Prosodic Effects of Segmental Correspondence*

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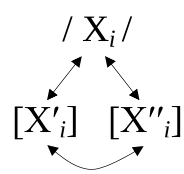
1 Introduction

- This talk examines how extensions of Correspondence Theory (McCarthy & Prince [M&P] 1995) can be used to explain a class of misapplication effects arising in reduplication and copy epenthesis.
- **Phenomenon of interest:** exceptional patterning in the assignment of phonological properties relating to prominence (i.e. unexpected patterns of stress, pitch, length).
- We argue that, to explain these effects, the phonological grammar must have the properties in (1):

(1) Necessary properties of the phonological grammar

(i) A correspondence relation between surface segments, arising under the sort of structural configuration below, where multiple output segments correspond to a single input segment.



(ii) Faithfulness constraints that require identity between correspondents with respect to suprasegmental properties like stress (i.e. IDENT[stress], etc.).

- We show that a grammar with these properties can generate a range of effects, many of which have to this point failed to receive satisfactory explanations in the literature.

2 Prosodic correspondence in reduplication

- Since M&P 1995, Correspondence Theoretic approaches to reduplication have appealed to faithfulness between Base (B) and Reduplicant (R) to explain numerous properties of reduplication.
  - Including, *under-application and over-application* (M&P 1995), *fixed segmentism* (Alderete et al. 1999), *back-copying* (M&P 1995).
- BR-correspondence has also been invoked to account for "length transfer" effects.
  - Base and reduplicant vowels match in length ($[\text{short}]_R \leftrightarrow [\text{short}]_B$ or $[\text{long}]_R \leftrightarrow [\text{long}]_B$).
  - Some languages exhibiting length transfer: Kihehe, Tagalog, Mokilese (M&P 1988).
- *Why is this noteworthy?* Length is a suprasegmental property rather than a feature, per se.
- Other than those involving length, however, BR-correspondence effects involving suprasegmental properties have not been very frequently reported in the literature.
  - But one very striking case is reduplication in Ngan'gityemerri (Zukoff 2015), which displays the effects of *stress matching*.

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2.1 Stress matching in Ngan'gityemerri reduplication

- In Ngan'gityemerri (Reid 2011), serial verbs are composed of an auxiliary stem plus a verbal stem:

(2) Ngan'gityemerri serial verb: $[\,[\acute{\sigma}\ \sigma\ \ldots]_{\text{AUX STEM}} = [\acute{\sigma}\ \sigma\ \ldots]_{\text{VERBAL STEM}}\,]_{\text{SERIAL VERB}}$

  - In the normal case, such a word has two and *only* two stresses:
    - One on the leftmost syllable of the auxiliary stem, and
    - One on the leftmost syllable of the verbal stem.

(3) Basic stress in the complex verb (examples from Reid: pp. 97-98)

a.	yé-nim=mì-wap-nyine	'She's married now'
b.	wárra-ngiti=fì-pal-endi-pe	'They'll come back for me later'

- This pattern can be described with the constraints in (4), ranked as in (5).

(4) Constraints for Ngan'gityemerri verbal stress

a. **StressL-stem**
Assign one violation mark * for each stem (i.e. auxiliary stem and verbal stem) whose leftmost syllable does not bear a stress.

b. **OneStress(complex verb)** (≈ Culminativity, Prince 1983)
The complex verb (i.e. the word comprised of auxiliary stem and verbal stem) should have exactly one stress. Assign one violation * for each additional stress in the complex verb.

(5) Ranking: StressL-stem » OneStress(complex verb)

- There is only one case in which additional stresses arise: when the syllable at the left edge of the verbal stem is standing in BR-correspondence with another syllable.
  - When this occurs, the other syllable involved in this BR-correspondence *also bears a stress*:

(6) Additional stresses under BR-correspondence (red. is underlined, base + red. in { })

a.	wí-rr-ing-gu={dà-dà}	'They (dual) are singing'	(p.97, ex. 1-114b)
b.	ngí-ni={kù-kùluk}-tye	'I was coughing'	(p.98, ex. 2-117)
c.	yé-mi-ngiti={fì-fìtyi}-pagu-pe	'Roll me some (smokes)!'	(p.98, ex. 2-118)
d.	ngúdum={bàt-bìt}	'...and knocked it to the ground.'	(p.99, ex. 2-121)
e.	wáddi={wà-wù}-tye	'They used to collect rations.'	(p.98, ex. 2-119)

- The behavior in (6) cannot be due to some more general desire for reduplicated forms to bear stress.
  - When Base and Reduplicant are both stem-medial, neither bears stress.

(7) No additional stresses stem-medially

a.	yé-rr-mi-gi=mì-{fa-fala}-pe	'Keep showing it!'	(p.186, ex. 3-255c)[1]
b.	wá-n-ngi=fì-mi-{tyat-it}-tye[2]	'They used to show me how to do it.'	(p. 98, ex. 2-114f)

➢ B & R are only stressed when one of B or R must be stressed to satisfy StressL-stem.

[1] Reid does not provide stress marking on the forms in Section 3 of his grammar. Stress marks in ((7)a) are inferred, based on his detailed description in Section 2.

[2] The vowels in base and reduplicant aren't identical; this is common, and does not disrupt the stress facts.

- The combined facts of (6) and (7) can be straightforwardly explained using BR-faithfulness:

(8) **IDENT[stress]-BR**
Assign one violation mark * for each syllable in the reduplicant in which the presence or absence of stress differs from the corresponding syllable of the base.

- If STRESSL-STEM requires a stress on a syllable of a Base or Reduplicant, IDENT[stress]-BR requires a stress on its BR-correspondent.[3]

(9) Additional stress with stem-initial BR: *yé-mi-ngiti=fì-fìtyi-pagu-pe* (ex. ((6)c))

/ ye-mi-ngiti={RED-fityi}-pagu-pe /	STRESSL-STEM	IDENT[stress]-BR	*CLASH	ONESTRESS (complex verb)
☞ a. yé-mi-ngiti=fì-fìtyi-pagu-pe			*	***
b. yé-mi-ngiti=fì-fityi-pagu-pe		*!		**
c. yé-mi-ngiti=fi-fityi-pagu-pe	*!			*

(10) No additional stress with stem-medial BR: *yé-rr-mi-gi=mì-fa-fala-pe* (ex. ((7)a))

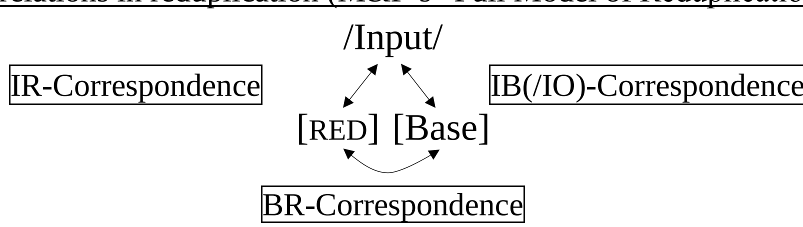
/ ye-rr-mi-gi=mi-{RED-fala}-pe /	STRESSL-STEM	IDENT[stress]-BR	*CLASH	ONESTRESS (complex verb)
☞ a. yérrmigi=mì-fa-fala-pe				**
b. yérrmigi=mì-fà-fàla-pe			*!*	***!*
c. yérrmigi=mì-fà-fala-pe		*!	*	***
d. yérrmigi=mi-fà-fàla -pe	*!		*	***

❖ Ngan'gityemmeri shows us several important points:
  - Faithfulness constraints must be able to reference *suprasegmental* properties like stress.
  - Faithfulness constraints must be able to reference *non-underlying* (i.e. surface) properties: stress is fully predictable and therefore only a property of surface forms.
  - Stress identity is independent of featural identity: the extra stress compelled by IDENT[stress]-BR is found even when the reduplicant imperfectly copies the base: (6)d [ngúdum={bàt-bìt}]

2.2 Extension: from reduplication to copy epenthesis

- Most models that allow BR-correspondence assert that *both* the output Base *and* the Reduplicant simultaneously stand in correspondence with the Input (M&P 1995, Spaelti 1997, Struijke 2000).
- These correspondence relations can be expressed as in (11):

(11) Correspondence relations in reduplication (M&P's "Full Model of Reduplication")



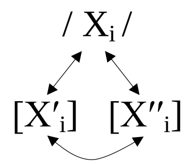
[3] Additional effects of IDENT[stress]-BR are found in nominal reduplication in this language as well (see Reid 2011:92).

Our claim: BR-Correspondence exists *because* both B and R stand in correspondence with the Input.

- We assert that this can and should be generalized:

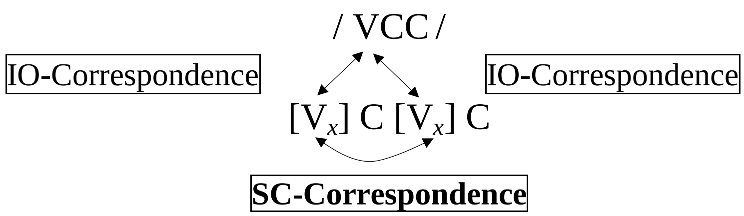
> Whenever two or more output segments stand in correspondence with the same input segment, *they also stand in correspondence with each other by transitivity* (see also Struijke 2000).

(12) Generalized multiple correspondence



- In addition to reduplication, we assert (*contra* Kawahara 2007) that **copy epenthesis** (distinct from default epenthesis), has such a structure, illustrated in (13):

(13) Correspondence relations in copy epenthesis



- Both output vowels correspond to a single input vowel, and therefore correspond with each other.
- We call the sort of correspondence which holds between the output vowels in (13) the **Surface Correspondents (SC)** relation (see Kitto & de Lacy 1999 for a similar proposal).
- We argue also that the grammar contains faithfulness constraints modulating the relationship between segments standing in SC-correspondence.
- ➢ We will show that these faithfulness constraints are the driving force behind *misapplication* of stress and other prosodic properties in the cases of copy epenthesis discussed below.

3 Copy epenthesis in Scottish Gaelic

- To illustrate our assumptions about the representation of copy epenthesis, we turn to Scottish Gaelic.
- In Scottish Gaelic, heterorganic falling sonority clusters are broken up by epenthesis.
  - o The epenthetic vowel is always identical to the vowel preceding it (*modulo* predictable effects of palatal-agreement).

(14) Copy epenthesis in Scottish Gaelic (Bosch & de Jong 1997:1-2) (epenthetic segment is underlined)

a.	/arm/	>	[ara̲m]	'army'
b.	/ʃalv/	>	[ʃala̲v]	'prosperity'
c.	/urxir^{j}/	>	[uru̲xir^{j}]	'shot'
d.	/dɔrxɔ/	>	[dɔrɔ̲xɔ]	'dark'
e.	/t^{hj}il^{j}k^{j}əɣ/	>	[t^{hj}il^{j}i̲k^{j}əɣ]	'to throw'

- The pattern in (14) is diagnostic of **copy epenthesis**, distinct from **default epenthesis**.

- We argue that default and copy epenthesis have distinct phonological representations:
  - Default epenthesis inserts material that has no relation to the underlying form.
    - We take this to violate DEP (or DEP[feature]).
  - Copy epenthesis, on the other hand, takes material that is present elsewhere in the underlying representation and causes it to additionally surface outside of its underlying location.
    - We take this to violate INTEGRITY, and not DEP.[4]

(15) Constraints for copy epenthesis

a. ***BADCLUSTER**: Cover constraint for whatever forces epenthesis.

b. **INTEGRITY-IO**: Assign one violation mark * for each input segment which stands in correspondence with multiple output segments.

c. **DEP-IO**: Assign one violation mark * for each output segment w/o an input correspondent.

(16) Ranking for copy epenthesis: *BADCLUSTER, DEP-IO » INTEGRITY-IO

(17) Copy epenthesis with short host vowels: /arm/ → [aram] (ex. ((14)a))

/arm/	DEP-IO	*BADCLUSTER	INTEGRITY-IO
a. arm		*!	
b. ☞ a_xr$\underline{a}_x$m			*
c. arəm	*!		

❖ Terminology: In copy epenthesis, we refer to the vowel which surfaces in its expected location as the *host*, and the epenthetic vowel as the *copy*.

- ***Notice:*** All forms that display copy epenthesis (as in (14)) have a *short* host vowel.
- When the cluster-type targeted by copy epenthesis occurs after a long vowel (or diphthong), however, copy epenthesis is **blocked,** and the cluster is not repaired (18).[5]

(18) Copy epenthesis blocked if host vowel is long (Hammond et al. 2014: 126)

a. /miːrvəlʲəx/ > [miːrvəlʲəx], not *[miːri̲vəlʲəx] or *[miːri̲ː̲vəlʲəx] ‘marvelous’

b. /du͡əlxəs/ > [du͡əlxəs], not *[du͡ələ̲xəs] or *[du͡əlu̲͡ə̲xəs] ‘tradition’

c. /ni͡alvər/ > [ni͡alvər], not *[ni͡ala̲vər] or *[ni͡ali̲͡a̲vər] ‘cloudy’

d. /iːrmɛltʃ/ > [iːrmɛltʃ], not *[iːri̲mɛltʃ] or *[iːri̲ː̲mɛltʃ] ‘firmament’

➢ When we assume the multiple-correspondence representation of copy epenthesis in (13) above, this blocking effect can be analyzed simply as an *emergence of the unmarked* effect against long vowels.

(19) Length constraints for blocking in Scottish Gaelic

a. **IDENT[length]-IO**: Assign one violation mark * for each pair of segments standing in Input-Output correspondence which mismatch in mora count (i.e. /V/↔[Vː] or /Vː/↔[V]).

b. ***LONGV**: Assign one violation mark * for each long vowel (or diphthong).

[4] It is likely that some sort of DEP constraint is violated in copy epenthesis – perhaps DEP-*timing slot*. This constraint would also be violated in default epenthesis.

[5] Kawahara (2007) claims, incorrectly, that length-matching effects in copy epenthesis are completely unattested. He argues that this gap in the typology is evidence against a correspondence-based analysis of copy epenthesis.

- When the would-be host vowel is long, length considerations interact to make copy epenthesis of *any* vowel, whether short or long, suboptimal.
    - (*LONGV » *BADCLUSTER, so copying a *long* vowel is not a possible repair; and copy epenthesis of a *short* vowel to a long input vowel is penalized by IDENT[length]-IO.)
- Scottish Gaelic's solution to this problem is to leave the bad cluster unrepaired.[6]

(20) Copy epenthesis blocked with long host vowels: /i:rmɛlʧ/ → [i:rmɛlʧ] (ex. ((18)d))

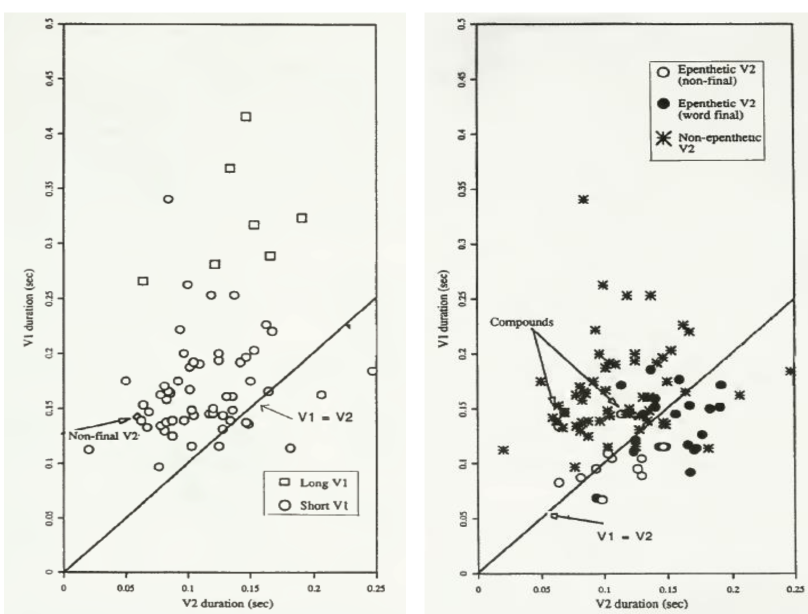
/i:rmɛlʧ/	DEP[F]-IO	IDENT[length]-IO	*LONGV	*BADCLUSTER	INTEGRITY-IO
a. ☞ i:rmɛlʧ			*	*	
b. i:$_x$ri̲:$_x$mɛlʧ			**!		*
c. i:$_x$ri̲$_x$mɛlʧ		*!	*		*
d. i:rəmɛlʧ	*!				

- Our structural assumptions about copy epenthesis make the analysis of the blocking straightforward.
- The blocking facts also show that suprasegmental properties (here, length) must be referenced by faithfulness constraints.

❖ But there is one more interesting piece to this example.

- IDENT[length]-IO prevents altering the *categorical* length of vowels. But there is a *sub-categorical* effect of **length matching** clearly visible in the cases of copy epenthesis.
    - ➢ Copy-host pairs match each other with respect to duration (Bosch & de Jong 1997).
- In normal (C)VCV(...) words (left, in (21) below), where V2 *isn't* epenthetic, V1 is longer than V2.
    - V1 bears stress, and is (sub-phonemically) lengthened as a cue to that prominence.
- But in words with copy epenthesis (right, in (21) below), V1 and V2 are about equal.

(21) Phonetic length in non-epenthetic (left) vs. epenthetic sequences (right) (Bosch & de Jong: pp. 5-6)



[6] We assume that default epenthesis is ruled out by DEP-IO » *BADCLUSTER, as is shown in (20). We will not address why copy epenthesis could not occur from the vowel on the other side of the cluster.

What's going on here:

- V1 is *shorter* in the epenthetic than non-epenthetic context.
- V2 is *longer* in the epenthetic than non-epenthetic context.

❖ The result: V1 and V2 are durationally equivalent **only when the sequence is a copy-host pair**.[7]

❖ This length-matching effect goes well beyond anything that would be predicted by IO-correspondence alone.

➢ The effect can, though, be captured by our proposal regarding surface correspondence:

- If two surface segments that derive from a single underlying segment themselves stand in correspondence, *they can become more similar through correspondence/faithfulness.*

<u>Gestural approaches to copy epenthesis:</u>

- Some previous work (e.g. Steriade 1990, Hall 2003) has proposed that copy epenthesis results from *gestural mistiming*.
- Under such analyses, the appearance of the copy vowel in words like [aram] (14) is not due to the insertion of an additional timing slot, but rather movement of the tongue tip gesture within the gestural score.

(22) <u>Copy epenthesis as gestural reorganization (based on Steriade 1990):</u>

```
                          a       r   m                                  a    r   a    m
Tongue body (/a/):[----------------------]     Tongue body (/a/): [----------------------]
Tongue tip (/r/):             [----]           Tongue tip (/r/):          [----] ←
Lips (/m/):                       [----]       Lips (/m/):                          [----]
```

- Under this analysis, the twin [a]'s in [aram] are not distinct exponents of the same input segment: rather, they are *two halves of the* ***same*** *exponent*.
- This analysis has the potential to account for some facts about the typology of copy epenthesis (e.g. locality), but it is unclear how it can be extended to account for the effects documented in this paper.
  - The featural identity predicted by (22) does not obviously extend to prosodic identity, since these suprasegmental properties are controlled by independent articulators.
  - Scottish Gaelic copy-host pairs match not only in duration, but in *all* prosodic properties (pitch, etc.; see Bosch & de Jong 1997). Similar facts hold in Hocank (§5).
  - It is not obvious how a gestural analysis could capture these facts.

- In the two case studies that follow, we show how the desire for suprasegmental identity between copy-host pairs induces misapplication in the assignment of prominence.
  - Selayarese in §4 (see also Mithun & Basri 1986, Piggott 1995, Alderete 1999, Kitto & de Lacy 1999, Broselow 2001).
  - Hocank in §5 (see also Miner 1979 *et seq.*, Hale & White Eagle 1980, Halle & Vergnaud 1987, Alderete 1995, Hayes 1995, Hall 2003, among many others)

❖ In both cases, the precise nature of the prominence targeted by SC-faithfulness constraints is unclear. For the sake of consistency and compatibility with the literature, we present them as *stress*.

[7] Bosch & de Jong (1997) also note that copy-host pairs resemble each other in pitch (and potentially stress), as well. This is consistent with our proposal that segments standing in correspondence are subject to Faithfulness constraints demanding identity for *all prosodic properties.* See Bosch & de Jong for data and discussion.

4 Stress misapplication I: copy epenthesis in Selayarese

➢ In Selayarese, there is one configuration in which copy epenthesis causes stress to misapply.

- In the general case, stress in Selayarese falls on the penultimate syllable.

(23) Penultimate stress in Selayarese (Mithun & Basri 1986:219 for a,b; 226 for c,d)

a. [rajinrá:jin] 'rather diligent'
b. [kasú:ᵐba] 'dye for coloring clothes or cake'
c. [sá:sa] 'cut (grass)'
d. [sássa] 'wash'

  - As shown in (23), if the stressed syllable is open, the vowel lengthens (a-c); if the stressed syllable is closed (by a geminate), the vowel is short (d).
  - Long vowels are not found except under stress.
  - ➢ For simplicity, we only entertain candidates that have the above properties.

- We model penultimate stress with the constraints *LAPSER and NONFINALITY (Gordon 2002).[8]

(24) Foot-free stress window constraints

a. ***LAPSER**: assign one violation mark * if neither of the final two syllables are stressed.
b. **NONFINALITY**: assign one violation mark * if the final syllable is stressed.

(25) Default penultimate stress: [kasú:ᵐba] (ex. ((23)b))

/kasuᵐba/	*LAPSER	NONFINALITY
a. ká:suᵐba	*!	
b. ☞ kasú:ᵐba		
c. kasuᵐbá:		*!

- There is, however, a class of words that has exceptional antepenultimate stress:

(26) Antepenultimate stress in Selayarese (Mithun & Basri 1986: 237)[9]

a. [só:ᵐbala] 'a sail'
b. [ká:tala] 'itch'
c. [bó:tolo] 'bottle'
d. [kí:kiri] 'metal file'
e. [hállasa] 'suffer'

- These words have certain properties in common:
  - Last two vowels are identical.
  - Last two vowels separated by /s/, /r/, or /l/ (coronal continuant).
  - Final vowel drops before a vowel-initial suffix: e.g. hállasa 'suffer' ↔ hallá:s-i 'make suffer'

[8] We use foot-free constraints here for simplicity, but we expect that the same result can be derived equally well with feet.
[9] Some previous accounts of Selayarese stress (Piggott 1995, Kitto & de Lacy 1999) have assumed that epenthetic vowels do not lengthen under stress. While it's true that epenthetic vowels fail to lengthen when they precede the possessive suffix /-ku/, outside of this specific environment, they lengthen just like underlying vowels do. See Broselow 2001:22 for details.

- The traditional explanation (Mithun & Basri 1986) is that the word-final vowel is epenthetic (likely due to a ban on codas), and invisible to stress assignment.

➢ **But epenthetic vowels aren't always invisible to stress.**

- In the loanwords in (27) and (28), stress lands on the penult despite there being an epenthetic vowel (underlined) in the penult (27) or the ultima and the antepenult (28).

(27) Internal epenthesis in loanwords (Broselow 2001:3)

a.	[kará:tu]	'card',	not *[ká:ratu]	(source: Bahasa Indonesian [kártu])
b.	[surú:ga]	'heaven',	not *[sú:ruga]	(source: Bahasa Indonesian [súrga])

(28) Internal and external epenthesis in loanwords (Broselow 2001:8)

a.	[solodé:re]	'weld',	not *[só:lodere]	(source: Bahasa Indonesian [sólder])
b.	[karatí:si]	'ticket',	not *[ká:ratisi]	(source: Bahasa Indonesian [kárcis])

- In such words, default stress applies, showing that the epenthetic vowels clearly count for stress.

- We propose that a drive for copy and host vowels *to agree in stress*[10] drives misapplication in the class of words with antepenultimate stress in (26) above (see also Kitto & de Lacy 1999).
  - We encode this with the following constraint:

(29) **IDENT[stress]-SC**:

Assign one violation * for each pair of vowels standing in SC-correspondence which do not have identical values for stress (i.e. [stressed]↔[unstressed] or [unstressed]↔[stressed]).

- **To derive misapplication** (antepenultimate stress): IDENT[stress]-SC » *LAPSER

(30) Misapplication of stress to satisfy IDENT[stress]-SC in final epenthesis: [só:^{m}bala] (ex. ((26)a))

/so^{m}bal/	NONFINALITY	*CLASH	IDENT[stress]-SC	*LAPSER
a. ☞só:^{m}ba$_{x}$la$_{x}$				*
b. so^{m}bá:$_{x}$la$_{x}$			*!	
c. so^{m}ba$_{x}$lá:$_{x}$	*!		*	
d. so^{m}bá$_{x}$lá:$_{x}$	*!	*!		

- IDENT[stress]-SC does *not* lead to misapplication in cases like (27) and (28), because there is no permissible means to satisfy it.

[10] An equivalent analysis in which the vowels must agree in *length* is also possible. We will not present this analysis here.

- **To explain (27)**: NONFINALITY, *CLASH » IDENT[stress]-SC
  - Stressing the final (NONFINALITY violation): worse than a copy-host stress mismatch.
  - Stressing both copy and host, causing clash: worse than having a copy-host stress mismatch.
  - Therefore, in the forms in (27), stress defaults to the penult (to satisfy *LAPSER).

(31) ***CLASH**: Assign one violation mark * for every sequence of two adjacent stressed syllables.

(32) Default penultimate stress with medial epenthesis: [kará:tu] (ex. ((27)a))

/kartu/	NONFINALITY	*CLASH	IDENT[stress]-SC	*LAPSER
a. ká:$_x$ra$_x$tu			*	*!
b. ☞ ka$_x$rá:$_x$tu			*	
c. ká$_x$rá:$_x$tu		*!		
d. ka$_x$ra$_x$tú:	*!			

- When there is both medial and final copy epenthesis, as in (28), putting a single stress on any vowel will result in a violation of IDENT[stress]-SC, so stress again defaults to the penult.

(33) Default penultimate with medial and final epenthesis: [solodé:re] (ex. ((28)a))

/solder/	NONFINALITY	IDENT[stress]-SC	*LAPSER
a. só:$_x$lo$_x$de$_y$re$_y$		*	*!
b. so$_x$ló:$_x$de$_y$re$_y$		*	*!
c. ☞ so$_x$lo$_x$dé:$_y$re$_y$		*	
d. so$_x$lo$_x$de$_y$ré:$_y$	*!	*	

- The only configuration where stress could possibly misapply is when the single copy-host sequence is word-final, as in (23). And this is exactly where we see misapplication, i.e. antepenultimate stress.

(34) Ranking summary

NONFINALITY   *CLASH
↘ ↙
IDENT[stress]-SC
↓
*LAPSE

[ka$_x$rá:$_x$tu] > *[ka$_x$ra$_x$tú:] ; [ka$_x$rá:$_x$tu] > *[ká$_x$rá:$_x$tu]

[só:^{m}ba$_x$la$_x$] > *[so^{m}bá:$_x$la$_x$]

Discussion:

- Consider the following near-minimal pair (Mithun & Basri 1986:217 for a; 238 for b):

(35) Stress difference in near-minimal pair:[11]

a. Antepenultimate stress: [já:guru] 'to box, punch' – final [u] is epenthetic
b. Default penultimate stress: [kaˀmú:ru] 'nose' – final [u] is underlying[12]

- These forms both have final [uru] strings, but only ((35)a) shows stress misapplication.
- *Significance*: the relevant correspondence relation cannot be sensitive just to surface similarity.
- The data in (35) aside, a potential alternative proposal for the data above might be:
    - Correspondence is established *for all pairs of identical vowels spanning* [r], [l], [s].
        - (On similarity-driven surface correspondence, see e.g. Rose & Walker 2004.)
- But if this were the right story, we would expect misapplication in both ((35)a) and ((35)b).
    - This *isn't* what happens: the correspondence relation isn't just sensitive to similarity.
    - Recall also that, in Ngan'gityemerri, stress-matching occurs even when the vowels are not featurally identical. This isn't a result of similarity-driven correspondence, either.
- ***To review***: correspondence is established when multiple output segments correspond with the same input segment. Surface similarity itself plays no role here.

- A virtually identical misapplication pattern occurs in Tahitian (Bickmore 1995), where identical translaryngeal vowels (V_iʔV_i) appear to correspond for stress.

5 Stress misapplication II: Dorsey's Law in Hocank

- Hocank (formerly Winnebago) also has a process of copy epenthesis, and, as in Selayarese, it can cause stress to misapply.
- This seemingly opaque interaction between stress and epenthesis has drawn much attention in the literature, but thoroughly analyzing the facts has proven difficult.

This section: If we make a slight emendation to the interpretation of the data (motivated by our reading of the early sources and evidence from pitch-tracking), the pattern receives a simple analysis in the IDENT-SC framework.

5.1 Stress in the basic case

- Even putting aside its interaction with epenthesis, the Hocank stress system is fairly complicated.
    - It is essentially a trisyllabic left-edge window system that is sensitive to syllable weight (long vowels and diphthongs attract stress; coda consonants do not).
    - These issues of weight do not crucially interact with the epenthesis facts, so, for simplicity, we will discuss only words with light syllables.
- Abstracting away from the weight effects, the basic Hocank stress pattern can be described as follows (all data in this section from Miner 1989 unless noted elsewhere):

[11] There is also at least one perfect minimal pair of this sort: [sá:hala] 'profit' (antepenultimate stress, final epenthesis) vs. [sahá:la] 'sea cucumber' (default stress, underlying final vowel) (Mithun & Basri 1986: 239-40). The accidental identity between the first vowel and the other vowels obscures the point being made in this section, so we illustrate that point instead with the near minimal pair.

[12] The epenthetic vs. non-epenthetic character of the final vowels in these examples is also independently attested by their differential interaction with the possessive suffix – see Mithun & Basri 1986: 239-40.

(36) Description of basic Hocank stress

a. If the word consists of three or more syllables, stress the third syllable from the left:
   3σ: *wanigík* 'bird', *hipirák* 'belt'
   4σ: *hinubáha* 'second', *wišcĩgéga* 'hare'
b. If the word contains only two syllables, stress the second from the left:[13]
   2σ: *hiwáx* 'to ask', *rajóx* 'to break in the mouth', *wašé* 'dress'

- This pattern can be described with the constraints in (37),[14] which are illustrated in (38) and (39).

(37) Constraints for post-peninitial stress:

a. **NONINITIALITY**: one * if stress falls on first syllable of the word. (See Garrett 1999)
b. **EXTENDEDNONINITIALITY**: one * if stress falls on one of the first two syllables of the word.
c. ***EXTENDEDLAPSEL**: one * if stress no stress falls within the first three syllables of the word.

(38) 3[rd] syllable (post-peninitial) stress in 3+ syllable words

/hinubaha/	NONINITIALITY	EXTNONINITIALITY	*EXTLAPSEL
a. hínubaha	*!	*	
b. hinúbaha		*!	
c. ☞ hinubáha			
d. hinubahá			*!

(39) 2[nd] syllable (peninitial) stress in 2 syllable words

/hiwax/	NONINITIALITY	EXTNONINITIALITY	*EXTLAPSEL
a. híwax	*!	*	
b. ☞ hiwáx		*	

- None of these constraints conflict, so they cannot yet be ranked with respect to one another.
    - Once we consider the epenthesis facts, we will be able to posit some rankings.

5.2 Copy epenthesis and misapplication of stress

- In Hocank, *voiceless obstruent + sonorant* clusters are broken up by epenthetic copy vowels.
    - This is traditionally referred to as "Dorsey's Law" (DL).

(40) Examples of Dorsey's Law epenthesis (copy vowel is underlined)

a. /kre/ → [k<u>e</u>re] 'to leave returning'
b. /sros/ → [s<u>o</u>ros] 'deep'

- When a word contains a Dorsey's Law sequence in certain positions, *stress misapplies*.
- ➢ We argue that this is a result of **undominated IDENT[stress]-SC**.

[13] Words consisting of a single light syllable appear to be unattested. Monosyllabic words always consist of a heavy syllable, such as *zí:* 'yellow, orange', which bears stress. The absence of words consisting of a single light syllable implies the activity of a minimal word requirement.

[14] We might consider using a gradient right-alignment constraint rather than (EXT)NONINITIALITY. However, we believe this may run into problems with some of the weight-sensitivity facts.

❖ In the table in (41), we compare words of identical shapes that differ in whether or not (and where) they include a Dorsey's Law sequence (bracketed).

NOTE: We assert that, when one member of a DL sequence bears stress, so does the other. This is not what most recent accounts assume, but there is strong evidence in favor of this view. See the appendix.

(41) Stress in DL vs. non-DL words[15]

Word shape	Non-epenthetic word	Dorsey's Law word (DL sequence(s) in [ ])	
$\sigma_1\sigma_2$	$\sigma_1\acute{\sigma}_2$ ex. *hiwã́x* 'to ask'	$[\acute{\sigma}_1\acute{\sigma}_2]$ ex. [*ke̱ré*]	(← /**kr**e/) 'to leave returning'
$\sigma_1\sigma_2\sigma_3$	$\sigma_1\sigma_2\acute{\sigma}_3$ ex. *hipirák* 'belt'	$[\sigma_1\sigma_2]\acute{\sigma}_3$ ex. [*xe̱re*]*hí*	(← /**xr**ehi/) 'to boil'
		$\sigma_1[\acute{\sigma}_2\acute{\sigma}_3]$ ex. *hi*[*pe̱rés*]	(← /hi**pr**es/) 'to know'
$\sigma_1\sigma_2\sigma_3\sigma_4$	$\sigma_1\sigma_2\acute{\sigma}_3\sigma_4$ ex. *hiǰowíre* 'fall in'	$[\sigma_1\sigma_2]\acute{\sigma}_3\sigma_4$ ex. [*xo̱ro*]*ǰíke*	(← /**xr**oǰike/) 'hollow'
		$\sigma_1[\sigma_2\sigma_3]\acute{\sigma}_4$ ex. *hi*[*ko̱ro*]*hó*	(← /hi**kr**oho/) 'to prepare'
		$\sigma_1\sigma_2[\acute{\sigma}_3\acute{\sigma}_4]$ ex. *hiru*[*pĩ̱́nĩ́*]	(← /hiru**pn**i/) 'to twist'
		$[\sigma_1\sigma_2][\acute{\sigma}_3\acute{\sigma}_4]$ ex. [*ke̱re*][*pã̱́nã́*]	(← /**krepn**a/) 'unit of ten'
$\sigma_1\sigma_2\sigma_3\sigma_4\sigma_5$	$\sigma_1\sigma_2\acute{\sigma}_3\sigma_4\sigma_5$ ex. *hokiwároke* 'swing'	$\sigma_1[\sigma_2\sigma_3][\acute{\sigma}_4\acute{\sigma}_5]$ ex. *wa*[*ki̱ri*][*pa̱rás*][16]	(← /wa**kr**i**pr**as/) 'flat insect'

- While we see multiple different patterns among DL forms, the major points can be illustrated by comparing the words of four syllables.
  - The stress pattern we find depends on the position of the DL sequence:

(42) Stress in 4σ words

	Word type	Stress pattern	Example	Stress application type	
a.	Non-DL word	$\sigma_1\sigma_2\acute{\sigma}_3\sigma_4$	*hiǰowíre*	Normal application:	Stress on σ_3
b.	DL in $[\sigma_1\sigma_2]$	$[\sigma_1\sigma_2]\acute{\sigma}_3\sigma_4$	[*xo̱ro*]*ǰíke*	Normal application:	Stress on σ_3
c.	DL in $[\sigma_2\sigma_3]$	$\sigma_1[\sigma_2\sigma_3]\acute{\sigma}_4$	*hi*[*ko̱ro*]*hó*	Misapplication:	**Stress on σ_4**
d.	DL in $[\sigma_3\sigma_4]$	$\sigma_1\sigma_2[\acute{\sigma}_3\acute{\sigma}_4]$	*hiru*[*pĩ̱́nĩ́*]	Misapplication:	**Stress on σ_3 & σ_4**

[15] *hiǰowíre* and *hokiwároke* are from Miner 1979; all other data are from Miner 1989. Note also that *hokiwároke* is transcribed with a final secondary stress.

[16] This is the only (mono-morphemic) five syllable word containing a DL sequence that we can find. We therefore do not know the behavior of other logically possible configurations of DL in 5(+) syllable words.

- The different patterns result from the fact that there are two ways to satisfy IDENT[stress]-SC:
  - Stress *neither* the copy nor the host.
  - Stress *both* the copy and the host.

- When the DL sequence occupies [$\sigma_1\sigma_2$], nothing prevents stress from applying normally to σ_3.
  - So ((42)b) [$\sigma_1\sigma_2$]$\acute{\sigma}_3\sigma_4$ shows normal application, just like ((42)a) $\sigma_1\sigma_2\acute{\sigma}_3\sigma_4$.

(43) Normal application: 3rd syllable stress with DL in [$\underline{\sigma_1}\underline{\sigma_2}$] ([*x$\underline{\text{o}}$ro*]*ǰíke* 'hollow')

/xroǰike/	IDENT[stress]-SC	NONINITIALITY	EXTNONINITIALITY	*EXTLAPSEL
a. ☞ x$\underline{\text{o}}_x$ro$_x$ǰíke				
b. x$\underline{\text{o}}_x$ró$_x$ǰike	*!		*	
c. x$\underline{\text{ó}}_x$ro$_x$ǰike	*!	*	*	
d. x$\underline{\text{o}}_x$ro$_x$ǰike		*!	*	

- However, when the DL sequence includes σ_3 (((42)c) and ((42)d)), **misapplication** results.
  - Because IDENT[stress]-SC is undominated, applying normal σ_3 stress triggers the need for stress on the other member of the DL sequence.
  - Hocank displays two responses for this problem, driven by the interaction between the metrical constraints and the two means to satisfy IDENT[stress]-SC.

- **The first response**: satisfy IDENT[stress]-SC by stressing **neither** DL vowel (σ_1[$\sigma_2\sigma_3$]$\acute{\sigma}_4$).
  - Normal application of stress (σ_3) would compel a stress on σ_2, due to IDENT[stress]-SC.
  - Stressing σ_2 would cause a violation of EXTNONINITIALITY.
  - Fourth-syllable stress is preferred in this context: EXTNONINITIALITY » *EXTLAPSEL.

(44) Misapplication: 4th syllable stress with DL in [$\underline{\sigma_2}\underline{\sigma_3}$] (*hi*[*k$\underline{\text{u}}$ru*]*ní* 'tangled')

/hikruni/	IDENT[stress]-SC	EXTNONINITIALITY	*EXTLAPSEL
a. hik$\underline{\text{ú}}_x$rú$_x$ni		*!	
b. ☞ hik$\underline{\text{u}}_x$ru$_x$ní			*
c. hik$\underline{\text{u}}_x$rú$_x$ni	*!		

- **The second response**: satisfy IDENT[stress]-SC by stressing **both** DL vowels ($\sigma_1\sigma_2$[$\acute{\sigma}_3\acute{\sigma}_4$]).
  - Normal application of stress (σ_3) compels stress on σ_4, due to undominated IDENT[stress]-SC.
  - A possible alternative: satisfy IDENT[stress]-SC by stressing σ_2 instead.
  - This is ruled out by EXTNONINITIALITY » *CLASH.

(45) Misapplication: 3rd & 4th syllable stress with DL in [$\underline{\sigma_3}\underline{\sigma_4}$] (*hiru*[*p$\underline{\text{ĩ́}}$nĩ́*] 'to twist')

/hirupni/	IDENT[stress]-SC	EXTNONINITIALITY	*CLASH
a. ☞ hirup$\underline{\text{ĩ́}}_x$nĩ́$_x$			*
b. hirúp$\underline{\text{ĩ}}_x$nĩ$_x$		*!	
c. hirup$\underline{\text{ĩ́}}_x$nĩ$_x$	*!		

- The two types of misapplication we see in four syllable words share a common cause:
  - IDENT[stress]-SC must always be satisfied, even at the expense of *CLASH.[17]
  - EXTNONINITIALITY must be satisfied when possible, at the expense of *EXTLAPSEL (as in (44)) and *CLASH (as in (45)).

- The other patterns found in (41) are consistent with the rankings demonstrated in four syllable words, and in addition reveal several others.
  - These are summarized in the following tableaux:

(46) 1st & 2nd syllable stress in 2σ DL-only words ([*k$\underline{\text{é}}$ré*] 'to leave returning')

/kre/	IDENT[stress]-SC	NONINITIALITY	*CLASH
a. ☞ k$\underline{\text{é}}_x$ré$_x$		*	*
b. k$\underline{\text{é}}_x$re$_x$	*!	*	
c. k$\underline{\text{e}}_x$ré$_x$	*!		

(47) 2nd & 3rd syllable stress in 3σ words with DL in [σ$_{\underline{2}}$σ$_{\underline{3}}$] (*hi*[*p$\underline{\text{é}}$rés*] 'to know')

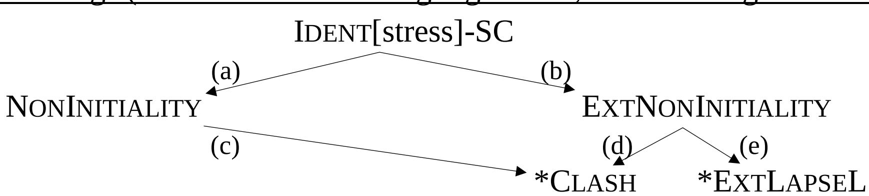
/hipres/	IDENT[stress]-SC	NONINITIALITY	*CLASH
a. ☞ hip$\underline{\text{é}}_x$ré$_x$s			*
b. híp$\underline{\text{e}}_x$re$_x$s		*!	
c. hip$\underline{\text{e}}_x$ré$_x$s	*!		

(48) 4th & 5th syllable stress in 5σ words with DL in [σ$_{\underline{2}}$σ$_{\underline{3}}$] & [σ$_{\underline{4}}$σ$_{\underline{5}}$] (*wa*[*k$\underline{\text{i}}$ri*][*p$\underline{\text{á}}$rás*] 'flat insect')

/wakripras/	IDENT[stress]-SC	EXTNONINITIALITY	*EXTLAPSEL	*CLASH
a. ☞ wak$\underline{\text{i}}_x$ri$_x$p$\underline{\text{á}}_y$rá$_y$s			*	*
b. wak$\underline{\text{í}}_x$rí$_x$p$\underline{\text{a}}_y$ra$_y$s		*!		*
c. wak$\underline{\text{i}}_x$rí$_x$p$\underline{\text{a}}_y$ra$_y$s	*!			
d. wak$\underline{\text{i}}_x$ri$_x$p$\underline{\text{á}}_y$ra$_y$s	*!		*	

- A ranking summary of the analysis is shown in (49):

(49) Stress rankings (annotated with ranking arguments; transitive arguments omitted)



(a) [k$\underline{\text{é}}_x$ré$_x$] > *[k$\underline{\text{e}}_x$ré$_x$][18]
(b) [hip$\underline{\text{é}}_x$ré$_x$s] > *[hip$\underline{\text{e}}_x$ré$_x$s]
(c) [hip$\underline{\text{é}}_x$ré$_x$s] > *[híp$\underline{\text{e}}_x$re$_x$s]
(d) [hirup$\underline{\text{í}}_x$ní$_x$] > *[hirúp$\underline{\text{i}}_x$ni$_x$]
(e) [hik$\underline{\text{u}}_x$ru$_x$ní] > *[hík$\underline{\text{ú}}_x$rú$_x$ni]

[17] In Hocank, pitch is the primary (if not only) cue to stress (see Miner 1989, Hall 2003), so what we call *CLASH could just as well be defined as a constraint dispreferring high pitch plateaus.
[18] To ensure that some stress surfaces in *kéré* (as opposed to the alternative *kere*, where there are no stresses), we also assume that ONESTRESS is undominated, i.e. that all Hocank words must have some stress.

5.3 Other evidence for SC-faithfulness in Hocank: vowel-length

- In addition to stress, the behavior of vowel length/duration gives additional indication that copy vowels and their hosts must be identical in (all?) derived, i.e. predictable, features.

- Authors have noted that both vowels in the DL sequence are **overly short**.
    - Susman (1943:9-10), via Alderete (1995): "...[DL sequences] can be identified [...] usually by the fact that the vowels are very short."
    - Miner (1979:26): "the sequences are spoken [...] faster than other CVCV sequences."

➢ **Our interpretation**: *this is back-copying of length (i.e. shortness) due to SC-correspondence*
- Hocank requires epenthetic vowels to be very short (on this see Steriade 2001).
- Host vowels become overly short in order to match their copy.
- This is back-copying of (sub-categorical) length induced by SC-correspondence.

❖ Compare to Scottish Gaelic (§3), where the demand for length identity altered both copy and host.

- Similar IDENT-SC effects can also be seen for vowel nasality (see e.g. Miner 1989).

➢ These effects provide further support for the existence and activity of SC-correspondence in Hocank.

5.4 Hocank summary

- Hocank displays simultaneously several properties found independently in Ngan'gityemerri (§2.1), Scottish Gaelic (§3), and Selayarese (§4).
    - Like we saw for Ngan'gityemerri, stress identity between surface correspondents can force the placement of an additional stress, even at the expense of creating a clash:
        - IDENT[stress]-BR/SC » *CLASH
    - Like we saw for Selayarese, the need for stress identity between surface correspondents can force misapplication of stress (i.e. exclusive placement outside of the normal stress domain), when metrical constraints permit.
    - Like Scottish Gaelic, the need for durational identity between surface correspondents leads to an abnormally short duration of the host vowel.

6 Summary and conclusion

- We have argued that the following two properties are part of the phonological grammar:

(50) <u>Properties of the phonological grammar</u>

(i) The existence of a correspondence relation among surface segments, arising under particular structural configurations (of which copy epenthesis is one, and reduplication maybe another).

(ii) Faithfulness constraints that require identity between surface correspondents for suprasegmental properties like stress.

- We have shown that a grammar with these properties can account for a diverse range of effects.

(51) Summary of effects observed

Language	***Process***	***Source***	***Effect***	***Type of prominence***
Ngan'gityemerri	Reduplication	Reid 2011	misapplication of stress	stress
Scottish Gaelic	Copy epenthesis	Bosch & de Jong 1997 Hammond et al. 2014	duration matching[19]	duration
Selayarese	Copy epenthesis	Broselow 2001	misapplication of stress	stress / length
Tahitian	Copy epenthesis	Bickmore 1995	misapplication of stress	stress
Hocank	Copy epenthesis	Miner 1979, 1989	- misapplication of stress - duration matching - nasality matching	- stress / pitch - duration - nasality

- These effects provide strong evidence that copy epenthesis must involve *correspondence*, as argued for by Kitto & de Lacy (1999), and not (exclusively) *spreading*, as argued for by Kawahara (2007).
    - Kawahara argues that Kitto & de Lacy's (1999) correspondence-based analysis of copy epenthesis *overgenerates*: it predicts identity between copy-host pairs for prosodic properties, a class of effects that Kawahara's survey of copy epenthesis does not uncover.[20]
    - But we have shown these effects are attested; Kawahara's overgeneration argument is moot.
    - It is difficult to imagine how an analysis that *only* makes use of spreading could account for the effects observed here. Their existence is therefore an argument strongly in favor of the correspondence-style analysis.
- In addition, the proposed structural similarity between copy epenthesis and reduplication (anticipated by Kitto & de Lacy) helps us understand why the two processes display many of the same effects.
    - We have shown that similar suprasegmental identity effects occur in both processes.
    - If copy epenthesis and reduplication both involve multiple correspondence, their similarity in this respect is predicted, and it's also what's attested.

7 References

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[19] Recall that the categorical blocking effects can be accounted for with IO correspondence; it's the more subtle length-matching effects documented by Bosch & de Jong (1997) that require SC-correspondence.

[20] Kawahara's main additional objection to a correspondence-based analysis has to do with locality restrictions: copy epenthesis never copies a vowel other than the closest one, whereas reduplication can choose which segments to copy based on markedness preferences. We believe that this generalization is correct, but that locality is an artifact of the phonetic origins of copy epenthesis, rather than the sign of an altogether different mechanism.

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8 Appendix: on the transcription of stress in DL sequences

- All sources on Hocank stress agree that, when it falls in certain positions within the word, a Dorsey's Law (DL) sequence must carry stress.
    - However, the transcription of stress in such DL sequences has varied across descriptions.
- Starting with Hale & White Eagle (1980), work on stress in Dorsey's Law sequences assumes that only one of the copy-host pair bears stress.
- But, in work prior to Hale & White Eagle (1980), there is some acknowledgment of prominence on both members of a stressed DL sequence:

Susman 1943:13 (via Hall 2003:173): in DL sequences, "secondary stress seems to attach equally to both syllables."

Miner 1979: both copy and host vowels are transcribed with stress (e.g. hipèrés, 'know').
- Although Miner transcribes secondary stress on the first member of the DL pair, he notes (pp. 26-27) that often "the secondarily accented syllable has almost as much accent as, or even as much as (but never more than) the primarily accented one."
- Miner (p.27) speculates that this perceptual ambiguity caused the authors of earlier grammars (Lipkind 1945, Wolff 1950, 1951, Matthews 1958) to transcribe stress on the first syllable of DL sequences only.
    - Miner's move in later work (1981, 1989) to transcribe stress on only one portion of the DL sequence is made without comment.

- Based on these descriptions in the earlier sources, and the pitch-tracking data presented below in (53)-(55), we assert that:
    - ➢ In stressed DL sequences, *both vowels* (i.e. copy and host) bear stress.

- In (52), we provide the transcriptions we assume in our analysis, compared to the transcriptions used in later analyses such as Miner 1989.

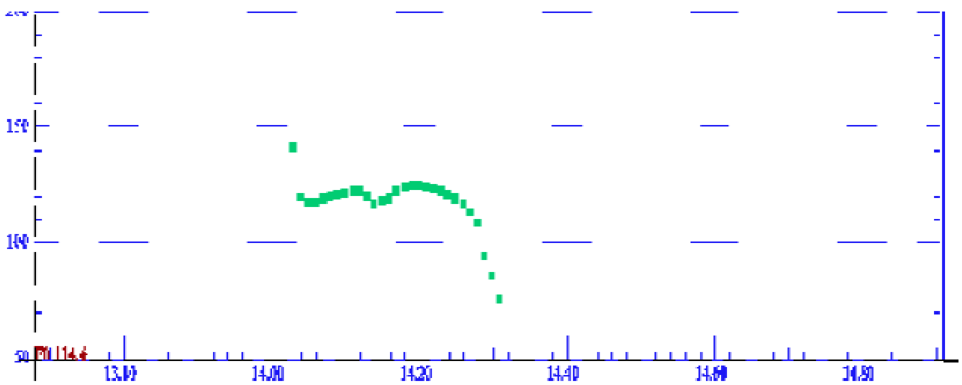
(52) Transcription of stress in Dorsey's Law words

			Our interpretation	Miner's (1989) transcription
a.	/kre/	'to leave returning'	[kéré]	[keré]
b.	/hipres/	'to know'	[hipérés]	[hiperés]
c.	/hirupni/	'to twist'	[hirupíní]	[hirupíni]
d.	/sruxruk/	'you earn'	[suruxúrúk]	[suruxúruk]
e.	/wakripras/	'flat insect'	[wakiripárás]	[wakiripáras]
f.	/hikroho/	'to prepare'	[hikorohó]	[hikorohó]
g.	/hikruni/	'tangled'	[hikuruní]	[hikuruní]

- The early interpretation that both syllables bear stress is supported by pitch data (Hall 2003:172ff).
    - Pitch is the major (maybe only?) cue to stress in Hocank (Miner 1979:25).

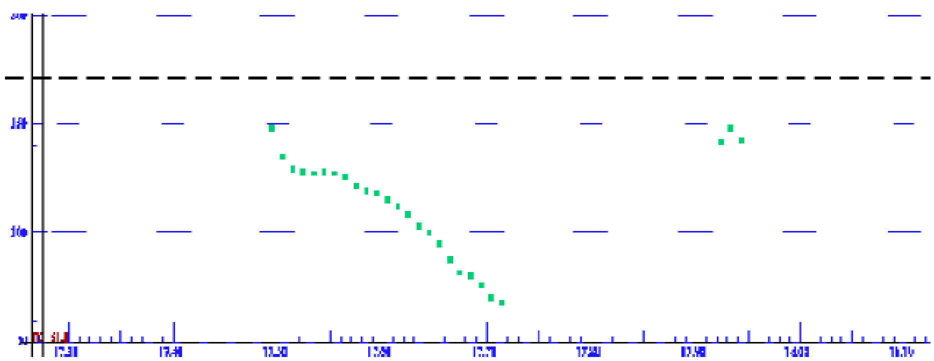
- In DL sequences, both vowels bear high pitch (53).

(53) <u>Pitch track for [seretʃ] (-*sere*- is a DL sequence)</u>



- This contrasts with stressed long vowels (54), in which only one half of the vowel (the first half) bears high pitch:

(54) <u>Pitch track for monosyllabic [sé:p]</u>



- This contrasts also with light disyllabic words without DL (55), in which only the stressed syllable bears high pitch:

(55) <u>Pitch track for non-DL disyllabic [warútʃ]</u>