MINIMAL WORDS AREN'T MINIMAL FEET

EDWARD GARRETT
garrett@ucla.edu

Since McCarthy and Prince (1986), most linguists have claimed that the minimal content word of a language is equivalent to the minimal foot allowed by the language. In this paper I survey minimal word restrictions in over fifty languages to show that the minimal word syndrome is not connected to foot structure. Instead, in some cases the minimal word of a language is connected to stress properties of the right and/or left edge of the word. For many languages the independently necessary right edge constraint prohibiting final stress, NON-FINALITY (Hyman 1977, Prince and Smolensky 1993, Hung 1994, Walker 1996), predicts minimal word constraints. To handle left edge effects, I introduce a constraint disfavoring stressed syllables which are not preceded by unstressed syllables (which therefore disfavors initial stressed syllables), UPBEAT. In a great many other cases, I show that there is not even a connection between stress and minimality. I account for the minimal word restrictions in these languages with the phonetically motivated constraint BE-LONG, which penalizes short words.

1. INTRODUCTION[1]

Since McCarthy and Prince (1986), minimal word data have been taken as important evidence for foot structure. They and others since have claimed that the minimal content word of a language is the same size as the minimal foot allowed by the language. So, if a language allows degenerate CV feet in disyllabic or longer words, then it is expected to have CV content words. On the other hand, if a language prohibits such feet in disyllabic or longer words, then it is not expected to have CV content words.

For example, on a standard analysis of Latin, CVX syllables (where CVX encompasses both CVC and CVV) may form feet on their own, while CV feet are prohibited. As a result, we get the following metrical structures:

(1) a. a.(mí:)<ku:s> 'friend'
b. (sí.mu)<la:> 'similarity'
c. *si.(mú)<la:>

The final syllable is extrametrical in both cases. In (a), since *mi:* is a heavy syllable, it can form a foot on its own. On the other hand, (c) is impossible, since *mu*, being light, is unable to form a foot by itself; for this reason, stress appears on the antepenultimate syllable, as in (b).

[1] I thank Matt Gordon, Bruce Hayes and Donca Steriade for their many helpful comments on this work.

Given that the CV foot in (1c) is disallowed, it is not surprising that underlying CV monosyllables must undergo lengthening:

(2) da => (dá:), *(dá) 'give'

The second form in (2) is ruled out because it is a degenerate foot, and such feet are prohibited in Latin, as also illustrated by the infelicity of (1c). Thus, the size of the minimal word in Latin (CVX) is said to fall out from the independently necessary foot structure of the language (Mester 1994, pp. 22-3).

Since the appearance of Optimality Theory on the phonological scene (Prince and Smolensky 1993), McCarthy and Prince's original position can be weakened somewhat. For example, the infelicity of (1c) need not show that Latin *prohibits* degenerate feet, but rather just that it disprefers them. In Prince and Smolensky (1993), minimal word restrictions come from FTBIN, an OT constraint which says, "Feet must be binary", that is, either CVX or disyllabic. On this approach, (2) does not strictly follow from (1).

Optimality theoreticians, nevertheless, have generally maintained a weak version of McCarthy and Prince's claim, as is evident from their use of the FTBIN constraint (or similar constraints) to deal with minimality. Their thesis could be stated simply and informally as:

(3) *There is a connection between the foot structure of a language and its minimum word.*

In this paper, I examine stress patterns and minimal word restrictions in over 50 languages. I show that there is no connection between foot structure and minimal word size (section 2). Although there does appear to be a connection between stress patterns and word minimality in some languages, this can be captured without using foot-based constraints, but rather with constraints on the placement of main stress (section 3). In other languages, there is no connection at all between stress and word minimality. Such languages provide evidence for a constraint against short words (section 4).

2. MINIMAL WORDS AREN'T MINIMAL FEET

The most elaborate and empirically tested theory of word minimality in the spirit of McCarthy and Prince's original claim can be found in Hayes (1995). For Hayes, the question of whether or not a language allows subminimal CV words boils down to a basic parameter of the theory, whether or not degenerate (CV) feet are allowed under main stress in surface phonology.[2] If degenerate feet are allowed, then MW=CV; if not, then the minimal word is the smallest syllable in the

[2] Hayes argues that degenerate feet are totally excluded under secondary stress.

language that can constitute a foot on its own, usually either CVV or CVC.

Thus, Hayes' theory makes two sorts of predictions. First, if there is evidence that a language forms degenerate CV feet in disyllabic or longer words, the theory positively predicts that this language will possess CV content words. Second, if there is *no* evidence for degenerate foot formation from disyllabic or longer words, the theory predicts that *if* CV content words are disallowed, then the minimal content word will be the minimal foot the language allows.

In the following subsections, I show that both of the above predictions are incorrect. First, languages in which disyllabic or longer words provide evidence for degenerate CV foot formation need not have a CV minimal word restriction (section 2.1). Second, languages which disallow CV words often do not have minimal words that are equal to the minimal foot size predicted by foot-theory. In a considerable number of cases, there is a mismatch (section 2.3); and in some cases the minimal word is longer than the minimal foot size (sections 2.2 and 2.6).

Other evidence against the purely foot-based approach to word-minimality comes from syllabic trochee languages, which often employ a minimal word constraint of CVX, even though there is no evidence that CVC (or CVV) plays a role in the computation of foot structure (section 2.4); from unbounded stress languages, where evidence for foot structure is scant, but the same minimality restrictions are observed (section 2.5); and from languages which base stress on vowel quality distinctions, which behave just like other languages with respect to minimality (section 2.6).

In conclusion, the point that will ultimately emerge is not that a foot-based theory is inherently unable to account for the minimality typology. As I already pointed out, an Optimality Theoretic approach with violable FTBIN affords a great deal of flexibility. Rather, the point is that the minimal word syndrome does not offer compelling evidence for foot structure.

Before proceeding, I should comment briefly on the research methodology employed in this section. In a minority of cases, data on word minimality is explicit, either in Hayes (1995) or in grammars, dictionaries, or other primary sources. For most of the languages discussed here, however, such data is not explicit. That is, primary sources usually do not state what the minimal content word of a language is. Thus, I often say that language X disallows CV words because I found no such words in an article about X, or in a grammar or dictionary of X, citing the relevant source(s) without noting that I have only reached my conclusion by inference. In many cases, such determinations are probably well-justified, given the size of the

grammar or dictionary consulted. In some cases, however, given the paucity of data on the language, uncertainty remains.

A second important cautionary note concerns the definitions of "function word" and "content word". Usually, the class of function words will include determiners, pre/post-positions, exclamations and the like, but it may also include existential verbs, the words "yes" and "no", personal pronouns, and other (arguably) intermediate cases.

A related question arises when considering the status of words with special intonational properties. For example, I categorize some languages as having a CVX minimal word restriction even though they may have subminimal number words or imperatives.[3] When exceptions to word minimality are few and systematic, this seems to me to be the most sensible way to proceed. Although such issues are orthogonal to the main point of the discussion, it is important that they be made clear.

2.1. *Degenerate Foot Formation does not Imply Degenerate Words*

Cahuilla is a left-to-right moraic trochee language in which words beginning with LH (L=light, ie CV or CVC; H=heavy, CVV or CV?) are argued by Hayes to provide evidence for degenerate feet (pp 132-140). Consider the following example:

(4) /LHL/: *sʊ́kà?tì* 'the deer (objective case)'
(Seiler 1977, p. 28)

In (4), main stress is assigned to the initial CV syllable, while the following CV? is stressed because it is heavy. Hayes presents compelling evidence that the final stress in (4) is due to phonetic final lengthening (p. 137), which leads to the following metrification:

(5) *(sʊ́)(kà?)ti*

The initial foot, *(sʊ́)*, is a degenerate CV foot under main stress, which means that Cahuilla should allow CV words. However, this turns out to be wrong. While there are plenty of CVX words in Cahuilla—eg *net* 'ceremonial chief' (Seiler 1977, p. 32) and *c'ah* 'ten' (p. 22)—the only CV words are grammatical: *ku* 'indeed' (p. 193: always clause-final and always unstressed), *mu* 'still' and *tu* 'only' (p. 195: both clitics) (Seiler 1977, Seiler and Hioki 1979).

Within Optimality Theory, we can assume that the unusual metrification in (5) arises from a dual desire to stress the initial syllable and to stress all heavy syllables. Or, to put it in foot structural terms,

[3] I mention number words and imperatives because I have found more than a few cases where just one or the other of these classes of words are allowed to violate otherwise strict minimal word restrictions.

from a dual desire to align a foot to the left edge of the word and to always have heavy syllables constitute feet by themselves. Either way, a degenerate foot is constructed at the left edge of the word. But this has no effect on Cahuilla's minimal word.

2.2. *Disyllabic Minimal Words may be Larger than even Maximal Feet*

Hayes observes that the minimal word in Nyawaygi is exceptional on his treatment, since it has heavy syllables but defines the minimal word as a disyllable. Apparently, "this suggests that the peculiarity of ... Nyawaygi should be localized in [its] unusual minimal word constraint: [it] defines the minimal word as a maximal foot, rather than the minimal foot that is usually found" (p. 105).

In fact, however, Nyawaygi fits into a natural class that can be explained without reference to foot structure. The following languages all have disyllabic minimal word requirements:

(6) *Languages with disyllabic minimal word requirements*
Cayuvava (Bolivia; Key 1961)
Cavineña (Tacanan, Bolivia; Key 1968)
Dyirbal (Pama-Nyungan, Australia; Dixon 1983)[4]
Nyawaygi (Pama-Nyungan; Dixon 1983)
Kuuku-Ya?u (Pama-Nyungan, Cape York; Thompson 1976)
Bidyara/Gungabula
(Pama-Nyungan; Hayes p. 199, Breen 1973)
Pitta-Pitta (Pama-Nyungan; Hayes p. 201)
Diyari (Pama-Nyungan; Austin 1981)
Wangkumara (Southwest Queensland; Hayes p. 202,
McDonald & Wurm 1979)
Yukulta (Australian; Keen 1983, p. 196)
Uradhi (Australian; Crowley 1982)[5]
Carib (Cariban, Surinam; Hoff 1968)
Hixkaryana (Cariban, Northern Brazil; Hayes p. 206)
Hopi (Northern Uto-Aztecan, Arizona;
Jeanne 1982, Seaman 1985)

One property that all of the above languages have in common is that they never assign main stress to final syllables. Thus, it is conceivable that disyllabic minimal word requirements result from the constraint NON-FINALITY, which prohibits final main stress (Prince and Smolensky 1993; see also section 3).

Interestingly, a unified explanation of these cases cannot rely on Hayes' definition of the minimal word as a "maximal foot". This is

[4] A few disyllabic words in Dyirbal have monosyllabic alternants with long vowels, though these "are less frequent realizations", according to Dixon (1983, p. 17).
[5] There are a very small number of monosyllabic verbs in the Uradhi dialects, but judging from the conjugations in Crowley (1982, p. 361), these verbs never occur in isolation as phonological words.

because Carib and Hixkaryana set MW=HL, even though they are iambic; (HL) is not a maximal iambic foot—in fact, it is generally considered to be a prohibited iambic foot (see Hayes p. 206).

A foot theoretic approach framed within OT could also capture the minimality restrictions in (6), but only, as far as I can tell, by adopting the same constraint I've suggested is relevant, NON-FINALITY, defined not in terms of foot structure but rather in terms of stress. Thus, the restrictions in (6) are not connected to foot structure.

2.3. *Foot Structure "Heavy" ≠ Minimum Word "Heavy"*

Another argument against the standard foot theoretic approach to word-minimality comes from languages that count CVV as heavy and CV(C) as light. More often than not, if such languages have minimal word requirements they set MW=CVX, in spite of the fact that CVC cannot constitute a foot on its own (at least not in disyllabic or longer words). In 2.1 above I gave one example of this: Cahuilla, in which only CVV and CV? are heavy, permits "degenerate" CVC words, but not CV words. Below I give a list of such languages (see Gordon 1996), with their stress patterns and minimal word restrictions:

(7) *Languages in which CVV is heavy and CVC is (usually) light*

Language	Type	MW
Khalkha Mongolian (Altaic)	leftmost non-final CVV, else initial (?)	CVX
(Street 1963, Walker 1996)		
Buriat (Altaic)	"	CVX
(Walker 1996, Poppe 1960: *gar* 'hand' p. 11, *em* 'medicine' p. 14; *bi* 'I' p. 48, *ba* 'and' p. 82)		
Gurkhali (Indo-European)		CVX
(Meerendonk 1949: *din* 'day' p. 7, *top* 'gun' p. 9, *ghar* 'house' p. 10)		
Paamese (Austronesian)	antepenultimate	CVX
(Crowley 1982: *gul* 'he swam' p. 13, *wɛn* 'its handle' p. 17)		
Hupa (Na Dené, Golla)	leftmost CVV	CVX
(Matt Gordon, personal communication)		
Yupik (Eskimo-Aleut)	LR iambic	CVX
(Reed et al 1977: *yuk* 'person', *meq* 'water')[6]		
Cahuilla (Uto-Aztecan)	LR moraic trochee	CVX
Wintu (Penutian)		CVX
(Pitkin 1984: *pot* 'intestines' p. 30, *ta?* 'child-in-law' p. 31, vs. *ni* 'I' p. 20, *mi* 'you' p. 37)		
Huasteco (Mayan, Mexico)	rightmost CVV, else initial	CVX
(Larsen and Pike 1949: *ha?* 'water' p. 271, *hom* 'incense' p. 276)		
Aguacatec (Mayan)	rightmost CVV, else final	CVX
(McCarthur and McCarthur 1956)		

[6] In some dialects of Yupik, word-initial CVC syllables are counted as heavy.

Murik (Lower Sepik)	leftmost CVV, else initial	CVX[7]
(Abbott 1985)		
Maithili (Indo-European)	RL moraic trochee	CVV
(Hayes pp. 149-162—especially p. 152, Yadav 1984, Yadav 1996)[8]		
Kawaiisu (Aztec-Tanoan)	final CVV, else penultimate	CVV
(Zigmond, Booth and Munro 1990)		
Wargamay (Pama-Nyungan)	stress on initial or second, not final	CVV
(Dixon 1981: *ma:l* 'man', *wi:* 'sun' p. 18)		
Winnebago (Siouan)	ternary iambic	CVV
(Hayes pp. 346-364, Miner 1979, Morrison 1994: *há:s* 'berry' p. 6, *hé:* 'fur, hide' p. 34)		
Menomini (Central Algonquian)	LR iambic	CVVC
(Bloomfield 1962, 1975)		
Malayalam (Dravidian)	initial, unless second is CVV(C)	CVV
(Hayes pp. 92-3, T. Mohanan 1989: *tii* 'fire')		
Lardil (Pama-Nyungan)	initial	CVV
(Hale 1973, Klokeid 1974: *tjaa* 'foot' p. 55, *peed* 'ti-tree species' p. 57)		

The data above suggests that there is no direct connection between what counts as heavy in a language and what the minimal word of the language is. In the pre-OT Hayesian framework, such a connection is expected: typically, heavy syllables will be allowed to constitute feet on their own, while sub-heavy syllables will not. In an OT framework, on the other hand, the data can be accounted for, though not in a very illuminating fashion.

2.4. *Unbounded Stress Languages have Minimal Words but no Feet*

Unbounded stress languages can be divided into two general types: stress rightmost/leftmost heavy syllable, else rightmost/leftmost syllable (="default-to-same"); and stress rightmost/leftmost heavy syllable, else leftmost/rightmost syllable (="default-to-opposite"), with the additional complication of NON-FINALITY (Walker 1996; also see Hayes pp. 296-7 for examples and discussion). Neither type provides much evidence for binary foot-structure, although foot-based analyses are of course imaginable (see Prince 1985). The traditional analysis of such cases employs unbounded feet, although there has never been any independent evidence for such constituents. In fact, as Walker (1996) shows, the entire typology of unbounded stress languages can easily be accounted for by using constraints that any theory of stress already needs, without making reference to foot structure.

In spite of the fact that unbounded stress systems provide notoriously poor evidence for foot structure, they display the same sorts of word-

[7] The only CV words cited by Abbott (1985) are the 1st and 2nd person pronouns, and two verbs, *di* and *twi*, but I could find no indication as to whether or not these verbs can be used in isolation.

[8] As Hayes points out, vowels in CVC syllables resist reduction, and thus it may be plausible to count such syllables as "heavy". Given the highly restricted distribution of CVC syllables in Maithili, however, the data is somewhat difficult to interpret.

minimality phenomena observed elsewhere. (Most of the following table has already appeared above in (7), but is repeated below for convenience).

(8) *The minimal word of unbounded stress languages*

Language	Type	MW
Buriat (Altaic)	lft non-final CVV, else initial	CVX
Khalkha (Altaic)	"	CVX
Huasteco (Mayan)	rightmost CVV, else initial	CVX
Aguacatec (Mayan)	rightmost CVV, else final	CVX
Murik (Lower Sepik)	leftmost CVV, else initial	CVX
Amele (Gum, Papua NG) (Roberts 1987)	leftmost CVC, else initial	CV

As far as I know, noone has systematically discussed word minima in unbounded stress languages. There are thus no predictions to (dis)confirm. Faced with the data in (8), the foot-based theorist has two options: either to take the data as evidence for minimal feet and then analyse these languages using feet; or to analyse such languages without feet, in the manner of Walker (1996), and then to say that minimality is not always dependent on foot structure.

I will pursue the second approach, since Walker's treatment of unbounded stress languages is convinving, while the first approach relies on a putative connection between minimal feet and minimal words that draws no support from the data.

Notice again that the majority of the above languages have CVX minimal words even though CVC does not count as heavy in the computation of stress.

2.5. *Syllable Trochees do not Support Foot Structural Approach*

The table below lists minimal word requirements in a typologically diverse range of syllabic trochee languages:

(9) *Minimal word restrictions in syllable trochee languages*

Language	Type	MW
Macedonian (Slavic) (Lunt 1952, Comrie 1976)	antepenultimate	CVX
Polish (Slavic) (Comrie 1976, Bulas et al 1961)	penultimate + LR trochees	CVX
Garawa (Karawic, Australia) (Hayes p. 203, Furby and Furby 1977)	initial + RL trochees	CVX
Dalabon (Guwinyguan) (Capell 1962: *ngu?* 'the inside/guts' p. 96, *bad* 'a stone' p. 100)[9]	LR trochees	CVX

[9] Hayes categorizes Dalabon as a language without a minimal word constraint (p. 199). However, my search of Capell (1962) revealed only two CV content words: *mo* 'bone' (p. 96) and *bi* '(native) man' (p. 100). Every example sentence with the latter in connected speech, however, has a long vowel: *bi: mɔndi* 'a good man' (p. 104), *bi: gɛning?* 'person-what=who?' (p. 106), *bi: baladanjburin, gɔ:g bila?jɛlɛngɔrmin* 'the men were angry, and

Pintupi (Pama-Nyungan)	LR trochees	CVX[10]
(Hansen and Hansen 1969)		
Anguthimri (Paman)	LR trochees	CVG
(Crowley 1981: *baw* 'tooth' p. 189, *tʳay* 'penis' p. 190; see also p. 154)		
Cavinena (Tacanan, Bolivia)	RL trochees	CVCV
(Key 1968)		
Chama (Tacanan, Bolivia)	RL trochees	CV
(Key 1968: *di* 'mosquito' 66, *do* 'howler monkey' p. 65)		
Warao (Paezan, Venezuela)	RL trochees	CV
(Osborn 1966)		
Nengone (Austronesian)	RL trochees	CV
(Tryon 1967a: *p'a* 'grandfather' p. 4, *ne* 'thunder' p. 8)		
Dehu (Austronesian)	LR trochees	CV
(Tryon 1967b: *p'u* 'dream', *ta* 'seat' p. 4)		
Ono (Western Huon, NG)	LR trochees	CV
(Phinnemore 1985: *ba* 'sugercane' p. 175)		

Syllabic trochee languages present a dilemna rather like that presented by unbounded stress languages. In the above cases, words that are disyllabic or longer do not provide any evidence for monosyllabic feet, so the observed word minima can in general not be predicted on the basis of foot structure.

One might expect to find evidence of monosyllabic foot formation in words of odd-length. However, I have not been able to find any. All of the above LR trochee languages main stress the initial syllable, and all of the above RL trochee languages main-stress the penultimate syllable (where a distinction between main and secondary stress is noted in the sources consulted). This means that the only monosyllabic feet that might arise in odd-length words are under secondary stress, which does not appear to be connected to minimality restrictions in any case.

Thus, syllabic trochee languages, whether for good reasons or whether simply for reasons having to do with inadequate source material, do not support a foot structural approach to word minima.

2.6. *Vowel Quality Languages still have CVX Word Minima*

Several languages assign stress on the basis of vowel quality distinctions, either the distinction between full and reduced vowels—eg Chuvash, Ossetic, Mari, Au, Javanese, Malay, Lushootseed, Aljutor—or that between non-high and high vowels—Jaz'va Komi, Mordvin, etc (see Gordon 1996, p. 9). Javanese, for example, is a language which main stresses the penult, unless it is a schwa, in which case main stress falls on the ultima. Hayes suggests a possible right-to-left iamb analysis with syllable extrametricality, where syllables with schwa are light while syllables with other vowels are heavy (p. 263).

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set fire to the hut' (p. 114). I will therefore assume that such lengthening is automatic and that it applies to *mo* 'bone' as well.

[10] As in many Australian languages, most words in Pintupi are disyllables, and there are only a handful of CVV monosyllables.

Under such an approach, it is plausible to assume that a heavy syllable, ie one with a non-schwa vowel, can constitute a foot on its own, while a syllable with schwa cannot. Similar analyses are imaginable for other languages of this class, with the result, in each case, that a heavy syllable is one which consists of a full vowel, and a light syllable, one with a reduced vowel. Similarly for the languages utilizing vowel height distinctions.

Though such analyses may be coherent on foot theoretic grounds, they make the wrong minimal word predictions, because this class of languages behaves just like the other languages we've seen so far. That is, CVX is a frequent minimal word for languages of this class, even though CV—without a coda consonant but with a full/non-high vowel—is sufficient to count as heavy. Languages of this class along with their word minima are given below:

(10) *Languages that stress on the basis of vowel quality*

Language	Type	MW
Lushootseed (Salishan)	leftmost full V, else initial schwa	CVX
(Hess and Hilbert 1974: *bad* 'father', *bəc* 'fall down' p. 154, *ʃəq* 'high' p. 167; but $k^{w}i$ 'the/a' p. 161, *qa* 'a lot, much, many'; see also Hess 1976)		
Chuvash (Turkic)	rightmost full V, else initial	CVX
(Hayes, p. 296; Krueger 1961)[11]		
Javanese (Austronesian)	penult unless schwa, else final	CVX[12]
(Hayes p. 262, via Herrfurth 1964; Clarke Horne 1974: *bol* 'a bowl-shaped container; rectum' p. 87, *met* 'soldier's cap' p. 377)		
Au (Torricelli, NG)	leftmost full V, else initial	Cf
(Scorza 1985: *wi* 'day' p. 230, *nu* 'wood' p. 240; *mɨt* 'men' p. 231, *wit* 'village' p. 230, *sak* 'pig' p. 226, *kʌn* 'he went' p. 244)		

Notice in particular two interesting cases. In Au, weak or reduced vowels include ʌ, the mid central close unrounded vowel that appears in 'he went', and ɨ, the high central close unrounded vowel that appears in 'men'. While CV words are allowed only if V is full, CVC words are allowed if V is full *or* reduced, even though a CVC syllable with a reduced vowel doesn't count as heavy in the computation of stress, as the following examples indicate: *míɨtɨk* 'man', with two light syllables, versus *kʌwât* 'he gives', with a light syllable followed by a heavy syllable.[13] This is strong evidence against an approach that attributes word minima exclusively to foot structure, for in such a theory CVC with a reduced vowel should behave identically to CV with a reduced vowel, yet the latter is prohibited.

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[11] The only CV words listed in Krueger (1961) are a handful of CV verb roots used in isolation as imperatives, which, as I noted earlier, are typically prosodically exceptional, and "a small class of nominals ending in –u" (p. 101).

[12] Most words are disyllabic, and many of the CVC words are transparent borrowings. Most CV words are grammatical words, with the exception of a set of "words" which result from a regular process of dropping final syllables of (certain) disyllabic words in informal speech, eg *ga* <=> *GAWA*, *SAGA*, *UGA* (Clarke Horne 1974, p. 180).

[13] Scorza (1985) cites very few examples of CV content words.

The second case of interest is Lushootseed, which counts syllables with schwa as light. In Lushootseed, the minimal word is CVX, but again, V can be either a full vowel (eg 'father') or schwa (eg 'fall down'), even though syllables with a reduced vowel do not count as heavy in the computation of stress.

2.7. *Conclusions*

In summary, the above survey has established that there is no direct connection between foot structure and word minima in most cases, perhaps in all cases.

In some cases—for example the disyllabic minimal word languages discussed in section 2.2—the minimal word restriction is connected to stress. To reiterate, these languages never stress final syllables in disyllabic or longer words. So it should not come as a surprise if they disallow monosyllables. If NON-FINALITY is undominated in these languages, then all words will have to be at least disyllabic. There are many other cases where the independently necessary but non-foot-theoretic constraint NON-FINALITY plays a role in minimality restrictions. I discuss them at length in section 3.

However, in the majority of cases examined above, not only is the minimal word size not connected to foot structure, but it's not connected to stress patterns either. In Cahuilla, degenerate feet are permitted in longer words, but still the minimum word is CVX (section 2.1). In many languages, heavy for the purpose of stress assignment is not the same as heavy for the purpose of word minimality: languages that count CVV as heavy often have CVX minimal words (section 2.3); and languages that stress on the basis of vowel quality distinctions, where CV(C) is heavy for some values of V and light for others, still may have CVX minimal words, regardless of the value of V (section 2.6). Finally, languages that are not traditionally used as arguments for foot structure—unbounded stress systems and lexical stress languages—still have minimal word restrictions, very often CVX.

The survey therefore should cause us to reask the question: why do languages have minimal word restrictions? And why is that minimal word so very often CVX?

Though I cannot do full justice to these questions in this paper, in section 4 I do address them, starting with the observation that CVC and CVV, although often treated differently phonologically, are equally long, phonetically speaking. I then introduce the constraint BE-LONG, which penalizes short (CV) words. This constraint is entirely independent of foot structure and stress, and I will argue that it is motivated by phonetic and processing considerations.

3. NON-FINALITY

Several authors have argued on independent grounds that NON-FINALITY, formally a constraint against final stress (first proposed by Prince and Smolensky 1993), is an important and necessary constraint. It is supported by the numbers in Hyman's (1977) stress typology: the strongest stress in many languages is on the penultimate syllable, despite the final syllable's demarcative advantage. Further work by Hung (1994) showed that final stress avoidance is widespread in both trochaic and iambic languages, and work by Walker (1996) added NON-FINALITY to the list of constraints determining the typology of unbounded stress languages.

In this section I show that the independently motivated constraint NON-FINALITY can account for the minimal word constraints of many languages. At variance with previous authors, however, I will (a) only be interested in the NON-FINALITY constraint which governs *main* stress, as the distribution of secondary stresses does not appear to be connected to word-minimality; and (b) subdivide NON-FINALITY into a hierarchy of universally ranked constraints, which expresses a gradient interpretation of the constraint: the closer the stress to the right edge of the word, the worse the violation of NON-FINALITY:

(11) NF(CV) >> NF(CVX) >> NF(CVXX)
A word final CV(X(X)) syllable may not bear *main* stress.

That is, it is worse to main stress a final CV syllable than it is to main stress a final CVX (ie CVV or CVC) syllable, and so on. For the purposes of evaluating (3), I will assume that stress is normally realized on the first mora of a heavy syllable, eg C'VV and C'VC (see Kager 1993).

The logic of this section is simple: if NF(CV) is undominated in a given language, then that language will have no CV words. If NV(CVX) is also undominated, then it won't have CVX words either. And so on.

I first examine right-to-left languages (section 3.1), then languages that never stress final syllables (section 3.2), and finally languages that assign exceptional final stress (section 3.3).

3.1. *Right-to-Left Languages*

The class of languages that main stress word-final syllables if they are CVX, but not if they are CV, tend to have a minimal word of CVX. This follows straightforwardly from the following ranking, where EDGE-LEFT/RIGHT is defined in (13), FILL in (14):

(12) NF(CV) >> FILL >> EDGE-RIGHT >> NF(CVX)

(13) EDGE-LEFT/RIGHT: Main stress must be assigned as far to the left/right edge of the word as possible (assessed gradiently).

(14) FILL: Do not lengthen a segment present in the input (cf Prince and Smolensky 1993).

Justification for the above ranking comes from Fijian. (I take the following Fijian data from Hayes 1995: 142-49, via Schütz 1985 and Dixon 1988.) NF(CV) >> EDGE-RIGHT >> NF(CVX) because final CVX is stressed (16), while final CV is not (15). NF(CV) >> FILL because underlying CV is lengthened (17). (17c) suggests that FILL >> NF(CVX): it's better to fill in just a mora and stress a final CVV syllable than it is to fill in an entire syllable and not stress a final syllable. Finally, assuming that EDGE-RIGHT is violated equally by C'VV and C'VCV—in other words, that it is evaluated in terms of the "moraic" distance of a stress from the right word edge—as I will, there is no evidence for a particular ranking between FILL and EDGE-RIGHT.

(15) *láko* 'go' (Hayes p. 142)

/lako/	NF(CV)	FILL	EDGE-RIGHT	NF(CVX)
√ a. láko			*	
b. lakó	*!			
c. lakó:		*!	*	*

(16) *kilá:* 'know' (Hayes p. 142)

/kila:/	NF(CV)	FILL	EDGE-RIGHT	NF(CVX)
a. kíla:			**!	
√ b. kilá:			*	*

(17) *-i* (ablative marker)[14]

/i/	NF(CV)	FILL	EDGE-RIGHT	NF(CVX)
a. î	*!			
√ b. î:		*	*	*
c. îta		**!	*	

Thus, that the minimal word in Fijian is CVX is easily accounted for without feet, solely by reference to NON-FINALITY and related constraints. (I say the minimal word in Fijian is CVX: there are no CVC words in Fijian because there are no CVC syllables.)

[14] Bound monomorphemic forms are lengthened when pronounced as citation forms. For example, the ablative marker in (17) is lengthened in the context "Did you say ___?" (Hayes p. 144).

Other languages identified by Hayes (1995, p. 181) as "languages with Fijian-like stress" also have CVX minimal words. In Digueño, the final syllable is stressed only if it's CVX, and the minimal word is CVX. In Kawaiisu, the final is stressed if it's CVV, and the minimal word is CVV (no word final consonants occur). Tongan is just like Fijian, in lacking CVC syllables, stressing final CVV, and having a minimal word of CVV. Hawaiian is a similar case. Finally, Tol stresses final syllables if they're CVC, but has a CV minimal word, probably due to its patterns of exceptional stress (see section 3.3).

Restating the key point, NON-FINALITY is the crucial ingredient for determining the minimal word in Fijian-type languages. Disyllabic and longer words show that main stress on final CV syllables is avoided. Final CVX, on the other hand, may be stressed with impunity. Since this much needs to be said already for longer words, there is no reason why it shouldn't apply to monosyllabic words as well—and once so applied, the minimality facts are directly predicted.

3.2. *Languages that never Stress Final Syllables*

In section 2.2 I listed several languages whose minimal word is disyllabic, plausibly because main stress on word-final syllables is disallowed. I assume these are languages with the following crucial ranking:

(18) NF(CV) >> NF(CVX) >> FILL

In other words, violations of FILL are incurred in order to satisfy the NON-FINALITY constraints. The idea is that subminimal input will not surface as such, but will instead be augmented, thus creating a minimal word that is disyllabic.

A language that differs from the above pattern but fits into the general class of languages that have disyllabic word minima and never stress word-final syllables is Hixkaryana, analysed by Hayes (pp. 205-7) as a left-to-right iambic language that iambicly lengthens stressed CV syllables. I assume that this lengthening is induced by the following constraint:

(19) *C'V: Don't stress a CV syllable.

Furthermore, I capture the alternating iambic pattern with UPBEAT, defined below:

(20) UPBEAT: A stressed syllable must be preceded by an unstressed syllable.

(20) helps produce the result in (21):

(21) *ówtohò:na* 'to the village' (Hayes p. 206)

/owtohona/	*C'V	NF(CV)	FILL	UPBEAT
a. ówtohóna	*!			*
√ b. ówtohó:na			*	*
a. ówtóhona	*!			**
a. ówtó:hona			*	**!

I have abstracted away from the initial stress on *ow*: this is irrelevant to the present point, since all (C)VC syllables are stressed.

Underlying long vowels do not exist in Hixkaryana, nor do word-final consonants occur. Furthermore, word-final lengthening is prohibited. Thus, since syllables cannot be stressed unless they are CVX, the minimal word in Hixkaryana is CVXCV. Underlying CVCV => CVVCV. I will assume that UPBEAT dominates NF(CVX), but that an undominated constraint against final heavy syllables blocks final lengthening:

(22) *CVX#: Word-final syllables may not be heavy.

More precisely, (22) should be broken down into two constraints, one against word-final long vowels, and one against word-final consonants, since many languages allow one but not the other (see, for example, Dixon's (1980) discussion of word-final possibilities in the aboriginal languages of Australia). However, I will simplify.

(23) *tu:na* 'water' (Hayes 1995, p. 208,
via Derbyshire 1985, p. 177)

/tuna/	*CVX#	*C'V	NF(CV)	FILL	UPBEAT	NF(CVX)
a. túna		*!			*	
√ b. tú:na				*	*	
c. tuná		*!	*			
d. tuná:	*!			*		*

Thus, the minimal word in Hixkaryana follows from the constraints introduced here. Though I am aware of no evidence on the matter, my analysis predicts that underlying monosyllables will be augmented by a syllable. Whether this is true or not remains an open question.

It is interesting to compare Hixkaryana to Macushi, one of its closely related neighbors. In Macushi, the otherwise regular iambic pattern is not compromised in disyllabic words. As in Hixkaryana, stress on word-final CV is disallowed. However, since final CVX *is* allowed, disyllabic forms lengthen their underlying final light syllables. Thus, */tuna/* 'water' has a different surface form:

(24) *tuná:* 'water' (Abbott 1991, p. 149)

/tuna/	*C'V	NF(CV)	FILL	UPBEAT	NF(CVX)	*CVX#
a. túna	*!			*		
b. tú:na			*	*!		
c. tuná	*!	*				
√ d. tuná:			*		*	*

Interestingly, Macushi is different from Hixkaryana in another way: its minimal word is CVX, not CVXCV (Abbott 1991: *bei* 'sun' p. 143, *moh* 'worm' p. 140, *pâŋ* 'salt' p. 144). Thus, underlying CVX is allowed to surface as such:

(25) *moh* 'worm'

/moh/	*C'V	NF(CV)	FILL	UPBEAT	NF(CVX)	*CVX#
√ a. móh				*	*	*
b. móha	*!		*	*		
c. móhta			*!*	*		
d. mó:ha			*!*	*		

Again, as in Hixkaryana, I have found no evidence for the existence of subminimal input. If it does exist, however, the prediction is that underlying CV => CVX, presumably CVV:[15]

(26) hypothetical underlying CV

/CV/	*C'V	NF(CV)	FILL	UPBEAT	NF(CVX)	*CVX#
a. C'V	*!	*		*		
b. C'VVCV			**!*	*		
√ c. C'VV			*	*	*	*
d. CVC'VV			**!*		*	*
e. CVC'V	*!	*	**			
f. C'VCV	*!		**	*		

To summarize, we see that the observed minimality difference between Hixkaryana and Macushi follows from different properties of word-final syllables in the two languages. I have assumed that both languages are like Fijian in having the following mini-hierarchy of constraints: NF(CV) >> FILL >> NF(CVX), a hierarchy which helps to produce languages with CVX word minima. In Hixkaryana, however, an extra property of word final syllables, namely that they cannot be CVX, creates a disyllabic minimum word.

[15] Abbott (1991) gives only one potential example of subminmal input: *we* 'feces'. However, judging from morphological alternations, it appears that *we* is underlyingly *awe*--it is not clear why the initial vowel may delete in its citation form: *iratai* 'its side' => *irataika* 'to divide it' or 'take out', *we* 'feces' => *aweka* 'to defecate' (p. 126).

3.3. *Languages with Exceptional Final Stress*

There is also a less obvious way in which NON-FINALITY is relevant to minimality. Several languages which normally don't stress final syllables exhibit lexically exceptional final stress for some words. Hayes (1995) suggests that trochaic languages exhibiting such exceptionality form final, lexically listed degenerate feet. In Warao, for example, main stress is normally penultimate. Frequently, however, Spanish loans, especially personal names, retain final stress. Thus, *hesú*, in Warao, is exceptionally footed as *he(sú)* (Osborn 1966, p. 111). Thus, in the derivational non-OT approach pursued by Hayes (1995), it is not surprising that Warao permits degenerate CV words, given that it allows degenerate CV feet in some lexical items. Languages with exceptional final stress are listed below:

(27) *Languages with exceptional final stress*

Language	Type	MW
Warao (Venezuela)	penultimate	CV
Sentani (Sentani, New Guinea) (Hayes pp. 330-3, Cowan 1965)	penultimate	CV
Tol (Hokan, Honduras) (Fleming and Dennis 1977)	final if CVC, else penultimate	CV
Chama (Tacanan, Bolivia) (Key 1968)	penultimate	CV
Macedonian (Slavic) (Comrie 1976)	antepenultimate	CVX
Polish (Slavic; Comrie 1976)	penultimate	CVX

Each of the above languages is analysed by Hayes as trochaic. It should be pointed out, however, that this does not mean that their word minima are connected to foot structure. Take an example: in Tol, "in a majority of cases, stress occurs on the final syllable of consonant-final words [*phesmás* 'skunk'] and the penultimate syllable of vowel-final words [*phésme* 'skunk'] ... However, stress may also occur on the final syllable of vowel final words [*ʔisí* 'water', *chiyó* 'dog'] and, less frequently, on the penultimate syllable of consonant-final words" (Fleming and Dennis 1977, p. 127). Long vowels do not occur, but CV monosyllables are allowed: *tɪ* 'heavy' p. 121, *pi* 'buttocks', *pe* 'rock' p. 122.

The irrelevance of foot structure to the minimum word in Tol can be seen from the following two tableau. Both take underlying /CVCV/ input: the former tableau shows the ranking necessary to establish the regular stress pattern, penultimate stress, while the latter illustrates the ranking that must hold for forms with exceptional final stress. I will assume that exceptionally stressed words already have stress in their input form; this stress is preserved by the following constraint:

(28) IDENT(STRESS): Output syllables corresponding to underlying stressed syllables must be identical in all respects to their underlying form. (Violated once for each way in which the output syllable is different from the underlying syllable.)

(29) *ʔáwʌ* 'fire' (Fleming and Dennis 1977, p. 127)

/ʔawa/	IDENT	NF(CV)	EDGE-R	NF(CVX)	UPBEAT
√a. ʔáwʌ			*		*
b. ʔʌwá		*!			

(30) *ʔʌmáˑ* 'dirt' (Fleming and Dennis 1977, p. 127)

/ʔamá/	IDENT	NF(CV)	EDGE-R	NF(CVX)	UPBEAT
a. ʔámʌ	*!		*		*
√b. ʔʌmá		*			
c. ʔʌmá:	*!		*	*	

The regular stress pattern for disyllables is exemplified in (29), the crucial point being that NF(CV) >> EDGE-RIGHT. In (30), the first candidate, *ʔámʌ* (a), loses because the underlying (exceptional) final stress is not present in the output. Candidate (c), *ʔʌmáː*, also loses because it violates IDENT: the underlying stressed syllable is CV, not CVV. Thus the optimal candidate is *ʔʌmáˑ*, even though it violates NF(CV).

Stressed CV monosyllables like *pí* 'buttocks', of course, violate both NF(CV) and UPBEAT. This possibility, however, should not come as a surprise, since exceptional forms like (30) show that NF(CV) is not undominated, and regular forms like (29) show that violations of UPBEAT are tolerated. I will assume, then, that CV monosyllables are allowed because FILL >> NF(CV). (I do not assume that they are underlyingly marked with stress.)

(31) *pĭˑ* 'buttocks'

/pi/	IDENT	FILL	NF(CV)	EDGE-R	NF(CVX)	UPBEAT
a. tapí		*!*	*			
b. píta		*!*		*		*
√c. pí			*			*
d. pí:		*!		*	*	*
e. pít		*!		*	*	*

Turning to Polish, main stress is normally penultimate, eg *pròtestówal* 'protest' (Kenstowicz 1994, p. 36), though in some exceptional forms it is final: *rezím* 'regime', *akurát* 'precisely' (Comrie 1976, p. 239, citing Topolinska 1961, p. 80). Such exceptions seem to only involve final CVC syllables; interestingly, the minimal word in Polish is CVX. That is, final stress in *rezím* and similar forms does not provide a precedent for final C'V, only for final C'VC. To put it

another way, longer words provide evidence that NF(CVX) is violable, while there is no evidence that NF(CV) is violable. The fact that CVC content words are widespread, eg *bil* 'lard' p. 28, *cel* 'target' p. 46, *cug* 'set of coach horses' p. 62, while CV content words appear to be nonexistent (Bulas et al 1961), is not at all suprising. All that is required is to rank NF(CV) >> FILL >> NF(CVX).

The situation in Macedonian is quite similar: main stress is normally antepenultimate, but certain words with two or more syllables have final stress: *autobús* 'bus', *citát* 'quotation' (Comrie 1976, p. 234). Again, the exceptions involve final CVC syllables, and the minimal word in Macedonian is CVX.[16]

An illustration of the relevance of exceptional final stress on word-minimality comes from a pair of closely related languages, Cavineña and Chama (Tacanan, Bolivia). The basic stress pattern of both languages is to (main-)stress the penultimate syllable, with secondary stresses on alternating preceding syllables. While the minimal word in Cavineña is disyllabic, Chama allows CV words. Interestingly, in Chama "a limited number of nouns have final stress", eg *esá* 'bone', *esó* 'seed' (Key 1968, p. 33). Monosyllabic words in Chama (CH) correspond to disyllabic forms in Cavineña (C): C *do?o*, CH *do* 'macaw' p. 65; C *di?i*, CH *di* 'mosquito' p. 66; and C *kara*, CH *xa* 'macaw' p. 65.

To summarize, in this subsection I have not made any downright predictions, eg I have not said that all languages that have lexically exceptional final stress have smaller minimal words than you might otherwise expect. Rather, I have framed the analysis as follows: these languages provide evidence from longer words that NF(CV)—or in the case of Polish and Macedonian, NF(CVX)—can be violated. Therefore, we should not be surprised to find that other constraints, such as FILL, are also ranked higher than the relevant NF constraint.

Why, then, are the above languages all trochaic? Well, I suggest that this follows from the free violability of UPBEAT in most trochaic languages. Iambic languages that stress final CV in lexically exceptional cases should be less likely to have CV minimum words because UPBEAT penalizes initial stress in iambic languages. And UPBEAT, like NF(CV), can force words to be larger than just CV.

In fact, in iambic languages we find the reverse phenomenon: languages that exceptionally stress initial CV may have CV mimimal

[16] I am not suggesting that the existence of exceptional words with final C'VC is *the reason for* the existence of monosyllabic CVC words in Polish and Macedonian, but rather that the two facts are consistent and require no special treatment. In fact, in both languages, it is more likely that the reverse is true: since the words with final stress are loan words while the monosyllabic words are native, it seems more likely that the existence of monosyllabic CVC words provided the precedent for words with final stress on CVC to flourish.

words. For example, in Dakota, disyllabic words are typically parsed with final stress. However, certain exceptional disyllables have *initial* stress; a nice minimal pair is *ũkcé* 'to fart', which follows the regular pattern, and *ǔkce* 'shit', which is exceptional (Chambers 1978, p. 4). The latter form is identified by Chambers as one of "only a handful of such exceptions". However, due to a stress system which interacts with the morphology in rather complex ways, there are actually a great many surface disyllables with initial stress: for example, *sápa* 'to be black' p. 13, and *púza* 'to be dry' p. 14. In these cases, there are strong morphological arguments to show that the final *a* is not part of the root, but rather epenthetic (Chambers 1978, Shaw 1978). Thus, initial stress in such cases is plausibly the result of a desire to stress the base rather than the epenthetic vowel.

Whatever the analysis of the various exceptional stress patterns, within the framework here, it is clear that both ...C'V# and #C'V... have precedents. That is, longer words provide evidence for the violability of both UPBEAT and NF(CV). Thus, the same arguments given above for trochaic languages with exceptional final stress applies to naturally accomodate the fact that the minimal word in Dakota is CV (Chambers 1978: *t'a* 'die', *xna* 'rattle' p. 16; Shaw 1978: *pte* 'buffalo' p. 232):

(32) *pte* 'buffalo'

/pte/	FILL	UPBEAT	NF(CV)
√ a. pté		*	*
b. ptetá	*!*		*
c. pté:	*!	*	

Araucanian may well be a similar case. Though most words in Echeverria and Contreras (1965) are disyllabic, there are some monosyllabic words: *zhu* 'nose', and *ko* 'water'. Perhaps this is linked to the fact that "two-syllable words ending in a vowel may be stressed on either syllable" (p. 135). As in Dakota, the competing stress patterns CVC'V and C'VCV show that the language tolerates violations of both NF(CV) and UPBEAT; thus, CV monosyllables are not totally unexpected.

In the next section I will show that while NF(CV) is relevant to word minima in some cases, eg those just discussed, in many other cases it plays no role: many languages regularly stress final CV syllables and yet don't have CV word minima.

4. A CONSTRAINT AGAINST SHORT WORDS

So far my theory of minimality has relied exclusively on the interaction of two edge-based constraints with FILL. On the right side of the word, the NF family of constraints penalizes final stress, and thus also monosyllables. On the left side of the word, UPBEAT penalizes initial

stress, and thus also monosyllables. If one of these constraints is ranked higher than FILL, then subminimal words are augmented so as not to violate the constraint. On the other hand, when these constraints are less highly ranked, we often find short words, eg CV, implying that FILL outranks these constraints.

But this is only part of the story. In many languages as we've seen, there is no obvious connection between stress and minimality. The most glaring examples of this are languages like Lushootseed and Chuvash, which do not have CV content words even though they stress on the basis of the full vs reduced vowel opposition, and not on the basis of CVX vs CV (see section 2.6 above).

In some trochaic languages also there is no obvious connection between stress and minimality. In Dalabon, for example, main stress in disyllabic and longer words always falls on the initial syllable, whether it is CV or CVC. Thus, UPBEAT is regularly violated. Furthermore, since main stress is initial, disyllabic or longer words provide no evidence to suggest that NF, either, has anything to do with the minimal word requirement, which is CVX. Of course, one *could* say that the minimal word in Dalabon is a consequence of NF, but one could just as easily say something else.

Thirdly, there are unbounded stress systems, most of which have CVX minimal words (see section 2.4 above). In general, longer words may tell us about whether or not NF(CV) is important in a given language, or whether UPBEAT is important, but often they don't tell us enough to make insightful predictions about minimal word sizes. In fact, in many languages, there is evidence that NF(CV) is totally irrelevant, and no evidence that UPBEAT plays a role, and yet the minimal word is still bigger than CV:

(33) *Languages that regularly (often) stress word-final CV*

Language	Type	MW
Uzbek (Eastern Turkic) (Walker 1996, Khakimov 1994)	final stress	CVX
Uyghur (Eastern Turkic) (Hahn 1991)	penultimate CVX, else final	CVX
Javanese (Austronesian) (Hayes p. 262)	penult unless schwa, else final	CVX
Aguacatec (Mayan)	rightmost CV:, else final	CVX

Of course the minimal word in such languages could come from other constraints: the point is just that there is no particularly good evidence that anything related to stress is responsible for the minimal word in these languages.

Finally, let's take a global look at the languages discussed in section 2—those which count CVV as heavy and CVC as light (section 2.3); unbounded stress systems (section 2.4); certain syllable trochee systems (section 2.5); and languages that stress on the basis of vowel quality

distinctions (section 2.6). Not only do most of these languages fail to support a foot structural approach to minimality, but very few of them support the view that minimality is caused by NF and/or UPBEAT, the right and left edge stress constraints.

Of the 34 languages discussed in sections 2.3-2.6, 18 have CVX word minima—that is, they allow both CVC and CVV words, but nothing shorter—8 have CVV or CVG word minima, 6 have CV word minima, 1 CVVC and 1 CVCV. What's striking in these numbers is that CVX is more common than CVV, in spite of the fact that the majority of these languages either (a) count CVV and not CVC as heavy, or (b) define heavy as even smaller than CVX. That is, these languages either give us reason to think that (a) the minimal word should be CVV, not CVX; or (b) the minimal word could be either CVX or CVV—but the weight criterion in the language doesn't allow us to distinguish between these possibilities.

Now, if it is a true generalization that CVX (including both CVC and CVV) is a more common minimum word than CVV (to the exclusion of CVC)—as my data suggests—, then this is a significant fact. As Gordon (1996; and references cited therein) reports, CVC and CVV are equally long. Therefore, if the most common minimal word is CVX—and not CVV to the exclusion of CVC, or CVC to the exclusion of CVV—then it seems likely that minimality phenomena are related to word-length, and not necessarily to metrical structure or stress.

To capture the cases where neither NF(CV) nor UPBEAT appears relevant to minimality, and those cases where CVX seems to be chosen almost as a default minimal word size, I introduce the constraint BE-LONG, which penalizes short words. As with NON-FINALITY, BE-LONG is a universally ranked family of constraints:

(34) BE(CV)LONG >> BE(CVX)LONG >> BE(CVCV)LONG

The first constraint, BE(CV)LONG, is violated by words that aren't as long as CV. BE(CVX)LONG, similarly, is violated by any word that is not at least CVX. And so on. Since BE-LONG is based on length, and CVV is not any longer than CVC, there is no BE(CVV)LONG constraint.

Suppose that I am correct, and the BE-LONG constraint family exists. Then: why should it be so? Why should words be pressured to be long? And if they are supposed to be long, then why don't we all speak Turkish, restricting our utterances to things like *avrupa-li-laš-tir-ama-dik-lar-imiz-dor-mi-siniz* 'Are you among those that we were not able to Europeanize?'

The BE-LONG constraints may find motivation from phonetic and perceptual factors. On the phonetic side, it turns out that the length of each syllable in a word is more or less inversely proportional to the number of syllables in the word. As Lehiste (1970, p. 40) puts it,

> It appears that in some languages the word as a whole has a certain duration that tends to remain relatively constant, and if the word contains a greater number of segmental sounds, the duration of the segmental sounds decreases as their number in the word increases.

Lindblom et al (1981, p. 21) conclude from a review of the literature that "a word length dependence may be present in Swedish, German, Lappish, British English, Hungarian, Dutch, French, American English, Finnish, Estonian, and Spanish."

My own investigation into has yielded similar results. Although the minimal word in Warao is CV, "vowels in monosyllables tend to be longer" (Osborn 1966, p. 111). And in Selepet, "the syllables of polysyllabic words are shorter than identically composed syllables in mono- or disyllabic words" (McElhanon 1970, p. 16). In Kawaiisu, monosyllabic CVC words can optionally be realized as CV_1CV_2, where V_2 is a "raised vowel ... which represent non-syllabic vowel phonemes ... in utterance medial environments, these vowels are lost altogether ... non-syllabic vowels are more likely to be realized in monosyllabic forms than in disyllabic forms[, although] there is considerable individual variation [on whether or not these vowels are pronounced]" (Zigmond et al 1990: pp. 13, 19; eg *wɛnᵉ* 'its handle' p. 17). Finally, in Cahuilla, "a salient phonetic feature ... is voiceless echo vowels. They constitute phonetic material to be assigned phonemically to the glottal stop /?/ or to a word-final stop. They echo a vowel in the immediate neighborhood of the stop ... The perceptibility varies; it is greater in monosyllables than in polysyllabic words [eg */net/* => *[nétɛh]*] ... voiceless vowels do not count as morae at the end of [the] word" (Seiler 1977, pp. 32-3).

All of these observations support the contention that monosyllables are longer than polysyllables, perhaps for exactly the reason that Lehiste cited: so that they may be as long as other words. In the cases above, the facts seem to be the consequence of phonetic rather than phonological factors. I suggest that phonological word minima are often imposed on a language for exactly the same reason. The idea is simple: suppose a language has many disyllabic words, which are of length X. Suppose also that monosyllables strive to be X long. Naturally, then, the longer the monosyllable is, the less it needs to phonetically lengthen to attain length X. The segments in a CVC or CVV monosyllable can be slightly longer than usual, and in this way they easily attain the length of, say, CVCV. CV monosyllables, on the other hand, are problematic in two respects: first, CV must lengthen more (than CVC or CVV) to attain length X. And second, if CV lengthens to the same length as CVV, then there will be no contrast between the two syllable types in monosyllabic words.

Thus, if a word is phonologically too short, it either has to phonetically lengthen perhaps more than is possible, or it will simply

fail to lengthen, thereby failing to achieve its objective of attaining the length of other words in the language.

The phonetic facts support the BE-LONG constraints, also explaining why we don't all speak Turkish. The point is not that words should be long, but that they shouldn't be too short, or more accurately, that they should all be the same length. Of course, the longer words could be longer, but then the shorter words would have to be even longer to catch up with them.[17]

The following subsections analyse particular languages for which BE-LONG can be argued to play a role:

4.1. *Dalabon*

BE(CVX)LONG may well play a role in Dalabon. Disyllables are parsed with initial main stress, like all words:

(35) júlɨ 'earth, ground'

/julɨ/	EDGE-LEFT	BE(CVX)LONG	FILL
√ a. júlɨ			
b. jul'ɨ	*!		
c. júllɨ			*!

CVC monosyllables are allowed, by the same ranking, since CVC satisfies BE(CVX)LONG:

(36) *bád* 'stone'

/bad/	EDGE-LEFT	BE(CVX)LONG	FILL
√ a. bád			
b. báda			* !

CV monosyllables, on the other hand, must augment, since CV does not satisfy BE(CVX)LONG:

(37) *bǐ:* 'man'

/bi/	EDGE-LEFT	BE(CVX)LONG	FILL
a. bí		*!	
√ b. bí:			*
c. bíta			**!

[17] On the perceptual side, general principles of lexical access might support the BE-LONG constraints. Cutler (1989) has shown that the difficult task of segmenting speech into perceptible units benefits from knowledge of where words begin and end. Since a fixed word length would allow speakers to know in advance roughly when words begin and end, it might also assist in segmentation, in which case Lehiste's phonetic observation could have a perceptual root.

Since CVV satifies BE(CVX)LONG, no more than one FILL violation is required, and so the second candidate beats the third.

4.2. *Cahuilla*

Cahuilla is analysed by Hayes (1995) as a left-to-right moraic trochee language. Main stress is normally assigned to the word-initial syllable. As already mentioned above, when the second syllable of the word is heavy (CV? or CVV), it may receive secondary stress, thus clashing with the initial main-stressed syllable.

Given that main stress is initial, it is not possible to show, on the basis of disyllabic or longer words, that NON-FINALITY, as defined above, plays any role at all. Thus, I will instead assume that the Cahuilla minimal word is the result of BE(CVX)LONG.

The following analysis utilizes the constraints EDGE-LEFT and BE(CVX)LONG, as defined above, and CLASH and STRESS CVV/?, defined below:

(38) CLASH: Adjacent syllables may not be stressed.
(39) STRESS CVV/?: CVV and CV? syllables must be stressed.[18]

The first tableau below shows what happens to a trisyllabic word followed beginning with a light syllable followed by a heavy syllable, while the second tableau shows what happens to a monosyllabic CVC input:

(40) *súkà?ti* 'the deer (objective case)'

/suka?ti/	BE(CVX)LONG	EDGE-L	FILL	CVV/?	CLASH
a. súka?ti				*!	
√ b. súkà?ti					*
c. suká?ti		*!			

(41) *nét* 'ceremonial chief'

/net/	BE(CVX)LONG	EDGE-L	FILL	CVV/?	CLASH
√ a. nét					
b. néta			*!		
c. né:t			*!		

The second two candidates in (41) violate FILL unnecessarily, since the first candidate, being CVC, already satisifies BE(CVX)LONG. Again, though I have been unable to locate any cases of the augmentation of underlying CV, such augmentation is predicted by the above analysis, since BE(CVX)LONG >> FILL.

[18] To simplify I conflate what should be two separate constraints.

4.3. *Summary*

I've included explicit analyses of only two languages in this section because that's enough to illustrate the effect of BE-LONG. I believe that BE-LONG is relevant to the constraint hierarchies of at least those languages in which there is some mismatch between heavy for the purpose of stress and long for the purpose of minimality; and those languages for which NF and UPBEAT appear to play no major role. Additional analyses are unnecessary, since the constraint interaction is very simple. For example, whether or not a language allows CV words may boil down to whether or not FILL >> BE(CVX)LONG. Furthermore, this constraint interaction is only relevant for monosyllables. There can be no evidence in principle for the ranking of BE(CVX)LONG from disyllabic or longer words, since all disyllabic or longer words, regardless of their parsing or metrical constituency, satisfy BE(CVX)LONG.

5. CONCLUDING REMARKS

The typology of section 2 established that there is no robust connection between foot structure and minimal word size. The metrical phonologist could back off and settle for the claim that foot structure is relevant in *some* cases. However, I showed that the minimal word restriction of many languages could be accounted for with the already necessary constraint NON-FINALITY, and a new constraint with left-edge effects, UPBEAT. The interaction of these two constraints with FILL, a constraint against adding structure to an underlying input form, determined the minimum word of a substantial number of languages.

At the same time, however, CVX emerged as a default minimal word length. When so many stress systems distinguish between CVV and CVC, it would be peculiar to find CVX as a default minimal word if the minimum word syndrome was related to stress or metrical structure. This led to the hypothesis that words should be long, which found form in the BE-LONG constraints. So, for the second set of languages discussed, the minimal word arose from the interaction between BE-LONG and FILL.

My treatment has largely avoided making distinctions between CVV and CVC. I phrased both NF and BE-LONG in such a way that the two syllable types would be treated the same. For BE-LONG this expressed the contention that the minimum word syndrome is directly related to word length.

In spite of what I've said, there *are* languages with CVV but not CVC words, or with CVVC but not CVCC words. In 5.1 I speculate on how to deal with these languages in my system.

Finally, in section 5.2 I briefly acknowledge the existence of minimal root constraints. Since words, not roots, get pronounced, minimal root

constraints don't obviously follow from considerations of word length. I suggest a possible way around the conclusion that such languages show that the present approach is wrong.

5.1. *Distinctions between Vowel and Consonant Codas*

There are a small number of languages that impose CVV(C) minimality requirements. I list some of these below:

(42) *Languages with CVV(C) word minima*

Language	Type	MW
Maithili (Indo-European)	RL moraic trochee	CVV
Kawaiisu (Aztec-Tanoan)	final CVV, else penultimate	CVV
Wargamay (Pama-Nyungan)	stress on initial or second, not final	CVV
Winnebago (Siouan)	ternary iambic	CVV
Menomini (Algonquian)	LR iambic	CVVC
Malayalam (Dravidian)	initial, unless second is CVV(C)	CVV
Lardil (Pama-Nyungan)	initial	CVVC
Cebuano	RL iambic	CVV[19]
(Bunye & Yap 1971, Shyrock 1993: *húuk* 'hook', *tíip* 'tip' p. 140, *háas* 'snake' p. 124)		
Ancient Greek	final if CVX, else penultimate	CVV
(Hayes p. 181, Steriade 1988, Golston 1991)		

So, two questions arise. First, in the present framework, how can such languages be accounted for? And second, why are there so few?

Some of the minimal word restrictions have a trivial explanation: the relevant languages don't allow word-final consonants. For example, in Kawaiisu CVV words exist, though most words are at least disyllabic; furthermore, "the only known word in the language that appears to be underlyingly consonant-final is the archaic *potok* 'water-bird'" (Zigmond et al 1990, p. 6), a fact which presumably also explains why there are no CVC words. In Maithili, too, final CVC is prohibited (Hayes p. 156). Finally, Pintupi (Pama-Nyungan, Australia) sets MW=CVV (*tja:* 'mouth' p. 162)—though most words are disyllabic—, but this is because CVC syllables do not occur in word-final position (Hansen and Hansen 1969, p. 160).

Other languages with CVV minimal word requirements do not succumb to the same easy explanation. I suggest that such cases be treated under the theory of extrametricality (see Hayes 1979 and others since). As many linguists have observed, word-final consonants often behave strangely, opaque to certain phonological processes. They often retain onset properties rather than coda properties, reflecting their likely origin as onsets of syllables whose vowels have subsequently been lost. I believe that whatever explains the peculiar properties of final consonants in Cebuano (Shyrock 1993), Ancient Greek (Steriade

[19] Shyrock (1993) points out that the minimal word in Cebuano is CVV(C)--although most words are disyllabic--and that all such forms are either loanwords or synchronically derived from CV*l*V(C) by *l*-deletion (p. 126).

1988), and the other languages, should also be used to account for the minimal word restrictions of these languages. In saying this, I don't mean to endorse a particular theory of extrametricality, or to rule out a radically different approach to the same facts. Rather, I mean to suggest that these languages properly fall outside the theory of minimality as I've outlined it in this paper.

5.2. *Minimal Root Constraints*

At least a few languages, such as Ancient Greek and Russian, have minimal root constraints that differ from their minimal word constraints. For example, in Ancient Greek there is no nominal root shorter than CVC, eg *pod-* 'foot'. Nevertheless, *pod-* cannot surface as such; instead it undergoes the following changes, ending up with a long vowel, which allows it to satisfy the minimal word requirement of Ancient Greek:

(43) *pod-* 'foot': nominative singular derivation (Golston 1991)
underlying form: *pod-s*
T/D deletion: *po-s*
lengthening: *poo-s*
O-raising: *pou-s*
(compare with: */pod-si/* 'foot (dative pl)' => *posi*)

The only constraints I've used in my theory of minimality are NF, UPBEAT and BE-LONG. None of these constraints are designed to impose limits on underlying forms (that is, roots). NF and UPBEAT are reserved for surface forms because in the present theory, stress is viewed as a property of pronounced words, something that is only specified underlyingly if exceptional. BE-LONG is even more fundamentally restricted to surface forms: the arguments for BE-LONG were based on audible word-length—it stands to reason that underlying forms don't have length in the same sense.

I could just create versions of NF, UPBEAT and BE-LONG to apply to underlying forms rather than surface forms. But given the natural association between these constraints and surface forms, an alternative approach is to be preferred. At this point, I can't present a full theory of minimal root constraints. However, I will offer up the idea that such constraints could be made to follow from a general desire not to let the phonology do too much work. That is, if it is desirable for surface forms to resemble underlying forms, not only because surface forms should preserve the details of their underlying form, but also because the phonology should be saved the trouble of doing so much tampering with the underlying form, then it is natural that word roots should be about as long as minimal words, for otherwise a great deal of lengthening of subminimal inputs would need to occur. That is, if lengthening is bad, then the less of it the better. If analysed this way, constraints on roots also fall outside the theory outlined in this paper.

REFERENCES

ABBOTT, STAN. 1985. A tentative multilevel multiunit phonological analysis of the Murik language. *Papers in New Guinea Linguistics* 22, 339-73. Canberra: Australian National University.

ABBOTT, MIRIAM. 1991. Macushi. In Desmond C. Derbyshire and Geoffrey K. Pullum (eds.). *Handbook of Amazonian Languages, Volume 3*, pp. 23-160. Berlin: Mouton de Gruyter.

AUSTIN, PETER. 1981. *A grammar of Diyari, South Australia.* New York: Cambridge University Press.

BLOOMFIELD, LEONARD. 1962. *The Menomini Language*. New Haven: Yale University Press.

BLOOMFIELD, LEONARD. 1975. *Menomini Lexicon.* Milwaukee Public Museum Publications in Anthropology and History 3. Milwaukee: Milwaukee Public Museum.

BREEN, JOHN GAVIN. 1973. *Bidyara and Gungabula: Grammar and Vocabulary*. Melbourne: Monash University.

BULAS, KAZIMIERZ, LAWRENCE L. THOMAS and FRANCIS J. WHITFIELD. 1961. *The Kosciuszko Foundation Dictionary, Volume II, Polish-English*. The Hague: Mouton and Co.

CAPELL, ARTHUR. 1962. *Some Linguistic Types in Australia.* Oceanic Linguistic Monographs, Number 7. Sydney: University of Sydney.

CHAMBERS, J. K. 1978. Dakota accent. In Eung-Do Cook and Jonathan Kaye (eds.). *Linguistic Studies of Native Canada*, pp. 3-18. Vancouver: University of British Columbia Press.

CLARK HORNE, ELINOR. 1974. *Javanese-English Dictionary*. New Haven: Yale University Press.

COMRIE, BERNARD. 1976. Irregular stress in Polish and Macedonian. *International Review of Slavic Linguistics* 1, 227-40.

COWAN, HENDRIK KAREL JAN. 1965. *Grammar of the Sentani Language.* 's-Gravenhage: Martinus Nijhoff.

CROWLEY, TERRY. 1981. The Mpakwithi dialect of Anguthimri. In Robert M. W. Dixon and Barry J. Blake (eds.). *Handbook of Australian Languages, Volume 2*, pp. 146-94. Amsterdam: John Benjamins.

CROWLEY, TERRY. 1982. *The Paamese Language of Vanuatu.* Pacific Linguistics B87. Canberra: Australian National University.

CUTLER, ANNE. 1989. Auditory lexical access: where do we start? In William Marslen-Wilson (ed.). *Lexical Representation and Process*, pp. 342-56. Cambridge: MIT Press.

DERBYSHIRE, DESMOND C. 1985. *Hixkaryana and Linguistic Typology*. Arlington: Summer Institute of Linguistics.

DIXON, ROBERT M. W. 1981. Wargamay. In Robert M. W. Dixon and Barry J. Blake (eds.). *Handbook of Australian Languages, Volume 2*, pp. 1-144. Amsterdam: John Benjamins.

DIXON, ROBERT M. W. 1983. Dyirbal. In Robert M. W. Dixon and Barry J. Blake (eds.). *Handbook of Australian Languages, Volume 3.* Amsterdam: John Benjamins.

DIXON, ROBERT M. W. 1983. Nyawaygi. In Robert M. W. Dixon and Barry J. Blake (eds.). *Handbook of Australian Languages, Volume* 3. Amsterdam: John Benjamins.

DIXON, ROBERT M. W. 1988. *A grammar of Boumaa Fijian*. Chicago: University of Chicago Press.
ECHEVERRÍA, MAX S. and HELEN CONTRERAS. 1965. Araucanian phonemics. *International Journal of American Linguistics* 31, 132-35.
FLEMING, ILAH and RONALD K DENNIS. 1977. Tol (Jicaque) phonology. *International Journal of American Linguistics* 43, 121-7.
FURBY, E. S. and C. E. FURBY. 1977. *A Preliminary Analysis of Garawa Phrases and Clauses*. Pacific Linguistics, Series B. Canberra: Australian National University.
GOLSTON, CHRIS. 1991. *Both Lexicons*. PhD thesis, Los Angeles: UCLA.
GORDON, MATTHEW. 1996. A phonetically driven account of syllable weight. ms. Los Angeles: UCLA.
HAHN, REINHARD F. 1991. *Spoken Uyghur*. Seattle: University of Washington Press.
HALE, KENNETH. 1973. Deep-surface canonical disparities in relation to analysis and change: an Australian example. *Current Trends in Linguistics* 11, 401-58.
HANSEN, KENNETH C. and L. E. HANSEN. 1969. Pintupi phonology. *Oceanic Linguistics* 8, 153-70.
HAYES, BRUCE. 1979. Extrametricality. *MIT Working Papers in Linguistics* 1, 77-86.
HAYES, BRUCE. 1995. *Metrical Stress Theory: Principles and Case Studies*. Chicago: University of Chicago Press.
HERRFURTH, HANS. 1964. *Lehrbuch des Modernen Djawanisch*. Leipzig: Veb Verkig Enzyklopädie.
HESS, THOMAS. 1976. *Dictionary of Puget Salish*. Seattle: University of Washington Press.
HESS, THOMAS and VI HILBERT. 1974. *Lushootseed I*. Seattle: Daybreak Star Press.
HOFF, BEREND. 1968. *The Carib Language*. Verhandelingen van het Koninklijk Instituut voor Taal-, Land-, en Volkenkunde 55. The Hague: Martinus Nijhoff.
HUNG, HENRIETTA. 1994. *The Rhythmic and Prosodic Organization of Edge Constituents*. PhD thesis, Waltham, MA: Brandeis University.
HYMAN, LARRY. 1977. On the nature of linguistic stress. In Larry Hyman (ed.). *Studies in Stress and Accent*, pp. 37-82. Southern California Occasional Papers in Linguistics 4. Los Angeles: USC.
JEANNE, LAVERNE MASAVESYA. 1982. Some phonological rules of Hopi. *International Journal of American Linguistics* 48, 245-70.
KAGER, RENÉ. 1993. Alternatives to the iambic-trochaic law. *Natural Language and Linguistic Theory* 11, 381-432.
KEEN, SANDRA. 1983. Yukulta. In Robert M. W. Dixon and Barry J. Blake (eds.). *Handbook of Australian Languages, Volume 3*, pp. 190-304. Amsterdam: John Benjamins.
KEY, HAROLD H. 1961. Phonotactics of Cayuvava. *International Journal of American Linguistics* 27, 143-50.
KEY, MARY RITCHIE. 1968. *Comparative Tacanan Phonology*. Janua Linguarum, Series Practica 50. The Hague: Mouton.
KHAKIMOV, KAMRAM M. 1994. *Uzbek-English, English-Uzbek Dictionary*. New York: Hippocrene Books.

KLOKEID, TERRY. 1974. *Topics in Lardil Grammar*. PhD thesis, Cambridge: MIT.
KRUEGER, JOHN R. 1961. *Chuvash Manual*. Uralic and Altaic Series 7. Bloomington: Indiana University.
LARSEN, RAYMOND S. and EUNICE V. PIKE. 1949. Huasteco intonations and phonemics. *Language* 25, 268-77.
LEVINSOHN, STEPHEN H. 1976. *The Inga Language*. Janua Linguarum, Series Practica 188. The Hague: Mouton.
LICHTENBERK, FRANTISEK. 1983. *A Grammar of Manam*. Oceanic Linguistics Special Publication Number 18. Honolulu: University of Hawaii Press.
LINDBLOM, BJORN, BERTIL LYBERG and KARIN HOLMGREN. 1981. *Durational Patterns of Swedish Phonology: do they Reflect Short-Term Motor Memory Processes?* Bloomington: Indiana University Linguistics Club.
LUNT, HORACE. 1952. *A Grammar of the Macedonian Literary Language*. Skopje.
MCARTHUR, HARRY and LUCILLE MCCARTHUR. 1956. Aguacatec phonemes in the stress group. *International Journal of American Linguistics* 22, 72-6.
MCCARTHY, JOHN and ALAN PRINCE. 1986. Prosodic morphology. ms. Amherst: University of Massachussetts.
MCDONALD, M. and S. A. WURM. 1979. *Basic Materials in Wangkumara (Galali): Grammar, Sentences, and Vocabulary*. Pacific Linguistics, Series B. Canberra: Australian National University.
MCELHANON, K. A. 1970. *Selepet Phonology*. Pacific Linguistics B14. Canberra: Australian National University.
MEERENDONK, M. 1949. *Basic Gurkhali Grammar (4th Edition)*. Singapore: Sen Wah Press and Co.
MESTER, ARMIN. 1994. The quantitative trochee in Latin. *Natural Language and Linguistic Theory* 12, 1-61.
MINER, KENNETH L. 1979. Dorsey's law in Winnebago-Chiwere and Winnebago accent. *International Journal of American Linguistics* 47, 340-42.
MOHANAN, TARA. 1989. Syllable structure in Malayalam. *Linguistic Inquiry* 20, 589-625.
MORRISON, HEATHER MICHÈLE. 1994. *Morphological Influences on Winnebago Accent*. MA thesis, Los Angeles: UCLA.
OSBORN, HENRY. 1966. Warao I: phonology and morphophonemics. *International Journal of American Linguistics* 32, 108-23.
PHINNEMORE, THOMAS R. 1985. Ono phonology and morphophonemics. *Papers in New Guinea Linguistics* 22, 173-214. Canberra: Australian National University.
PITKIN, HARVEY. 1984. *Wintu Grammar*. University of California Publications in Linguistics 94. Berkeley: University of California Press.
POPPE, NICHOLAS N. 1960. *Buriat Grammar*. Uralic and Altaic Series, Volume 2. Bloomington: Indiana University.
PRINCE, ALAN. 1985. Improving tree theory. *Berkeley Linguistics Society* 11, 471-90.

PRINCE, ALAN and PAUL SMOLENSKY. 1993. Optimality theory: constraint interaction in generative grammar. ms. New Bruswick, NJ: Rutgers University.
REED, IRENE, OSAHITO MIYAOKA, STEVEN JACOBSON, PASCHAL AFCAN and MICHAEL KRAUSS. 1977. *Yup'ik Eskimo Grammar*. Alaska Native Language Center, University of Alaska.
ROBERTS, JOHN R. 1987. *Amele*. Guildford: Biddles.
SCHÜTZ, ALBERT J. 1985. *The Fijian Language*. Honolulu: The University of Hawaii Press.
SCORZA, DAVID. 1985. A sketch of Au morphology and syntax. *Papers in New Guinea Linguistics* 22, 215-73. Canberra: Australian National University.
SEAMAN, DAVID P. 1985. *Hopi Dictionary*. Flagstaff: Department of anthropology, Northern Arizona University.
SEILER, HANSJAKOB. 1977. *Cahuilla Grammar*. Banning: Malki Museum Press.
SEILER, HANSJAKOB and KOJIRO HIOKI. 1979. *Cahuilla Dictionary*. Banning: Malki Museum Press.
SHYROCK, AARON. 1993. A metrical analysis of stress in Cebuano. *Lingua* 91, 103-48.
STREET, JOHN C. 1963. *Khalkha Structure*. Uralic and Altaic Series 24. Bloomington: Indiana University.
THOMPSON, DAVID A. 1976. A phonology of Kuuku-Ya?u. In Peter Sutton (ed.). *Languages of Cape York*, pp. 213-35. Canberra: Australian Institute of Aboriginal Studies.
TRYON, DARRELL T. 1967a. *Nengone Grammar*. Pacific Linguistics B6. Canberra: Australian National University.
TRYON, DARRELL T. 1967b. *Dehu Grammar*. Pacific Linguistics B7. Canberra: Australian National University.
WALKER, RACHEL. 1996. Prominence-driven stress. ms. Santa Cruz: UCSC.
YADAV, RAMAWATAR. 1984. *Maithili Phonetics and Phonology*. Mainz: Selden and Tamm.
YADAV, RAMAWATAR. 1996. *A Reference Grammar of Maithili*. New York: Mouton de Gruyter.
ZIGMOND, MAURICE L., CURTIS G. BOOTH AND PAMELA MUNRO. 1990. *Kawaiisu: a Grammar and Dictionary*. University of California Publications in Linguistics 119. Berkeley: University of California Press.