IAMBIC LENGTHENING AND FINAL VOWELS

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To appear in IJAL 64.3 (July 1998)

0. Introduction. Hayes (1995) observes that in languages with iambic lengthening of vowels in alternating open syllables, word-final vowels typically fail to become long. I argue here that this failure should be attributed not to iambic lengthening per se but rather to other properties found in many languages of the world, notably the lack of long vowels in word-final position and the extrametricality of final syllables. The observed pattern results from the intersection of quite independent properties.

I begin in section 1 by illustrating the general phenomenon of iambic lengthening (IL) with the commonly cited example of Choctaw, which exhibits the failure of lengthening in final position and lacks final long vowels in general. In section 2 I illustrate the fact that long vowels are prohibited in word- (or phrase-) final position in many languages that lack IL altogether. 2 This independent property can explain the lack of final IL in Choctaw. In section 3 I illustrate another frequent property of languages, the extrametricality of a word-final syllable. In section 4 I show that in Hixkaryana and Carib, this constitutes a distinct cause of non-lengthening in final position, since the final vowel is not footed. In section 5 I give a third category of explanation, found in Kashaya: an entire set of suffixes resists IL, whether the vowel in question is final or not. The explanation in this case is morphological, not purely phonological. In section 6 I survey additional cases of final non-lengthening and consider relevant explanations. In section 7 I turn to the question of whether, as predicted by this approach, there are languages in which IL is NOT blocked in final position. Each language has its own complications, but I suggest that several support the possibility of final lengthening. A brief conclusion is given in section 8.

1. The Phenomenon. IL is a rhythmic pattern found in many languages with iambic foot structure. The basic nature of the iamb is weak-strong; that is, in a branching iamb the left branch is weak (less prominent) and the right branch is strong (more prominent). Further, the optimal form of an iambic foot is one in which the strong syllable is heavy, while the weak branch is light (cf. Hayes 1985:437; 1995:80; McCarthy and Prince 1986; 1990:217). That is, the state to which an iamb tends has a light weak syllable followed by a heavy strong syllable.

1.1. Metrical Sketch. Hayes (1995:262) notes a very strong cross-linguistic tendency for iambics to be constructed from left to right, rather than from right to left (see also Kager 1993:400). This tendency is true of every language discussed in this paper, so directionality will simply be assumed throughout. In an odd-numbered string of light syllables, it is the final syllable (rather than the first) that will be left over. (Parentheses mark the constituency of feet.)

(1) Iambic foot construction

CV CV CV CV CV → (CV CV)(CV CV)CV

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1 This paper was presented at the Winter Meeting of the Society for the Study of the Indigenous Languages of the Americas, in San Diego, January 5–7, 1996. Numbers following examples indicate the page number where the data can be found (referring to the works as cited in the text). For comments and corrections I would like to thank Eric Baković, Aaron Broadwell, Carrie Dyck, Berend Hoff, Karin Michelson, Dan Silverman, and Charles Ulrich. Any remaining errors are, of course, my own.

2 In the languages discussed in this paper, the domain in which finality is defined is most often the word, but in other cases some larger phrasal constituent. I do not dwell on this issue, and simply assume that the principles discussed — lack of final long vowels, and final extrametricality — can be defined relative to either type of constituent on a language-specific basis.
I follow Hayes (1995:87) and others in assuming that degenerate (monomoraic) feet are avoided cross-linguistically, and in the general case I leave such syllables unfooted.

Since iambics are quantity-sensitive feet, they do not permit a heavy syllable to occupy the weak branch of the foot. This fact leads to nonbranching feet when an underlyingly heavy syllable is encountered in an appropriate position in the process of foot construction.

(2) **Iambic foot construction with heavy syllables**

\[
\text{CVC CV CV CVC} \rightarrow (\text{CVC})(\text{CV CV})(\text{CVC})
\]

In this schematic example it is assumed that closed syllables are heavy; this is not true for all languages, and below I note what situation holds in each case.

In morphological concatenation, a particular string of syllables very often fails to have the optimal iambic pattern of light-heavy light-heavy etc. Many languages with iambic feet correct the string by lengthening the vowel of a light syllable in strong metrical position; this is IL, also termed Rhythmic or Alternate Lengthening.

(3) **Iambic lengthening**

\[
(\text{CV CV})(\text{CV CV})\text{ CV} \rightarrow (\text{CV CV:})(\text{CV CV:})\text{ CV}
\]

IL maximizes iambic rhythm by making the strong branch of the foot heavy. For various approaches to the formalization of this process, see Hayes (1995:83), Crowhurst (1991:93), Kager (1993:422), Hung (1994:63), Baković (1996:7; 1997:24), and van de Vijver (1996:215). For present purposes we need only assume that a mora is introduced into the representation, yielding a long vowel. Some languages render the syllable heavy by gminating the following consonant, in what can be called iambic gemination (Hayes 1995:83). Since the focus of this paper is final vowels, these cases will receive limited attention here. See, however, the discussions below of Yupik (7.4) and Delaware (7.2.1).

The pressure for asymmetric weight is by no means absolute, since some iambic languages simply lack the process. One example is the Pichis dialect of the Arawakan language Asheninca, spoken in Peru (data from Payne 1990; see also Hayes 1995:288). Its foot structure is clearly iambic, but notice that stressed vowels do not lengthen (despite the existence of underlying long vowels in the language, illustrated in (c)).

(4) **Asheninca: No iambic lengthening**

a. nopito \rightarrow (nopít)o ‘my canoe’ 193
b. hamanantakenero \rightarrow (hamát)i(nantá)(kené)ro ‘he bought it for her’ 188
c. atiripayenì \rightarrow (aťi)(ripá)(yé):ni ‘people’ 191

For another iambic language without IL, see Hopi in 3.

Even languages that do have IL often exhibit various restrictions on the application of the rule. In particular, Hayes (1995:269) makes the following observation.

A mysterious property of iambic lengthening rules is their tendency not to apply to syllables in word-final position [...] I have incorporated this restriction in various ways into the individual analyses, but find this unsatisfactory. If the avoidance of final iambic lengthening is truly general, it deserves general explanation.

It is the purpose of this paper to explore the nature of this tendency, and to ask whether it is truly a fact about IL rules, or rather the intersection of IL with independent phonological patterns. I will argue that there is good reason to believe that avoidance of final iambic lengthening is not a general property of that process itself, but rather the result of restrictions on long vowels, or metrical structure, in word-final position.
1.2. Choctaw Lengthening. Individual languages typically have various complications in their IL rules, but Choctaw, a Western Muskogean language spoken in Mississippi and Oklahoma, provides a reasonably straightforward example. (Very similar facts obtain in closely related Chickasaw; see §7.3.2.) It is also a much-discussed example of the phenomenon (see Munro and Ulrich 1984:192; Ulrich 1986:53; Hayes 1995:209). The data below illustrate the basic fact of IL (Nicklas 1975:242).

**Choctaw: Lengthening of metrically strong vowels**

(5) a. habina → (habi:)na
   b. či-habina-li → (čiha:)(bina)li
   's/he receives a present'
   'I receive a present from you'

(6) a. pisa-li → (pisa:li)
   b. či-pisa → (čipi:sa)
   c. či-pisa-či-li → (čipi:)(sači:li)
   's/he sees you'
   'I cause you to see'

(7) a. tokwikili-či-li → (tok)(wik:)(lič:li)
   'I shine a light'

As the following examples show, however, there is no lengthening of metrically strong vowels located in word-final position.3

**Choctaw: No lengthening in final position**

(8) a. habina-li → (habi:)(nali)
   b. habina-či → (habi:)(nači)
   c. či-habina → (čiha:)(bina)
   d. či-habina-či-li → (čiha:)(bina)(či:li)
   'I receive a present'
   's/he gives a present'
   'you receive a present'
   'I give you a present'

(9) a. pisa → (pisa)
   b. pisa-či-li → (pisa:)(či:li)
   c. či-pisa-či → (čipi:)(sači)
   's/he sees'
   'I cause to see'
   's/he causes you to see'

Nicklas (1975:18) notes that Choctaw has no long vowels in word-final position, and Lombardi and McCarthy (1991:41) attribute the lack of final IL in Choctaw to this independent fact. Let us briefly consider some evidence for its independence. Within a word, a short vowel followed by a (nongeminate) nasal consonant surfaces as a long nasalized vowel when the two segments occur together in the rime of the syllable — that is, when the nasal consonant is in the coda.

(10) **Choctaw: Derivation of a long nasalized vowel**

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</tr>
</thead>
<tbody>
<tr>
<td>a. onsi</td>
<td>→</td>
<td>qši</td>
<td>'eagle'</td>
<td>244</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. impa</td>
<td>→</td>
<td>i:pa</td>
<td>'to eat'</td>
<td>244</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. am-pala</td>
<td>→</td>
<td>a:pa</td>
<td>'my lamp'</td>
<td>245</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. am-minko</td>
<td>→</td>
<td>a:miŋko</td>
<td>'my chief'</td>
<td>245</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. ho:n-mi</td>
<td>→</td>
<td>ho:mi</td>
<td>'bitter (N-GRADJE)'</td>
<td>245</td>
<td></td>
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</tr>
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3 There are complicated facts regarding the distribution of final [ʔ] and [h] in Western Muskogean (see Ulrich 1986:86; 1993). In some cases, for example, [ʔ] marks nominalization or simply status as a noun, but this segment is not reported for all speakers, and for some it may be optional. By contrast, [h] can occur at the end of a verb but with little semantic content, perhaps marking only its verbal status (Ulrich 1986), though it could also be treated as purely epenthetic as in Iroquoian (cf. Michelson 1988:10). If all seemingly vowel-final words end in one of these segments, they might be responsible for the blocking of IL (cf. Ulrich 1986:432). At the same time, however, these languages permit word-final VVC, so the analysis is not straightforward. Since there are varieties where verbs do not always end in [h], such as Chickasaw (Ulrich 1993:fn.4), it is still necessary to find some other explanation for the lack of final IL. In addition, see section 7.3.2 for discussion of blocking in morphological contexts where no glottal segment is present but the vowel is treated as domain-final nonetheless.
In contexts where a long vowel is not permitted, the sequence vowel + nasal results in a short nasalized vowel. These contexts are in a syllable closed by a consonant, as in (11), and also word-finally, as in (12).

(11) Choctaw: Derivation of a short nasalized vowel in a closed syllable

| a. lọ:ssa | → lọ:ssa | ‘river bottom land’ 244 |
| b. bì:yònkkọ | → bì:yòkkọ | ‘strawberry’ 244 |
| c. tì:nkìlì | → tì:skìlì | ‘bluejay’ 244 |
| d. ta:n-kì | → tákì | ‘to tie (N-GRADE)’ 245 |

(12) Choctaw: Derivation of a short nasalized vowel word-finally

| a. ma:n | → mà | ‘that (OBJECTIVE)’ 244 |
| b. -a:či:n | → -a:čj | ‘my (UNAFFIXED)’ 244 |
| c. am | → a | FUTURE ENCLITIC 244 |

This distribution motivates a general prohibition on word-final long vowels in Choctaw, and it is this prohibition to which we can appeal in order to account for the lack of final IL in the language. As we will now see, such prohibitions are quite common cross-linguistically, quite independent of whether iambic foot structure exists in the language.

2. Final Vowel Length. In the approach adopted here, it is assumed that, at least in some cases, the lack of IL in final position is due to an independent restriction in the language on long vowels in that position; in other words, that the failure of final lengthening is not a basic property of IL. If this is true, it should also be expected that each of these properties should obtain independently in languages of the world in which the second does not obtain. For example, we should find languages that prohibit long vowels in final position even in the absence of IL. Such languages are easy to find.5

A fairly simple and familiar example comes from Italian, a language without distinctive vowel length but that lengthens stressed vowels in open syllables (Vogel 1982; Chierchia 1986:23; Repetti 1989; Sleyters 1990; Nagy and Napoli 1996:212). Representative examples are given below (from Chapallaz 1979).

(13) Italian: Lengthening of stressed word-medial vowels

| a. eco | [ɛ:kɔ] | ‘echo’ 82 |
| b. papa | [pà:pa] | ‘pope’ 165 |
| c. capitano | [kapì:tnɔ] | ‘captain’ 165 |
| d. capitano | [kà:pitano] | ‘they’ arrive’ 165 |
| e. povero | [pò:vero] | ‘poor’ 164 |

(14) Italian: No lengthening in closed stressed syllables

| a. ecco | [ɛk.kɔ] | ‘behold’ 82 |
| b. ombra | [ɔmбра] | ‘shadow’ 152 |
| c. altro | [àl.tro] | ‘other’ 152 |

There is no lengthening of stressed final vowels, however, indicating a restriction on final vowels.

4 Most words with final VN remain unchanged (Ulrich 1986:63). The point is that in those cases where the change occurs, it results in a short vowel.

5 This contextual restriction on vowel length is presumably related to final lengthening at the phonetic level (among many others, cf. Cooper and Paccia-Cooper 1980; Selkirk 1984:267ff; Beckman and Edwards 1990; Hayes 1993:100). That is, if all vowels are phonetically lengthened in this position, they can be reanalyzed as phonologically short, which is the unmarked member of the long/short contrast. ítò and Mester (1994:11) analyze languages that prohibit all long vowels with the constraint AlignRight(V, σ), i.e. every vowel must be rightmost in the syllable; the constraint operative here (at the end of the prosodic word) is perhaps AlignRight(V, PrWd), though details regarding word-internal violations would need to be worked out.
(15) **Italian: No lengthening word-finally**

a. *papà* \([papà]\) ‘father’ 165  
b. *così* \([kɔzì]\) ‘thus’ 134  
c. *caffe* \([kaffè]\) ‘coffee’ 164  
d. *resterà* \([rêstè]\) ‘will stay’ 134

The preference for the stressed syllable to be bimoraic is realized word-finally only when there is a following consonant, in which case the syllable is closed by geminating the following consonant, by the process known as *raddoppiamento sintattico* (Kaise 1985:156; Nespor and Vogel 1986:165).

(16) **Italian: Gemination after a stressed word-final vowel**

a. *così buono* \([kozì\,bù\,nɔ]\) ‘so good’ 135  
b. *caffe nero* \([kaffè\,nè\,rò]\) ‘black coffee’ 134  
c. *resterà con me* \([rêstè\,kò\,mmè]\) ‘will stay with me’ 134

These data show that the pressure for bimoraic stressed syllables exists even for final syllables, but can be realized only by gemination because the default choice of vowel lengthening is prevented in this position.

The same restriction is particularly widespread in the Bantu family; I illustrate with Luganda (Hyman and Katamba 1990). As is well known, Luganda and other Bantu languages often create long vowels by compensatory lengthening, as when a high vowel becomes a glide preceding another vowel (Clements 1985:47; Rosenthall 1994:64). (Tone is omitted here; these examples from Hyman and Katamba 1993.)

(17) **Luganda: Glide formation and compensatory lengthening**

a. *ku-kial-a* → *kukya-la* ‘to visit’ 1  
b. *ku-kuek-a* → *kukwek-a* ‘to hide’ 1  
c. *ku-gu-ir-a* → *kugwî-ra* ‘to fall for’ 3  
d. *tu-â-la-ba* → *twâ-la-ba* ‘we saw’ 7  
e. *mu-ana* → *mwâ-na* ‘child’ 7  
f. *mu-limi omu* → *mulimy ô-ì-mu* ‘one farmer’ 1

In final position, however, the result of glide formation is a short vowel (remaining examples from Hyman and Katamba 1990).

(18) **Luganda: Glide formation in final syllables**

a. *ku-li-a* → *kûla* ‘to eat’ 24  
b. *ku-gu-a* → *kugwa* ‘to fall’ 24  
c. *ku-lab-u-a* → *kulâbwa* ‘to be seen’ 2  
d. *mu-tue* → *mutwe* ‘head’ 18  
e. *mu-mo-i* → *mumwi* ‘barber’ 32  
f. *te-ba-a-lab-i-e* → *teba:labe* ‘they didn’t see’ 21

This outcome suggests a prohibition on final long vowels, a conclusion confirmed by further data. When a clitic follows one of the words in (18), the vowel is no longer final and does undergo compensatory lengthening.
(19) **Luganda: Glide formation before a clitic**

a. ku-li-a=ki \(\rightarrow\) kulyaki  
   ‘to eat what?’ 25
b. ku-gu-a=ko \(\rightarrow\) kugwako  
   ‘to fall on (top of)’ 25
c. ku-la-ba-u=ko \(\rightarrow\) kulabwako  
   ‘to be seen a little’ 2

d. mu-tue=ki \(\rightarrow\) mutweki  
   ‘which head?’ 18

e. mu-mo-i=ki \(\rightarrow\) mumwikik  
   ‘which barber?’ 32
f. te-ba-la-ba=ko \(\rightarrow\) teba:labyako  
   ‘they didn’t see a little’ 21

Similarly, a vowel at the end of a copular proclitic undergoes compensatory lengthening, since it is not final in the clitic group as a whole.

(20) **Luganda: Glide formation in a proclitic**

a. ki-e=ki-kopo \(\rightarrow\) kye:kikopo  
   ‘[this] is the cup’ 6
b. lu-e=lu-ggi \(\rightarrow\) lwe:luggi  
   ‘[this] is the door’ 6

c. bi-a=bi=kisa \(\rightarrow\) bya:wa:kisa  
   ‘[the cups] of the kind one’ 6

Descriptively, the position in which long vowels are prohibited in Luganda is the end of a clitic group. Whether this exists as a formal prosodic constituent (Nespor and Vogel 1986:145) or is simply a recursion of the prosodic word (cf. Inkelas 1990:238; McCarthy and Prince 1993:85; Selkirk 1995:441), the basic point remains: long vowels are prohibited in final position.

Kashaya, a Pomoan language of northern California, also has a restriction against long vowels in final position (Oswalt 1961; Buckley 1994a:312). This restriction is exhibited most strikingly in cases where an underlyingly long vowel is shortened when it occurs at the end of a word. One type of example is found with verbs when the second of two vowels is elided, leaving the first vowel in final position, where it then undergoes shortening if long.

(21) **Kashaya: Vowel elision and final shortening**

a. du-k:ki \(\rightarrow\) duki \(\rightarrow\) duki  
   ‘scratch it with your fingernail!’
b. qa-i \(\rightarrow\) qa \(\rightarrow\) qa  
   ‘leave him/her!’
c. hi-sha-i \(\rightarrow\) hi:sha \(\rightarrow\) hi:sha  
   ‘break’

Another example comes from noun compounding. First, note that Kashaya does permit underlying long vowels in word-final position, where they contrast with short vowels (remaining data in this section are from Oswalt 1975).

(22) **Kashaya: Contrastive final vowel length**

a. ?i:hya: \(\rightarrow\) ‘bone, strong’
   ?i:hya \(\rightarrow\) ‘wind’
b. hadu: \(\rightarrow\) ‘different, other’
   hayu \(\rightarrow\) ‘dog’
c. ha:go: \(\rightarrow\) ‘fish trap’
   ba:go \(\rightarrow\) ‘what’

As already seen in (21), however, there is also pressure to eliminate length in this position. This pressure surfaces in compounding when it shortens a long vowel at the end of either of the words making up the compound (Oswalt 1961:308).6

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6 There is a certain degree of idiosyncracy with regard to shortening in compounds: in some lexicalized cases it does not apply, or applies only optionally (Oswalt 1961:308). After elision, however, the shortening is exceptionless.
(23) **Kashaya: Final shortening in compounds**

a. ḥaʔa  
   ḥiʔa:  
   ḥaʔa ḥiʔa  
   ‘man’  
   ‘bone, strong’  
   ‘strong man’

b. ḥiʔu:\  
   ḥiʔa:\  
   ‘ice, snow’  
   ‘woman’  
   ‘ice woman’

c.  \cʰu\ye:\  
   ʔa\le  
   ʔu\ye  
   ‘sugar pinecone’  
   ‘sugar pine’  

While word-final long vowels are permitted in a non-derived environment, as in (22), an underlyingly long vowel that occurs word-finally in a derived environment is subject to shortening, as in (21) and (23).

Not only does Kashaya permit underlying final long vowels, it actually creates them morphologically. In a small set of words, a noun marking a place can be converted into an adverbial marking movement along or toward, or location at that place, by lengthening the final vowel and, if present, deleting a glottal segment in the coda of the first syllable (Oswalt 1961:130).

(24) **Kashaya: Morphologically derived final long vowels**

a.  \ʔa\h\ca  
   \ʔa\ca  
   ‘house’  
   ‘to or at a house’

b.  b\ʔi\da  
   bi\da  
   ‘stream, creek, river’  
   ‘downstream, below’

c.  \dono  
   \dono  
   ‘mountain, hill’  
   ‘uphill’

This conversion might actually be thought of as mapping the noun to an iambic template, since all the words of this category that I have seen are disyllabic. At any rate, it is clear that Kashaya sometimes eliminates final vowel length, yet permits it underlyingly and may even actively create it as part of the exponent of some morphological category. The point of this discussion, then, is to show that restrictions on word-final length may be somewhat complex but nonetheless quite real: even a language that sometimes permits final long vowels may in fact prefer to eliminate them when possible. By the same token, a language that permits underlying final length may still prefer not to create it by a rule such as IL. In the terms of Optimality Theory (Prince and Smolensky 1993), the prohibition on final long vowels is a ranked constraint: it is violated for the sake of some requirements (morphological lengthening in Kashaya) but not for others (such as IL). See also the discussions of Northern Sierra Miwok in 6.2 and Chickasaw in 7.3.1.

3. **Final Extrametricality.** Another common phenomenon cross-linguistically is the extrametricality of a final syllable — that is, the exclusion of the final syllable from metrical structure, or a requirement that the final syllable not be stressed. As we will see in the next section, such extrametricality also accounts for some languages where IL fails to apply word-finally. First, however, we will examine some examples independent of IL.

A standard example of final extrametricality is Latin, a language with trochaic feet, i.e. feet of the form strong-weak (Mester 1994). A striking fact about Latin and similar languages is that, while the main stress always occurs close to the right edge of the word, it never occurs on the final syllable (except, trivially, in monosyllabic words). Rather, stress falls on the penult if that syllable is heavy, and otherwise on the antepenult. In no case is the weight of the final syllable relevant. These facts motivate treating the

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7 A related process involves suffixation of -\i, rather than lengthening of the final vowel, and is attested in at least one trisyllabic word: cahu\la ‘north’, cahu\la\l ‘northward’ (Oswalt 1961:130). Even here, though, the final two syllables of the word match an iambic template.
final syllable as extrametrical, so that it is ignored by the rules of foot construction. Extrametricality is indicated here by angled brackets.\(^8\)

(25) **Latin: Stress and final-syllable extrametricality**

a. dūciṃus \(\text{(dū'ki}<\text{mus}>)\) ‘we lead’
   dūcēṃus \(\text{du'(kē}<\text{mus}>)\) ‘we will lead’

b. cōgĭtō \(\text{(kō'gi}<\text{tō})\) ‘I think’
   cōgĭtāre \(\text{kō'gītā}<\text{tē}>)\) ‘to think’

c. laudāvetint \(\text{law}(\text{dā'we}<\text{tīn})\) ‘they will have praised’
   laudāvêrunt \(\text{lawdā}(\text{wē};<\text{run})\) ‘they have praised’

The Latin pattern is quite common, and holds of regular English nouns as well (Hayes 1982:240). Such languages illustrate the need for final-syllable extrametricality independent of iambic stress.

Final extrametricality is found in iambic systems as well, but can still be independent of IL. One example is Hopi, in which main stress is determined by an iamb at the left edge of the word. Due to the normal quantity-sensitive restriction that a weak branch is permitted only over a light syllable, if the first syllable is heavy the foot is nonbranching and the first syllable takes the stress (Jeanne 1982:253f).

(26) **Hopi: Initial stress on a CVV syllable**

a. (pá:)wik’a \(\text{‘duck’}\)
   b. (mó:)ki \(\text{‘to die’}\)
   c. (ná:)tihota \(\text{‘to hurt oneself’}\)

(27) **Hopi: Initial stress on a CVC syllable**

a. (lēs)tavi \(\text{‘roof beam’}\)
   b. (r̥c)vewa \(\text{‘chair’}\)
   c. (nā:pnə \(\text{‘shirt’}\)

When the initial syllable is light, a branching foot is possible and the second syllable (whatever its weight) takes the stress. Notice the lack of IL in Hopi (28), as in Asheninca above (4).

(28) **Hopi: Penultimate stress on CVCV**

a. (koyó)po \(\text{‘turkey’}\)
   b. (tayá)ti \(\text{‘to laugh’}\)
   c. (yi̠:n)atā \(\text{‘to speak’}\)

(29) **Hopi: Penultimate stress on CVCVC**

a. (caqá)p(a \(\text{‘dish’}\)
   b. (panáp)ca \(\text{‘window’}\)
   c. (mirk)h(o \(\text{‘hunting stick’}\)

An exception to this generalization is found in disyllables. In such words, the initial syllable takes the stress even if it is light.

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\(^8\) Under a well-motivated view of the quantity-sensitive trochee, where the foot contains a maximum of two moras, the actual foot structures would be \(\text{(dū'ki}<\text{mus}>, \text{(kō'gi}<\text{tō}>, \text{law}(\text{dā'we}<\text{run})\text{. Since it is orthogonal to the present discussion, I gloss over this issue; but see in particular Mester (1994:7).}
(30) **Hopi:** Initial stress on disyllables

a. (cô)<mo> ‘hill’
b. (wâ)<ri> ‘to run’
c. (sî)<hi> ‘wood’

Hayes (1995:59) terms such exceptions AVOIDANCE CLAUSES: in a word with a light initial syllable the stress falls on the second syllable, but final stress is avoided and that avoidance overrides the more general pattern. The formalization of this avoidance is final-syllable extrametricality (Hayes), or equivalently a constraint such that the final syllable cannot bear stress (Prince and Smolensky 1993:55; Hung 1994:124).

4. **Final Extrametricality and Non-Lengthening.** In this section I discuss two related languages that both illustrate the role of final extrametricality in accounting for the lack of final IL. The basic claim remains the same as that suggested earlier with regard to prohibitions on word-final long vowels: it is not a property of IL that explains the lack of final lengthening, but rather some independently motivated property of the language that is incompatible with final IL.

4.1. **Hixkaryana.** Hixkaryana is a Cariban language spoken in northeastern Brazil; the data come from Derbyshire (1979; 1985). Previous theoretical discussions of the stress pattern include Blevins (1990), Crowhurst (1991:94), Hung (1994:57), and Hayes (1995:205). As the following examples show, Hixkaryana has iambs from the left with IL within the phonological phrase. (I omit primary stress marks here, which occur word-finally apparently without regard to the normal rhythmic alternation.) Closed syllables are heavy; page numbers refer to Derbyshire (1985).

(31) **Hixkaryana:** lambic lengthening

a. torono → (torô:)no ‘small bird’ 181
b. akmatari → (âk)(matâ:)ri ‘branch’ 181
c. owto hona → (ôw)(tohô:)na ‘to the village’ 181
d. nemokotonono → (nemô:)(kotô:)no ‘it fell’ 181
e. tohkuruye hona hašha → ( tôh)(kurî:)(honâ):(hašâ:ha ‘finally to Tohkurye’ 181
f. yoneyekoni ymo ma hați → (yoni:)(kôni:)(mâ:)(mahâ:ti) ‘he was still eating (it)’ 179

In the words in (31), it is assumed that degenerate feet are not created on the final syllable; this accounts for the lack of lengthening there. In the words below, however, there is an even number of light syllables present, and we would expect that the final two syllables should be footed together as shown; but then we must explain why there is no lengthening of the final vowel.

(32) **Hixkaryana:** No lengthening of final vowels

a. aćowowo → ? (aćô:)(owô) ‘wind’ 181
b. tohkuruye hona → ? ( tôh)(kurî:)(honâ) ‘to Tohkurye’ 181
c. manhono → ? (mân)(honô) ‘he danced’ 177
d. uhuçhuru → ? (uhuç)(huru) ‘his skin’ 178

It happens to be true in Hixkaryana that there are no long vowels in final position; but then there are no underlying long vowels at all, so that this generalization reduces to the fact there is no final lengthening. Other facts indicate that it is foot structure, rather than a restriction on final long vowels per se, that accounts for this lack of lengthening.
The crucial evidence is found in words that consist underlyingly of two light syllables. In these words the vowel of the first syllable regularly lengthens.

(33) **Hixkaryana: First-syllable lengthening in disyllables**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>a. kana</td>
<td>→</td>
<td>k:na</td>
</tr>
<tr>
<td>b. kirí</td>
<td>→</td>
<td>kirí</td>
</tr>
<tr>
<td>c. tuná</td>
<td>→</td>
<td>tuná</td>
</tr>
<tr>
<td>d. nahi</td>
<td>→</td>
<td>nahi</td>
</tr>
</tbody>
</table>

Note that no lengthening is found when the first syllable is already heavy because it is closed.

(34) **Hixkaryana: Disyllables with an initial heavy**

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</thead>
<tbody>
<tr>
<td>a. jášme</td>
<td></td>
<td>‘silver-beaked tanager’ 177</td>
</tr>
<tr>
<td>b. arko</td>
<td></td>
<td>‘take it’ 177</td>
</tr>
<tr>
<td>c. fotwo</td>
<td></td>
<td>‘species of banana’ 177</td>
</tr>
</tbody>
</table>

Hayes (1995) and Hung (1994) argue that this pattern is best explained with two assumptions. First, there is a minimal size constraint of one foot imposed on all words in the language, and as shown by much independent research the minimal size of a proper foot is two moras (for extensive references see McCarthy and Prince 1995:321f). Second, as in Latin and Hopi, the final syllable of every word in Hixkaryana is extrametrical, so that it cannot contribute to the two-mora minimum. This means that the words in (33), with initial light syllables, must undergo lengthening to meet the minimal size constraint.

(35) **Hixkaryana: Lengthening in disyllables**

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<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>a. ka&lt;na&gt;</td>
<td>→</td>
<td>(ka:)&lt;na&gt;</td>
</tr>
<tr>
<td>b. ki&lt;ri&gt;</td>
<td>→</td>
<td>(ki:)&lt;ri&gt;</td>
</tr>
<tr>
<td>c. tu&lt;na&gt;</td>
<td>→</td>
<td>(tu:)&lt;na&gt;</td>
</tr>
</tbody>
</table>

The words in (34), on the other hand, already meet the minimality requirement, even without the final syllable, since the first syllable is closed and bimoraic.

(36) **Hixkaryana: Footing of disyllables with an initial heavy**

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<table>
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</thead>
<tbody>
<tr>
<td>a. (báš)&lt;me&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. (ár)&lt;kó&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. (fót)&lt;wo&gt;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The facts regarding length in disyllables thus motivate the regular exclusion of the final syllable from foot structure.

Having established this extrametricality, we have an explanation for the lack of final lengthening. IL applies to the head of a foot; if the final syllable is not footed, it cannot possibly undergo IL. That is, the words in (32) actually have the foot structures shown below, once again assuming that no degenerate feet are permitted.9

(37) **Hixkaryana: Footing of words with an even number of syllables**

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<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>a. (ačó:wo&lt;wo&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. (tóż)(kúri:)ho&lt;na&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. (mán)ho&lt;no&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. (uhúč)hu&lt;ru&gt;</td>
<td></td>
<td></td>
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</tbody>
</table>

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9 The prohibition of degenerate feet is confirmed by the need for lengthening in (35): the creation of a heavy syllable is triggered by the requirement that the foot contain at least two moras.
Noncrucially, this analysis also predicts that the final syllables in (31) are not simply unfooted due to their monomoractivity, but actually extrametrical, e.g. (toro:<no>). Once again we have seen an example of the failure of IL in word-final position, explicable by some property of the language formally independent of IL, and independently required in the language.

4.2. Carib. Carib, spoken in coastal Surinam, is related to Hixkaryana and its metrical phonology is in many ways similar; but an important difference is that long vowels exist underlyingly in Carib, unlike in Hixkaryana (previous analyses include Inkelas 1990:203; van der Hulst and Visch 1992; Visch 1996). The following examples illustrate IL in the language; all data are from Hoff (1968).10

(38) Carib: Iambic lengthening

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<tr>
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<tbody>
<tr>
<td>a.</td>
<td>tosipi</td>
<td>tosipi</td>
</tr>
<tr>
<td>b.</td>
<td>tanosɛ</td>
<td>tanosɛ</td>
</tr>
<tr>
<td>c.</td>
<td>kiyerepuŋ</td>
<td>kiyerepuŋ</td>
</tr>
<tr>
<td>d.</td>
<td>arakapuša</td>
<td>arakapuša</td>
</tr>
<tr>
<td>e.</td>
<td>paranakiri</td>
<td>paranakiri</td>
</tr>
<tr>
<td>f.</td>
<td>ixporiri</td>
<td>ixporiri</td>
</tr>
</tbody>
</table>

Failure to lengthen word-final vowels is exhibited by Carib, as illustrated by the next set of examples.

Carib: No lengthening of final vowels

(39) |   |   |   |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>a.</td>
<td>tuxkusi</td>
<td>tuxkusi</td>
</tr>
<tr>
<td>b.</td>
<td>pičiri</td>
<td>pičiri</td>
</tr>
<tr>
<td>c.</td>
<td>itubiři</td>
<td>itubiři</td>
</tr>
<tr>
<td>d.</td>
<td>tisabake</td>
<td>tisabake</td>
</tr>
</tbody>
</table>

(40) |   |   |   |
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>a.</td>
<td>enema</td>
<td>enema</td>
</tr>
<tr>
<td>b.</td>
<td>enema-po</td>
<td>enema-po</td>
</tr>
<tr>
<td>c.</td>
<td>enema-po-ko</td>
<td>enema-po-ko</td>
</tr>
</tbody>
</table>

We know that distinctive vowel length must be underlyingly present in Carib because long vowels occur in positions where they cannot be generated by IL and contrast with the short initial vowels in (38). For example, the vowels in the word-initial syllables in (41) must be underlyingly specified as long.

(41) Carib: Unpredictable length in an initial syllable

<p>| | | |</p>
<table>
<thead>
<tr>
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<th></th>
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</thead>
<tbody>
<tr>
<td>a.</td>
<td>e:raŋ</td>
<td>‘guard’ 45</td>
</tr>
<tr>
<td>b.</td>
<td>yakara:wa</td>
<td>‘deer’ 73</td>
</tr>
<tr>
<td>c.</td>
<td>ma:puŋ</td>
<td>‘staff’ 73</td>
</tr>
<tr>
<td>d.</td>
<td>makidona</td>
<td>proper name 44</td>
</tr>
</tbody>
</table>

The same is true of long vowels following a closed syllable; as seen in examples such as (38f) and (39a), closed syllables are heavy, and cannot serve as the weak branch of a foot.

(42) Carib: Unpredictable length after a heavy syllable

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>a.</td>
<td>miŋka:ri</td>
<td>‘gill-slit’ 44</td>
</tr>
<tr>
<td>b.</td>
<td>tam-po:ko</td>
<td>‘old man’ 44</td>
</tr>
<tr>
<td>c.</td>
<td>kajkusi</td>
<td>‘jaguar’ 39</td>
</tr>
</tbody>
</table>

---

10 Orthogonal complications arise when a prefix is present. The basic issue is that the word seems to undergo IL both before and after prefixation; see Kenstowicz (1995:418) for discussion. These representations abstract away from the predictable palatalization of supralaryngeal consonants after /i, j/ (Hoff 1968:39f).
While it is found both word-initially and after a heavy syllable, underlying length is not found word-finally (Hoff 1968: 72); as we will see below, Carib disallows all final long vowels.

For the set of words of the shape CV:CV in isolation, we can distinguish two underlying forms, with and without a long vowel. The relevant test is the prosodic shape of the word when the full word is longer than two syllables, due to affixation. In some cases, the location of the long vowel is the same whether affixed or not.11

**Carib: Invariant length in disyllabic roots**

(43) a. e:ka 
    b. e:ka-ri
    c. e:ka-to-ko
    d. e:ka-xpo

(44) a. o:ma
    b. o:ma-mbo
    c. o:ma-kon

(45) a. wa:re
    b. wa:re-ta
    c. wa:re-ta-no
    d. wa:re-ka-xpo

Contrast these examples with stems that have an initial long vowel in isolation, but that, when affixed so as to be longer than two total syllables, have a long vowel in the second syllable, where it is predicted by IL.

**Carib: Alternating length in disyllabic roots**

(46) a. e:ma
    b. ema-ri
    c. ema-po
    d. ema-to-ko

(47) a. i:ro
    b. iro-kon
    c. iro-kon-imbo

(48) a. mi:ya
    b. miya-ro

This pattern points to a metrical analysis of the same type as in Hixkaryana: the final syllable is always extrametrical, and if just one light syllable remains available for foot structure, the vowel of that syllable is lengthened to meet a minimal size of two moras (49a). The lengthening is not necessary under suffixation because more than one syllable remains to be footed; and that foot is of course subject to IL (49b).12

(49) **Carib: Lengthening in disyllabic roots**

\[
\begin{align*}
\text{a. ema} & \rightarrow \text{e<ma>} \\
\text{b. ema-ri} & \rightarrow \text{ema<ri>}
\end{align*}
\]

---

11 Historically such vowel length results in at least some cases from compensatory lengthening after the loss of a syllable, e.g. eka from 'esika (Gildea 1995:98).

12 There is one function word violating this generalization, uwa ‘no’, but I follow Hoff (1968:73) in treating this simply as an exception.
(It is important to emphasize again that what we see in (49a) is not IL, but rather satisfaction of a minimal size requirement.) Contrast this situation, where there is no underlying length, with underlying CV:CV, where the long vowel in the first syllable is stable.

(50) **Carib: No need for lengthening with underlying long vowel**

a. e:ka → e:<ka> → (e:)<ka>

b. e:kari → e:ka <ri> → (e)ka <ri>

No adjustment to vowel length is necessary in (50a), since the first syllable already satisfies the bimoraic minimum.13

These data show that the final syllable in Carib is extrametrical — when there are at least two syllables present in the word. In monosyllables, extrametricality is revoked in order to prevent the entire domain from being invisible to foot construction, a principle well established in other languages (Franks 1989:554; Buckley 1994b:429; Hayes 1995:58). The following examples illustrate closed monosyllables and a diphthong.

(51) **Carib: Closed monosyllables**

a. bær ‘one who is afflicted with’ 44

b. mañ ‘one who serves as’ 46

c. noñ ‘at this occasion’ 46

d. mañ ‘he, it is’ 46

e. teñ ‘time’ 46

(52) **Carib: Monosyllables with a diphthong**14

a. au T’ 85

b. pau ‘bang’ 85

c. tau ‘slap’ 85

Quite strikingly, when a monosyllable is not closed and does not contain a diphthong, the vowel is short, in violation of the bimoraic minimum; but under suffixation, the vowel is long.

**Carib: Underlying CVV monosyllables**

(53) a. wo ‘to beat, to kill’ 61, 116

b. wo:nen ‘murderer’ 70
c. wo:poti ‘to beat repeatedly’ 78
d. wo:potri ‘to beat repeatedly’ 78
e. wo:nembo ‘mean murderer’ 70

(54) a. ta ‘in’ 75

b. tano ‘which is in; contents’ 75
c. tanokon ‘which are in’ 251
d. tanokon:imbo ‘which were in’ 251

---

13 As predicted by this analysis, the table given by Hoff (1968:81) confirms that there are no words of the shape CVCV, since with extrametricality, i.e. CV<CV>, it would violate minimality. We also expect to find a stem that alternates between isolation CV:<CV> and suffixed CV.CV., but I could find no such example. One potential candidate, em:añ ‘guard’, does not qualify because it has an underlying long vowel, as shown by the affixed form se:ran:da ‘I put a guard there’ 59.

14 The tautosyllabic diphthongs in (52) are to be distinguished from a heterosyllabic sequence (Hoff 1968:84f). Compare the IL found with the sequence in wana:u ‘otter’ with the lack of it in marauni ‘Maroni river’; the first word has heterosyllabic [a.u], the second has the diphthong [au].
(55) a. ki ‘to rasp’ 76
     b. këpoti ‘to rasp repeatedly’ 76
     c. kitopo ‘polishing tool’ 360

This pattern is quite general; as Hoff (1968:75) notes, “the short vowel of a base with one vowel, in suffixing is always lengthened.” While examples such as tano in (54c) could be explained by lengthening to meet minimality requirements, as in (49a), the longer words show that this is not the actual case (*tano:kon). Rather, the roots must be underlyingly bimoraic — inherently satisfying the size requirement — but a long vowel cannot appear at the end of a word, as discussed for other languages in 2. Although a prohibition on final long vowels is not the technical explanation for the lack of final IL in Carib, this prohibition still plays a role in the language, and in fact is unviolated.

Shortening can also be seen under prefixation, since the long stem vowel is still at the end of the word.

(56) Carib: Final shortening in longer words

a. ti-wɔ → tiwɔ ‘beaten’ 76
b. i-ta: → ita ‘in it’ 252
c. wox-ki: → woɔki ‘to be rasping’ 122

Examples (56a,b) illustrate the loss of underlying length in word-final position, together with lengthening of the vowel in the first syllable in order to satisfy minimal size, as illustrated in (57). In (56c) the initial heavy syllable makes lengthening unnecessary.

(57) Carib: Minimality-based lengthening and final shortening

a. ti-wɔ → tiwɔ → (ti)<wɔ>
b. i-ta: → ita → (i)<ta>

What distinguishes these words from the isolation forms (wo, ta) is that the prefixed forms have another syllable available that permits a long vowel, while the monosyllables have no recourse and the absolute prohibition on final long vowels wins out over the minimal size constraint. The Carib case interestingly illustrates the independence of these two potential factors, either of which is sufficient to prevent final IL. It also emphasizes the pervasiveness of prohibitions on final length, so often responsible for the lack of final IL.

5. The Role of Morphology. In Kashaya (already illustrated in 2), IL follows the by-now familiar pattern in that it is blocked in word-final position (for previous analyses see Oswalt 1961; 1988; Buckley 1994a; 1996; page numbers refer to Oswalt 1961).

Kashaya: lambic lengthening

(58) a. kel-ad-uwa-du.edu → (kel:)(duwa:)(duce:du) ‘keep peering here and there’ 221
     b. w-aq-ad-uce-du → (waq:)(duce:du) ‘keep going out!’ 227
     c. w-aq-ce-ed-uce-du → (waq:)(cedu:)(cedu) ‘keep going up!’ 227

(59) a. kel-ad-uce-du → (kel:)(duce:du) ‘keep peering’ 220
     b. kel-mul-ad-uce-du → (kel:)(mul:)(duce:du) ‘keep peering around’ 220
     c. mo-mul-ad-uce-du → (mo:mul:)(lada:)(cedu) ‘keep running around’ 220
Matters are more complicated than this, however. The following examples illustrate that the suffixes -p'ila and -eti (among many others) fail to undergo lengthening even when they are in the appropriate metrical position — in fact, even if that vowel is stressed (60d).

Kashaya: No lengthening in certain suffixes

(60) a. kel-alap'ila
    → (kel)(alap'ila)
    ‘after he peers down’

b. kel-calap'ila
    → (kel)(calap'ila)
    ‘after he peeks down’

c. tala-mec-p’ila
    → (tala)(me7)(t’ip’ila)
    ‘after climbing up there’

d. ši-p’ila
    → (šip’ila)
    ‘if [it] happens’

(61) a. mo-mac-ed-eti
    → (mor)(aceti)
    ‘although he runs in there’

b. mo-mac-eti
    → (mor)(aceti)
    ‘although he ran in there’

What we are looking at is a morphologically defined restriction: any vowel located in a particular set of suffixes resists IL, regardless of whether it is in word-final position or not. Specifically, Buckley (1997) shows that these suffixes resist any change in their underlying length, whether from IL or another source. Due to the position-class morphology of Kashaya, every verb must end in a suffix drawn from this set; and as a result, the morphological generalization necessary to account for the data in (60) and (61) is sufficient to explain the apparent word-final effects in (58) and (59). That is, the vowel in -a fails to undergo IL not because it is final, but because it belongs to a suffix in the same morphological class as -p’ila and -eti. See 7.3.2 for a formal analysis of this pattern, and additional discussion. For the present, the important point is that not all cases in which IL is blocked in final position are due to purely phonological factors.

6. Determining Causation. We now have two basic phonological explanations for the lack of IL in final position. First, it may be attributable to a general prohibition on final long vowels as in Choctaw; second, it may be due to a lack of metrical structure on the final syllable as in Hixkaryana, so that the structural description of IL is simply not met. In this section I consider two cases of IL without final lengthening that can be explained by at least one of these factors. In both cases I argue that a prohibition on final long vowels is the best account.

6.1. Choctaw Revisited. I presented evidence in 1.2 that Choctaw IL fails to apply in final position as the result of a prohibition on final long vowels. Others analyzing Choctaw have appealed not to a prohibition on final length, but rather to the lack of the appropriate metrical structure on the final syllable. Kenstowicz (1994:589), for example, assumes that the final syllable is extrametrical, while Hung (1994:118) permits a final syllable to be footed with a preceding light syllable, but due to a prohibition on a rhythmic prominence not followed by an unstressed syllable, that final foot has no head, and does not satisfy the description of IL. Specifically, Hung argues for a Rhythmicity constraint that looks for a weak metrical beat after every strong beat.

(62) Rhythmicity

a. Following beat, well-formed
   x
   (x x) x

b. No following beat, ill-formed
   x
   (x x)
Rhythmicity disfavors heavy syllables in word-final position since weight attracts stress — a strong beat — which will not be followed in that position by a weak beat. This approach essentially unifies the two explanations: avoidance of a final strong beat entails the lack of a final headed foot (roughly, extrametricality), as well as non-lengthening in that position since a long vowel ought to be the head of a foot.

There is perhaps some empirical evidence for these claims: Munro and Ulrich (1984:194) report that heavy syllables — those that are closed, underlyingly long, or rhythmically lengthened — are "perceptually prominent", a fact that could be attributed to phonological stress. Since word-final vowels are not rhythmically lengthened, they are (given this description) presumably not perceptually prominent, and one might then conclude that they are not stressed, i.e. not heads of feet. This line of reasoning presents several difficulties, however.

First, the evidence is weaker than it at first appears. Choctaw (as well as closely related Chickasaw; see 7.3.1) has rule-assigned pitch accent on the final syllable independent of metrical structure (Ulrich 1986:67), so that the final syllable is always intonationally prominent, and its situation is not comparable to that of the medial heavy syllables. This means that the reported word-final perceptual prominence may simply be due phonetically to the quantity of the heavy syllables; without a contrast between "stressed" and "unstressed" syllables of the same weight, the explanation is overdetermined.

Second, the status of disyllabic words introduces a complication. For Hung, at least one foot in the word must have a head; the final foot in a syllable cannot be headless, because it is the only foot. If a final rhythmic prominence is prohibited, that lone foot cannot be an iamb. Hung (1994:117) proposes that a disyllable in Choctaw is footed as a trochee, with initial prominence; there is, however, no empirical evidence for this metrical structure, which is driven by theory-internal considerations. Kenstowicz does not discuss these disyllabic cases, but for him two approaches suggest themselves. One is that extrametricality is revoked in order to satisfy a bimoraic minimum foot size, and some motivation analogous to Hung's leads to the creation of a trochee — for example, if extrametricality is formulated as a Nonfinitality constraint (Prince and Smolensky 1993:52). Another approach is that extrametricality is maintained, and a degenerate foot is permitted on the first syllable. This is essentially what we find in Hixkaryana and Carib (4), but the absence in Choctaw of the lengthening seen in (35) means that there is, again, no motivation for the analysis; it is also dubious because words consisting of a single light syllable are absent from the language, indicating a prohibition on degenerate feet (see McCarthy and Prince 1995:321). On the other hand, as noted above in 1.2, a prohibition on final long vowels is well motivated in the language, and accounts for the lack of IL without additional complications or apparatus. Quite plausibly this is the solution that the learner of Choctaw will prefer to account for the IL pattern, whether or not the other formal apparatus is universally available.15

Finally, Hung's approach also runs into a significant problem in accounting for final syllables of the shape CV:C. As illustrated previously in (12), an absolute final sequence VN becomes short nasalized V. Hung explains this by the Rhythmicity constraint that disfavors final heavy syllables (62). However, in final position, CVNC becomes CV:C with a nasalized vowel (Nicklas 1975:244), providing a clear example in which a final heavy syllable is created.

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15 It bears mentioning that the related Muskogean language Creek, which also builds iambic from left to right, does not have final extrametricality. As shown by Haas (1977) and later work (see Hayes 1995:64 for references and analysis), accent in Creek falls on the penultimate or final syllable, whichever is the rightmost strong syllable in the word: (apa)takda 'pancake', (ama)pasik'a 'my pancake'. The final accent in words like apaksik'a shows that there is no final extrametricality. While it is possible that this is a property by which Creek and Choctaw differ, a simpler assumption is that the languages have the same inherited foot structure, but they put it to different uses: in Creek, foot structure determines the location of accent; in Choctaw, it serves as the basis of IL, subject to the independently motivated restriction on final long vowels. See Martin (1996) for reconstruction of iambic in Proto-Muskogean.
(63) **Choctaw**: Derivation of a long nasalized vowel in a closed final syllable

a. hallons → hallɔːs 'leech' 244
b. okčank → okčʔak 'melon' 244

The resulting long vowel makes the final syllable heavy (the final consonant is extrasyllabic): from the perspective of metrical structure, the long vowel is final, since it heads the final syllable, and that is the level of structure relevant to Nonfinality. This pattern points strongly to a specific restriction against word-final long vowels, rather than a restriction on final heavy syllables. I assume, therefore, that in both Choctaw and Chickasaw there is normal iambic footing without extrametricality, and that IL is constrained by a general prohibition on final long vowels.

It is relevant at this juncture to note that the Carib facts (4.2) also serve as evidence against the approach of Hung (1994) by which lack of final lengthening can be attributed to Rhythmicity. In Carib monosyllables such as wo in (53), the prominence has no choice but to fall on the final (and only) syllable, but shortening happens nevertheless; this shows that prohibition of final length is not (always) attributable to rhythmic structure. The same is true for Kashaya, which has shortening of final vowels even then they are stressed: all the words in (21), for example, have final stress but the vowel shortens nonetheless (Buckley 1994a:312). These facts are easily explained by a specific constraint against a final long vowel that is not tied to metrical structure.

6.2. **Northern Sierra Miwok**. For Northern Sierra Miwok, an Utian language of northern California, Callaghan (1987:19) gives a rule equivalent to IL formulated in such a way that it will not apply to word-final vowels.\(^\text{16}\)

(64) CVCVCV(C) → CVC:CV(C)

In prosodic terms, this rule can be reformulated as follows, including an ad hoc requirement that the lengthened vowel be followed by some other syllable — i.e. that it not be word-final.

(65) \((σ_μ σ_μ) σ \rightarrow (σ_μ σ_μμ) σ\)

Because there are no prefixes in the language, we do not find length alternations in roots; in this context the rule serves to explain the absence of roots with the (surface) form CVCV(C). That is, after an initial light syllable, an open syllable always contains a long vowel.

(66) **Miwok**: Lengthening in a root

a. kočaj-p → (kočːp)(ip) 'they’re building a house' 113
b. hewem-uʔ → (hewem)(muʔ) 'dried' 70
c. siken-m → (siken)(nim) 'I’m hurting' 197

For suffixes, IL explains actual alternations in length. In particular, notice that the ‘possessing’ suffix ʔak surfaces with a long vowel when in the appropriate metrical context (67a,b); in other cases it remains short, though an adjacent vowel may lengthen (c,d).

(67) **Miwok**: Lengthening in a suffix

a. suki-jakʔ → (suː)(kijak)(ʔiʔ) 'having a tail' 19
b. tolakte-jakʔ → (tolok)(tejak)(ʔiʔ) 'thirteen' 218
c. čuku-jak-teʔ → (čukuː)(jak)(teʔ) 'I have a dog' 94
d. kawwali-jakʔ → (kawː)(waliː)(jakʔ) 'having a leg' 19

Elsewhere, IL accounts for vowel length in a reduplicant (68).

\(^{16}\) Here, of course, the parentheses indicate optionality rather than foot structure, as elsewhere in this article.
(68) **Miwok: Lengthening in a reduplicant**

a. sa:lip-sa:lip-ʔ → (sa:)(lip)(sa:)(piʔ)  
   ‘swallow (bird)’ 195, 301

b. ?akkal-?akkal-ʔ → (?ak)(kal)(?akal)(iʔ)  
   ‘roof of the mouth’ 301

It is not easy to test whether final vowels can undergo IL in Miwok because most verbs and nouns end in a consonantal suffix, and even when a final vowel exists, the frequency of closed syllables and underlyingly long vowels makes final sequences of CVCV even less common. But a handful of examples indicate that final lengthening does not occur.17

(69) **Miwok: No lengthening word-finally**

a. ?oto → (?oto)  
   ‘then’ 285

b. ne:ʔato → (ne:)(ʔato)  
   ‘and then’ 166

c. kottoto non → (kot)(toto)(non)  
   ‘a long time ago’ 117, 170

d. ?oma → (?oma)  
   ‘still, always’ 282

e. kači → (kači)  
   ‘he said, she said’ 109

f. helej-sajni-mu → (helej)(saj)(nimu)  
   ‘you want to see me’ 26

At the same time, final long vowels are permitted underlyingly, albeit rarely.

(70) **Miwok: Underlying word-final length**

a. ne:ʔi:  
   ‘this, that (is); he, she, it’ 166

b. no:ʔi:  
   ‘that one, that person’ 170

c. hiʔane:  
   ‘may be so’ 90 [cf. ?ane ‘maybe’ 264]

d. ?iššo:  
   ‘scat! go away!’ (exclamation) 277

e. wi:  
   ‘take it!’ 253

f. wu:  
   ‘my!’ (exclamation) 256

A much more frequent source of final long vowels is that they are morphologically derived in third-person singular verb agreement (71) and the vocative case of nouns (72).

(71) **Miwok: Derived word-final length in verbs**

a. ?ipsi:  
   ‘is swimming’ 23

b. ?okje:  
   ‘makes’ 31

c. ?uču:  
   ‘is staying’ 287

d. huppa:  
   ‘is rolling (it)’ 83

e. čunusu:  
   ‘is sliding’ 50

(72) **Miwok: Derived word-final length in nouns**

a. ?ipi:  
   ‘father’ 23

b. ?ama:  
   ‘grandmother’ 263

c. ?anispu:  
   ‘stepson!’ 265

Miwok resembles Kashaya (2) in that long vowels are found underlyingly in final position and as the exponence of a morphological category; but recall that in Kashaya we still find shortening of final long vowels. It is entirely plausible that Northern Sierra Miwok has, like Kashaya, a prohibition on final vowel length, but that the primary effect of the prohibition is that it prevents IL in that position. Evidence to support a dispreference for final length comes from the realization of the sequence /ij/, where /ij/ is a

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17 The form in (69d) is an alternate for ?omah which also occurs as ?oma: (in which the length is presumably due to compensatory lengthening after deletion of [h], rather than IL). Only one of the two dialects has kači as in (e); the other has kačč where IL is not expected anyway due to the heavy syllable. The word seems to be a frozen expression rather than a normal conjugated verb.
palatal glide. This is realized as a long vowel [i:] word-internally, but as a short vowel [i] at the end of a word (Callaghan 1987:19). I assume that, all else being equal, /ij/ would always surface as a long vowel; it is a restriction on final length that disrupts this pattern.

(73) Miwok: Final shortening

kočaⁿ̂tyː → kočaⁿ̂tyi: → kočaⁿ̂ty ‘my house (OBJ)’

This pattern is easily treated as final shortening — exactly as in Kashaya, only underlying length and morphological lengthening rules are exempt. The alternative explanation for the lack of final IL is to claim that Miwok has final extrametricality, leaving the final syllable unfooted; Callaghan (1987) provides no information on stress, so it is difficult to evaluate this possibility. Hayes (1995:261), following Freeland (1951:7), indicates that the leftmost iamb bears main stress throughout Sierra Miwok, suggesting that the second syllable in a word such as ʔotó (69a) is the head of a foot, and final extrametricality is not a viable analysis. Certainly, an avoidance of final long vowels is a plausible and motivated analysis for Northern Sierra Miwok.

7. Final Lengthening. If, as argued here, the failure of IL in final position is not inherent in IL itself, and the factors that prevent the lengthening there can occur independent of IL, we would expect IL to occur independent of these factors as well, such that in some cases IL does in fact apply in final position. Due to the frequency of the inhibiting factors — restrictions against final long vowels, and final-syllable extrametricality — it is not easy to find such examples. In this section I discuss a range of cases that together point to the potential independence of the application of IL and related processes from restrictions on final vowel length.

7.1. Lengthening under Stress. I discuss here two languages cited by Hayes (1995:208, 269) as exhibiting IL, and that also show application of the process to word-final vowels. Both are unfortunately not clear examples of IL, but may rather be a more phonetically based lengthening of any stressed syllable, not just in branching feet.

7.1.1. Macushi. The first example is Macushi, a Cariban language spoken in the border regions of Guyana, Venezuela, and Brazil (Abbott 1991). Iambs are constructed from left to right across phrases (as in related Hixkaryana, 4.1); the heads of feet are lengthened and stressed, and we find examples apparently showing that IL does, in fact, apply to phrase-final vowels.

(74) Macushi: Lengthening in branching feet

a. pata → (patáː) ‘place’ 146
b. erėpamí → (eréː)(pamíː) ‘I arrive’ 146
c. uyekkari → (uyéː)(karíː) ‘my fruit food’ 147
d. umājmu yawirí → (umáːj)(muyíː)(wíːríː) ‘according to my word’ 146

This lengthening is not, however, a clear example of IL. First of all, as seen in (74), even closed syllables are marked by Abbott as lengthened; and this is true for nonbranching feet (which themselves show that odás bear weight), as seen below.

(75) Macushi: Lengthening in nonbranching feet

a. eipepi → (éː)(pepiː) ‘I am ashamed’ 146
b. entamóʔkan → (énː)(tamóʔː)(kánː) ‘we eat’ 147

These data suggest that stressed syllables are lengthened regardless of whether this serves to maximize the weak-strong quantity distinction (the function of IL). Furthermore, in Macushi final syllables are always stressed, and therefore long, regardless of the alternating pattern.
(76) **Macushi: Final stress and lengthening**

a. upata \(\rightarrow\) (upá):(tá:) ‘my place’ 146  
b. upata?pí \(\rightarrow\) (upá):(tá?):(pí:) ‘my former place’ 146  
c. arimorekayami \(\rightarrow\) (aré)(mará):(kayá):(má:) ‘dogs’ 146

Metrically, this pattern of final stress can be analyzed by permitting degenerate feet at the end of the left-to-right iambic parse (the “weak prohibition” of Hayes 1995:87), with lengthening of stressed vowels. These two assumptions account for the lengthening in closed syllables (75) and final degenerate feet (76). Consequently, the analysis is also sufficient to account for the data in (74), which then do not constitute a persuasive example of final IL. It is simply lengthening under stress, regardless of foot type, analogous to that found also in trochaic languages (Hayes 1995:33f). This lengthening appears to be phonic, not phonological, which is why we might not expect it to be sensitive to a phonological prohibition on final length, or to the normal bimoraic upper limit on syllable size.\(^{18}\)

7.1.2. **Maidu.** In Maidu, a (possible) Penutian language of northern California, we find a situation similar to that in Macushi. Shipley (1964:10) reports the following generalization:

Vowels are very short (less than one mora) in unstressed syllables. Vowels are short (about one mora) in closed syllables with primary or secondary stress. Vowels are long (about one and one-half or two morae) in open syllables with primary or secondary stress.

The lengthening reported for stressed open syllables does occur in word-final position. I mark feet here only where Shipley indicates stress; in the normal case, each word has only one foot.

(77) **Maidu: Lengthening of stressed vowels**

a. kile \(\rightarrow\) (kilé:) ‘woman’ 13  
b. ?ama \(\rightarrow\) (?amá:) ‘then’ 13  
c. sidî \(\rightarrow\) (sidí:) ‘city’ 15  
d. sidina \(\rightarrow\) (sidí:na) ‘to (the) city’ 15  
e. kaletani \(\rightarrow\) (kalé:):tani ‘with wagons’ 13

Although Maidu is iambic — regular stress falls on an initial heavy syllable, otherwise on the second syllable — it is doubtful whether this lengthening should be considered IL, for two reasons. First, as noted in the quote above, lengthening applies in closed syllables, although to a lesser degree (indicated by [\(\cdot\)]). Example (78a) illustrates a secondary stress in a multiple-word phrase.

(78) **Maidu: Lengthening in closed syllables**

a. ?ómkanajdi \(\rightarrow\) (?óm)(káná:j)di ‘under the rock’ 13  
b. ?ómítjdom \(\rightarrow\) (?ómí:t)jdom ‘coming in’ 13  
c. sol \(\rightarrow\) (só:l) ‘sing’ 13

Second, the lengthening applies in degenerate feet; these feet occur in monosyllabic words, as well as in irregularly stressed syllables that are either initial or preceded by another stress (Robbins 1991). Here the lengthening obviously does not serve to maximize a quantity distinction between the two branches of a foot, since the foot is not branching.

(79) **Maidu: Lengthening in degenerate feet**

a. ?ó \(\rightarrow\) (?ó:) ‘rock’ 13  
b. (se)wina \(\rightarrow\) (se):(wí)na ‘to (the) river’ 15  
c. (mo)mím \(\rightarrow\) (mó):(mí:m) ‘water’ 15  

\(^{18}\) See Hawkins (1950) for discussion of a Macushi speaker who deletes the unstressed vowels, yielding a pattern comparable to Delaware in 7.2.1.
It seems, rather, that stressed syllables are simply lengthened, as in Macushi, with no crucial goal of increasing the difference between the two branches of an iamb. The data are overall consistent with the claim of final IL but require a more general rule of lengthening under stress that obviates the IL rule.

7.2. Other Instantiations of Iambic Asymmetry. It is worth considering two other means of increasing the asymmetry between the two branches of an iamb, and whether they apply in a final foot. These are the reduction of the vowel in the weak branch (7.2.1) and variable realization of a laryngeal segment as part of the onset in the weak branch, or the coda in the strong branch (7.2.2).

7.2.1. Delaware Vowel Reduction. A phenomenon related to IL, insofar as it has the same fundamental motivation, is the reduction of vowels in the weak branch of an iamb.\(^{19}\) An extreme example is the Unami dialect of the Algonquian language Delaware, in which certain unstressed vowels can be deleted entirely (the Munsee dialect shows a similar pattern; see Goddard 1979:26; Hayes 1995:211). Primary stress falls on the penultimate foot;\(^{20}\) the evidence for secondary stresses is somewhat indirect: these vowels resist reduction. Vowels that delete are underlined (data from Goddard 1979).

(80) *Delaware: Deletion of unstressed vowels*

a. napakasi:kan → (napak)(kaši)(kan)  
  → (mpäk)(kaši)(kan)  
  ‘my knife’  

b. naskawasi: → (naská)(waši)  
  → (nšá)(isi)  
  ‘I am weak’  

c. maxkםaw → (máx)(kaš́aw)  
  → (máx)(ksó)  
  ‘he is red’  

d. pakaw → (pañ́aw)  
  → (pañó)  
  ‘(vegetable) gum’  

e. natalaxaköye: → (naltá)(laxáh)(kayése)  
  → (ntá)(lxáh)(kiyé)  
  ‘I plow’  

f. nakalalane: → (naká)(lalá)(nè)  
  → (naká)(llá)(nè)  
  ‘if I leave you (sg.)’

Foot structure is maintained in the output for ease of comparison, but it is unclear whether these surface feet should be considered phonologically real. A second process maximizing quantity differences between the weak and strong branches of the foot is the gemination of a voiceless stop that immediately follows a stressed open syllable; this iambic gemination is illustrated by the underlined [k] in (80a). Distinct from the vowel deletion that radically enforces iambic quantity differences, notice in (80b,e,f) that a final long vowel undergoes shortening (Goddard 1979:25), parallel to what we saw for other languages in 2. The existence of this shortening in Unami further confirms the independence of prohibitions on final vowel length from IL.

For our present purposes, the most noteworthy fact about vowel deletion is that it occurs in the word-final foot (80b-e). This supports the view that the lack of absolute final IL is indeed a property of final position, and not of the final foot. Thus, it is not true that the final foot is less concerned with maintaining the iambic pattern of quantity distinctions, and it is only a prohibition on final length that prevents IL from realizing this distinction in the final foot.

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\(^{19}\) Kager (1993:427) questions whether this pattern is truly related to iambic footing, since trochaic languages such as English also show reduction in unstressed syllables. Without a thorough cross-linguistic survey of reduction phenomena, it is difficult to know whether, and to what degree, the presence of iambic feet may increase the occurrence of reduction and deletion.

\(^{20}\) Following Hayes (1995:211), this pattern can be analyzed by extrametricality of the final foot, with the rightmost visible foot selected for primary stress. Two other processes illustrated by the data are vowel coalescence, specifically where /a/ becomes [o, i] before /w, y/; and the assimilation of a nasal to the place of a following consonant. See Goddard (1979:211) for details.
7.2.2. **Cayuga Laryngeal Metathesis.** Three members of the Lake Iroquoian subgroup of the Iroquoian family — Onondaga, Seneca, and Cayuga — have developed iambic rhythm to varying degrees, which coexists with synchronic reflexes of the penultimate stress pattern dating from an earlier time (Foster 1982; Michelson 1988; Hayes 1995; Dyck to appear). I concentrate here on Cayuga; data are from Foster (1982).

First let us consider some evidence for basic iambic foot structure in Cayuga. A rule of Pretonic Lengthening applies to the vowel in a syllable preceding a stressed penult, but only if that pretonic vowel is also the head of a foot, determined by iambic footing from left to right. We see below in (81a) that the pretonic vowel heads a foot, and lengths; while in (b) the same vowel is in the weak branch of a foot, and remains short. The lengthened accented vowel in these examples is determined by a rule independent of iambic structure, and so is given here as part of the input to iambic footing (cf. Hayes 1995:222).

(81) **Cayuga: Lengthening of a pretonic vowel if metrically strong**

- a. ḥēn-atówat-s
  → (hē,na)(tō)wats
  → (hē,na’) (tō)was
  ‘they’re hunting’ 63
- b. ḋ-ḥēn-atówat
  → (ḏ,hē)(na,tō)wat
  ‘they will hunt’ 61

Because this process is restricted to pretonic position, we naturally cannot test whether it applies to final vowels. In fact, while it depends on iambic foot structure, it is not a true example of IL. Rather, as first suggested by Prince (1983:86), the rule probably functions to relieve the stress clash between the penultimate accent and the preceding foot; when the pretonic syllable is not metrically strong, no clash exists and no remedy is required. Importantly, the function of the rule is not to increase the quantity distinction between the two branches of the foot, a defining characteristic of IL.21

Another rule, Tonic Lengthening, similarly depends on iambic feet and is also not an example of IL. Under particular circumstances, a rule places an accent on the “rightmost nonfinal even syllable” (Michelson 1988:99). In metrical terms, following Hayes (1995:222), a word-final foot is extrametrical, otherwise the rightmost iamb takes the accent. (Foot extrametricality is not indicated here since my basic concern is with the simple location of feet.) According to the rule of Tonic Lengthening, if the accent is in the penult, the penultimate vowel (underlined) lengthens (examples (82a) and (83a)).

**Cayuga: Lengthening of an accented penult**

(82) a. katawēh → (katā)wēh ‘I swim’ 64
   b. akatawēh → (akukan)awēh ‘I’m swimming’ 64

(83) a. ḥatakse’ → (hatāk)kse’ ‘he is running’ 64
   b. ḥatitakse? → (hatit)kakse? ‘they are running’ 64

This Tonic Lengthening simply lengthens an accented penult; the fact that the penult acquires its accent by iambic rhythm is incidental to the process, which has its roots in the historical penultimate accent of Iroquoian. For example, related Mohawk has penultimate accent, with the same Tonic Lengthening, but no iambic rhythm at all (Michelson 1988:54). In Cayuga — as well as Onondaga and Seneca — this lengthening simply increases the prominence of a stressed penult, and it is essentially a coincidence that the

21 We will see below that Menomini has IL in just the first foot of the word (75). Onondaga has similar second-syllable lengthening subject to two basic conditions: the word must be at least five syllables long, and the relevant vowel must be followed by a consonant cluster of stop or affricate plus sonorant. Michelson (1988:97f) suggests that there may be a further condition such that the following (i.e. third) syllable be closed by a laryngeal or contain a long vowel. This condition perhaps reduces to a requirement that the following syllable be stressed (because heavy), so that Second-Syllable Lengthening resembles Pretonic Lengthening.
source of that stress is an iambic pattern — and not a true example of IL. In addition, note that even though secondary stresses occur according to an iambic pattern, only if a (primary) accent falls on the penult does lengthening occur (Foster 1982:61).

(84) **Cayuga: No lengthening of secondary accents**

\[(e\bar{k}a)(t\bar{a}\bar{t})(k\bar{w}e\bar{t}\bar{a})::ny\bar{e}\quad I\ will\ make\ some\ people\ for\ myself\]

The two feet preceding the main stress do not show lengthening, further distinguishing the Cayuga pattern from the typical case of IL.

There is another phenomenon in Cayuga, however, that is more directly relevant to maintenance of iambic quantity distinctions, and this is Laryngeal Metathesis. According to this rule, when the weak branch of an iamb is closed by a laryngeal consonant, that consonant moves to the onset of the same syllable — it metathesizes from CVH to CHV — leaving that syllable open (Foster 1982:69; Michelson 1988:104; Hayes 1995:301). There are two facts to bear in mind. First, a postvocalic laryngeal consonant syllabifies in the coda even if another vowel follows, e.g. [Vh.V], and is susceptible to the metathesis rule. Second, while a coda consonant does not render the syllable sufficiently heavy to prevent it from serving as the weak branch of an iamb, it does seem to count for a certain amount of weight, and this “demi-weight” is what Laryngeal Metathesis appears to eliminate (see Hayes 1995:301 for a formal moraic analysis). Certain phonetic details are omitted from the representations below (see Foster 1982:70).

In (a) of each example below, the underlined vowel-laryngeal rimes appear in the weak branch of a foot, and undergo Metathesis, since the process functions to lighten the weak branch. In (b), they are in the strong branch, and remain unchanged, since the heavier the strong branch of an iamb is, the better.23

**Cayuga: Laryngeal Metathesis in metrically weak syllables**

(85) a. akekaha? → (akê)(kha.a)’ ‘my eye’ 63
    b. okaha? → (okâh)a? ‘eye’ 63

(86) a. akeke’a? → (akê)(kê.e.a?) ‘my hair’ 63
    b. oke’a? → (okê)a? ‘hair’ 63

(87) a. kahwista’eaks → (kha.wis)(tê.es) ‘it strikes, chimes’ 69
    b. akahwista’ek → (a.kah)(wis.tê)ek ‘it struck, chimed’ 69

This Metathesis is the opposite of IL in that it reduces the weak branch rather than increasing the strong branch; but both processes serve the same larger function of maximizing quantity differences between the two branches. As with weak vowel reduction in Delaware (7.2.1), the crucial point here is that this adjustment to iambic well-formedness occurs freely in the final foot of the word. Exactly because it is not

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22 The surprising syllabification pattern suggests another analysis: the laryngeal is underlyingly not a full segment, but a laryngeal feature associated with the vowel (cf. the approach of Silverman 1994). It will surface in the coda in metrically strong position (to enhance the weight difference), but will surface in the onset if metrically weak (so as not to reduce the weight difference). If the laryngeal feature must remain within the same syllable as the vowel that underlyingly sponsors it, we have an explanation for the violation of the normal “onset first” principle (cf. Itô 1989:223). This approach is supported by the fact that /h/ can be realized as devoicing of an entire syllable (Foster 1982:70; Dyck to appear), suggesting that it is a [spread glottis] feature that is realized throughout the syllable.

23 In accounting for the location of stress in Cayuga, Prince (1983:84f) claims that the final syllable is extrametrical. This, of course, is not compatible with the foot structures necessary to account for Metathesis. Either there are two different foot structures in the derivation, or the stress must be generated without appeal to extrametricality. One possibility is a constraint such as Nonfinality (Prince and Smolensky 1993:40) that prevents (main) stress from falling on a final syllable without necessarily requiring that the syllable be unfooted. See Dyck (1996, to appear) for discussion of the final syllable in Cayuga.
lengthening of the final vowel, the adjustment is unimpeded by restrictions on final vowel length, and the impulse for iambic asymmetry is permitted a realization.

7.3. Domain Finality. I have been assuming so far a certain sense of “final”: the end of a word or, more rarely, a phrase. But there is another notion of finality that does not correspond to either of these, namely when IL applies within some domain smaller than the word. In this section I present two cases in which IL applies to the last vowel in such a domain.

7.3.1. Kashaya. As noted in 5, all Kashaya vowels in word-final position resist IL, due to membership in a morphological class of suffixes that maintain their underlying vowel length. Nevertheless, IL must apply to vowels that are stem-final at the time when the rule is active — or, in other terms, to a vowel that is final in the domain to which lengthening applies. The “non-lengthening” suffixes, such as -pʰila, -eti, and -tu, always occur after the lengthening suffixes. The difference in behavior can be analyzed by substituting the representation at one lexical level, where the lengthening suffixes have been added, to a lengthening rule that does not reapply in later levels, where the non-lengthening suffixes are added (cf. Buckley 1997).

(88) LEVEL A (kela:) la (lengthening)
LEVEL B (kela:) (lapʰ) la (suffix -pʰila; lengthening no longer active)

(In other words, the grammar of level B is like the grammar of Asheninca (4), where IL does not occur at all.) Note, however, that a vowel that immediately precedes one of the non-lengthening suffixes does undergo IL. An example was provided in (60b), and is given a derivation below.

(89) LEVEL A (kel) (calac:) (lengthening)
LEVEL B (kel) (calac:) (pʰila) (suffix -pʰila; lengthening no longer active)

At Level A, the final vowel /a/ becomes long. A similar point can be made in a less derivational framework: there is some subconstituent of the word (call it “A”) that serves as the domain of IL, and all non-lengthening suffixes are located outside of this domain.

(90) Kashaya


While the Kashaya /a/ that lengthens is final in the lengthening domain (or in the entire string at the time the rule applies, in (89)), the vowel is not word-final, and this is the specific location where IL is blocked. These data provide an example of finality that is not the same as the position in which long vowels are prohibited, supporting the claim that it is not finality per se, but rather location in a position where length is disfavored, that blocks IL; the process itself seeks to apply regardless of finality.

7.3.2. Western Muskogean. The two Western Muskogean languages Choctaw and Chickasaw both have rules of IL, but with slightly different details. The following examples from Chickasaw illustrate that, as in Choctaw (1), word-final vowels do not undergo IL (data from Munro and Willmond 1994:xxxiv–vi). Since IL in these languages is non-neutralizing — a lengthened vowel is shorter in duration than an underlying long vowel — I use a gerundive vowel to indicate underlying length, and a colon to indicate derived (rhythmic) length (see Hayes 1995:211 for a moraic interpretation of the distinction).

**Chickasaw: Iambic lengthening**

(91) a. toksali —> (tok)(sali) 'he works'
b. toksali-tok —> (tok)(sali):(tok) 'he worked'

(92) a. baafa-li —> (baa)(fali) 'I stab him'
b. baafa-li-tok —> (baa)(fali):(tok) 'I stabbed him'
(93) a. hapompoyo  →  (hapom)(poyo)  he looks around'
b. hapompoyo-li  →  (hapom)(poyo;li)  I look around'
c. hapompoyo-tok  →  (hapom)(poyo;)(tok)  he looked around'

While the basic nature of IL in the two languages is the same, there are certain morphological differences regarding the domain in which lengthening applies. Munro and Ulrich (1984:192f) contrast the status of the vowel that precedes the past tense suffix -tok in (i) the Oklahoma dialect of Choctaw and (ii) Chickasaw and other dialects of Choctaw. In Chickasaw (and most Choctaw dialects), a vowel before -tok is susceptible to IL.

(94) **Chickasaw: Lengthening before -tok**

a. sa-litiha-tok  →  (sali̊)(tihå)(tok)  'I was dirty'  192
b. taha-tok  →  (tahå)(tok)  'it's used up'  194
c. başa-tok  →  (başå)(tok)  'he was cut'  196

The same fact is illustrated in (91) to (93). In Oklahoma Choctaw, by contrast, a vowel before this suffix generally does not undergo IL (though the rule does apply for some speakers: Ulrich 1986:74).  

(95) **Oklahoma Choctaw: No lengthening before -tok**

a. sa-litiha-tok  →  (sali̊)(tihå)(tok)  'I was dirty'  193
b. taha-tok  →  (tahå)(tok)  'it's used up'  194
c. pisa-tok  →  (piså)(tok)  'he saw'  Nicklas1975: 243

I argued above in 6.1 that failure of IL in word-final position in Choctaw is due to a prohibition on final long vowels, rather than to the absence of foot structure on final syllables.  

Munro and Ulrich (1984) give an analysis distinguishing the two languages within the framework of lexical phonology. The essential point they make is that in Chickasaw, IL has an opportunity to apply after the suffix -tok is added, at which point the preceding vowel is not final and is not blocked from undergoing the rule. For them (as for Ulrich 1986:56), non-application to final vowels is stipulated in the rule, which is what I am attempting to avoid.

(96) **Chickasaw**

LEVEL 1  (sali̊)(tihå)  (lengthening, but not finally)
LEVEL 2  (sali̊)(tihå)(tok)  (lengthening still active)

In Oklahoma Choctaw, at least for speakers who do have the second lengthened vowel in (96), IL applies before -tok is present, so that the vowel that, on the surface, precedes the suffix, is final at the relevant stage, and the rule is blocked (see also Ulrich 1986:55).

(97) **Oklahoma Choctaw**

LEVEL 1  (sali̊)(tihå)  (lengthening, but not finally)
LEVEL 2  (sali̊)(tihå)(tok)  (lengthening no longer active)

Under this analysis, IL does not have an opportunity to reapply after -tok is added. But lack of application at Level 1 is surprising, given the Kashaya result in (89). The conclusion based on Kashaya is quite

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24 Hayes (1995:209) notes that Chickasaw, unlike Choctaw, has underlying long vowels in final position, and includes a stipulation in his IL rule such that it will not apply to a final vowel. I showed in 2, however, that the existence of underlying final long vowels does not mean that no prohibition on them exists that can have an emergent effect in the derivation. The (non-absolute) prohibition on final length is tenable in Chickasaw as well as Choctaw.
clear: since the vowels WITHIN suffixes such as -p'Ha do not undergo IL, the rule cannot be active once the suffix is added. The evidence from Oklahoma Choctaw is of a different type: what the analysis seeks to prevent is lengthening BEFORE the relevant suffix, not within it, where lengthening is not syllabically possible in the first place (cf. Ulrich 1986:54).

One possible revision of the analysis is extrametricality of the final syllable in Oklahoma Choctaw but not in Chickasaw.

(98)

<table>
<thead>
<tr>
<th>Chickasaw</th>
<th>Oklahoma Choctaw</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEVEL 1</td>
<td>(sali):(tiha)</td>
</tr>
<tr>
<td>LEVEL 2</td>
<td>(sali):(tiha):(tok)</td>
</tr>
</tbody>
</table>

I argued against the extrametricality approach in 6.1, however. Fortunately, a nonderivative analysis similar to (27) is also possible. Lombardi and McCarthy (1991:fn.5) identify Choctaw -tok as an enclitic (as does Nicklas 1975:239); this implies that the preceding vowel is followed by a prosodic word boundary, which blocks IL by the general prohibition on word-final long vowels.

(99) Oklahoma Choctaw


(In these representations dittics induce recursion of the prosodic word, as mentioned for Luganda in 2.) In Chickasaw -tok would have to be a regular suffix, so that there is no following word boundary.

(100) Chickasaw


In the similar analysis of Kashaya (7.3.1), domain A is clearly not a word, and the non-lengthening suffixes are not dittics. Because there is no word boundary corresponding to 1aW the prohibition on word-final long vowels is irrelevant and IL is free to apply.

This approach works formally, although Lombardi and McCarthy do not provide any independent evidence for a prosodification such as that in (99). Further, there is a complication presented by the next words, the only relevant forms given by Munro and Ulrich. Here the level-two suffix -li lengths before the other level-two suffix -tok, but not before the level-three suffix -kat.

(101) Chickasaw: Status of -li

a. pilači-li-tok  →  (pila):(čili):(tok)  
   →  pila:šili:tok  I send it to him' 198
b. pilači-li-kat  →  (pila):(čili):(kat) 
   →  pila:šlikat  [that] I send it to him' 198

The presumed lexical phonological derivations are given below. (The formal analysis of the late rule that deletes /i/ between /č/ and a following consonant, with a subsequent change to [š], is disregarded here.)

Chickasaw

(102) LEVEL 1 (pila):či  
      LEVEL 2 (pila):(čili):(tok)  
      →  pila:šili:tok  (lengthening)
(103) LEVEL 1 (pila):či  
      LEVEL 2 (pila):(čili)  
      LEVEL 3 (pila):(čili):(kat)  
      →  pila:šlikat  (lengthening)

(lengthening still active)

(lengthening still active, but not finally)

(lengthening no longer active)
The importance of these examples lies in level 2, where the stem-final vowel does not lengthen, in contrast to the Kashaya derivation. It would be possible to use final-syllable extrametricality for Chickasaw in level 2 — but not level 1: recall (98) — but this seems a rather ad hoc approach.

Another possibility is available, following (99) above for Oklahoma Choctaw, which makes use of word boundaries in a different location — specifically, by treating as prosodic clitics the level two (and presumably level three) suffixes of Oklahoma Choctaw, btol telvltresi e Chickasaw.

(104) Chickasaw

a. [ pilačilitok ]w  \rightarrow [ pilačlištok ]\bar{W} 

b. [ [ pilačili ]w kat ]w  \rightarrow [ [ pilačli ]w kat ]\bar{W} 

In sum, a domains-based analysis can capture the facts without stipulating the lack of final lengthening in the IL rule itself. Such an approach is consistent with the general conclusions from Kashaya, but I cannot pursue the implications of such a claim for the overall phonology of Western Muskogean.

7.4. Yupik. In Central Alaskan Yupik there is a complex interaction of lengthening, gemination, and finality. I will treat only a small part of the facts; see Krauss (1985), Woodbury (1987), Hayes (1995), and Baković (1996; 1997) for extensive discussion. My general point is that Yupik avoids word-final long vowels, but there is nonetheless a preference for a heavy syllable in that position.

First, note the existence of IL, which does not apply to the final vowel in (105a); these data are from Reed et al. (1977).

(105) Yupik: Iambic lengthening

a. pisuqačalinnini  
   \rightarrow (pisq)(qatač)(hinič)lini  ‘apparently about to hunt’ 13

b. mitxaqalinnili  
   \rightarrow (mit)(taqč)(tańč)(niluń)ni  ‘apparently about to land’ 13

Long schwa is disallowed in Yupik, so that when a schwa in an open syllable is metrically strong, IL is replaced by Iambic Gemination: rather than creating ill-formed [a:], the syllable is rendered heavy by geminating the following consonant.

(106) Yupik: Iambic gemination after schwa

a. tumami  
   \rightarrow (tumam)ni  ‘on the footprint’ 13

b. ikamtarəpəcəni  
   \rightarrow (i_kam)(tar)(pəcən)ni  ‘in your (pl) sled’ 13

The basic conclusion regarding word-internal feet is that IL preferentially applies to vowels, but when the vowel cannot undergo the rule, a consonant is geminated.

The next fact to consider is that final syllables are (at least under one analysis) uniformly unstressed in phrase-final position; this is illustrated by examples (107a) and (108a) below, as well as in (105a) above. A word-final stress that is phrase-medial does surface (b). Underlying long vowels are written as geminates, derived long vowels with a colon; brackets indicate phonological phrases. Remaining examples are from Miyaoka (1985). As in 7.3, I use geminate vowels for underlying length, and [:] for derived length.

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25 This analysis — with a rule deleting the phrase-final foot — raises certain theoretical questions, as discussed by Hayes (1995:258).
Yupik: Phrase-final destressing

(107) a. [ qayá:mun ]
    b. [ qayá:mún tak:túq ]

(108) a. [ nunákka ] [ tamá:na ]
    b. [ nunákka tamá:na ]

Given this perspective, we have an automatic explanation for why there is no final IL in (105a) above: the final vowel is unstressed, and simply does not fit the structural description of IL. This situation resembles the extrametricality in Hixkaryana and Carib (4), though in Yupik the absence of metrical structure is due to destressing rather than extrametricality per se.

What about when a word-final short vowel is followed by another word in the same phrase? When the next word starts with another vowel, there is still no lengthening of the vowel.26

(109) Yupik: No word-final iambic lengthening

a. qayaliciquci
    \(\rightarrow\) (qayá):(lici):quci
    ‘you will be making a kayak’ 67

b. qayaliciquci amani
    \(\rightarrow\) (qayá):(lici):(quci)(amá):ni
    ‘you will be making a kayak over there’ 67

When the next word starts with a consonant, however, we find gemination of that consonant.

Yupik: Word-final gemination

(110) a. anyákka
    \(\rightarrow\) (án)ykákka
    ‘my two boats’ 68

b. anyákka mikánrituk
    \(\rightarrow\) (án)(yakánm)(mikán)rituk
    ‘my two boats are not small’ 68

(111) kina tanám
    \(\rightarrow\) (kiná)tanám
    ‘who ever?’ 71

(112) nuna tamana
    \(\rightarrow\) (nuná)(tamá):na
    ‘that (extended) land’ 70

(113) nunaka tamana
    \(\rightarrow\) (nuná)(kátj)(tamá):na
    ‘that (extended) land of mine’ 70

Resorting to gemination within a word, as in (106), is forced by the prohibition on long schwa. Similarly, the existence of gemination in (112) and (113) suggests that some principle disfavors lengthening. I propose that it is exactly a constraint against (derived) word-final long vowels that forces gemination here. The general picture emerging is that lengthening of a vowel is preferred over gemination of a consonant; but gemination is used when vowel lengthening is impossible. The two contexts are when the vowel is a schwa, and when the vowel is final.

An important question in assessing the relevance of these data for the nature of IL is to ask whether the gemination seen in these phrasal examples is, in fact, the result of IL. This question arises because, as seen in (113), the word-final foot need not be branching in order for gemination to occur. I suggest that there are actually two factors at work: in a degenerate foot, minimal considerations force the creation

26 I am speaking here of a following word, rather than a following clitic; when a clitic follows a vowel-final word, there is lengthening (which Hayes attributes to cyclic rule application before clitics). This suggests that some larger constituent equivalent to the clitic group (Nespor and Vogel 1986:145) is the actual domain in which final long vowels are prohibited (cf. Luganda in 2). All words in these examples are also (vacuously) clitic groups.
of a heavy syllable; this is why \((ka)\) becomes \((kat)\) and also why no gemination occurs after \((kaa)\) in (108), which is already heavy. In a branching foot, however, minimality is satisfied, and yet we still find gemination — e.g. (112). Here it is, in fact, IL that causes the syllable to become heavy. These examples are directly relevant to the question of whether IL (or its alternative, gemination) can apply after a final vowel, and the Yupik facts indicate that the answer is yes.\(^{27}\) \(^{28}\)

7.5. Menomini. Menomini, an Algonquian language spoken in Wisconsin, provides an example of IL that can be seen to apply to a word-final foot. In the interest of brevity I will not analyze several other processes affecting vowel length in the language; see Pesetsky (1979) and Hayes (1995:219) for discussion of these other phenomena in a metrical context.

First, note that the basic stress pattern is iambic (Bloomfield 1962:20; Goddard, Hockett, and Teeter 1972; Hayes 1995:218). All data here are from Bloomfield (1962).\(^{29}\)

(114) **Menomini: iambic footing**

a. \((p\acute{e})(sek\grave{o})(ka\tilde{s})<w>\) ‘horse’ \(^6\)

b. \((ken\grave{e})(no\tilde{h}t\grave{o})(ne\tilde{n})<m>\) ‘we understand you’ \(^6\)

When the word begins in a branching foot, the head vowel of that foot lengthens. Coda consonants do not contribute to syllable weight, as seen by the presence of closed syllables in the weak branch of a foot (115d,e). Not surprisingly, then, a closed syllable can undergo IL (115f,g).

(115) **Menomini: iambic Lengthening in an initial foot**

a. \(an-anMekw\) → \((an\tilde{a})(me\tilde{e})<k>\) ‘dead fish washed ashore’ \(^76\)

b. \(men\tilde{w}-\tilde{i}kan\) → \((men\tilde{e})(\tilde{k}a)<n>\) ‘town’ \(^73\)

c. \(p\tilde{e}me\tilde{t}-\tilde{onak\rangle\) → \((p\tilde{e}me)(\tilde{t}ona)<k>\) ‘athwart the canoe’ \(^69\)

d. \(es\tilde{p}-\tilde{e}\tilde{w}-\tilde{p}-\tilde{ah}-\tilde{am\rangle\) → \((es\tilde{p}\tilde{e})(\tilde{w}e)(\tilde{p}a)<m>\) ‘he tosses it aloft’ \(^80\)

e. \(mahk\tilde{e}\tilde{es}\) → \((mahk\tilde{e})\tilde{se}<n>\) ‘moccasin, shoe’ \(^76\)

f. \(ne-k\tilde{oh}-\tilde{n}-\tilde{a}-\tilde{w\rangle\) → \((nek\tilde{e})\tilde{h}na<\tilde{w}>\) ‘I fear him’ \(^91\)

g. \(p\tilde{e}m-o\tilde{h}-\tilde{ne}-\tilde{w\rangle\) → \((p\tilde{e}mo)(\tilde{h})ne<\tilde{w}>\) ‘he walks along’ \(^91\)

This lengthening happens only in the first foot of the word. Hayes (1995:220) conjectures that the first foot may have historically borne main stress, and this could account for its exclusively undergoing IL.

Every Menomini word ends in a consonant (Bloomfield 1962:3), but it is clear that final consonants are extrasyllabic: final VC patterns consistently like a word-medial open syllable, indicating that the final consonant is excluded from syllable structure (cf. Hayes 1995:56f). The next sets of data are discussed here only to demonstrate this fact; see Hayes (1995:219) for analysis. First, notice that IL does occur in a non-initial foot when the strong syllable is closed.

\(^{27}\) This analysis implies that foot construction is exhaustive within the phrase, with two caveats: a foot (branching or not) is avoided phrase-finally, and the left edge of a word must correspond to the left edge of a foot (cf. McCarthy and Prince 1993:80), so that a degenerate foot can be created (and repaired) at the end of a phrase-medial word.

\(^{28}\) An interesting additional place within Yupik to look for evidence regarding the topic of this article is a phenomenon noted by Hayes (1995:247), citing Woodbury (1981). Normally a VC rime is light, but will become heavy by the mora-insertion that IL accomplishes. Here the vowel does not lengthen; rather, the consonant is phonetically lengthened, a result attributable to the added mora. I have not been able to determine whether this is true of a word-final CVVC foot, but if so it would constitute an excellent example of how the pressure for IL can be realized even in the face of restrictions on final long vowels.

\(^{29}\) I do not distinguish “primary” and “secondary” stresses here, since they do not appear to be phonologically distinct — in Bloomfield’s terms, every long vowel bears primary stress. On p. 20 he states that secondary stresses do not occur on word-final syllables, but on p. 6 he identifies the final-syllable vowels of the words in (114) as being “stronger and clearer”, a statement suggestive of stress. I assume that the final syllable can be stressed, but is perhaps not able to bear pitch accents otherwise diagnostic of stress (or that there is interference from phrase-final accents); cf. Hayes (1995:100).
(116) Menomini: Lengthening in a strong closed syllable

a. kaskapahkenekew
   → (kaskanek)(kenew)<w>
   ‘he scratches at the reed wall’ 388
b. wikopaskemotwy-an
   → (wi:)(kopa:)(en<o)<n>
   ‘basswood bags’ 81
c. wenanaksk
   → (we:)(nakwak)<k>
   ‘dirty fellows’ 87
d. ne:hi:wei:tok
   → (ne:hi:)(wei:no)<k>
   ‘one who storms at it’ 100

In a non-initial foot whose strong syllable is open, on the other hand, no lengthening occurs (cf. (116a,b)); in fact, an underlying long vowel is shortened there, as seen below. (Hayes 1995:220f proposes a historical explanation for this surprising synchronic pattern.)

(117) Menomini: Shortening in a medial strong open syllable

a. wapet-yekat
   → (wa:)(pet)<y><k><a><t>
   ‘it is white cloth’ 81 (ye → i)
b. netesp-e:we:pah-an
   → (netep:)(espe)(paha)<n>
   ‘I toss it aloft’ 80
c. pakeweyan
   → (pake:)(yewan)<n>
   ‘canvas’ 80
d. acecekahpowahe-ew
   → (ace:)(cekah)(pwah)<w>
   ‘he stands him upside down’ 92
e. mamahkekat:e:w
   → (mamah)(kekah)<te:w>
   ‘he has big legs’ 100

These data show that after the first foot of the word, IL occurs only in a closed syllable; in a metrically strong open syllable, a long vowel is actually shortened.

Now we return to the question of final VC. The following examples show that this syllable behaves as if it is open, because as the strong branch of a non-initial foot it does not lengthen, and in fact will shorten if underlyingly long (as in (117)). 30

(118) Menomini: Shortening in a final strong open syllable, modulo extrasyllabicity

a. a?setenh:ew
   → (a?seteh)<e:w>
   ‘he places him close up to something’ 92
b. me?tekikan
   → (me?tek)<ikan><n>
   ‘wooden house’ 73
c. nohtawe-ew
   → (noh)(taw)<w>
   ‘he hears him’ 92

Since the final consonant is extrasyllabic, the word-final foot ends in a vowel. The data in (118) might be taken to support the idea that final vowels do not undergo IL, but actually the lack of IL is due to the fact that the feet are non-initial.

30 Examples (118a,b) show that IL fails to apply when the left branch of the foot is a syllable closed by a glottal stop (termed “glottal words” by Bloomfield 1962:90). In such cases, we find the rules typical of non-initial feet, for example the shortening illustrated more generally in (118): a?te:w → (a?te)<w> ‘it is there’. This pattern indicates that the shortening rule is the general case, while IL is a special process applying to the initial feet of non-glottal words (cf. Bloomfield 1962:91). In a foot that fails to meet these conditions, i.e. that is non-initial or glottal, IL is blocked and more general shortening (or lengthening in a closed syllable; see (116)) applies instead. A possible explanation of the role of glottal stop, if only historically, is that the glottal coda attracts the stress and forces creation of an anomalous trochaic foot, so that IL is naturally not possible.
The crucial test of the interaction of IL and final vowels is a word-final foot that is also initial; that is, we must look at disyllabic words with a light first syllable, so that there is just one foot over the entire word. Here we see that IL does occur.

(119) Menomini: Final IL in a disyllable

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. anemw</td>
<td>→ (anem&lt;qm&gt;)</td>
<td>‘dog’ 70</td>
</tr>
<tr>
<td>b. mehk-am-w</td>
<td>→ (mehka&lt;qm&gt;)</td>
<td>‘he finds it’ 90</td>
</tr>
<tr>
<td>c. ne-mw-ek</td>
<td>→ (nemo&lt;km&gt;)</td>
<td>‘he eats me’ 90</td>
</tr>
<tr>
<td>d. ne-set</td>
<td>→ (neset&lt;et&gt;)</td>
<td>‘my foot’ 70</td>
</tr>
<tr>
<td>e. ohpenny</td>
<td>→ (ohpe&lt;nn&gt;)</td>
<td>‘potato’ 71</td>
</tr>
<tr>
<td>f. kan-ek-w</td>
<td>→ (kane&lt;kk&gt;)</td>
<td>‘the other escapes from him’ 89</td>
</tr>
</tbody>
</table>

Since this foot is initial in the word, it is subject to IL; but since it is also final, we can test whether IL in Menomini occurs word-finally. The answer is yes, but of course it is only final in a certain sense: the vowel that lengthens in (119) is final in the word-final foot, but is not the final segment in the word. This is exactly the sort of context that can distinguish between these two properties. That is, Menomini supports the claim that it is not the word-finality of the foot, or of the vowel within the foot, but of the vowel within the word that would prevent IL. Since in Menomini the vowel is not word-final, it is not subject to a positional restriction and is free to lengthen. (A similar point was made for Choctaw compensatory lengthening in 6.1.) This once again confirms that it is the finality of a vowel — making it susceptible to restrictions on final length — that leads to the non-application of IL, rather than the finality of the foot.

8. Conclusion. I have surveyed a range of languages with IL, with primary attention to the question of whether this process applies to final vowels, and what is responsible for the failures of application. I have identified three basic causes of non-application, all of which are in principle independent of iambic structure: a prohibition on final long vowels; extrametricality or other non-footing of a final syllable; and morphological immunity to changes in length. The ban on final long vowels is the only factor that actively BLOCKS IL at the end of a word: the structural description of the rule is satisfied, but a higher-ranking consideration prevents it from applying. The other widespread factor discussed here, extrametricality, merely prevents the structural description from being met in the first place: the word-final vowel is not the head of a foot and there is no pressure from IL to lengthen it (whether or not such pressure would be resisted by the ban on final long vowels). In this sense, the ban on final vowel length is the central explanation for the blocking of final lengthening, while in the case of extrametricality the ban on final length is not directly testable.

I have also examined a number of languages that do have final lengthening of some sort. Although no perfectly clear-cut example of final IL has been discovered, several languages have partial application to final vowels, or full application to vowels in a particularly defined final position. This result supports the assertion that there is no fundamental property of IL preventing its application in final position; rather, it is common but orthogonal properties that so often block the rule.
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Final draft, 18 February 1998

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