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CiV lengthening and the weight of CV

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11.1 Two problems for CiVL

CiV Lengthening (CiVL) turns a stressed non-high vowel followed by a string of the form CiV into a long vowel, to be later diphthongized by the rule of Vowel Shift (Chomsky & Halle, 1968).[1]

(1) CiVL alternations

Cán[ə]da	Can[éɪ]dian	pál[ə]ce	pal[éɪ]tial
Pánam[ə]	Pànam[éɪ]nian	Ár[ə]b	Ar[éɪ]bian
Áb[ə]l	Àb[í:]lian	molýbd[ə]num	molỳbd[í:]nian
Hánd[ə]l	Hand[í:]lian	Béethov[ə]n	Bèethov[í:]nian
Bóst[ə]n	Bost[óʊ]nian	mél[ə]dy	mel[óʊ]dious
cól[ə]ny	col[óʊ]niəl	fél[ə]ny	fel[óʊ]nious[2]

[1] I deviate from IPA's conventions on marking stress: I place an acute or grave accent on the vowel, sidestepping questions about syllabic division.

The pattern described in this note is that reported for American English in the online version of the Oxford English Dictionary, with results checked against Merriam Webster's website and Kenyon and Knott (1953). To assess the productivity of CiVL, a list of Latinate forms containing the strings éCiV, óCiV, áCiV was obtained through regular expression searches in the OED. I retained all the forms which, like (1), are synchronically related to an English base, if that base does not itself contain the corresponding VCiV string. The vowel qualities in the data follow the OED except in the few cases where Kenyon and Knott or Merriam Webster's entries deviate from it. Inspection of this list confirms the unrestricted productivity of CiVL, at least among the editors of the OED[3] . The list is available from the author.

What is the Structural Description of this productive process? Chomsky and Halle (1968: 182, 242) and subsequent writers, most recently Baković (2013: 81), identify it as $V_{[-high]}$CiV. This SD and its OT translations are rejected here as unable to answer two questions.

The first question involves the contribution of the right context _CiV to the lengthening effect. Beyond insuring that the target vowel is in an open syllable, why should it be precisely iV that's needed to open that syllable? Why not any vowel, in any context? CiVL is limited to English, while open syllable lengthening under stress is widespread.[4] This suggests that the complexity of the context in the SD VCiV hides English-specific interactions of simpler constraints.

What could those simpler constraints be? In other phonological systems, including North Germanic, West Germanic, and earlier forms of English (Dresher & Lahiri, 1991), a short vowel lengthens under stress in all open syllables, no matter what follows. The Stress to Weight Principle (SWP; Prince 1991) provides a well-understood incentive for open syllable lengthening and has broad typological support. The proposal here will be to reduce the effect of CiVL to that of SWP, interacting with further aspects of English prosodic structure.

The second question raised by CiVL involves the interpretation of the Derived Environments Effect (DEE; Kiparsky 1973). Although fully productive in forms like (1), CiVL fails morpheme internally: *onion*, *valiant, cameo, tilapia,*

[3]On the productivity of CiVL: apparent exceptions like *Maxw[ɛ]llian* were thought predictable by Chomsky and Halle (1968: 182, fn. 17), who took orthographic geminates to reflect aspects of the underlying form. Alternative explanations follow. There remain, among the better known items, three words: *Itálian, compánion, medállion.* Historically, at least, these are not exceptions: they are borrowings of *Italien, compagnon, médaillon,* which preserve the quantity of their sources, not generated as English derivatives of *Italy, company, medal.*

[4]Cf. Revithiadou (2004) for a survey of open syllable lengthening in trochaic systems.

patio, amianth, manioc, Cheviot, aria, Iscariot[5] . This is part of the DE syndrome, but the application of CiVL is restricted beyond what a standard DE effect demands: the rule is blocked if stress stays on the same vowel in the derivative as in the base, e.g., *Color*[á]*do* vs. *Color*[á]*dian,* a fact first noted by Burzio (2005: 68ff).

This is unusual. The original interpretation of DEEs (Kiparsky, 1973) is that the SD of the rule must be new relative to strings contained in the underlying forms, or in the outputs of earlier cycles. That condition is met in *Color*[á]*d-ian*, if the SD of CiVL is $V_{[-high]}$CiV. Generally, any strings of the form $V_{[-high]}$ + CiV, $V_{[-high]}$ C +iV, $V_{[-high]}$Ci + V (where '+' = affixal boundary) should satisfy a standard DE condition on CiVL, whether stress has changed on the target vowel, or not. As Burzio notes, that is clearly not so: CiVL operates only if the target vowel is newly stressed, as in *Canádian*.

(2) CiVL is blocked if the derivative's main stress is identical to base

Color[á]do	Color[á]dian	Alab[á]ma	Alab[á]mian
Nep[á]l	Nep[á]lian	Balz[á]c	Balz[á]cian[6]
Som[á]li	Som[á]lian	Lapl[á]ce	Lapl[á]cian
Mal[á]wi	Mal[á]wian	Pasc[á]l	Pasc[á]lian
Haw[á]ii	Haw[á]iian	Louisi[ǽ]na	Louisi[ǽ]nian
Rav[é]l	Rav[é]lian	Cincinn[ǽ]ti	Cincin[ǽ]tian
D[ɛ́]lhi	D[ɛ́]lhian	Gorbatch[ɛ́]v	Gorbatch[ɛ́]vian
Pantagru[ɛ́]l	Pantagru[ɛ́]lian	Gorbatch[ɔ́]v	Gorbatch[ɔ́]vian

Next to (1), the forms in (2) show the productivity of this DE effect in the dialect of the same speakers for whom CiVL is otherwise unrestricted. Both the basic process and its blockage are fully general. In the list described above I found a small number of exceptions to the pattern in (2). Most of these can be explained in one of two ways: (a) the base of the CiV-derivative is different from the one first assumed (e.g. *Orig*[ɛ́]*nian* based on *Orig*[ɛ́]*nic*, with stress identity blocking CiVL, rather than *Órig*[ə]*n*; (b) the CiV-derivative in A.English contains unexpected lengthening, given (2), because it follows

[5]Regarding *aria, Iscariot*: contemporary speakers may neutralize the <ɛɪr> - <ɛr> contrast. But these words are recorded by Kenyon and Knott (1953) as containing nuclear sequences they transcribe as <ɑr, ɛr, ær> and <ær> respectively, not <er>; <e> is the grapheme used by KK to record the CiVL output transcribed here as [eɪ]. More on the interpretation of <ar>, <er>, <or> in the CiVL context appears in the full version of this note.

[6]Spelled <Balzackian> by William James, with <ck> signaling a short V, i.e. blockage of CiVL: "a real Balzackian figure—a regular porker, coarse, vulgar, vain, cunning, mendacious." (Letters 11 Apr. (1920) I.318, *apud* OED.)

a British model, where CiVL is justified (e.g. *polyg*[ɔʊ]*nial*, A.English *pólyg*[ɔ]*n*, British *pólyg*[ə]*n*.

If a syllable starts out with some stress in the base and merely acquires primary stress in the derivative, the evidence in (3) shows that CiVL is blocked. Apparent exceptions are found in (4). I take blockage to be the invariant rule: the base of one of two apparent exceptions in (4), *Amazon*, has a variant Á*maz*[ə]*n* that licenses CiVL in *Amazónian*; the other form, *Cycl*[ɔʊ]*pean*, can be derived without CiVL from the plural *Cycl*[ɔʊ]*pes.*

(3) CiVL blocked if main stressed V is stressed in base

Trínid[ù]d	Trìnid[á]dian	Élg[ù]r	Èlg[á]rian
Cónr[æ̀]d	Cònr[ǽ]dian	Yúgosl[ù]v	Yùgosl[á]vian
Bórg[ɛ̀]s	Bòrg[ɛ́]sian[7]	Sómers[ɛ̀]t	Sòmers[ɛ́]tian
Hjélmsl[ɛ̀]v	Hjèlmsl[ɛ́]vian	Whíteh[ɛ̀]d	Whìteh[ɛ́]dian
Nímr[ɔ̀]d	Nìmr[ɔ́]dian	Slóv[ù]k	Slòv[á]kian

(4) CiVL of base [ɔ] licensed in the derivative?

Ámaz[ɔ̀]n Àmaz[ɔʊ]nian	Cýcl[ɔ̀]ps Cỳcl[ɔʊ]pean
cf. variant Ámaz[ə]n	cf. pl. Cỳcl[ɔʊ]pes

The question raised by the data in (2-3) – why is suffixation insufficient to create a DE for CiVL – arises equally under OT formulations of DEEs: McCarthy's 2003 Comparative Markedness, and alternatives in Burzio (2005), Wolf (2008), and Storme (2017). What I propose to do here is not rethink the DEEs–on that see Storme (2017). Rather the project is, in part, to show that on a better understanding of CiVL no DEE question arises.

11.2 SWP under stress change

Both CiVL puzzles – the unexplained requirement that CiV follow the vowel to be lengthened, and the unusually stringent DEE – are eliminated if CiVL reduces to the Stress to Weight Principle Prince1991, which bans light stressed syllables, interacting with a new version of Trisyllabic Shortening, TSS. I discuss first the interpretation of SWP needed here.

Several facts obscure SWP's activity in English. The most obvious is that hundreds of monomorphemic words, like *cólor, léper, cámel,* violate it. I explain this by letting SWP itself be subject to DE blockage. For simplicity, I use

[7] In the OED, this form is recorded as an alternate to the CiVL'ed *Borg*[íː]*sian*. I pair this form with the variant *Bórg*[ə]*s* of the base word, which licenses CiVL.

here McCarthy's (2003) $_{N}$M constraints in formalizing DEEs. These penalize only marked structures distinct from the underlying form or the derivational base of the candidate. Using this interpretation, a DE-version of SWP, $_{N}$SWP (BD), prohibits only stressed short vowels that differ, in being stressed, from the corresponding Base vowel. The annotation (BD) indicates that $_{N}$SWP requires a difference between the surface Base vowel and its output counterpart in the Derivative – as opposed to one between the underlying and surface forms.

(5) $_{N}$SWP (BD):
assign a * to any stressed light syllable in D's stem that is new relative to B.

It is to this constraint that I attribute the lengthening that was earlier chalked up to CiVL: $_{N}$SWP (BD) explains the difference between *Canádian* and *Colorádian*: $_{N}$SWP (BD) is satisfied in *Colorádian* without any change, because the short stressed vowel isn't *new* there.

(6) $_{N}$SWP (BD) under stress change: *Canadian* vs. *Coloradian*.

B	kǽnədə	$_{N}$SWP (BD)	ID[±LONG] IO/OO
a.	kənǽdiən	*!	
b. ☞	kənéɪdiən		*

B	kùləɹɑ́doʊ	$_{N}$SWP (BD)	ID[±LONG] IO/OO
a. ☞	kùləɹɑ́diən		
b.	kùləɹéɪdiən		*!

By letting $_{N}$SWP (BD) refer to all stressed vowels we explain the fact that a mere change from secondary to main stress can't trigger CiVL:

(7) Main stress shifts, but stress doesn't change

B	nímɹɔ̀d	$_{N}$SWP (BD)	ID[±LONG] IO/OO
a. ☞	nìmɹɔ́diən		
b.	nìmɹóʊdiən		*!

The analysis must explain why other stress changes, in non-CiV contexts, don't trigger lengthening. There are four cases to consider. The first involves short stressed vowels in a closed syllable, as in *párent, paréntal*. They are explained by assuming that the active version of the SWP, the one stated in (5), is satisfied by a closed syllable, without lengthening.

The second case represents the bulk of apparent counterevidence to $_{N}$SWP (BD): derivatives like *gener*[æ]*ity*, **gener*[éɪ̂]*ity,* with stress shifted from *géneral*. In such cases, the newly stressed vowel is subject to Trisyllabic Shortening (TSS). One component of the revised analysis will be to assume that the Markedness constraint triggering TSS outranks $_{N}$SWP (BD). The best understood part of this TSS trigger is a bimoraic maximality condition on the English trochee Prince1991, coupled with the independent requirement that at most one syllable at the right edge stay unfooted: this allows parses like [(dʒɛnə)(ɹǽl-ə)ɾi], and excludes *[(dʒɛnə)(ɹéɪ̂l)-əɾi] (too many unparsed syllables), and *[(dʒɛnə)(ɹéɪ̂l-ə)ɾi] (too many moras in the last foot). A foot-free interpretation of TSS, based on the idea of moraic lapse (cf. Kager 1993) is possible, but involves complexities that can't be explored here. A narrower statement of TSS follows in (8), engineered for upcoming developments in this study, along with an illustration:

(8) TSS: Assign a * to a long V followed by a mora in its foot.

B	dʒénəɹəl	TSS	$_{N}$SWP (BD)	Id[±long] IO/OO
a. ☞	(dʒɛ̀nə)(ɹǽl-ə)ɾi		*	
b.	(dʒɛ̀nə)(ɹéɪl-ə)ɾi	*!		*

The third case involves stress advancement in *–ic* forms, whose suffix attracts stress to the penult (*átom, atómic*). These forms also typically shorten an underlying long tonic vowel (*c*[óʊ]*ne, c*[ɔ́]*nic,* **c*[óʊ]*nic*), in addition to inhibiting lengthening (*at*[ɔ́]*mic,* **at*[óʊ]*mic).* This doubly idiosyncratic pattern is attributed by Myers (1987), as interpreted in Prince (1991), to the fact that *-ic* must be parsed in a minimally and maximally bimoraic foot: shortening is a consequence of just this fact. This idea can be incorporated into our analysis: the newly stressed vowel in *atómic* doesn't lengthen because Myers's constraint forces a right-aligned trochee in *a(tómic).* Under this parse TSS blocks lengthening.

(9) Shortening in right-aligned trochees

B	átom	Myers-on-*ic*	TSS	$_{N}$SWP (BD)
a. ☞	ə(tɔ́mɪk)			*
b.	[ə(tóʊ)mɪk]	*!		
c.	[ə(tóʊmɪk)]		*!	

The fourth source of apparent counterexamples to $_{N}$SWP (BD) comes

from derivatives whose stress shifts backwards, as in *stàtistícian* from *statístic*.[8] What is relevant for $_{N}$SWP (BD) is that the stem-initial vowels that gain stress under this retraction recover full quality, but don't lengthen: it's *st*[æ]*tistícian*, not **st*[èɪ]*tistícian*. The retracted stress always lands at distance of one syllable from the main stress. I attribute this instance of non-lengthening to TSS as well. (Here too, a foot-free interpretation is possible, based on Kager's ideas about moraic lapse.)

Beyond such cases and beyond CiVL, are there any other stress shifts that license SWP lengthening? Yes. A pattern parallel to, but distinct from CiVL is found with newly stressed vowels in hiatus. Some of the data has been earlier presented under the rubric of PreVocalic Tensing (Chomsky and Halle 1968: 242; Halle and Mohanan 1985: 81; Hammond 1997: 7), but tensing is a misnomer.

First, as Halle and Mohanan (1985: 81) observe, PreVocalic Tensing does not induce Vowel Shift, while PreVocalic Lengthening does. Compare Tensing in *várious*, *mániac* with Lengthening+Vowel Shift in *varí-ety, manía-al*. Second, Tensing operates regardless of stress, while Lengthening requires a newly stressed vowel as its target. The data in (10) shows this: a short unstressed vowel placed in prevocalic position by affixation lengthens and vowel-shifts *when stress lands on it*. The data in (11) shows that, in the same hiatus configuration, when stress does not change between the base and the derivative, the vowel tenses without Vowel Shift, that is without Lengthening. In other words, the instance of Lengthening in (10) is subject to the same DE condition as the Lengthening in *Canádian*: the target vowel must be newly stressed. The contrast between (10-11) lends support to an analysis in terms of $_{N}$SWP (BD), because it is predicted by it.

(10) Lengthening in hiatus under change of stress

álgebr[ə]	àlgebr[éɪ-ɪ]c	Júd[ə]h	Jud[éɪ-ɪ]c
fórmul[ə]	fòrmul[éɪ-ɪ]c	délt[ə]	dèlt[éɪ-ɪ]c
mán[ɪ.æ]c	man[áɪ.ə]c-al	vár[i]	var[áɪ-ə]ty
simultán[ɪ-əs]	simultan[í:-ə]ti	notór[ɪ-əs]	notor[áɪ-ə]ti

(11) No Lengthening in hiatus without change of stress

Mac[áʊ]	Mac[á.-ɪ]st	Júd[ə]	Júd[ə-ɪ]st
Dád[ɑ]	Dád[ɑ.-ɪ]st	Chín[ə]	Chín[ə-ɪ]st
Niétzsch[ə]	Niétzsch[ə-àɪ]te	Káfk[ə]	Kàfk[ə-é]sque

[8] These shifts were seen as word-internal effects of the Rhythm Rule (Hayes, 1982; Kager, 1993; Kiparsky, 1973) or as consequences of Parse » Ident Stress (Pater, 2000). A third proposal is defended in Stanton and Steriade (in progress).

[8] The OED lists also the lengthened form they transcribe as ['dʒudeɪɪst]. I assume this pro-

The present analysis builds on Halle and Mohanan's distinction between Prevocalic Tensing and Lengthening. I differ on two points from those writers: I claim that stress conditions the lengthening in (10), which is triggered by $_N$SWP (BD), and that the process is fully regular, like CiVL. Halle and Mohanan believe, to the contrary, that Prevocalic Lengthening is an idiosyncratic minor rule, so minor in fact that they neither state nor name it. But both its application in (10) and its failure in (11) are predicted by the current analysis. Once we recognize the stress change requirement imposed by $_N$SWP (BD), there appear to be no exceptions to this instance of lengthening. What does have to be explained is not its application, or apparent exceptions to it, but rather the fact that TSS does not *undo* the effects of this lengthening, in items like *variety* or *algebraic*. That failure is predictable too, as we see next.

11.3 The weight of C_0V

We come now to a harder question: why doesn't TSS cancel out the CiV-induced lengthening in *Canadian?* Our current analysis says it should:

(12) TSS and CiVL

B		kǽnədə	TSS	$_N$SWP (BD)
a.	☞	kənǽdiən		*
b.	☹	kənéɪdiən	*!	

Similarly, why doesn't TSS block or cancel the effects of PreVocalic Lengthening in *notoriety* and *maniacal*? Why, given Myers' conjecture about trochee-final parses of *–ic* forms, are the effects of PreVocalic Lengthening allowed to surface in *algebraic*? And similarly why does TSS allow underlying long vowels to be preserved in items like *Barbadian* and *Boolean*? In all these cases, an unexpected long vowel surfaces when it is in hiatus itself (in *algebraic, maniacal*) or followed by hiatus (in *Canadian, Boolean*). Clearly it is a fact about hiatus that underlies these exceptions to TSS: what is this fact?

I propose that prevocalic vowels weigh less than their non-prevocalic counterparts. A first version of this idea is spelled out next, in moraic language. The moraic analysis is revisited in the last section. Suppose then that the syllable of prevocalic short [i] is shorter than one mora. That explains why TSS doesn't block CiVL in *Can*[éɪ]*dian*: there is no full mora after [éɪ], in its foot.

nunciation contains a tertiary stress on the middle syllable and is based on *Judáic*.

(13) Submoraic C_0i satisfies TSS without shortening

B		kénədə	TSS	NSWP (BD)	ID[±LONG] (BD)
a.		kə(nédi)ən	(i/_V < 1μ)	*!	
b.	☞	kə(nɛ́ɪdi)ən	(i/_V < 1μ)		*

Suppose, *mutatis mutandis*, that the syllables of the prevocalic long vowels, or perhaps of prevocalic Vi dipthongs, are shorter than *two* moras. Then they are less than fully bimoraic and it is natural to suppose that TSS doesn't prevent these items of intermediate quantity from preceding another mora within their foot. That's why *var*[áɪ-ə]*ty* and *algebr*[éɪ-ə]*c* surface with unshortened stressed vowels: their quantity has already been reduced by hiatus.

(14) Sub-bimoraic C_0V:/_V satisfies TSS without shortening

B		vɛ́ɹi	TSS	NSWP (BD)	ID[±LONG] (BD)
a.	☞	və(ɹáɪ.ə)ɾi	(aɪ/_V < 2μ)		*
b.		və(ɹí.ə)ɾi		*!	

B		ælʤəbɹə	TSS	NSWP (BD)	ID[±LONG] (BD)
a.	☞	(ælʤə)(bɹéɪ.ək)i	(eɪ/_V < 2μ)		*
b.		(ælʤə)(bɹí.ək)		*!	

Stress is also sensitive to the lighter quantity of prevocalic nuclei: stress avoids falling on V_1 in V_1V_2 sequences, especially if V_1 = short [i], as noted by Liberman and Prince (1977: 276), and by Hayes (1982: 247ff). These authors' examples include medial Lapse violations in forms like *mét*[iə]*ròid*, *amél*[iə]*ràte*, where the expected stress for these suffixes should skip just the immediately presuffixal vowel: in fact the entire V.V sequence is invariably skipped. We should add under the same rubric examples of Extended Lapse violations in forms like *merid*[iə]*nal, septéntr*[iə]*nal, obsíd*[iə]*nal, spírit*[uə]*l,* and the rare *énemious*, all derivative types where antepenult main stress is otherwise the rule[9]; and perhaps Extended Lapse violations like *áx*[iə]*matìze*, *ál*[iə]*nable*, although the source of these latter lapses is harder to untangle.

Stress on $V_1.V_2$ is allowed if V_1 is lengthened, as in the cases like *algebraic* seen earlier in (10). And stress on the V_2 element of $V_1.V_2$ is always

[9]For iV sequences, avoidance of stress on V_1 is the rule, while for uV the pre-antepenult stress in *spíritual* is isolated, the normal pattern being that of *habítual*, *resídual*, *ambíguous*. Either way these deviations from normal stress patterns involve only hiatus sequences and suggest that at least short [i] in V_1 is always too short to bear stress.

fine, including when V_2 is short, as in *b*[aɪ.ɔ]*logy*, *av*[i.ɔ]*nics*, *therm*[i.ɔ]*nic*, *histr*[i.ɔ]*nic,* showing that it is only the weight of V_1 that is reduced in hiatus.

In analyzing this stress data, the first thing to note is that the syllable defined by V_1 in $V_1.V_2$ *is not invisible to stress*: an invisible V_1 would predict **Cánadian*, **cústodial,* **félonious*. This observation weighs against accounts in which [iV] originates as /jV/, with /j/ vocalizing after stress (Hayes, 1982: 267).[10] Our proposal is that submoraic V_1 in $V_1.V_2$ is visible, in the sense that it counts as a syllable for purposes of Lapse and/or Parse, but is poorly suited to *carry* stress, because it is too short. Because the syllable of V_1 is visible, stress is forced to advance in forms like *Canádian* from the first syllable of its base *Cánada*, to the second syllable of the suffixed derivative. Because V_1 is too short to carry stress, stress can't advance in *merídional,* from *ri* to prevocalic *di*, and an extended lapse ensues. Similarly, stress can't advance from the initial of *méteor* to the submoraic second syllable in *méteoròid*.

Lengthening V_1 in hiatus does happen, as in *varíety*, but this only mitigates rather than solves the stress-to-weight problem posed by these forms: as suggested above, a lengthened vowel in hiatus still falls short of the optimal bimoraic weight for a stressed syllable. For this reason, stressing-cum-lengthening V_1 in $V_1.V_2$ remains a strategy limited to a minority of suffixed derivatives:

(15) a. $_N$SWP(V_1V_2) (BD): assign a violation to any new prevocalic stressed short V.

b. $_N$SWP (BD): assign a violation to

i any new prevocalic stressed long V: *$V{:}_1V_2$

ii any new preconsonantal stressed short V: *V_1CV_2

[10]Can Hayes' (1982) j→i account be rescued if stress on the antepenult, at the intermediate stage **félon*[j]*ous,* is excluded on the grounds that the closed penultimate *lon* should attract stress? No: first, if the syllabic parse is *felón.*[j]*ous,* then CiVL, which never affects closed syllables, will be incorrectly blocked. Second, the distribution of underlying /j/ must be controlled to prevent preconsonantal [i]s, originating as /j/s, from being skipped by stress in other contexts where [i] surfaces, e.g. in *habitual*. Even if we ignore Richness of the Base issues, the morpheme structure constraint analysis that Hayes advocated in 1982 misses a key point: what English avoids is a *surface stressed [i] in prevocalic position*, regardless of its derivational history. A surface generalization like this can't be guaranteed by a Morpheme Structure Condition.

c. Lapse and no lengthening in *méteoròid*

B		mí:tiəɹ	$_{N}$SWP(V_1V_2) (BD)	$_{N}$SWP (BD)	*Lapse
a.		(mì:)(tíə)(ɹòid)	∗!		
b.		(mì:)(táɪ.ə)(ɹòid)		∗!	
c.	☞	(mí:ti)ə(ɹòid)			∗

d. Antepenult stress and preV lengthening in *variety*.

B		vǽɹi	$_{N}$SWP(V_1V_2) (BD)	*ExtLapseR$_{ITY}$	$_{N}$SWP (BD)
a.		və(ɹí.ə)ti	∗!		
b.		(vǽɹɪ)əti		∗!	
c.	☞	və(ɹáɪ.ə)ti			∗

e. Penult stress and preV lengthening in *algebraic*.

B		ǽldʒəbɹə	$_{N}$SWP(V_1V_2) (BD)	Myers-on-ic	$_{N}$SWP (BD)
a.		(ǽldʒə)(bɹǽ.ɪk)	∗!		
b.		(ǽl)(dʒébɹə).ɪk		∗!	
c.	☞	(ǽldʒə)(bɹéɪ.ɪk)			∗

f. No lengthening and extended lapse in *merídional*.

B		məɹídiən	$_{N}$SWP(V_1V_2) (BD)	$_{N}$SWP (BD)	*ExtLapse
a.		(mɛ̀ɹə)(díə)nəl)	∗!		
b.		(mɛ̀ɹə)(daí.ə)nəl		∗!	
c.	☞	mə(ɹídi)ənəl			∗

Summarizing: a conjecture about the lighter weight of prevocalic vowels explains apparent exceptions to TSS found in or before hiatus sequences, as well as the stress-avoiding behavior of V_1 in V_1V_2. The conjecture is that the syllable projected by a prevocalic vowel is lighter than that projected by its preconsonantal counterpart. That makes a short prevocalic vowel, and especially *i*, generally unsuited for stress. A lengthened prevocalic vowel is still less suitable than a lengthened preconsonantal one. The same conjecture explains the hiatus exceptions to TSS: the stress foot in *Ca(nádi)an* is followed by less than a full mora, and thus satisfies TSS without any need for shortening, while the main stress feet in *alge(bráic)* and *va(ríe)ty* don't contain the fully long vowel that's penalized by TSS.

11.4 No CuVL

SPE's STATEMENT OF CiVL (Chomsky & Halle, 1968: 182, 242) is justified in singling out prevocalic [i], to the exclusion of its closest counterpart [u] or any other vowel. Alternations like *gr*[eɪ]*de - gr*[æ]*dual, tr*[aɪ]*be - tr*[ɪ]*bual* (the OED pronunciation of an obscure version of *tribal*) show that TSS effects surface before CuV. Items like *perpetual*, *innocuous, strenuous, tenuous, annual, manual, casual* display invariably lax vowels in the antepenult, contrasting in this with their counterparts in CiV, like *menial, venial, odious, copious, facial* etc. It seems significant that, even in non-derived contexts, the general rule in the Latinate vocabulary is to have a long nucleus before CiV, but a short one before CuV. We have to recognize then that if prevocalic C_0i can be submoraic, prevocalic C_0u is mostly not.

The two high vowels differ systematically beyond English. The vowel *i* is more likely than *u* to form a post-nuclear glide (Kubozono 2001 on Japanese, Steriade 1984 on Romanian). When it occupies the position of postnuclear glide, [i̯] is more likely to be a light, C-like glide, while [u̯] is invariably heavy (Steriade 1990 on Greek word-final dipthongs in [Vi̯] vs. [Vu̯]). This divergence between the high vowels could stem from a difference in duration or loudness that would explain the *i-u* asymmetry observed in English, but studies available to me do not provide clear evidence to bear on this conjecture.

11.5 The [aɪ] problem

THIS ACCOUNT JUST PROPOSED has a flaw. To identify it, we review how the SPE answers the question about the interaction between CiVL and TSS (Chomsky and Halle 1968: 242; Halle and Mohanan 1985: 78, 83; cf. Baković 2013: 52ff). SPE's proposal is that CiVL follows TSS, counter-feedingly. Then, if TSS shortens an underlying long vowel, as in a case like *Ambr[oʊ]sian,* CiV Lengthening later restores it:

(16) SPE-style derivation of *Ambrosian,* cf. *Ambrose*

Stress	àmbró:z-ian
TSS	àmbróz-ian
CiVL	àmbró:z-ian
Other rules	æ̀mbróʊz-iən

A counterfeeding order also has to hold between TSS and PreVocalic Lengthening so the latter process comes too late in forms like *variety* to have

its effects canceled by TSS.

(17) SPE-style derivation of *variety,* cf. *var[ĭ]*

Stress	varí-iti
TSS	n/a
PreVLength	varí:-iti
Other rules	vəɹáɪ̯-əti

Now, SPE's TSS and CiVL rules differ in the height of vowels they target: TSS is unrestricted by height while CiVL operates to lengthen only non-high vowels. This difference describes something that our own account doesn't, as yet. Long high vowels are shortened by TSS and this shortening effect is not undone by later lengthening: it is not undone because CiVL doesn't apply to the high vowels. This part of SPE's analysis describes the shortening found in items like *li:ne, línear*; and the non-alternations in *cívil, civílian*, **civ*[áɪ]*lian*; *pérfidy*, *perfídious*, **perf* [áɪ]*dious.*

(18) SPE-style derivation of *linear,* cf. *line*; *civílian,* cf. *cívil*

Stress	lí:n-iar	sivílian
TSS	lín-iar	n/a
CiVL	n/a	n/a
Other rules	lɪniəɹ	sɪvíliən

The present account predicts length preservation in *linear*, as *[láɪniəɹ], because this long nucleus is followed by a hiatus sequence, as it is in *Bóolean,* where length is indeed preserved. Our account also predicts lengthening in *civílian*, because *[sɪ(váɪli)ən] has a better score than [sɪ(vɪli)ən] on the length-inducing constraint SWP.

(19) a. *línear* fails under the present analysis

B	láɪn, -iəɹ	TSS	NSWP (BD)	ID[±LONG] (BD)
a.	☞ (láɪ.ni)əɹ	(i/_V < 1μ)		
b.	(lí.ni)əɹ	(i/_V < 1μ)		*!

b. *civílian* fails under the present analysis

B		sɪvɪl, -iən	TSS	NSWP (BD)	ID[±LONG] (BD)
a.	☞	sɪ(váɪli)ən	(i/_V < 1μ)		*
b.		sɪ(víli)ən	(i/_V < 1μ)	*!	

To get to the root of the problem, we should first understand the source of descriptive success in SPE's analysis. That source is two stipulations. First, that TSS and CiVL stand in counterfeeding order. Second, that CiVL does not target high vowels. I can't offer here a deeper reason for exempting high vowels from lengthening under stress in pre-C position. Short of an explanation, one can still plug the descriptive gap by matching SPE's stipulation with one of our own. We need to prohibit [i:] or its Vowel Shifted transform [aɪ] *in preconsonantal, foot-nonfinal position*. This will allow our analysis to generate *var*[áɪ.ə]*ty*, with lengthening in directly prevocalic position, but *civ*[í]*lian*, without lengthening, and *l*[í]*near* with shortening.

(20) a. *(aɪ CX): a * to any aɪC that's non-final in its foot.
b. *(aɪ CX) blocks CiV Lengthening of high vowels.

B		sɪvɪl, -iən	*(aɪ CX)	NSWP (BD)	ID[±LONG] (BD)
a.		sɪ(váɪli)ən	*!		*
b.	☞	sɪ(víli)ən		*	
c.		(sɪvɪ)(láɪ)ən		*	*!

c. *(aɪ CX) does not block PreVLength of high vowels

B		væɹi, -əti	NSWP(V_1V_2) (BD)	*(aɪ CX)	NSWP(BD)
a.		və(ɹí.ə)ti	*!		
b.	☞	və(ɹáɪ.ə)ti			*

d. *(aɪ CX) triggers shortening

B		láɪn, -iəɹ	*(aɪ CX)	NSWP(BD)	IDENT ±LONG
a.		(láɪni).əɹ	*!		
b.	☞	(líni).əɹ			*

With the addition of *(aɪ CX), the real results of our analysis are maintained. First, *modulo* some account of the Vowel Shift alternations, we now have a transparent analysis: the counterfeeding order between TSS and the two lengthening rules, CiVL and PreVocalic Lengthening, is eliminated. TSS ranks above $_{N}$SWP(BD), but TSS does not block satisfaction of $_{N}$SWP(BD) whenever the target vowel is followed by a submoraic syllable (in *Canadian*), or when the target syllable is itself less than bimoraic (in *algebraic*). Second, we understand the conditioning factors of lengthening in pre-CiV and in directly prevocalic position: they jointly amount to the DE version of SWP, $_{N}$SWP(BD). Finally, we begin to understand the role of hiatus in English lengthening, shortening and in stress. All these effects reduce to one: vowels are shorter – or rather syllables are lighter – in hiatus.

11.6 Intervals and weight in hiatus

I RETURN IN CLOSING TO THE KEY hypothesis about weight that allowed a reanalysis of CiVL as lengthening in a newly stressed open syllable: the idea that when two syllables stand in hiatus, $V_1.V_2$, the first is lighter relative to its weight in pre-consonantal position, i.e. V_1CV_2. Weight-reducing effects of hiatus are not limited to English. Stress on prevocalic [i] is avoided in Norwegian (Lunden, 2010); in Finnish (Karvonen, 2008), with consequences that include lapse and extended lapse; and in Romanian, whose stress pattern for $CiVC_0$# words is similar to that of Norwegian. Stress on any prevocalic high vowel is impossible in Iskunun Bunun (Huang, 2005). Tukang Besi avoids secondary stress on any V_1 of any quality in hiatus (Donohue, 1999). In Bhojpuri, primary stress is avoided on any V_1, whether long or short, in $V_1.V_2$; and secondary stress is avoided on short V_1 in $V_1.V_2$ (Shukla, 1981). The lighter quantity of prevocalic long nuclei is observed in the quantitative meter of Greek and Vedic (Devine & Stephens, 1994: 256). This last effect may be the source of *correptio vocalis ante vocalem*, the categorical neutralization of the length contrast between prevocalic long and prevocalic short vowels.

In closing, I note that there is a theory of weight that predicts lighter quantity for the first rhythmic unit in $V_1.V_2$ compared to the first such rhythmic unit in V_1 CV_2. This theory operates with units that differ slightly from syllables in that they begin with a nucleus and include the entire consonantal interlude separating it from the next nucleus, or from the end of the prosodic domain. A unit with exactly this organization is used under the name of *vowel-to-vowel interval* in phonetic studies of durational compensation (Farnetani & Kori, 1986; Kato, Tsuzaki, & Sagisaka, 2003; McCrary, 2006). I ar-

gue for its phonological uses, under the abbreviated name of *interval* (Steriade n.d.; cf. Sturtevant 1922). To briefly illustrate the composition of intervals, the words *quantity* [kʷɑntəti] and *nuclear* [nukliəˠ] are parsed into such units, with boundaries marked by 'ǀ', as kʷǀɑntǀətǀiǀ and nǀukǀliǀəˠǀ.

If the duration of each segment in an interval contributes to that interval's weight, then a number of finer weight distinctions are predicted than those available to the theory of weight defined on rimes alone. Thus, VC intervals are predicted to be, all else equal, lighter than VCC: this allows an interval-based computation of weight to distinguish 'light' from 'heavy penults' in words like *cámera* vs. *agénda,* as VC vs. VCC intervals. "Light" CC clusters, like the *br* of *algebra* are predicted to add weight to an interval in proportion to their duration: if they are longer than single consonants, such clusters should attract stress (Hirsch, 2014).

Relevant to present concerns is the fact that the parse into intervals distinguishes the penults of *rádial* and *rádical* (a pair from Baković 2013), and thus contributes to an explanation of CiVL: the penultimate interval in *rádi.al* is a V interval, while that of *rádical* is a VC interval. Likewise, intervals ending in a long vowel or diphthongs (like the antepenult in *variety*) should be lighter than those ending in V:C or diphthong-C (like the antepenult in *Canadian*). This explains why there is no reluctance to stress the antepenult in *Canádian* comparable to the reluctance to stress, even with lengthening, the antepenult in *merídional*: **merid*[áɪ]*onal* is less acceptable than *Can*[éɪ]*dian* because their stressed intervals differ in size, VV vs. VVC.

The interval-based computation of weight predicts all the distinctions documented in this note: the unit identified in syllabic terms as a C_0V syllable will be lighter if directly followed by another nucleus than if followed by a 'C-initial syllable'. An interval parse explains this because all postvocalic consonants belong to the interval defined by the preceding vowel and thus add to its weight: the fewer such postnuclear consonants the lighter the interval. The rime-based computation of weight does not predict these asymmetries.

Although this opens a different topic, we should note also that the difference between 'light,' generally unstressable final VC rimes, as in *origin*, and 'heavy,' generally stressed medial VC rimes, as in *agenda*, follows from the division into intervals as well: the former are VC intervals, the latter VCC. A further relevant point is that word-final short vowels (= V intervals) are, with negligible exceptions, unstressable in English and under certain circumstances altogether invisible for stress (e.g. *pársimony* and similar data in Liberman and Prince 1977: 297). It seems significant that the uncounted final [i] in words like *pársimony*, and with the unstressable prevocalic [i] of *merídional*, define the shortest intervals. In this they differ from what, in syllabic terms,

we would call, medial 'preconsonantal C_0V' syllables, which *are* stressable: the latter are VC intervals, while final and prevocalic Vs are just V intervals.

The original grounds for developing interval-based computations of weight did not include the effects of hiatus on stress and quantity. The present study, which confirms predictions arrived at independently, suggests that the interval idea is on the right track.

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