

GLOW 2005

CV Metathesis in Kwara'ae: Implications for a Theory of Stress

1 Introduction

- Kwara'ae (Austronesian: Southeastern Solomonian) has two speech registers, the Citation and Normal forms. These words are related by CV metathesis, a process in which $C_1V_1C_2V_2$ sequences in the Citation form are $C_1V_1V_2C_2$ sequences in the Normal form.
- All the data in this handout, except where noted, comes from Sophie Streeter, a native speaker of Kwara'ae, to whom I extend my deepest gratitude.¹

1.1 Purpose

- Provide a synchronic analysis of where and why CV metathesis occurs. I will argue that the Stress to Weight Principle motivates CV metathesis and that therefore it is the stress pattern that determines the locations of CV metathesis.
- Discuss some of the implications of this analysis.

1.2 Basic Paradigm

- CV metathesis may occur more than once in a single word. Underlined segments in the Citation form are metathesized in the Normal form.

(1)	Citation	Normal	
a.	' <u>ŋe.la</u>	' <u>ŋeal</u>	'child'
b.	fi.'ku. <u>da</u>	'hi. <u>ku</u> ad	'to gather them together'
c.	'ke. <u>ta</u> . <u>la.ku</u>	'keat. <u>lauk</u>	'my height'
d.	da.' <u>ro</u> .ʔa. <u>ni.da</u>	'daor.ʔa. <u>ni</u> ed	'to share them'
e.	'ra. <u>ʔe</u> .ra. <u>ʔe</u> .na. <u>ʔa</u>	'raeʔ. <u>rae</u> ʔ. <u>na</u> ʔ	'incline, slope'

- CVV syllables in the Citation form regularly fail to metathesize in the Normal form.

(2)	Citation	Normal	
a.	ko.' <u>re.a</u>	'ko. <u>re</u> a	'to marry'
b.	'mae. <u>la.ku</u>	'mae. <u>lauk</u>	'my death'
c.	'ta. <u>ʔi</u> . <u>ha</u>	'teiʔ. <u>ha</u>	'all'
d.	li.' <u>mau</u> . <u>mu.lu</u>	'li.mau. <u>mu</u> l	'your (pl) hands'

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- There is a third previously unnoticed allomorph, which I call the Focus Final form (this will be discussed extensively in §6).

(3)	Citation	Normal	Normal] _{focus}	
a.	'si. <u>na</u>	'si _̂ ɛn	'si _̂ ɛ.'na	'sun'
b.	bo.'be. <u>ʔa</u>	'bo.ɓeəʔ	'bo.ɓeə.'ʔa	'fat
c.	'ʔi. <u>hi</u> .te. <u>ʔi</u>	'ʔi'h.ɓeɪʔ	'ʔi'h.ɓeɪ.'ʔi	'bed'

- The Normal form is the speech register used in normal discourse.²
- The Citation form is the speech register used in traditional songs and for clarification.³ Gegeo and Watson-Gegeo (1986) write that these forms are also used in alternation in calling out routines (a ritualized, songlike speech style).

1.3 Reasons for a Synchronic Analysis

- **Robustness of the Paradigm.** Every word, including morphologically related words, has a pronunciation in the Normal and Citation form.

(4)	Citation	Normal		Citation	Normal	
a.	'su. <u>li</u>	'suil	'bone'	b. su.'li. <u>ku</u>	'su.ɓiuk	'my bone'
c.	'ʔo. <u>so</u>	'ʔo's	'a lie'	d. ʔo.'so. <u>ʔa</u>	'ʔo.ɓoəʔ	'guile'

- **Loanwords.** Loanwords also have undergone this transformation, which indicates that CV metathesis is productive.

(5)	Citation	Normal		Citation	Normal	
a.	'bi. <u>ta</u>	'bi _̂ t	'Peter'	b. 'ha. <u>re</u>	'ha _̂ r	'Harry'
c.	're. <u>sa</u>	're _̂ s	'razor'	d. 'be. <u>ba</u>	'be _̂ b	'paper'

- **Richness of the Base.** There are no C₁V₁C₂V₂ sequences in Normal surface forms. The grammar must transform underlying forms like /C₁V₁C₂V₂/ into legal surface forms.

2 Analysis

2.1 The Grid

- I follow previous researchers in maintaining that the stress pattern holds the key to the locations of CV metathesis (Laycock 1982, Blevins and Garrett 1998, Norquest 2001, Baird 2002).
- The Normal form speech register is quantity-sensitive.

– CV and GV syllables are light; everything else is heavy.

²The Normal form has also been called the short form (Sohn 1980) and the discourse form (Norquest 2001, 2003)

³The Citation form has also been called the long form (Sohn 1980), historical form (Simons 1977, Blevins and Garrett 1998), or underlying form (Sohn 1980, Gegeo and Watson-Gegeo 1986).

(6)	Final Syllable	Normal		(cf. Citation)
a.	CV	'ma.n.ta.ɿe	'to pity her, him or it'	'ma.na.ta.ɿa
b.	GVC	'ma.n.ta.ɿed	'to pity them'	'ma.na.ta.ɿda
c.	CGVC	'ba.b.li.liuk	'my cheek'	ba.'ba.li.li.ku
d.	CVGC	'ma.n.ta.lauk	'my thinking'	ma.'na.ta.la.ku
e.	CVVC	'si.s.hu.la'ʔ	'goosebumps'	si.'si.hu.la.ʔa
f.	CGV	'boel.bo.lea	'crazy'	bo.'le.bo.le.a

C = consonant, V = vowel, G = semivowel (glide)

- We can abstract away from the heavy light distinction by representing stress using the metrical grid (Liberman and Prince 1977, Prince 1983, Gordon 2003).
- Light syllables project one mora; heavy syllables project two. This distinction is based on the total sonority of the syllable (Prince 1983, Gordon 2002a,b).
- Crucially, stressed heavy syllables cannot bear stress on the “weak” mora of the syllable i.e. stressed heavy syllables should always be represented in the grid as $\overset{x}{xx}$ as shown in (7), not as $\overset{x}{xx}$ as shown in (8), nor as $\overset{xx}{xx}$ as shown in (9) (Prince 1983).
- Examples are from the Normal [li.maŋk] ‘my hand’ (cf. Citation [li.'ma.ku]).

(7)

2		x	
1		x	x
0		x	x x
		<hr/>	
		li	maŋk

(8) *

2		x	
1		x	x
0		x	x x
		<hr/>	
		li	maŋk

(9) *

2		x	
1		x	x x
0		x	x x
		<hr/>	
		li	maŋk

2.2 The Stress Pattern of the Normal Form

2.2.1 Grid Profiles and the Locations of CV Metathesis

- With the above framework in place, we can see the grid profiles of Kwara’ae words, where 2 indicates a X2 gridmark (primary stress), 1 a X1 gridmark (secondary stress), and 0 a X0 gridmark (no stress).

(10)	Citation	C. Grid	Normal	N. Grid	
a.	'ka.do	2.0	'kaod	2.0	'thin'
b.	ma.'da.mo	0.2.0	'ma.daom	2.10	'moon, month'
c.	'ke.ta.la.ku	2.0.1.0	'keat.lauk	20.10	'my height'
d.	da.'ro.ʔa.'ni.da	0.2.0.1.0	'daor.ʔa.niɿd	20.0.10	'to share them'
e.	li.'maŋ.mu.lu	0.20.1.0	'li.maŋ.mul	2.00.10	'your (pl.) hands'
f.	'ra.ʔe.ra.ʔe.na.ʔa	2.0.1.0.1.0	'raeʔ.raeʔ.naʔ	20.10.10	'incline, slope'

- The stress patterns of the Normal and Citation forms are both cross-linguistically well-attested,⁴ but recognizably different in words with an odd number of moras.

⁴The Citation stress pattern is similar to MalakMalak, and the Normal stress pattern is similar to Indonesian.

- Citation Form Stress: secondary stress on the penultimate mora and alternating moras to its left, primary stress on the leftmost secondary stressed mora.⁵
- Normal Form Stress: main stress on the initial mora, secondary stress on the penultimate mora and alternating moras to the left, with a lapse following the initial syllable in words with an odd number of moras greater than four.⁶
- The Normal stress pattern is one that can be generated without metrical feet using the constraint system presented in Gordon (2003) (as is the basic Citation pattern).
- The table in (10) is repeated in (11), with the locations of metathesis underlined in each column (omitting subarches for readability).

(11)	Citation	C. Grid	Normal	N. Grid	
a.	'ka. <u>do</u>	2.0	'ka <u>od</u>	20	'thin'
b.	ma.'da. <u>mo</u>	0.2.0	'ma.,da <u>om</u>	2.10	'moon, month'
c.	'ke. <u>ta</u> .,la. <u>ku</u>	2.0.1.0	'ke <u>at</u> .,la <u>uk</u>	20.10	'my height'
d.	da.' <u>ro</u> .ʔa.' <u>ni</u> . <u>da</u>	0.2.0.1.0	'da <u>or</u> .ʔa. <u>ni</u> <u>ɛd</u>	20.0.10	'to share them'
e.	li.'ma <u>u</u> .,mu.lu	0.20.1.0	'li.ma <u>u</u> .,mul	2.00.10	'your (pl.) hands'
f.	'ra. <u>ʔe</u> .,ra. <u>ʔe</u> .,na. <u>ʔa</u>	2.0.1.0.1.0	'rae <u>ʔ</u> .,rae <u>ʔ</u> .,na <u>ʔ</u>	20.10.10	'incline, slope'

2.2.2 Observations

- The historical story must be more complicated than commonly assumed.
 - Blevins and Garrett (1998) argued, cross-linguistically, CV metathesis is a diachronic process of copy and deletion (Blevins and Garrett 1998).
- (12) 'C₁V₁C₂V₂ > 'C₁V₁V₂C₂V₂ > 'C₁V₁V₂C₂
- Counterexamples: the second syllable in (C)V.'CV.CV.CV Citation forms is stressed, but metathesizes. E.g. 'to share them' Citation [da.'ro.ʔa.'ni.da], Normal ['daor.ʔa.niɛd], not Normal *[da.'roaʔ.iɛd].
 - The historical story must be more complex; e.g. there must be some intermediate form now lost to time.
- Looking only at the Normal form, only vowels associated with 0s that immediately follow a 1 or 2 are the ones which metathesize (with one exception: *limaumulu* 'your hands').

2.3 Stress to Weight Principle

- Stressed syllables should be heavy (Stress to Weight Principle).
- The Stress to Weight Principle motivates CV metathesis in Kwara'ae (Norquest 2001, Heinz 2004). Specifically, SWP ≫ LINEARITY.

⁵This is really only true for words without diphthongs or long vowels which attract stress. In these cases, the stress pattern is only slightly more complicated.

⁶Unfortunately previous researchers have not found words longer than three heavy syllables, and neither have I, so it is not possible to verify this prediction at this time. However, this prediction is in line with the cross-linguistic study by Kager (1999), who argued that lapses occur near the rhythmic peak (main stress) in a word.

- Consequently, $[^1C_1V_1V_2C_2] \succ [^1C_1V_1C_2V_2]$ because it is more important for stressed syllables to be heavy on the surface than it is to be faithful to the linear order.

SWP incurs a violation for each stressed light syllable in the output (Kager 1999).

Linearity incurs a violation for each pair (x,y) in the input where $x > y$ and where $y' > x'$ in the output where y', x' are correspondents of y,x respectively.⁷

	/ɲela/	SWP	LINEARITY
(13)	a. 'ɲeal		*
	b. 'ɲe.la	*!	

- The analysis extends easily to larger words, assuming the stress pattern is fixed.

	/daroʔanida/	SWP	LINEARITY
(14)	a. 'daor.ʔa.niɛd 20.0.10		**
	b. 'da.roaʔ.niɛd 2.00.10	*!	**
	c. 'daor.ʔa.ni.da 20.0.1.0	*!	*
	d. 'da.ro.ʔa.niɛd 2.0.0.10	*!	*
	e. 'da.ro.ʔa.ni.da 2.0.0.1.0	*!*	

3 Analyzing the Stress System

3.1 The Constraints and their Rankings

- The Normal form stress pattern can be analyzed without metrical feet using constraints from Gordon (2003).⁸

AlignEdges incurs a violation if either the initial or final mora has a stress level 0; if both, assign two (stress initial and final moras).

Nonfinality incurs a violation if the final mora has a stress level greater than 0. (do not stress final mora)

***Clash** incurs a violation for each pair of adjacent moras where both have a stress level greater than 0. (no moraic clash)

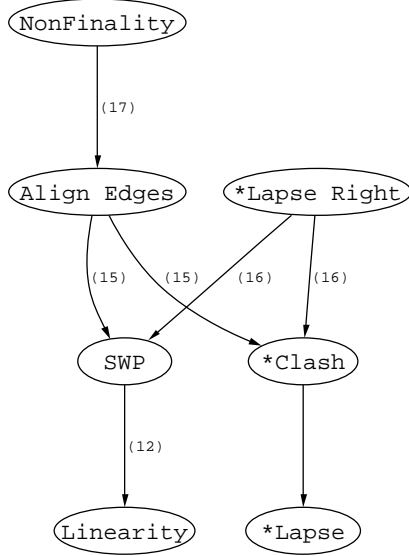
***Lapse** incurs a violation for each pair of adjacent moras where both have a stress level 0. (no moraic lapse)

***LapseRight** incurs a violation if the ultimate and penultimate moras both have a stress level 0. (stress one of the final two moras)

⁷This is essentially the same definition given in McCarthy and Prince (1995), Hume (2001). As described in Hume (2001), if the metathesizing segments are not adjacent, further violations will be scored. For an alternative way to calculate faithfulness violations resulting from metathesis, see Heinz (In preparation).

⁸Gordon's constraint system was designed to account for the stress systems found in quantity-insensitive languages, but I consider it a worthy project to try to apply (and extend where necessary) his constraints to account for the stress systems of quantity-sensitive languages. There are other constraints than the ones presented here; but these are sufficient to establish the basic pattern.

3.2 Constraint Rankings



3.3 Establishing Penultimate and Initial (moraic) Stress

- ALIGNEDGES is the constraint that ensures the initial mora is always stressed.

	/limaku/	ALIGNEDGES	*CLASH	SWP
(15)	a. 'li,mauk 2.10	*	*	*
	b. 'li,ma.ku 2.1.0	*	*	**!
	c. li.'mauk 0.20	**!		

- One of the final two moras must be stressed since *LAPSERIGHT is undominated.

	/limaku/	*LAPSERIGHT	SWP	*CLASH	*LAPSE
(16)	a. 'li,mauk 2.1.0		*	*	
	b. 'li,ma.ku 2.1.0		**!	*	
	c. 'liɛm.ku 20.0	*!			*

- Therefore the ranking NONFINALITY \gg ALIGNEDGES ensures that stress always falls on the penultimate mora and not the final one.

	/limaku/	NONFINALITY	ALIGNEDGES	*CLASH	SWP
(17)	a. 'li,mauk 2.10		*	*	*
	b. 'li,ma.ku 2.1.0		*	*	**!
	c. 'liɛm.ku 2.01	*!			*

- The constraints *LAPSERIGHT, NONFINALITY and ALIGNEDGES are responsible for fixing stress on the penultimate and initial moras. Since these constraints are ranked higher than *CLASH, a clash in trimoriac words is unavoidable.

4 Refining the Analysis

- At this point the analysis still overestimates the locations of CV metathesis in two cases.

4.1 Trimoriac forms and *WeakMora=X1

- Why does /limaku/ surface as [ˈli.maḱ 2.10] and not *[ˈliɛm.ku 21.0]?

		/limaku/	SWP	LINEARITY
(18)	⊕	a. ˈliɛm.ku 21.0		*
	⊖	b. ˈli.maḱ 2.10	*!	*

- There is a prohibition on stressing the weak mora of a syllable which I encode as *WEAKMORA=X1 (based on Prince (1983)).

(19) ***WeakMora=X1** incurs a violation if the second mora of a heavy syllable has a stress level greater than 0. (do not stress weak mora of a heavy syllable)

		/limaku/	*WEAKMORA=X1	SWP	LINEARITY
(20)	⊕	a. ˈli.maḱ 2.10		*	*
	⊖	b. liɛm.ku 21.0	*!		*

4.2 Pentamoriac forms and VV-Contig

- Why does /limaumulu/ surface as [ˈli.maḱ.muḱ 2.00.10], and not *[ˈliɛ.mu.muḱ 20.0.10]?

		/limaumulu/	SWP	LINEARITY
(21)	⊕	a. ˈliɛ.mu.muḱ 20.0.10		**
	⊖	b. ˈli.maḱ.muḱ 2.00.10	*	*

- Unlike the previous problem, this candidate cannot be ruled out by markedness, since it is a legal surface form (cf. hypothetical /liamumulu/). Therefore it must be ruled out by faithfulness.
- CV metathesis may create vowel clusters, but it may not destroy them.

V-V Contiguity incurs a violation if a V_1 immediately precedes V_2 in the input, but the vowel corresponding to V_1 in the output does not immediately precede the vowel corresponding to V_2 in the output. Here, vowels are understood to be [-consonantal]. (Underlying vowel sequences must be present on the surface)

		/limaumulu/	VV-CONTIG	SWP	LINEARITY
(22)	⊕	a. ˈli.maḱ.muḱ 2.00.10		*	*
	⊖	b. liɛ.mu.muḱ 20.0.10	*!		**

5 Summary

- There are two components to the analysis: a predictable stress pattern which sets up the environment, and a markedness constraint that acts on that environment.

- In the Normal form, primary stress falls on the initial syllable, secondary stress falls on the penultimate, and alternating moras to the left.
- Stressed syllables should be heavy (SWP).
- Two restrictions, *WEAKMORA=X1 and VV-CONTIG, are needed to reign in overestimations on the locations of CV metathesis.

6 Prediction #1 – Different stress yields a different metathesis pattern

6.1 The Third Allomorph – Focus Final Form

(23)	Citation	Normal	Normal] _{focus}	
a.	'si. <u>na</u>	'siɛn	siɛ.'na	'sun'
b.	bo.'be. <u>ʔa</u>	'bo.,beaʔ	bo.,bea.'ʔa	'fat'
c.	'ʔi. <u>hi</u> ,te. <u>ʔi</u>	'ʔi.h.,teiʔ	ʔi.h.,tei.'ʔi	'bed'

- First, I will demonstrate where this allomorph occurs.
- Second, I will identify its relevant phonological properties.

6.1.1 Distribution

- Kwara'ae is SVO.

(24) k_iɛr so.ŋeiʔ leaʔ [na 'ʔi.h.,teiʔ].
 they make well the bed
 They skillfully built the bed.

- Focus position in Kwara'ae is akin to the position of a clefted phrase in English; i.e. it occurs before the subject of the verb.
- The Focus Final Form (in bold) is the last word of a phrase in focus position in Kwara'ae.

(25) [na **ʔi.h.,tei.'ʔi**] neʔ k_iɛr so.ŋeiʔ leaʔ an.
 the bed that they make well to
 It is the bed that they skillfully built.

- We can see that it is the last word of a clefted phrase by considering focused objects with adjectives, which follow the noun.

(26) k_iɛr so.ŋeiʔ leaʔ [na ʔi.h.teiʔ 'ku'l].
 they make well the bed heavy
 They skillfully built the heavy bed.

(27) [na ʔi.h.teiʔ **ku'.lu**] neʔ k_iɛr so.ŋeiʔ leaʔ an.
 the bed heavy that they make well to
 It is the heavy bed that they skillfully built.

- Another set of examples is given below.

- (28) $\text{nia}'\text{?} \text{?ain} \text{ na } \text{bae.na}'\text{h} \text{ k}^{\text{w}}\text{a}'\text{s} \text{ ma } \text{ka} \quad \text{'g}^{\text{w}}\text{ai}'\text{r}$
 He ate the pineapple ripe and non-future cold
 He ate the cold ripe pineapple.
- (29) $[\text{na } \text{'bae.na}'\text{.}'\text{ha}] \text{ ne}'\text{?} \text{ nia}'\text{?} \text{ ?ain}$
 the pineapple that he ate
 It's the pineapple that he ate.
- (30) $[\text{na } \text{bae.na}'\text{h} \text{ ,k}^{\text{w}}\text{a}'\text{.}'\text{sa}] \text{ ne}'\text{?} \text{ nia}'\text{?} \text{ ?ain}$
 the pineapple ripe that he ate
 It's the ripe pineapple that he ate.
- (31) $[\text{na } \text{bae.na}'\text{h} \text{ k}^{\text{w}}\text{a}'\text{s} \text{ ma } \text{ka} \quad \text{'g}^{\text{w}}\text{ai}'\text{.}'\text{ri}] \text{ ne}'\text{?} \text{ nia}'\text{?} \text{ ?ain}$
 the pineapple ripe and non-future cold that he ate
 It's the cold ripe pineapple that he ate.

- Since the Focus Final Form occurs in Normal discourse, I assume it belongs to the Normal register.

6.1.2 Phonological Properties

- Examples:

(32)	Citation	Normal	Normal] _{focus}	
a.	'ku.lu	'ku'l	,ku'.lu	'heavy'
b.	'g ^w a.ri	'g ^w air	,g ^w ai'.ri	'cold'
c.	'k ^w a.sa	'k ^w a's	,k ^w a'.sa	'ripe'
d.	'bae.na.fa	'bae.na'h	,bae.na'.ha	'pineapple'
e.	'?i.hi.te.ʔi	'?i'h.teiʔ	,?i'h.tei'.ʔi	'bed'
f.	'si.na	'sjeŋ	,sje'.na	'sun'
g.	fi.'?i.ta.ʔa.li	'fi'ʔ.ta.ʔeil	,fi'ʔ.ta.ʔei'.li	'hibiscus (bush)'
h.	'bu.lu,bu.lu	'bu'l,bu'l	,bul,bu'.lu	'star'

- Main stress falls on the final syllable of the Focus Final form.
- The vowel qualities are not independent from each other. See Appendix A for a vowel chart.
 - The quality of the second element of the diphthong before the final vowel is predictable from the first element of the diphthong and the final vowel.
 - Similarly, the final vowel is predictable from the preceding diphthong.
- This suggests they are derived from the same vowel.
- Recall Blevins and Garrett (1998) copy and deletion diachronic analysis:⁹

$$(33) C_1V_1C_2V_2 > C_1V_1V_2C_2V_2 > C_1V_1V_2C_2$$

⁹Blevins and Garrett (1998) give some evidence from Kwara'ae to support this hypothesis. Transcriptions from Andrew Pawley circa 1982 have some Normal forms as $[C_1V_1V_2C_2V_2]$. See Appendix B.

- Thus, the third allomorph appears to exhibit partial metathesis; i.e. the copying but not the deletion.¹⁰

6.1.3 Analysis of the Focus Final Form

- The above facts suggest that the focus final stress pattern blocks complete CV metathesis at the right edge of the word, resulting in partial metathesis.
- There are two questions:
 - Why is there no deletion? Stress.
 - Why is there copying? Something else.

- I assume there is a constraint regulating placement of stress next to the rightmost focus-phrase boundary:

(34) **Focus-Stress** incurs a violation for every X0 grid mark between the right focus boundary and an X3 grid mark, or, if there are no X3 gridmarks, then every X0 grid mark incurs a violation (place phrasal stress on the mora closest to the right focus boundary).

- I assume that the final vowel and the second element of the diphthong are derived from the same underlying vowel, in violation of INTEGRITY (McCarthy and Prince 1995).

(35) **Integrity** incurs a violation for every pair of segments in the output which correspond to the same segment in the input.

6.2 Why There Is No Deletion

- FOCUS-STRESS is high ranked so that it forces a stressed syllable word-finally in the focus final position, in violation of SWP. Consider *sina* ‘sun’.

/sina] _{focus} /		FOCUS-STRESS	INTEGRITY	SWP	LINEARITY
(36)	a.		*	*	*
	b.	*!			*

- Candidates like [ˈsiɛ̃n̩] are eliminated because the weak mora of a heavy syllable cannot bear stress (Prince 1983).
- As a result, deletion (and thus complete metathesis) is blocked word-finally.

¹⁰I have recently learned that the partial metathesis is in fact optional. In other words, *sina* ‘sun’ may be pronounced [si.'na] as a Final Focus form. This talk does not address Focus Final forms like [si.'na], though the analysis presented readily extends to this case.

6.3 Why There Is Copying

- Why is there partial metathesis? I.e. What motivates copying? Why not $[\text{s}^{\text{x}}\text{i}^{\text{x}}\text{.}\text{n}\text{a}^{\text{x}}]$?

6.4 Output to Output Faithfulness to the Normal form

- Partial metathesis occurs to make the Focus Final Form more similar to the Normal form.

(37) **OO V-V Contiguity** incurs a violation if a V_1 immediately precedes V_2 in the Normal form, but the segment corresponding to V_1 in the Focus Final form does not immediately precede the segment corresponding to V_2 in the Focus Final form. (Contiguous vowels in the Normal form must be contiguous in the Focus Final Form.)

- This constraint ensures that contiguous vowels in the Normal elsewhere form are present in the Focus Final form; i.e. the Focus Final form of *sina* ‘sun’ $[\text{s}^{\text{x}}\text{i}\text{e}^{\text{x}}.\text{n}\text{a}]$ has the same contiguous vowels of the Normal form $[\text{s}^{\text{x}}\text{i}\text{e}\text{n}]$.

	$/\text{s}^{\text{x}}\text{i}_1\text{n}\text{a}_2]_{\text{focus}}/$, Normal $[\text{s}^{\text{x}}\text{i}\text{e}\text{n}]$	FOCUS-STRESS	OO VVCONTIG	INTEGRITY
(38) a.	$\begin{array}{c} \text{x} \quad \text{x} \\ \text{x} \quad \text{x} \\ \text{x} \quad \text{x} \quad \text{x} \\ \text{s}^{\text{x}}\text{i}_1\text{e}_2.\text{n}\text{a}_2 \end{array}$			*
b.	$\begin{array}{c} \text{x} \quad \text{x} \\ \text{x} \quad \text{x} \\ \text{x} \quad \text{x} \\ \text{s}^{\text{x}}\text{i}_1.\text{n}\text{a}_2 \end{array}$		*!	
c.	$\begin{array}{c} \text{x} \\ \text{x} \\ \text{x} \\ \text{x} \quad \text{x} \quad \text{x} \\ \text{s}^{\text{x}}\text{i}_1\text{e}_2.\text{n}\text{a}_2 \end{array}$	*!*		*

6.5 Why Partial Metathesis Cannot be Motivated by SWP

- Note that a candidate with partial metathesis does better with respect to SWP than the candidate without partial metathesis.

	$/\text{s}^{\text{x}}\text{i}_1\text{n}\text{a}_2]_{\text{focus}}/$	SWP	INTEGRITY
(39) a.	$\begin{array}{c} \text{x} \quad \text{x} \\ \text{x} \quad \text{x} \\ \text{x} \quad \text{x} \quad \text{x} \\ \text{s}^{\text{x}}\text{i}_1\text{e}_2.\text{n}\text{a}_2 \end{array}$	*	*
b.	$\begin{array}{c} \text{x} \\ \text{x} \quad \text{x} \\ \text{x} \quad \text{x} \\ \text{x} \quad \text{x} \\ \text{s}^{\text{x}}\text{i}_1.\text{n}\text{a}_2 \end{array}$	**!	

- But without OO VVCONTIG, this requires ranking INTEGRITY below SWP, which makes incorrect predictions elsewhere. (40) shows why the ranking INTEGRITY \gg SWP must hold with forms like *korea* ‘to marry’.

	/korea/	INTEGRITY	SWP
(40)	a. 'ko. ₁ rea		*
	b. 'koe. ₁ rea	*!	

6.6 Focus Final Form Summary

- Primary stress falls close to the right word edge.
- As a result, deletion is not allowed to occur, confirming a prediction of a SWP analysis.
- Copying occurs, however, for a non-stress related reason (faithfulness to the Normal form).

7 Prediction #2 Multiple ways to satisfy SWP

- There are many ways to satisfy SWP; i.e. there are many ways to transform a $/C_1V_1C_2V_2/$ input so that its output is more harmonic than $[^{\cdot}C_1V_1C_2V_2]$, which violates the SWP.
 - The vowel V_1 may be lengthened
 - Consonantal material may be inserted after V_1
 - V_2 may be elided.

- Tonkawa is an extinct American Indian language from central Texas.

(41) /ke-we-yama₁xa-oo-ka/ ,kew.₁yam.₁xoo.ka ‘you paint our faces’

- Gouskova (2003) uses SWP \gg MAX-V to account for syncope.
- In Tonkawa and Kwara’ae [... $^{\cdot}C_1V_1C_2V_2$...] sequences are dispreferred. Tonkawa deletes V_2 , whereas Kwara’ae metathesizes V_2 .

8 Why SWP?

- When we consider the reasons why $[^{\cdot}C_1V_1V_2C_2]$ sequence is more harmonic than $[^{\cdot}C_1V_1C_2V_2]$ (from underlying $/C_1V_1C_2V_2/$), there are (at least) two other possible explanations:

Syllable Economy. Surface forms with fewer syllables are preferred.

Unstressed Syllable Economy. Surface forms with fewer unstressed syllables are preferred.

- I chose SWP because it highlights the similarities between other languages that regularly make stressed syllables heavy, like Tonkawa.
 - Kager (1999) invoked the Stress to Weight Principle to account for vowel lengthening in stressed syllables in Icelandic.
 - Other languages such as the Argyllshire dialects of Scots Gaelic insert glottal stops in stressed syllables (unless they would be followed by an obstruent) that would otherwise be light (Hall 2003).
 - See Hayes (1994) for other languages with iambic (and trochaic) lengthening.

However:

- Trochaic lengthening is cross-linguistically less robust than iambic lengthening (Hayes 1994) (and references therein).
 - Trochaic $\acute{L}L \rightarrow \acute{H}L$, but Iambic $LL \rightarrow LH$
- The Stress to Weight Principle predicts that trochaic lengthening should be just as robust as iambic lengthening.
- It's not clear in non-foot based framework what could reign in this overprediction, and that remains a challenge for the non-foot frameworks like the one adopted here.
- In a foot-based framework, presumably this is because a HL foot is more marked than other foot types (Prince 1992).

9 Final Remarks

- There is a non-stress related restriction on where CV metathesis may occur: it cannot destroy underlying vowel sequences.
- The stress pattern determines the locations of CV metathesis in Kwara'ae.
- CV metathesis occurs because the surface forms avoid stressed light syllables (the Stress to Weight Principle).
 - The Focus Final forms exhibit a different stress pattern, final primary stress, and we see metathesis not occurring there. Partial metathesis occurs to be faithful to Normal form vowel clusters.
 - CV metathesis in Kwara'ae is akin to other phonological processes which make stressed syllables heavy; i.e. Tonkawa where both languages transform 'CVCV sequences into heavy syllables.

A Normal Form Vowel Qualities

- The following table summarizes how the diphthong in the Normal form is predictably derived from two vowels from the set [i,u,e,o,a].

(42)

V ₁ V ₂		V ₂				
		i	u	e	o	a
V ₁	i	i'	i <u>u</u>	∅	i <u>o</u>	i <u>ɛ</u>
	u	u <u>i</u>	u'	u <u>ɛ</u>	∅	u <u>ʌ</u>
	e	e <u>i</u>	e <u>u</u>	ɛ'	e <u>o</u>	e <u>a</u>
	o	o <u>i</u>	o <u>u</u>	o <u>ɛ</u> , u <u>ɛ</u>	ɔ'	o <u>a</u>
	a	a <u>i</u> , e <u>i</u> , e'	a <u>u</u> , o'	æ, a <u>ɛ</u>	a <u>o</u>	a'

∅ = *unattested*

Nuclei following a ' , ' occur in fast speech

- The quality of the second element of the diphthong is predictable given V₁ and V₂.
- Likewise, given any cell, V₂ is predictable.

B Voiceless Vowels in the Normal form

- Blevins and Garrett (1998) give some evidence from Kwara'ae to support this hypothesis. Transcriptions from Andrew Pawley circa 1982 have some Normal forms as [C₁V₁V₂C₂V₂].
- In this data, voiceless vowels occur in the Normal form following any consonant except nasals, as long as V₂ is higher or the same height as V₁, which is the case in (43), but not in (44), which are taken from Blevins and Garrett (1998, p. 530).

(43) Citation Normal

fusi	h <u>i</u> s <u>i</u>	'cat'
kado	ka <u>o</u> ɔ	'thin'
sata	s <u>a</u> t <u>a</u>	'name'

(44) Citation Normal

lifa	li <u>ə</u> h	'teeth'
uta	w <u>ə</u> t	'rain'
ʔasufe	ʔ <u>a</u> s <u>u</u> əh	'rat'

- I found a different distribution of voiceless vowels. In my data, they occur optionally in the Normal form, primarily word finally after the laryngeals [ʔ] and [h], and somewhat less regularly word-finally after the continuants [l] and [s], and nowhere else. Relative vowel height does not matter, cf. 'stealing' and 'always'.

(45)	Citation	Normal	
a.	bi.'li.'ʔa	'bi.'li.ɛ'ʔɛ	'stealing'
	'i.du.'fa.'ʔi	'iud.'hei'ʔi	'always'
	'ma.'ʔu	'mau'ʔu	'fear'
	'u.'ʔa	'uɛ'ʔɛ	'crab'
b.	'ʔa.fe	'ʔaehɛ	'wife'
	'ka.fo	'kaɔhɔ	'water'
	ka.'ta.fo	'ka.'taɔhɔ	'papaya'
c.	'bu.su	'bu'su	'to burst'
	li.'mau.'mu.lu	'li.mau.'mu'lu	'your (pl.) hands'

- The overall picture, however, is in line with Blevins and Garrett's (1998) claim that the voiceless vowels are a residue of the former vowel. The speaker I work with most likely belongs to the next generation of speakers than the ones Pawley worked with over twenty years ago. Because her speech contains optional voiceless vowels in fewer positions overall, it's reasonable that her speech pattern reflects another stage of the decline of the final vowel.

References

- Baird, Paula. 2002. A Re-analysis of Metathesis in Kwara'ae. MIT Working Papers in Linguistics.
- Blevins, Juliette and Garrett, Andrew. 1998. The Origins of Consonant-Vowel Metathesis. *Language* 74(3):508–556.
- Gegeo, David and Watson-Gegeo, Karen-Ann. 1986. Calling-out and repeating routines in Kwara'ae children's language and socialization. In *Language Socialization Across Cultures*, edited by Elinor Ochs Bambi B. Schieffelin. Cambridge University Press, pages 17–50.
- Gordon, Matthew. 2002a. A Phonetically-driven Account of Syllable Weight. *Language* 78:51–80. Also in UCLA Working Papers in Phonology 2.
- Gordon, Matthew. 2002b. Weight-by-Position Adjunction and Syllable Structure. *Lingua* 112:901–931.
- Gordon, Matthew. 2003. A Typology of Quantity-Insensitive Stress. *Natural Language and Linguistic Theory*.
- Gouskova, Maria. 2003. Deriving Economy: Syncope in Optimality Theory. Ph.D. thesis, University of Massachusetts.
- Hall, Nancy. 2003. Gestures and Segments: Vowel Intrusion as Overlap. Ph.D. thesis, University of Massachusetts.
- Hayes, Bruce. 1994. *Metrical Stress Theory*. Chicago University Press.
- Heinz, Jeffrey. 2004. CV Metathesis in Kwara'ae. Master's thesis, University of California, Los Angeles. Available at <http://www.linguistics.ucla.edu/people/grads/jheinz/>.
- Heinz, Jeffrey. In preparation. Reconsidering Linearity: Evidence from CV Metathesis. In *Proceedings of the 24th West Coast Conference of Formal Linguistics (WCCFL)*. Cascidilla Press.

- Hume, Elizabeth. 2001. Metathesis: Formal and Functional Considerations. In *Surface Syllable Structure and Segment Sequencing*, edited by Jeroen van de Weijer Elizabeth Hume, Norval Smith. pages 1–25. HIL Occasional Papers.
- Kager, René. 1999. *Optimality Theory*. Cambridge University Press.
- Laycock, Don. 1982. Metathesis in Austronesian: Ririo and Other Cases. In *Papers from the Third International Conference on Austronesian Linguistics: Currents in Oceanic*, edited by S.A. Wurm Amran Halim, Lois Carrington, Pacific Linguistics C-74. pages 269–281.
- Lieberman, Mark and Prince, Alan. 1977. On Stress and Linguistic Rhythm. *Linguistic Inquiry* 8:249–336.
- McCarthy, John and Prince, Alan. 1995. Faithfulness and Reduplicative Identity. In *Papers in Optimality Theory*, edited by Jill Beckman, Laura Walsh Dickey, and Suzanne Urbanczyk, number 18 in University of Massachusetts Occasional Papers in Linguistics. pages 249–384.
- Norquest, Peter. 2001. The Collapse of the Foot in Oceanic. In *Proceedings of the Western Conference of Linguistics (WECOL) 2001*.
- Norquest, Peter. 2003. The collapse of the foot in Oceanic. Talk handout, AFLA X, Honolulu, Hawaii.
- Prince, Alan. 1983. Relating to the Grid. *Linguistic Inquiry* 14(1).
- Prince, Alan. 1992. Quantitative Consequences of Rhythmic Organization. *CLS* 26:355–398. Parasession of the Syllable in Phonetics and Phonology.
- Simons, Gary. 1977. A Kwara’ae Spelling List. *Working Papers for the Language Variation and Limits to Communication Project* Cornell University and Summer Institute of Linguistics.
- Sohn, Ho-Min. 1980. An Analysis of Metathesis in Kwara’ae. *Lingua* 52.