Chapter 9 | Michael Kenstowicz

Quality-Sensitive Stress

Editor's Note

In the early development of metrical theory, it was thought that the effect of segmental or syllabic structure on stress could be reduced to a binary (or perhaps ternary) distinction of syllable weight (e.g., Hayes 1980; McCarthy 1979). This chapter addresses languages where traditional notions of syllable weight are not helpful because the locus of stress is affected by vowel quality.

Prince and Smolensky's analysis of Berber in section 2 of chapter 1 shows how a linguistic hierarchy like sonority can join with some position, such as the syllable nucleus, to form markedness constraints expressing the most and least harmonic fillers for that position. In this chapter, the same basic idea is at work in accounting for the attraction of stress to lower and/or more peripheral vowels. Some familiarity with the basic Ft/PrWd alignment constraints of chapter 7 is assumed.

1 Introduction

Our primary goal in this paper is to document cases in which vowel quality plays a role in determining the location of stress. Specifically, we show that in several diverse languages stress seeks out the most optimal vowel as determined by the hierarchies in (2).

(2) a. a, ã > e, o > i, u
b. a, ã, e, o, i, u > ū

That is, lower vowels are more optimal stress-bearing units than higher vowels (2a) and peripheral vowels are more optimal than central vowels (2b). Secondly, we argue that with its key idea of ranked and violable constraints, Optimality Theory

Study and Research Questions

1 In Cayuvava, All-Ft-R is ranked below its "opposite" All-Ft-L, yet All-Ft-R is sometimes decisive. How is that possible? (More ambitious question: Give a general characterization of the conditions under which the lower-ranking of All-Ft-L and All-Ft-R is decisive.)

2 Construct a factorial typology of the constraints in (25). Show how the different rankings dispose of the words in (8).

3 In the original article, Elenbaas and Kager discuss and reject an alternative analysis based on the idea that there is a constraint Parse-2 defined as follows: "Of every two stress units one must be parsed into a foot" (Ishii 1996; Kager 1994). Apply this proposal to Cayuvava and note any problems that arise.

4 Kager has gone on to extend the *LAPS approach from ternary to binary alternations like those discussed in chapter 7. Work through Kager (2001) (it is a handout) and discuss its implications for alignment theory.
Prince & Smolensky (1993) provides a particularly perspicuous way to express this preference hierarchy.

In order to extend the OT model to the systems we consider here, several proposals are made. First, the Peak-Prominence constraint Prince & Smolensky (1993) develops for quantitative distinctions in Hindi stress is extended to the vocalic distinctions in (2). Second, comparable to the Prince & Smolensky (1993) analysis of Berber syllabification, the Peak-Prominence constraint is broken down into a set of micro constraints for each level in the hierarchy. It is demonstrated how these constraints can be interleaved with constraints that orient prominence with respect to the edges of the word. We also show that evaluation in terms of the prominence hierarchy must proceed in a "worst-to-best" fashion rather than "best-to-worst". Finally, in order to express the two opposing edge orientations in languages such as Mari (Cheremis), it is suggested that the scale in (2b) also optimizes the trough (nonpeak) portions of metrical constituents [omitted here — Ed.]. This parallels the margin constraints in the Prince & Smolensky (1993) analysis of Berber syllabification.

2 Preliminaries

[...]

In the more familiar languages studied in the metrical literature, the head of the metrical constituent is consistently found at its left or right edge in virtue of the constraints in (7).

(7) Head-Right: Align (Fr,R,R,R): The right edge of the foot coincides with a stressed syllable

Head-Left: Align (Fr,L,R,L): The left edge of the foot coincides with a stressed syllable.

In the languages we study here, stress seeks out the most prominent vowel in terms of the prominence hierarchies lower > higher and peripheral > central. Consequently, a constraint orienting stress in terms of this hierarchy (dubbed Peak-Prominence after Prince & Smolensky 1993) must dominate Head-R/L. We claim that the prominence hierarchy formally parallels the more familiar sonority hierarchy in syllabification. Just as more sonorous phonemes make better syllable peaks (nuclei) and less sonorous phonemes make better syllable margins (i.e., onsets and codas) so lower/peripheral vowels make better peaks in the stress wave while higher/centralized vowels make better troughs. Prince & Smolensky (1993: 127–67) formalize this phenomenon as the "alignment" of two separate prominence scales in Universal Grammar (UG): in the case of syllables, the Sonority Scale for phonemes a > e, o > i, u > a > ... > p, t, k and the Peak > Margin (a.k.a. Nucleus > Onset, Coda) for syllables. A one-to-one alignment of the two scales generates the harmonic relations of (8) that grade phonemes for their suitability as syllable peaks and margins.

(8) Peak syll. a > e, o > i, u > ..., > p, t, k

Margin syll. p, k > ..., > i, u > e, o > a

Prince & Smolensky derive the scales in (8) by deploying the alignment as the series of micro constraints in (9) that evaluate candidate syllable peaks and margins from "worst to best". Under worst-to-best evaluation, candidates that are least optimal are eliminated before more optimal ones are assessed.

(9) Peak Prominence

*P/p, t, k > ... > *P/i, u > *P/e, o > *P/a

Margin Prominence

*M/a > *M/e, o > *M/i, u > ... > *M/p, t, k

Casting the role of sonority in this way has two effects: first, each step in the scale is a separate constraint that can be evaluated in a binary yes/no fashion. More importantly, other constraints can be interleaved inside the sonority hierarchy.

In this paper, we demonstrate the existence of languages whose metrical stress is defined through the alignment of the prominence scales lower > higher and peripheral > central (of (2)) with the Peak > Trough scale for metrical feet. The result is the grading of vocalic nuclei as optimal peaks and troughs of the stress "wave" (10a). These hierarchies are derived from the constraint rankings in (10b) whose order is fixed by UG and cannot be reversed by individual grammars.

(10) a. Peak foot

a, å > e, o > i, u

Trough foot

i, u > e, o > a, å

b. *P/i, u > *P/e, o > *P/a, å

*P/o > *P/i, u, e, o, å

*P/a > *P/o, u, e, o, å

*T/a, å > *T/e, o > *T/i, u

*P/a > *T/a, o, å, u > *T/a

3 Bounded Quality-Sensitive Systems

In this section, we examine languages in which the word stress is located on the most prominent vowel in a disyllabic window at the right or the left edge of the prosodic word. These systems thus have a Fr-Bin > Align-Fr-L/R > Parse-σ[syllable] ranking schema that confines the peak of the prosodic word to this narrow window. The Peak-Prominence hierarchy rises above Head-R/L in the constraint hierarchy to situate the stress over the most prominent vowel inside the window. In the case of syllables with equivalent prominence, lower-ranked Head-R or Head-L then resolves the ties.

3.1 Kobon

The Kobon language of Papua New Guinea (Davies 1981) discriminates among its vowels in a particularly granulated way for purposes of stress placement. The
phonemic inventory of Kobon is composed of the familiar vowel triangle distinguishing low, mid, and high vowels supplemented with a pair of unrounded central vowels. Also, the low vowel [a] combines with a following high vowel [i] or [u] to form diphthongs.

(11) i i u e a o

Unaffixed word's stress is restricted to one of the final two syllables, seeking out the most prominent nucleus in this disyllabic window. The data in (12) illustrate this point. We depart from Davies' transcriptions by utilizing schwa for the mid central unrounded vowel.

(12) a > e hagape 'blood' [226]     
gate'gate 'to cry, of pig' [225]  
a > o alago 'snake species' [226]  
kidolmaN 'arrow type' [226]  
a > i ki.i 'tree species' [220]  
a > i háu.i 'vine species' [221]  
a > u ái.ud 'story' [221]  
a > i ánim,áim 'to lighten' [225]  
a > o wáin 'cassowary' [221]  
áian 'witch' [221]  
o > u mó.u 'thus' [220]  
o > i si.óq 'bird species' [221]  
o > i gíro'gíro 'to "talk" – of mother pig to piglet' [225]  
i > a gáin 'bird species' [226]  
wi.ar 'mango tree' [221]  
u > o hú,ól 'horizontal house timbers' [221]  
u > i mú.is 'edible fungus species' [221]  
ə > i gíís,gíís 'to tap' [225]  

When both vowels in the foot have equivalent prominence (13), stress lands on the penult, suggesting that HEAD-LEFT dominates HEAD-RIGHT.

(13) u = u dúbu,dúbu 'to make noise by footsteps' [225]  
i = u jinup,jinup 'to make squeaking noise, bird, rat' [225]  
i = i kijigil 'tattoo' [226]  

While Davies' statement of the stress generalizations is tentative, it seems clear that for the data we do have, the postulated prominence hierarchy in (14a) is playing a decisive role. This suggests that the Kobon vowel system is first sorted in terms of peripheral vs. central (14b) and then in terms of height (14c). We consider a vowel "central" if it is bounded on either side of the vowel triangle by another vowel: thus, schwa is bounded by [e] and [o], and [i] is bounded by [i] and [u].

(14) a. *P/i > *P/a > *P/i, u > *P/e, o > *P/a > HEAD-L > HEAD-R  
b. a, e, o, i, u > a, i  
c. a > e, o > i, u > a, i

In Kobon, the entire PEAK-PROMINENCE constraint rises above the constraint that orients stress laterally in the foot as a left-headed trochee. Let us examine a few tableaux to show how the analysis works. A form such as gáimaN shows that the search for a more prominent vowel is confined to a disyllabic window at the right edge of the word. This follows if FT-BIN and ALIGN-FT-RIGHT dominate the PEAK-PROMINENCE package of constraints.

(15) /gáimaN/     Ft-Bin     Al-Ft     *P/i     *P/a     *P/i, u     *P/e, o     *P/a     HEAD-L  
a. (e) *!  
b. (e) *  
c. (e) *  
d. (e) *!

In (16), the first two cases show where PEAK-PROMINENCE seeks out the most prominent vowel before HEAD-L gets a chance to stress the penult. Thus in si.óg the *P/i, u constraint eliminates the (e) candidate before *P/e, o assesses its violation against (e). The latter is the only candidate left and so is declared the output even though it violates the lower-ranking HEAD-LEFT constraint. The latter comes into play when the various PEAK-PROMINENCE constraints fail to make a decision, as in such forms as jinup where the vowels have equivalent inherent prominence. Here each candidate is assessed a violation by *P/i, u and so the decision is passed on to HEAD-LEFT which resolves the tie in favor of penultimate stress.

(16) /mó/u/     *P/i     *P/a     *P/i, u     *P/e, o     *P/a     HEAD-L  
a. (e) *!  
b. (e) *  

/si.óg/     *P/i     *P/a     *P/i, u     *P/e, o     *P/a     HEAD-L  
a. (e) *!  
b. (e) *  

/jinup/     *P/i     *P/a     *P/i, u     *P/e, o     *P/a     HEAD-L  
a. (e) *  
b. (e) *!
3.2 Chukchee

Like Kobon, the Paleo-Siberian language Chukchee exhibits a quality-based gradation among its vowels in their willingness to bear stress. The Chukchee hierarchy distinguishes nonhigh vowels from high vowels and schwa from the rest and thus discriminates its vowels in terms of both peripheralty and height. Our data come from the chapter on stress in Skorik's grammar (1961: 67–71) and from Krase (1979).

We first survey the generalizations governing stress as set out by Skorik, putting schwa to the side. A basic limitation is that stress is bound to the base – it never appears on an inflectional suffix (17).

(17) a. pøj-g-a 'spear' erg. [67], wakwa 'stone' erg. [67], i'w-ak 'to say' [68], winišt-at 'help' Infinit, winišt-atk 'to defend' [68], riqok-a 'sand' [68], micqišt-at 'to work' [68]

b. jará-Na 'house' [68], welō-lgan 'ear' [68], ekwišt-at 'to send' [68], winišt-atk 'to defend' [68], winišt-at 'to work' [68]

The location of stress within the base is governed by the following factors. When the final syllable of the base is not the final syllable of the word (i.e. when one or more syllabic suffixes follow), then stress is located on the final syllable of the base. However, when there is no suffix (e.g., one of the allomorphs of the absolutive sg.) or the suffix lacks a vowel, then stress is retracted from the final syllable of the base (18).

(18) abs.sg.

| titít-Na  | 'needle' | titít-[t] [69] |
| qorá-Na  | 'reindeer' | qorá-t |
| melotá-lgan | 'rabbit' | mulet-[t] |
| ricit  | 'belt' | ricit-ti |
| wárat   | 'people' | wárat-te |
| játjol  | 'fox' | játjol-te |
| jëjwel  | 'orphan' | jëjwel-ti |

The plural suffix /-ti/ apocopates its vowel unless the base ends in a coronal to produce an apparent shift of stress from left to right (e.g., riqit, riqit-ai) or from right to left (e.g. qorá-Na, qorá-t) in singular–plural pairs.

The data introduced so far indicate that certain constraints are active in Chukchee. First, there is an undominated alignment constraint optimizing candidates in which the right edge of the base coincides with the right edge of a binary foot: ALIGN-BASE-R, FT-BIN ⇒ PARSE-$. This constituent is right-headed (iambic) but an over-riding constraint of NONFINALITY (Hung 1994) blocks candidates with stress on the word-final syllable to choose outputs with a retracted (trochaic) stress: NONFINALITY ⇒ HEAD-R.

Evidence for a prominence distinction among the vowels comes from cases (20a) in which the stress unexpectedly retracts from the final syllable of the base. They contrast with the examples in (20b) and indicate that stress will seek out a more prominent nonhigh vowel in the penultimate syllable of the base. In the nouns of (20), the absolutive sg. is marked by a reduplicative suffix that many disyllabic CVCV nouns take to protect themselves from apocope (Krase 1979).

(20) a. wëni-wen 'bell' [68]
   céri-cer 'dirt'
   kéli-kel 'paper'
   b. nuté-nut 'land'
   piñé-pín 'snowfall'
   jiljé-jil 'squirrel'

These data indicate that the *Pf, u portion of the PEAK-PROMINENCE constraint dominates HEAD-R. Due to the regular rule of vowel harmony whereby [i] and [u] become [e] and [o] in words with [o] and [a] (Kenstowicz 1979), the stress prominence of the nonhigh vowels [o] and [a] with respect to the high vowels [i] and [u] unfortunately cannot be assessed. The tableaux in (21) show the role of PEAK PROMINENCE in forcing violations of HEAD-RIGHT.

(21) /keli+kél/ *Pf, u HEAD-R

| a.  | $\varepsilon$ (o$\sigma$)$\sigma$ | $\checkmark$ |
| b.  | (o$\sigma$)$\sigma$ | $\checkmark$ |

/nute+nut/ *Pf, u HEAD-R

| a.  | (o$\sigma$)$\sigma$ | $\checkmark$ |
| b.  | $\varepsilon$ (o$\sigma$)$\sigma$ | $\checkmark$ |
However, attraction of stress to the more prominent mid vowel is always over-ridden by NONFINALITY, as seen in the plurals nüte-t and püte-t (Krause 1979: 122). These forms indicate that NONFINALITY dominates *P/ï, u.

(22)

<table>
<thead>
<tr>
<th>/nute-t/</th>
<th>NONFINALITY</th>
<th>*P/ï, u</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. əŋ (ðσ)</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. (σó)</td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

In (23), we summarize the constraint rankings of interest that have been introduced so far.

(23) NONFINALITY ≫ *P/ï, u ≫ HEAD-R ≫ HEAD-L.

Let us now turn to the behavior of schwa. According to Skorik (1961: 70), if the final syllable of the base has a schwa nucleus then stress is retracted to the preceding vowel (24a) unless the preceding vowel is also schwa, in which case stress remains on the final syllable of the base (24b).

(24) a. påitgæþ-an 'hole' [70]
    pipiqalq-an 'mouse'
    tālaN-ak 'to answer'
    röçgan-ak 'to enervate'
    b. mæcåkw-an 'shirt'
    taulwág-an 'fire site'
    rakগāt-ak 'to get stuck'
    rømåt-ak 'to wash up'

This behavior follows if the peripheral > central wing of the PEAK-PROMINENCE constraint (2b) splits off the schwa from the remaining vowels to make it the weakest in the hierarchy: *P/α ≫ *P/ï, u, e, o, a. Stress will retract from the final syllable of the base to a preceding stronger vowel (25a); but when the preceding syllable is also schwa (25b), then the two candidates tie on PEAK-PROMINENCE and the lower-ranked HEAD-R constraint decides in favor of stress on the final syllable of the base.

(25) a. /pipiqalq-an/  *P/α  *P/ï, u  HEAD-R

| əŋ(ðσ)σ | * | * |
| σ(σó)σ | *! | |

b. /ramät+ak/  *P/α  *P/ï, u  HEAD-R

| (ðσ)σ | * | * |
| əŋ(σó)σ | *! | |

There is, however, one respect in which the Chukchee schwa behaves differently from the other vowels in the prominence hierarchy. As shown by the forms in (26), when the penult is a schwa, the final syllable is stressed provided it is a stronger vowel. But when both the final and the penult are schwa, then the stress lands on the penult - as predicted by NONFINALITY ≫ HEAD-R.

(26) a. ayá 'mother' [K. 123]
    lâlē-t 'eyes'
    ?øø 'day'
    ârté 'a little, somewhat'
    Pənín 'your' [D. 43]
    Pənûn 'middle'

b. âltaq 'tundra' [K. 124]
    kâtpø 'sable'
    âttam 'bone'
    cûmø 'old bull'

Thus, in a form such as lâlē-t 'eyes' PEAK-PROMINENCE wins out over NONFINALITY while in nüte-t 'land pl.' NONFINALITY wins out over PEAK-PROMINENCE. This contrast motivates breaking the PEAK-PROMINENCE constraint into the subhierarchies of (2a) and (2b). NONFINALITY splits the hierarchy between *P/α and *P/ï, u.

(27) *P/α ≫ NONFINALITY ≫ *P/ï, u

The tableaux in (28) show the effect of ranking NONFINALITY below *P/α. In ayá (28a), *P/α rejects the candidate with stress on the schwa, allowing the one with final stress to win. In âltaq (28b) the initially and finally stressed candidates tie at *P/α, allowing the lower ranked NONFINALITY to decide in favor of retracted stress. Finally, in nüte-t (28c) both candidates tie on *P/α, in virtue of lacking a schwa. Once again, lower ranked NONFINALITY eliminates final stress in favor of retracted stress.

(28) a. /âltaq/  *P/α  NONFIN

| əŋ(σó)σ | * | |
| (ðσ)σ | ! | |

b. /âltaq/  *P/α  NONFIN

| əŋ(σó)σ | * | |
| (σó)σ | ! | |

c. /nute+t/  *P/α  NONFIN

| əŋ(σó)σ | * | |
| σóσ | ! | |
The diagram in (34) reviews the crucial rankings in our analysis; Head-Right $\gg$ *P/e, o is motivated by jatjöl-te (18).

(34) P/In Bin Align-Ft-R *P/a
Nonfinality

*P/i, u

Head-R

Parse-∅ Align-Ft-L Head-L *P/e, o

*P/a

Let us summarize the crucial points of the discussion. First, Chukchee stress draws a three-way distinction in prominence among its vowels in their capacity to bear stress. This is captured by ranking the *P/i, u and *P/a links of the Peak-Prominence constraint above Head-R. Second, the schwa behaves differently from the other vowels with respect to Nonfinality. This is explained by ranking *P/a above Nonfinality. Thus, both the vowel height (2a) and the peripheral $\gg$ central (2b) wings of the Peak-Prominence constraint are active in Chukchee.

Notes

[...]

2 Thanks to Stuart Davis for bringing these data to our attention.

3 We have found two exceptions in the cited data: *ri, a ‘day after tomorrow’ [221] has stress on a weaker centralized vowel instead of the peripheral [a] while kau.‘ai ‘tree species’ [221] has final stress instead of the expected penultimate stress.

4 Davies (1981: 226) remarks ‘the rules for positioning stress in two syllable words have yet to be determined. Relative vowel strength is almost certainly a conditioning factor since stress is almost always placed on the syllable which is strongest according to the following hierarchy: a/au/ai > o/e/ei/öö’.

5 This form is stressed as miltu-ti; we assume this is a printing error since it occurs in the list of examples Skorik uses to illustrate the generalization that when the suffix lacks a vowel, then stress appears on the penult instead of the final syllable of the base.

References


