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Alignment in Manam stress

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In analyzing the interaction of word stress and cliticization in Manam, Halle and Kenstowicz (1991; =HK) propose that stress is assigned first to the word; and that later, after cliticization, a new foot is created only if this can be done without destroying the existing foot structure. There are two essential aspects to this approach: a derivational framework with multiple rounds of foot construction; and the Free Element Condition (=FEC; Prince 1985), which prevents the second round from overwriting the results of the first. I argue here that a proper analysis of Manam stress requires abandonment of the first assumption, rendering the FEC superfluous. I develop an analysis within the framework of Optimality Theory (Prince and Smolensky 1991, 1993) based on the alignment of metrical feet with the edges of morphologically defined constituents, which avoids the empirical and explanatory inadequacies of HK's account.

The paper is organized as follows. I present in §1 HK's analysis of primary stress, then show in §2 that it cannot account for the facts of secondary stress. In §3 I move on to the interaction of clitics with words that have, and those that do not have, a final extrametrical syllable. In §4 I show that two derivational stages are not required to account for these interactions. I discuss in §5 special "shifted" stress patterns and provide a natural constraint-based analysis in which the lack of multiple derivational stages is a material advantage. A summary of the analysis and a conclusion are provided in §6.[*]

1. Primary stress

In Manam primary stress normally falls on a heavy ultima (1a), otherwise on the penult (1b,c). Heavy rimes consist of VN and VV (see §5.3). Roots are shown here in boldface.

(1)	a.	**máŋ**	'bird' 52	i-**maŋím**	'it is sour' 144
		ʔatéŋ	'carton' 210	**pura**-ŋá-m	'your arrival' 250
		u-**ʔáŋ**	'I ate them' 102	ta-**ʔabúŋ**	'we will gather them' 95
		anúa	'village' 262	**aléa**	'month' 273
	b.	**pátu**	'stone' 51	**amerí?a**	'America' 473
		wabúbu	'night' 595	**ruaŋá**-gu	'my friend' 273
		ta-**yaobóli**	'let's smile' 117	ʔu-**lele**-ʔáma	'you looked for us' 125
	c.	**mómbʷa**	'victory leaf' 52	m-**itiʔíŋ**-ʔo	'I will show (it) to you' 124
		ʔanán-da	'ours' 85	i-**enó**-ŋ-ʔo	'it exists for you' 507

HK restrict their attention to primary stress; see §2 for discussion of secondary stress. The pattern in (1) is disrupted by certain suffixes, termed "AP suffixes" by Lichtenberk (1983:54).

(2)	-a	1sg object	-o	'on'
	-i, -Ø	3sg object	-ru	dual
	-Ø	3sg adnominal	-to	paucal
	-di	3pl adnominal or object	-re	assertive

[*] Manam is an Austronesian language spoken on the islands of Manam and Boesa off the north coast of Papua New Guinea. Data come from the extensive grammar by Lichtenberk (1983), and are marked here by the page number; a few additional forms generously provided to me by Frank Lichtenberk are indicated with FL. Earlier metrical treatments of Manam include Chaski 1985, Ito 1989, and Halle 1990. Working versions of this paper were presented at the University of Massachusetts, Amherst, and at Rutgers University. I would like to thank Akin Akinlabi, Eric Baković, Abby Cohn, Laura Downing, Jane Grimshaw, Morris Halle, Larry Hyman, Bill Idsardi, Sharon Inkelas, Junko Itô, John McCarthy, Alan Prince, and Lisa Selkirk for their comments there and elsewhere, as well as anonymous LI reviewers; I am also grateful to Gillian Sankoff for discussions of Tok Pisin stress. Any errors are, of course, my own.

-ma	1st exclusive adnominal	-la	limiter
-lo	"general" suffix	-ra	assumption, distal, quotative, thematizer

AP suffixes are underlined. When one of these suffixes occurs word-finally, a heavy penult yields penultimate stress (3a), and a light penult results in antepenultimate stress, hence the term "AP" (3b).

(3) a. i-**ʔínt**-a 'he pinched me' 124 — ne-**mín**-to 'your' 201
matá-n-lo 'in your eye' 56 — i-**tiʔín**-di 'he showed them' 160
i-**rapuŋ**-ʔamín-ru 'he waited for you (two)' 125

b. i-**léle**-a 'he looked for me' 55 — **mánam**-o 'on Manam island' 32
tína-ma 'our mother' 55 — **sánde**-o 'on Sunday' 541
daŋále-lo 'in Dangale' 497 — u-**píle**-ra 'I said' 55

HK treat these AP suffixes as idiosyncratic triggers of final-syllable extrametricality, situated in the following set of rules (HK's example (22)).

(4) a. All and only syllable heads are stress-bearing (projected on line 0).
b. Accent (assign line 1 asterisks to) closed syllables.
c. Final syllables are extrametrical (restricted to lexically marked suffixes).
d. On line 0 construct binary left-headed constituents from right to left and assign line 1 asterisks to the heads.
e. On line 1 construct unbounded right-headed constituents and assign a line 2 asterisk to the heads.

These rules (a-e) are illustrated in the derivations below.

```
(5) a.    *  *  *        * * *      *  *  *  *      *  *  *  *
         ta ʔa buŋ      wa bu bu    u pi le ra      i ti ʔin di

    b.          *                                           *
          *  *  *                                     *  *  *  *
                           —            —
         ta ʔa buŋ                                  i ti ʔin di

    c.                                                      *
             —             —        *  *  * <*>     *  *  * <*>
                                    u pi le ra      i ti ʔin di

    d.    *     *        *  *       *  *            *     *
         (*  *)(*)      (*)(*  *)  (*)(*  *)<*>    (*  *)(*)<*>
         ta ʔa buŋ      wa bu bu    u pi le ra      i ti ʔin di

    e.          *           *          *                  *
         (*     *)      (*  *)     (*  *)          (*     *)
         (*  *)(*)      (*)(*  *)  (*)(*  *)<*>    (*  *)(*)<*>
         ta ʔa buŋ      wa bu bu    u pi le ra      i ti ʔin di
```

The basic elements of Manam stress in HK's approach, then, are left-headed feet constructed from right to left, quantity sensitivity, and lexically marked extrametricality.

2. Secondary stress

Noting that Lichtenberk omits secondary stresses from most of his transcriptions, HK restrict their attention to the placement of primary stress. This limitation seems appropriate given that their main interest lies in the effect of AP suffixes and clitics on the location of main stress (§3), but it leads to serious empirical problems. For while it is true that limitations in the data regarding secondary stress prevent us from deciding all issues definitively, there is nevertheless ample information to determine the basic pattern.

In this section I examine words for which Lichtenberk indicates secondary stress; the omission of an accent mark here is to be taken as meaningful. The following words, organized by number of moras, illustrate the general pattern of secondary stresses.[1]

(6)	a.	**tanépʷa**	'chief' 81	**morúŋa**	'all' 23
		ˀ**uŋ**-ída	'our ears' 81	ˀ**odé**ˀ**a**	'then' 17
		u-**zém**	'I chewed them' 30		
	b.	**wàu-wáu**	'new' 81	**mòmbʷa**-tína	'real victory leaf' 64
		ˀ**òadé**ˀ**a**	'then' 17	ì-**moná**ˀ**o**	'he ate' 24
		bòazíŋa	'hole' 24	ì-**bo**ˀ**áu**	'it is bent' 24
		mòarúŋa	'all' 23		
	c.	**tanèpʷa**-tína	'real chief' 63	i-**mòaná**ˀ**o**	'he ate' 24
		y-**un**-à-u-tína	'he hit me a lot' 80	i-**bòa**ˀ**áu**	'it is bent' 24
		i-**mòatúbu**	'it is heavy' 17	i-**rà**-ˀamíŋ	'it is bad for you' 74

In a trisyllabic word without heavy syllables, the initial syllable carries no secondary stress (6a); this shows that the output *wàbúbu* in (5e) is incorrect. Consequently, HK propose that "conflation of lines 1 and 2 applies in the cyclic block of rules" (p. 471).

(7) a. *Output of basic stress rules (5e)*

```
       *
   *   *
  (*)(*   *)
  wà bú bu
```

b. *Conflation*

```
       *
   *  (*   *)
  wa bú bu
```

This conflation removes the degenerate foot, which in their theory will not be recreated because the **crossover effect** prevents a parsing rule (right-to-left in (4d)) from crossing over an already-present constituent (i.e. the foot on /bubu/). The result, then, is correct *wabúbu*. But the secondary stress patterns in (6c) require a right-to-left parse, continuing from the foot which marks main stress. For HK the only possible source of secondary stress on a light syllable is a subsequent left-to-right parse (HK, fn. 2). Since this analysis predicts forms like **tànepʷa-tína*, it fails empirically.

The absence of a secondary stress on the first syllable in (6a,c) shows that degenerate (monomoraic) feet are avoided in Manam. These initial syllables are stressless not due to conflation of all secondary stresses, but to simple avoidance of degenerate feet. The problematic assumption in HK's treatment, which follows Halle and Vergnaud (1987), is that parsing is exhaustive. The evidence presented here strongly favors an analysis in which the regular parsing algorithm does not create degenerate feet in the first place; in such a framework there is no need for conflation, and the attendant complications disappear. This confirms the conclusions of a number of recent approaches which permit nonexhaustive footing (e.g. Hayes 1987, 1995, Kager 1989, Idsardi 1992). As we will now see, however, degenerate feet are crucial for other aspects of HK's analysis.

3. Suffix-clitic interaction

The phenomenon of primary interest to HK is the interaction of the stress pattern outlined so far with a set of four clitics (Lichtenberk 1983:66).

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[1] Several alternate forms are included in (6), e.g. *mòarúŋa* ~ *morúŋa*, *i-bòaˀáu* ~ *ì-boˀáu*. The members of each pair are related by optional deletion of /a/ in the sequence /oa/. The important point is that foot structure is computed on a representation which excludes the /a/, and thus the alternates serve as distinct examples of iterative metrification.

(8) =ˀi 'or'
=ˀa focus marker
=be 'and', focus marker
=ŋe 'this', resumptive pro-form

When added to a word without extrametricality, these clitics have no effect on stress placement, and in fact pattern superficially like the AP suffixes.

(9)	ˀu-**dóʔ**-i=ˀi	'you took them or' 67
	ŋái=ˀi	'he or' 396
	wabúbu=ˀa	'night (focus)' 67
	súru=be	'soup and' 67
	di-**goŋ-góm**=be	'they are performing sketches and' 198
	toánda=be	'long ago (focus)' 387
	di-**múle**=ŋe	'when they returned' 67
	da-**máte**=ŋe	'if it died' 532

When a clitic is added to a word ending in an AP suffix, however, we find penultimate stress on the larger domain: stress falls on the syllable which would be extrametrical if it were peripheral.

(10)	ˀu-**doʔ**-í=ˀi	'you took it or' 67
	baga-ló=ˀa	'from the mainland (focus)' 478
	ŋau-lá=ˀa	'only I (focus)' 67
	wabuna-ló=be	'in the morning (focus)' 358
	zuŋʔaʔ-á=be	'he hid me and' 426
	di-**taraʔaʔat**-í=ŋe	'after they cut it off' 67

HK analyze the clitics as noncyclic suffixes which, like the AP suffixes, trigger a rule of extrametricality; this accounts directly for the equivalence between AP suffixes and clitics in (9). The application of stress rules in the noncyclic block is constrained by the FEC not to change structure which is already present in the representation, created by the previous application of constituent construction in the cyclic block of rules.

```
(11) a. Cyclic stress rules        *  *                *
                                  (*)(*  *)           (*  *)<*>
                                  wa bu bu            ba ga lo

     b. Cliticization              *  *                *
                                  (*)(*  *)<*>        (*  *) * <*>
                                  wa bu bu ˀa         ba ga lo ˀa

     c. Noncyclic stress rules        *                      *
                                   *  *                *     *
                                  (*)(*  *)<*>        (*  *)(*)<*>
                                  wa bú bu ˀa         ba ga ló ˀa
```

Since only in the case of *bága-lo* is there an AP suffix, only that word has, after cliticization alters peripherality, a free (unfooted) syllable which can be parsed by the noncyclic rules as a monomoraic foot. So while degenerate feet make false predictions for secondary stress (§2), they are crucial in HK's treatment of clitics. While it is certainly possible to modify the derivational analysis to exclude degenerate feet, I turn now to a constraint-based analysis which avoids degenerate feet and sets the stage for a superior account of stress shift phenomena, treated below in §5.

4. An Optimality Theoretic account

The following analysis is formulated in the framework of Optimality Theory (=OT; see Prince and Smolensky 1991, 1993, McCarthy and Prince 1993a,b), a constraint-based approach to phonological well-formedness. I assume basic familiarity with the theory and its formalisms.

4.1. Basic foot structure

Three constraints fundamental to the analysis of Manam stress are given below; they are similar to well-formedness conditions in traditional metrical phonology.

(12) FTFORM (Trochaic) Foot → s w (Feet are left-headed, or trochaic.)

FTBIN Feet are binary under moraic or syllabic analysis.

PARSESYL Syllables are parsed by feet.

FTBIN dominates PARSESYL to ensure that no degenerate feet are created: it is more important that a foot contain at least two moras than that all syllables be footed. The constraint FTFORM is never violated: there are no iambs in Manam. This means that the constraint is undominated, and I omit from explicit consideration potential candidates which violate it.

To capture the basic stress facts of Manam, we need two alignment constraints (McCarthy and Prince 1993a, Itô and Mester 1994). ALIGNFT aligns the right edge of a foot with the right edge of the prosodic word (PrWd): this mimics the effect of right-to-left foot construction, since feet will pile up at the right edge. ALIGNHD aligns the right edge of the word with its head, the foot which encodes main stress; this mimics the effect of End Rule Right.

(13) ALIGNFT AlignR (Foot; PrWd).
ALIGNHD AlignR (PrWd; Hd(PrWd)).

PARSESYL must dominate ALIGNFT to make footing iterative: although all feet but the rightmost violate the alignment constraint to some degree, this violation is forced by the need to parse the syllables under those feet. Foot constituency is indicated by parentheses.

(14)

	FTBIN	PARSESYL	ALIGNFT	ALIGNHD
a. (tà)(nèp^wa)(tína)	*!		σσσ, σσ	
b. ☞ ta(nèp^wa)(tína)		*	σσ	
c. ta(nép^wa)(tìna)		*	σσ	σ!σ
d. (tàne)p^wa(tína)		*	σσσ!	
e. tanep^wa(tína)		**!*		

These constraints are sufficient to generate the basic pattern of primary and secondary stresses. See §5.4 below for more on the ranking of ALIGNHD.

4.2. Extrametricality

For the AP suffixes, I assume that the final syllable, while unfooted, is licensed by the prosodic word. Thus an 'extrametrical' syllable is linked directly to the word, as is any syllable which cannot be footed due to FTBIN (Prince and Smolensky 1993, McCarthy and Prince 1993a, Selkirk 1995).

(15) a. [(tí na $)_{Foot}$ ma $]_{PrWd}$

b. [u (pí le $)_{Foot}$ ra $]_{PrWd}$

These structures violate ALIGNFT (as well as ALIGNHD), and their acceptance as optimal must be forced by some other constraint. The basic type we require is NONFINALITY, stated by Prince and Smolensky (1993:57) as "No prosodic head of PrWd is final in PrWd." I construe this as an "anti-alignment" constraint, which in Manam refers specifically to suffixes of the AP class.[2]

(16) *ALIGNAP *AlignR (AP suffix; Foot)

A violation is assessed for any foot which right-aligns with an AP suffix. By minimal violation of ALIGNFT, the final foot is displaced by a single syllable (19a,c).

This particular formulation accounts easily for the two AP suffixes which have no segmental content: the 3sg adnominal and 3sg object, treated by Lichtenberk as a zero suffix -*Ø*.[3] These lead to the extrametricality of the final syllable of the stem to which they are attached, so that the morphological difference is realized purely in the placement of stress.

(17) a. **paŋána** 'head' 265
páŋana-Ø 'his head' 265
b. **balígo** 'grass skirt' 333
báligo-Ø 'her grass skirt' 261
c. da-**ʔáŋ** 'they will eat them' 543
dá-**ʔaŋ**-Ø 'they will eat it' 95

When the AP suffix is an empty string, the two morphological boundaries $]_{Root}]_{AP}$ can be interpreted as simultaneous. In a word such as *[[baligo]Ø]*, a foot right-aligned with the prosodic word is also right-aligned with both the root and the zero suffix. This means that *ALIGNAP as formulated in (16) will automatically have the effect of excluding the root-final syllable from foot structure.

(18) a. [[(bá li) go $]_{Root}$ $]_{AP}$
b. [[(dá) ʔaŋ $]_{Root}$ $]_{AP}$

It is these forms which prevent the use of a positive alignment constraint such as Align(AP suffix, L; Foot, R): that would work properly for simple cases such as *(tína)+ma*, but is ineffectual where the AP suffix is null, predicting for example **ba(lígo)+Ø*. The negative (anti-) alignment formulation in (16) makes exactly the correct predictions for both types of AP suffixes.

As illustrated in the following tableaux, *ALIGNAP must dominate PARSESYL in order to be effective (19a,b). The right edges of the AP suffixes *-ra* and *-Ø* are indicated by the bracket].

		*ALIGNAP	FTBIN	PARSESYL	ALIGNFT
(19)	a. ☞ u(píle)ra]			**	σ
	b. (ùpi)(léra)]	*!			σσ
	c. (úpi)lera]			**	σσ!
(20)	a. ☞ (dá)ʔaŋ]		*	*	σ
	b. da(ʔáŋ)]	*!		*	
	c. (dà)(ʔáŋ)]	*!	*		σ

[2] Anti-alignment constraints are proposed by Buckley (1994), Downing (1994), and Inkelas (1994). Itô and Mester (1994) mention the possibility of such constraints but leave the matter open. For further discussion of NONFINALITY constraints — which do not necessarily refer explicitly to alignment — see Cohn and McCarthy 1994, Hung 1994, and Spaelti 1994.

[3] Lichtenberk includes certain other zero suffixes in his representations, e.g. 3pl object (cf. (17c)) and benefactive, but since they have no phonological effect, I do not indicate them here.

The ranking *ALIGNAP » FTBIN is motivated by the treatment of disyllables, which are not exceptions to extrametricality (20a). Notice that OT permits us to limit degenerate feet to quite restricted contexts, such as this disyllable with a zero AP suffix.[4]

4.3. Clitics

The cliticized words in (9) resemble AP suffixes insofar as the final syllable of the string — in this case the clitic — is unfooted. I claim, however, that the source of the unfooted syllable is different. The constraint *ALIGNAP proposed above in (16) is a specific instantiation of the general intuition of NONFINALITY: metrical structure is prohibited in word-final position. This formalization, in turn, is consistent with the traditional notion of extrametricality, by which (typically) a syllable is excluded from the domain of metrification. An extrametrical syllable is normally part of the lexical word over which feet are constructed. It would be expected to fall inside the foot structure, but does not, and its exclusion requires a special account.

Clitics, on the other hand, are not part of the lexical word — the normal domain of foot construction. They are prosodically defective words, or syntactic affixes, and are fundamentally outside that lexical domain. As a result of their morphosyntactic separateness, they generally exhibit prosodic separateness as well. In a language such as English, where clitics do not normally alter the stress pattern of the word on which they lean, a possible analysis is that they are located outside the prosodic word which corresponds to the lexical word (Selkirk 1995). This can be formalized as an alignment constraint which requires the clitic to be preceded by a right word boundary, as in ... $]_{PrWd}$ *clitic*. In Manam, the division is not so clean, since the clitic does under special circumstances affect the placement of stress, as illustrated in (10). I propose that Manam clitics are defined by an alignment constraint which excludes them from prosodic structure; what makes them different from English clitics is that the constituent from which they are excluded is not the word but the foot.

(21) CLITIC Align(Clitic, L; Foot, R)

This constraint requires that the clitic be preceded by a foot. In most cases, FTBIN ensures that the clitic is thereby excluded from all foot structure: by itself, the monomoraic clitic cannot form a proper foot, and it cannot be joined in a foot with the preceding syllable due to the alignment imposed by CLITIC.[5]

CLITIC must be ranked over ALIGNFT in order to have any effect. Since FTBIN dominates PARSESYL (cf. (14a,b)), no degenerate syllable is created on the clitic. The left edge of the clitic is marked by [.

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[4] Another case of a degenerate foot is ***ŋá***-*ra*-*di* 'those' 333, the only word I have found with two adjacent AP suffixes. HK wrongly predict it should behave like an AP plus a clitic, as in (10), to make ****ŋa***-*(rá-di)*. In the present approach, *ALIGNAP » FTBIN produces ***(ŋá)***-*ra*-*di*, with the correct stress. Degenerate feet are also required for monomoraic stressed words such as *ú* and *gá* (Lichtenberk 1983:52). Finally, certain morphemes have an inherent stress on a final light syllable, which often necessitates a degenerate foot (e.g. ***ura***-*má* 'it's the rain' 364, ***sarará*** 'squat' 56). I assume constraints such as ALIGNR(*ma*; Hd(Foot)) which dominate FTBIN, forcing e.g. *(ùra)(má)*.

The lack of a foot which intervenes between the syllable and word is treated as a violation of PARSESYL, since this constraint refers specifically to the parsing of a syllable by the **foot**. It is possible to 'explode' this constraint into more specific subparts, such as PARSESYL(Foot) and PARSESYL(PrWd), where the latter can still be satisfied when the foot is absent (cf. Selkirk 1995). I tacitly assume a high-ranked constraint with this effect and will not consider candidates in which a syllable is not parsed by any higher prosodic structure.

[5] HK treat the clitics as different from plain suffixes in two ways: they are extrametrical (like AP suffixes), and they trigger noncyclic rules (unlike AP suffixes). They must use extrametricality to prevent a degenerate foot from being created over the clitic in a word like *wabúbu=ʔa*. Since I avoid degenerate feet on general grounds (by FTBIN), in the OT analysis the clitic can be visible and yet remain unparsed; the difference between clitics and plain suffixes is reduced to one dimension, their alignment constraints.

(22)

	CLITIC	FTBIN	PARSESYL	ALIGNFT
a. ☞ wa(búbu)[ʔa			**	σ
b. (wàbu)(bú[ʔa)	*!			σσ
c. wa(bùbu)[(ʔá)		*!	*	σ

I assume that the clitic is adjoined directly to the prosodic word, without intervening foot structure, exactly as shown for the AP suffix in (15). In every form examined in this paper, there is a single prosodic word in the representation; to avoid clutter, the right edge of PrWd — to which ALIGNFT makes reference — is not indicated in the candidates.[6]

We come now to the special case in which the clitic affects the placement of stress. The forms in (10) present a basic conflict between the constraints associated with the AP suffix and the clitic. *ALIGNAP demands that there not be a foot right-aligned with an AP suffix; but this is precisely where CLITIC demands a foot. The data in (10a,c) show that it is *ALIGNAP which wins, since the form that surfaces has no foot aligned with the AP suffix — that is, it obeys *ALIGNAP but not CLITIC. This means, of course, that *ALIGNAP must dominate CLITIC. (Recall that] is the right edge of the AP suffix, and [is the left edge of the clitic.)

(23)

	*ALIGNAP	CLITIC	PARSESYL	ALIGNFT
a. ☞ wa(bùna)(ló][be)		*	*	σσ
b. wa(búna)lo][be		*	**!*	σσ
c. (wàbu)(nálo)][be	*!		*	σσσ, σ

Given the analysis developed to account for the independent behavior of AP suffixes and clitics, the resolution of the basic conflict presented by words which include both types of morphemes tells us immediately the relative ranking of the two constraints.[7] Two stages of metrification are not necessary: words with both an AP suffix and a clitic simply entail a conflict between two alignment requirements, which can be resolved in parallel. This conclusion is important because, as we will see, a thorough examination of Manam stress raises significant problems for a serial analysis.

5. Stress shift

There are two contexts in Manam where stress is antepenultimate in the absence of an AP suffix or clitic; collectively I call them "stress shift".

5.1. The data

The first context for stress shift is roots where the three final syllables consist of a closed syllable followed by two lights: *(C)VC.CV.(C)V*. Rather than the expected penultimate stress as in (1b), we find antepenultimate stress on the closed syllable.

(24)

émbeʔi	'sacred flute' 61
óŋʔau	'Onkau (name)' 261
sándeʔa	'Sandeka (name)' 252
múŋguma ~ úŋguma	'person from a village other than one's own' 85
númbia	'Nubia (village)' 86
silíŋgisi	'T-shirt' 454 (Tok Pisin *sínglis*)
ʔaúnsolo	'elected village leader' 620 (Tok Pisin *káunsol*)

[6] Mutatis mutandis, the domain of footing could also be the "clitic group" (Nespor and Vogel 1986).

[7] Under the opposite ranking CLITIC » *ALIGNAP, form (23c) would win. This would be the outcome in a language where, from a derivational point of view, basic stress assignment follows cliticization.

This pattern is found in secondary stress as well.

(25) **èmbeˀi**-tína 'real sacred flute' 64, 82

The second context for unexpected antepenultimate stress is on a light syllable followed by two other light syllables, the first of which has no onset: *(C)V.V.(C)V*. In other words, the stress seems to shift from the penult onto the immediately preceding vowel.

(26)	a.	**móasi**	'song' 24	**góai**	'star' 51
		yáuya	'good (sg)' 294	**ˀáiˀo**	'you' 112
		bóesa	'Boesa island' 312	**móede**	'chiefly woman' 82
		táua	'trading partner' 22		
	b.	**balíau**	'Baliau (village)' 579	**sabóari**	'callophyllum tree' 278
		tamóata	'man' 294	**aláuri**	'later' 116
	c.	**áuta**	'inland' 572	**áira**	'when' 408
		áine	'woman' 71		

As with heavy-light shift, the pattern holds for secondary stress also.

(27) a. **yàuya**-tína 'very good (sg)' 80
gòai-tína 'real star' 63
ròa-na-tína 'her real husband' 82
b. i-**pòasagéna** 'he is tired' 24
di-**sòaˀi**-nóˀa 'they sat down first' 63

The two stress-shift patterns both result in stress one syllable further left than expected, and hold equally of secondary and primary stresses. An additional, and crucial, shared property is that both fail to occur when the trisyllabic sequence is followed by an AP suffix or a clitic.

(28) a. **oŋˀáu**-la 'Onkau himself' 309
i-**zampósaˀ**-i 'he broke it' 382
di-**mambúaˀ**-i 'they finished it' FL

b. **oŋˀáu**=ˀa 'Onkau (focus)' FL
embéˀi=be 'sacred flute and' 71

(29) a. **ˀaíˀo**-la 'only you' 271
tamoáta-di 'people' 279
poáˀe-di 'their sores' 504
aúta-lo '(towards) inland' 573
di-e-**boábu**-ru 'they clasped each other' 212
g-**iáriŋ**-i 'fence the garden!' 127
u-**taúam**-i 'he became my trading partner' 22
di-**zalaóno**-di 'they blocked their way' 336

b. **ˀaíˀo**=ˀa 'you (focus)' 271
aíne=ŋe 'this woman' 22
moéde=be 'chiefly woman and' 340
moáne=be 'man and' 365
tamoáta=ŋe 'this man' 462
i-**soáˀi**=be 'he sat and' 71

In at least one word, we can see that secondary stress continues iteratively to the left of the non-shifted foot.

(30) amà-**soáˀi**=be 'you will sit and' 82

This datum indicates that all feet in the word are sensitive to whether or not shift of the primary stress occurs.

5.2. HK's approach

In their analysis of stress shift, HK make reference to clashing stresses: a noncyclic rule removes a word-final branching foot when preceded by a level 1 asterisk (HK, fn. 3).

(31) *Trisyllabic Destressing*

```
  *                   *              line 1
(* *)   →    * *  /   * __ ]w        line 0
```

The stipulation that only a word-final foot destresses is included to prevent application when the trisyllabic sequence is followed by an AP suffix or a clitic. For heavy-light shift, the rule applies to the output of normal footing.

(32) a. *Footing*

```
 *   *                 *   *
(*)(*   *)            (*)(*   *)<*>
em be ʔi ]w           èm bé ʔi be ]w
```

b. *Trisyllabic Destressing*

```
 *
(*) *   *                  —
ém be ʔi ]w
```

Taking advantage of Destressing, HK propose an additional rule which places a level 1 asterisk on the first of two adjacent vowels.

(33) *VV Stressing*

```
              *
* *           * *
V V    →      V V
```

The addition of this asterisk, which often forces creation of a degenerate foot, can then feed Trisyllabic Destressing, deriving stress shift precisely when the two vowels in question are followed by a light syllable in word-final position.

(34) a. *VV Stressing*

```
*                    *
* * *                * * * <*>
ʔa i ʔo              ʔa i ʔo be
```

b. *Footing*

```
 *   *                 *   *
(*)(*   *)            (*)(*  *)<*>
 ʔà  í ʔo ]w           ʔà  í ʔo be ]w
```

c. *Trisyllabic Destressing*

```
 *
(*) *   *                  —
 ʔá  i ʔo ]w
```

In addition to its ad hoc nature — the asterisk is inserted only to trigger Destressing — this approach raises complications in words with an onsetless **heavy** syllable following a vowel, where stress does not shift.

(35)	**biéŋ**	'Bieng (Catholic mission station)' 548, FL
	ʔamoáŋ	'old (person)' 144
	di-**ʔaiboáŋ**	'they are hard' 550
	ʔaiboán-<u>di</u>	'(their being) strong' 346

VV Stressing will create a degenerate foot on the first of the two vowels here, e.g. *bìéŋ*. Trisyllabic Destressing is blocked by the lack of a following branching foot, correctly preventing stress shift; but the secondary stress created by VV Stressing must be eliminated, leading to the general Conflation problem discussed above (e.g. *ˀàmoáŋ*, but *biéŋ*, not **bìéŋ*).

Further, as seen in (25) and (27), stress shift occurs with secondary stresses, which are not in word-final position; thus Trisyllabic Destressing is not empirically adequate. Replacing "word" with "root" accounts for ***èmbeˀi**-tína*, but then the rule would wrongly apply in ***èmbéˀi**=be* and would still fail to account for *i-**pòasagéna***. The fundamental problem is that the word-edge is relevant not to the cases in which stress shift applies — for HK, where Destressing applies — but rather to those cases where stress shift is **blocked**. I argue that stress shift within the root is the normal case, blocked only by the more pressing demands of the suffixes and clitics; when these other demands are absent, as in *èmbeˀi-tína* and *i-pòasagéna*, shift is free to occur. The HK analysis treats stress shift as the special case, and this makes a fully adequate analysis of the Manam facts impossible. I turn now to a constraint-based analysis which avoids this problem.

5.3. A parallel approach

To account for stress shift within the OT analysis developed so far, I follow HK in interpreting heavy-light shift as the natural avoidance of stress clash.

(36) *CLASH — Clashing feet are prohibited.
WSP — Heavy syllables are stressed.

*CLASH must dominate PARSESYL to force omission of a foot. The well-motivated Weight-to-Stress Principle or WSP (Prince 1983, 1991, Prince and Smolensky 1993) ensures that the foot over the heavy syllable is the one which is preferred (37b,c).[8]

			WSP	*CLASH	PARSESYL	ALIGNFT
(37)	a.	(èm)(béˀi)		*!		σσ
	b. ☞	(émbe)ˀi			**	σσ
	c.	em(béˀi)	*!		*	
(38)	a.	(èm)(béˀi)(tína)		*!		σσσσ, σσ
	b. ☞	(émbe)ˀi(tína)			**	σσσσ
	c.	(émbe)(ˀíti)na			**	σσσσ, σ!

The rule of VV Stressing (33) is ad hoc and cannot be translated into a natural constraint. Instead, we must capture the special relationship between adjacent vowels. Following a suggestion made to me by John McCarthy, I treat cases of stress shift as the result not of special footing, but rather of special syllabification. Specifically, in the normal case adjacent vowels are syllabified together as diphthongs, motivated by the following well-known constraint.

(39) ONSET — Syllables must have onsets.

Under this assumption, the "shifted" stress is actually still on the penultimate syllable (though on the antepenultimate mora). In cases such as (40) below, the resulting heavy syllable has an onset, at the expense of PARSESYL. In (41), the heavy syllable does not have an onset, but the winning candidate has just one onsetless syllable (*au*) rather than two (*a.u*), and so is preferred.

[8] Clash can be found when stress shift is inapplicable (see §5.4): ***i-zùŋˀá**ˀ-i* 'he hid them' 52, FL; ***i-dàn-dàn**-la-láˀo* 'he keeps crawling away' 64. This indicates that WSP » *CLASH; see (50) below for a more complete ranking.

			ONSET	PARSESYL	ALIGNFT
(40)	a.	(tà.mo).(á.ta)	*!		σσ
	b. ☞	ta.(móa).ta		**	σ
(41)	a.	a.(ú.ta)	**!		
	b. ☞	(áu).ta	*		σ

ONSET must of course dominate whatever universal constraint would otherwise prevent diphthongs in the language, such as the ALIGN-V of Itô and Mester (1994).[9] Words like *biéŋ* in (35) necessarily violate ONSET since an undominated constraint prohibits the trimoraic rime VVN.

One special case remains, with three adjacent vowels as in *táua* and *balíau*. For these words, exactly one onsetless syllable is found in candidates (b) and (c) below, and by either PARSESYL or ALIGNFT we would expect the non-shifted foot in (b) to be optimal; but this is wrong.

			ONSET	PARSESYL	ALIGNFT
(42)	a.	ta.(ú.a)	**!		
	b. *☞	ta.(úa)	*	*	
	c.	(táu).a	*	*	σ!
(43)	a.	(bà.li).(á.u)	**!		σσ
	b. *☞	(bà.li).(áu)	*		σ
	c.	ba.(lía).u	*	*!*	σ

The difference between the candidates is that in non-shifted (b), the onsetless syllable is stressed, whereas in (c), which must win, it is unstressed. It appears that a stressed, or equivalently here a foot-initial syllable, has a more pressing need for an onset than does a stressless syllable. I capture this fact with a more particular version of ONSET.[10]

(44) FTONSET Foot-initial syllables must have onsets: AlignL (Foot; C).

---

[9] Lichtenberk (1983) does not identify any special pronunciation for the vowel clusters that I treat as diphthongs, suggesting that the segmental realization of vowels in Manam is the same for diphthongs (*áu.ta*) as for heterosyllabic clusters (*a.ú.ta.lo*). Plausibly, phonetic differences that may exist, for example in duration, were attributed by Lichtenberk to the distinct stress patterns rather than to syllabification. A reviewer points to an interesting analogy in the purely durational differences between prenasalized stops and (heterosyllabic) nasal-stop clusters; see Ladefoged and Maddieson 1996:119-123 for a valuable survey.

Stressed VC before another stressed syllable counts as a clash, e.g. **(èm)(béʔi)* in (37a), but stressed VV does not: cf. *(bòa).(zí.ŋa)* in (6b), not **(bóa).zi.ŋa*. I attribute this difference to the role of moraic structure in determining adjacency of stressed elements: in *V̀V.CV́* a nuclear mora separates the stresses and creates a trough at that level of structure. For example, in the "mora layers" approach of Hayes (1995:299f):

```
Clash:   x  x        Trough:   x  x
         μ  μ                  μμ μ
         μμ μ                  μμ μ
         VC.CV                 VV.CV
```

See also Kager 1993 for relevant discussion. I rely on the same difference in permitting the disyllabic foot (VC.CV) in *(émbe)ʔi*, but not *(VV.CV) in *(áu)ta*. Essentially, the foot must be bimoraic on at least one layer of the representation. If the footing *(áu.ta)* were possible, there would be no way to account for the blocking of VV shift under suffixation, since that form matches *a(ú.ta)* in right-alignment (see §5.4). It is possible to impose a strict bimoraic limit and prohibit even (VC.CV), but this would leave a lapse of two unfooted syllables in *(ém)beʔi*, which I prefer to avoid.

[10] Cross-linguistic support for this constraint can be found in Downing 1994 and Goedemans 1994. Another, equally plausible approach is to generate the equivalent of left-to-right syllabification using syllable alignment (see Mester and Padgett 1994).

Any syllable which violates FTONSET also violates more general ONSET (cf. Prince and Smolensky 1993:81f).

(45)

	FTONSET	ONSET	PARSESYL	ALIGNFT
a. ta.(ú.a)	*!	**		
b. ta.(úa)	*!	*	*	
c. ☞ (táu).a		*	*	σ

Where FTONSET cannot be satisfied, ONSET still plays a crucial role (cf. (41)).

(46)

	FTONSET	ONSET	ALIGNFT
a. a.(ú.ta)	*	**!	
b. ☞ (áu).ta	*	*	σ

Since FTONSET is relevant only to the limited type illustrated in (45), I exclude it from tableaux below.

In both types of stress shift — heavy-light and VV — a particular ranking of natural constraints (regarding clashes and onsets) gives us the required output forms. This in itself is an improvement over the ad hoc rule of VV Stressing, and also avoids the empirical problems that follow from Trisyllabic Destressing. It is important to emphasize that only in a surface-constraint analysis can this interaction of syllabification and foot structure be captured without substantial rearrangement of prosody during the derivation.[11] I now examine how this parallel approach accounts elegantly for the lack of stress shift before an AP suffix and a clitic.

5.4. Blocking of stress shift

I argue that the blocking of stress shift is due not to a following AP suffix or clitic per se, but rather to **any** following suffix (broadly construed to include clitics). The following data, which HK do not discuss, show that stress shift is blocked in the presence of non-AP suffixes.

(47) u-**zuŋˀáˀ**-i 'I hid them' 484
sagode-n-tína 'you are really well-mannered' 319
aro-n-túˀa 'right in front of you' 355
u-ˀ**an**-dói 'I have eaten some' 208

(48) **sarepi**-áne 'with a sickle' 355
go-**doˀ**-i-óti 'take them seaward!' 51
tauá-gu 'my trading partner' 280
aé-gu 'my leg' 16
roá-gu 'my wife' 357
ˀ**alaúr**-a 'sewing' 556
ŋa-**eluáˀ**-i 'he will bring them' 559

What is the generalization over all the data where stress shift is blocked? Simply that when a suffix (or clitic) is present in the representation, leftward shift of the main stress is not permitted. Yet when similar phonological structure is present in a word without a suffix — one ending in a root — leftward

[11] Idsardi (1992) and Halle and Idsardi (1995) develop a theory in which a foot edge can be inserted in the representation independent of the head of the foot, and of the other edge of the same foot. The effect is very much like an alignment constraint. For example, the CLITIC constraint (21) is similar to specifying a right foot boundary before the clitic. However, this constraint and others are violable, which does not translate into the representational approach. Further, it appears that in the Halle-Idsardi framework, because it is serial, ad hoc rules would still be necessary to generate the stress-shift patterns, rather than deriving them directly from constraints such as ONSET and *CLASH.

shift (as forced by *CLASH or ONSET) is permitted. What this means is that suffixes enforce right-alignment more vigorously than do roots.

Based on lexical-ordering phenomena in several languages, Buckley (1995, 1996) proposes the formalism of **constraint domain**: a substring of the representation in which a slightly different constraint ranking can hold.[12] The relevant constraint here is ALIGNHD (13), which as noted above is the equivalent of End Rule Right. In Manam, we need a higher ranking of ALIGNHD for suffixes than for roots. Specifically, the following ranking obtains.

(49) ALIGNHD$^{\{suf\}}$ » *CLASH, ONSET » ALIGNHD$^{\{rt\}}$

There is one constraint ALIGNHD$^{\{suf\}}$ which holds of right word-edges corresponding to suffixal (or clitic) material, and it outranks *CLASH and ONSET; while another constraint, ALIGNHD$^{\{rt\}}$, holds of right word-edges corresponding to root material, and ranks below the two stress-shift constraints.[13]

Contrast the outcomes for root-final /**embeʔi**/, which permits heavy-light shift, with suffix-final /u-**zuŋʔaʔ**-i/, without shift. The difference follows from the fact that only the second word is subject to higher-ranking ALIGNHD$^{\{suf\}}$.

		ALIGNHD$^{\{suf\}}$	WSP	*CLASH	ALIGNHD$^{\{rt\}}$
(50)	a. ☞ (émbe)ʔi				σ
	b. em(béʔi)		*!		
	c. (èm)(béʔi)			*!	
(51)	a. u(zúŋʔa)ʔi	σ!			
	b. ☞ u(zùŋ)(ʔáʔi)			*	

The same point can be made for VV shift, with intermediate ranking of ONSET. Examples are root-final /**ʔaiʔo**/ and suffix-final /**ʔalaur**-a/.

		ALIGNHD$^{\{suf\}}$	ONSET	ALIGNHD$^{\{rt\}}$
(52)	a. ☞ (ʔái)ʔo			σ
	b. ʔa(íʔo)		*!	
(53)	a. ʔa(láu)ra	σ!		
	b. ☞ (ʔàla)(úra)		*	

The blocking of stress shift before an AP suffix or a clitic is empirically different, since as we have seen the main stress is not fully at the right edge of the word. This fact follows from the necessary ranking of ALIGNHD$^{\{suf\}}$ below *ALIGNAP and CLITIC, in order for the latter constraints to have any effect. I illustrate with the VV shift examples /**ʔaiʔo**-<u>la</u>/ and /**ʔaiʔo**=ʔa/ from (29). ALIGNHD$^{\{rt\}}$ is omitted here as irrelevant.

[12] Other evidence for distinct ranking of the same constraint for roots and suffixes is given by McCarthy and Prince (1994, 1995:364f). They claim that root faithfulness must always dominate affix faithfulness; since the Manam constraints encode alignment rather than faithfulness, it is not clear whether the ranking in (49) is a counterexample. McHugh (1993), however, argues that in Hausa faithfulness to underlying tones is stronger for suffixes than for roots. See also Itô and Mester 1995 and Orgun 1996 for discussion of related issues.

[13] It is clearly ALIGNHD, not ALIGNFT, which is relevant, since shift of a secondary stress is possible under suffixation, as shown in (25) and (27).

		*ALIGNAP	CLITIC	ALIGNHD{suf}	ONSET
(54)	a. (ʔái)(ʔóla)]	*!			
	b. (ʔái)ʔola]			σσ!	
	c. ☞ ʔa(íʔo)la]			σ	*
(55)	a. (ʔái)(ʔó[ʔa)		*!		
	b. (ʔái)ʔo[ʔa		*!	σσ	
	c. ☞ ʔa(íʔo)[ʔa			σ	*

The nature of CLITIC makes ALIGNHD unimportant in (55): CLITIC draws the foot edge close to the same place that ALIGNHD wants it, but prevents full satisfaction of ALIGNHD by requiring that the foot end before the clitic, one syllable before the end of the word. Substitution of *CLASH for ONSET in the tableaux will similarly derive forms such as *(òŋ)(ʔáu)-la* and *(òŋ)(ʔáu)=ʔa* (28).

Finally, a different sort of exception to VV shift is found between a root vowel and a preceding prefixal vowel.

(56) u-**íta** 'I saw them' 256
ʔu-**óro** 'you went inland' 357
i-**ádo** 'it is level' 218
i-**éno** 'it is located' 96

It is not, however, the simple fact of prefixation which leads to blocking.

(57) i-**búiri** 'it turned' 452
i-**sóaʔi** 'he sat' 24
di-**góala** 'they are bad' 281
di-**bóadu** 'they are able' 99
ŋa-**moararóaʔi** 'it will be abundant' 274

See also the secondary stress examples in (27). These data suggest an additional type of alignment constraint, between the root and the syllable.

(58) ALIGNROOT AlignL (Root; Syllable)

Similar constraints exist in a number of languages, with various effects (McCarthy and Prince 1993a). The effect here is to prevent the two heteromorphemic vowels from combining in a single syllable; clearly it dominates ONSET. It prevents VV shift in cases like /u-**ita**/, but (correctly) not in cases like /i-**buiri**/. For convenience the left root boundary is indicated by |.

		ALIGNROOT	ONSET
(59)	a. .(ú | i).ta	*!	*
	b. ☞ .u. | (í.ta)		**
(60)	a. ☞ .i. | (búi).ri		*
	b. .(ì. | bu).(í.ri)		**!

To sum up, Manam prefers "shifted" stress in general, but not at the expense of stronger requirements: right alignment of feet with suffixes, and left alignment of roots with syllables. In this analysis, the constraints ONSET and *CLASH define the preferred type of syllable and foot structure; it is only when a higher-ranked constraint imposes a contradictory requirement that these preferred foot structures cannot be created. But even then, the special nature of AP suffixes and clitics is maintained and prevents full rightward alignment.[14]

6. Conclusion

In any substantial Optimality analysis it is important to show that all the proposed constraint rankings are consistent. The diagram below combines the constraints given in the tableaux, with crucial rankings indicated by a connecting line.[15]

(61) *Constraint hierarchy for Manam*

	FTBIN			
*ALIGNAP	CLITIC		PARSESYL	ALIGNFT
	WSP	*CLASH		
	ALIGNHD$^{\{suf\}}$	ONSET	ALIGNHD$^{\{rt\}}$	
	ALIGNROOT			

There are of course other constraints which must be ordered relative to those in (61), but since they are not central to the analysis of stress in the language, they are not considered here.

In conclusion, I have argued for an analysis of Manam stress within Optimality Theory that dispenses with the intermediate stages required by HK and others. By eliminating these steps, we eliminate the concomitant unattested representations, and capture much more effectively the interactions of various pressures on the output forms. A central role is played by constraints which refer to the alignment of prosodic and morphological categories, confirming the importance of this family of constraints in phonological theory; the formulation of *ALIGNAP as a constraint against alignment supports the extension of this family to include anti-alignment. Since there is only one surface representation subject to constraints, the complications and false starts required in a derivational analysis are avoided and the Free Element Condition is unnecessary. Instead, OT permits us to attribute the blocking of stress shift to the effect of ALIGNHD, which holds more strongly for suffixes than for roots. In this way the use of well-motivated surface constraints makes possible an elegant analysis of the complex patterns of Manam stress.

[14] From the limited data available it appears that all verbs — or equivalently, all prefixed words — are exceptions to heavy-light shift, e.g. ***i-embéʔi*** 'he played a sacred flute' 52. The data in (57) show that VV shift is not thus restricted. Unfortunately, relevant examples are too sparse to permit a confident analysis.

[15] Rankings which follow redundantly from transitivity are omitted for the sake of clarity. The reader may consult the following losing candidates to verify the need for the rankings given: *ALIGNAP above FTBIN (20b), CLITIC (23c), ALIGNHD$^{\{suf\}}$ (54a); ALIGNHD$^{\{suf\}}$ above *CLASH (50b), ONSET (53a); ALIGNROOT over ONSET (59a); PARSESYL below FTBIN (14a), CLITIC (22b), *CLASH (37a), ONSET (40a); ALIGNHD$^{\{rt\}}$ below *CLASH (50c), ONSET (52b); PARSESYL above ALIGNFT (14e). For WSP » *CLASH, see footnote 8.

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