Title
Towards a Uniform Account of Prominence-Sensitive Stress

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1. Introduction

Although various phenomena are often included under the general heading of prominence-sensitive stress, weight sensitivity and sonority sensitivity are the canonical examples. In weight-sensitive systems, stress is attracted to syllables with a greater number of moras at the expense of syllables with a lesser number. In sonority-sensitive systems, stress is attracted to syllables containing vowels of greater sonority at the expense of syllables containing vowels of lesser sonority. In this article, I will first develop an analysis of weight sensitivity, and then I will extend the analysis to sonority sensitivity. The aim is to provide a general and uniform account of both phenomena.

Such an account, however, must meet certain requirements. First, the account should have a single mechanism, or a few closely related mechanisms, that make stress sensitive to prominence. For example, if the various cases of weight sensitivity are truly the same phenomenon, we would expect a single constraint or constraint family to produce them. Similarly, if weight sensitivity and sonority sensitivity are the same phenomenon, we would expect the same constraints to be involved. Ideally, the constraints adopted should be independently motivated by additional phenomena unrelated to prominence sensitivity.

The second requirement is related to the first. The account should provide a single representation, or a few very similar representations, for the types of prominence to which stress can be sensitive. This would seem to be a prerequisite to accounting for the different types with a uniform mechanism. Ideally, the adopted representations should be formulated in terms of structures that the theory requires independently, such as the prosodic hierarchy and the metrical grid.

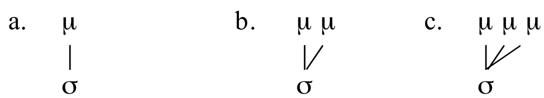
Finally, the mechanisms employed should be appropriately limited in power, in that they should not be able to recognize distinctions in prominence that are not actually required. For example, the account should not endow the grammar with a significant ability to count moras. In the vast majority of weight-sensitive systems, the grammar need only distinguish multimoraic syllables from monomoraic syllables – hence, McCarthy and Prince's (1986) maxim that 'light syllables contain one mora, heavy syllables two.' There are no cases where the grammar needs to distinguish between three moras and four or between four moras and five, and there are just a few cases where it seems desirable to distinguish between two moras and three.

To give an initial picture of how the proposed account will meet these requirements, I will outline its key components before proceeding to the more detailed presentation. Section 1.1 presents the notions of syllable weight employed in the proposed account, Section 1.2 introduces the mechanisms utilized to detect syllable weight, and Section 1.3 addresses the representation of prominence.

1.1 Syllable Weight

The proposal makes three central claims. The first is that there are two types of syllable weight, one based on prosodic structure and one based on metrical structure. The two are distinct, but they are closely related and similarly measured. The first type, *prosodic weight*, or *p-weight*, is the traditional type of syllable weight expressed in terms of moras. *Prosodically light*, or *p-light*, syllables contain a single mora, as in (1a).

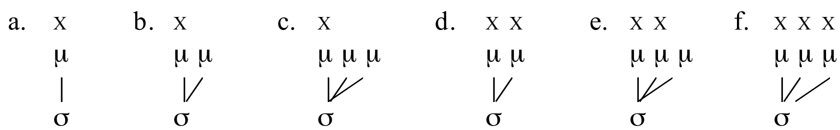
(1) P-light syllable P-heavy syllables



Prosodically heavy, or *p-heavy*, syllables contain more than a single mora, as in (1b, c).

The second type, *metrical weight*, or *m-weight*, is expressed in terms of mora-level gridmarks.[1] *Metrically light*, or *m-light*, syllables map to the metrical grid with only a single mora-level gridmark, as in (2a-c).

(2) M-light syllables M-heavy syllables



Metrically heavy, or *m-heavy*, syllables map to the grid with more than a single mora-level gridmark, as in (2d-f).[2]

The notion of m-weight is based on Prince's (1983) distinction between monopositional and bipositional mapping of heavy syllables to the metrical grid. Prince uses the distinction to account for the varying behavior of heavy syllables with respect to clash.[3] When a language maps its stressed heavy syllables bipositionally, as in (3a), they can immediately precede another stressed syllable without producing clash.

(3) a. No clash b. Clash

When a language maps its stressed heavy syllables monopositionally, as in (3b), they cannot immediately precede another stressed syllable without producing clash.

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[1] Following Kager (1993, 1995), I assume that entries on the grid's base level correspond to moras rather than syllables.

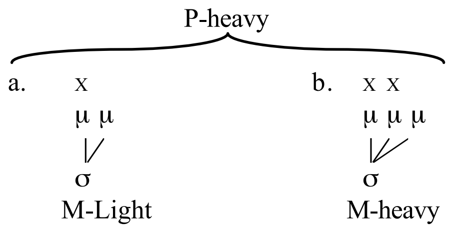
[2] Prosodic weight, metrical weight, and associated terms are merely descriptive and not intended to add anything to the theoretical machinery. They are not, for example, theoretical primitives that constraints might refer to. In fact, even the distinction between light and heavy, typically treated as a theoretical primitive, is merely descriptive under the proposed account. None of the constraints presented below refer to objects such as 'light syllable' or 'heavy syllable'.

[3] The following definition of clash is adapted from Prince 1983:

(i) Clash
When any two entries on level n + 1 of the grid do not have an intervening entry on level n, they are in clash.

The proposed account puts Prince's distinction to an additional use: accounting for prominence contrasts between different types of p-heavy syllables within the same language. Classical Arabic (Abul-Fadl 1961, Wright 1971, McCarthy 1979) and Kelkar's Hindi (Kelkar 1968, Hayes 1995), for example, both distinguish heavy bimoraic syllables from 'superheavy' trimoraic syllables:

(4)



As indicated in (4), bimoraic syllables and trimoraic syllables are both p-heavy in the proposed account. By leaving their final moras unmapped, however, the proposal can use m-weight to make the necessary distinction. Bimoraic syllables will be less prominent because they are m-light. Trimoraic syllables will be more prominent because they are m-heavy.[4]

1.2 A Uniform Mechanism

The proposal's second claim is that weight sensitivity is due to a single family of constraints: the NonFinality constraints. As recently argued in Hyde 2002, 2003, NonFinality's influence on stress and related phenomena is much more pervasive than previously thought. It operates at multiple prosodic levels and helps to produce phenomena as diverse as iambic-trochaic asymmetries, minimal words, extrametricality effects, and rhythmic lengthening. Using NonFinality constraints to make stress sensitive to syllable weight will not only provide a uniform mechanism to make stress sensitive to prominence (for reasons outlined in Section 1.3), but it will also fit prominence sensitivity into a much larger pattern of NonFinality phenomena.

The general formulation adopted here differs somewhat from Prince and Smolensky's (1993) original formulation. Rather than preventing prosodic heads from occurring in final position in the prosodic word, the adopted formulation prevents grid entries from occurring over specific final elements in specific domains.

(5) NFin(GCat, ECat, DCat)
No GCat occurs over the final ECat of a DCat (where GCat is an entry on a particular level of the metrical grid, ECat is a prosodic category or a grid entry, and DCat is a prosodic category or a segment).

As indicated in (5), the final element can be a prosodic category or another grid entry, and the domain can be a prosodic category or a segment.

Under a NonFinality approach, the *one*/*more-than-one* distinction upon which syllable weight is based becomes a *final*/*nonfinal* distinction. Heavy syllables allow

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[4] Although he was primarily concerned with the clash properties of different types of heavy syllables and not their relative prominence, it is interesting to note that the mapping contrast between superheavy and heavy syllables in (4) is the same contrast that Prince proposed for distinguishing between superheavy and heavy syllables in Estonian (Hint 1973, Prince 1980).

stress to avoid a particular syllable-final element, but light syllables do not. Consider, for example, the two NonFinality constraints in (6).

(6) a. NFin(x_F, μ, σ)
No foot-level gridmark occurs over the final mora of a syllable.

b. NFin(x_F, x_μ, σ)
No foot-level gridmark occurs over the final mora-level gridmark of a syllable.

NFin(x_F, μ, σ) 'no stress on syllable-final moras' makes stress sensitive to a syllable's p-weight:

(7)

	NFin(x_F, μ, σ)
a. x x μ μ μ σ	
b. x x μ μ σ	
c. x x μ σ	*

As illustrated in (7), the constraint prefers that stress fall on a p-heavy syllable, rather than a p-light syllable, since multimoraic syllables allow stress to occupy a nonfinal mora.

Similarly, NFin(x_F, x_μ, σ) 'no stress over syllable-final mora-level gridmarks' makes stress sensitive to a syllable's m-weight:

(8)

	NFin(x_F, x_μ, σ)
a. x x x x μ μ μ σ	
b. x x x μ μ μ σ	
c. x x x μ μ σ	
d. x x μ μ σ	*
e. x x μ σ	*

As (8) illustrates, NFin(x_F, x_μ, σ) prefers that stress occupy an m-heavy syllable, rather than an m-light syllable, since multipositionally-mapped syllables allow stress to avoid a syllable-final mora-level gridmark.

We have seen, then, that the proposal posits two distinct but closely related types of syllable weight, p-weight and m-weight, and we have seen that it utilizes NonFinality constraints to make stress sensitive to both types. One of the primary advantages of using NonFinality constraints in this context is that they have a limited ability to recognize weight contrasts. Since they only distinguish between *final* and *nonfinal*, they can only distinguish between *one* and *more-than-one*. They are not mora-counting devices with the ability to distinguish between *three* and *four*, for example, or between *four* and *five*.

1.3 A Uniform Representation

The proposal's third central claim is that prominence sensitivity is always weight sensitivity. Syllable weight and vowel sonority are given a uniform representation simply by translating the latter into the former,[5] allowing the weight-sensitive NonFinality constraints to act as a detection mechanism for both types of prominence.

[5] This approach has some history. For example, Hayes (1995) posits a bimoraic/monomoraic distinction to explain prominence contrasts between full and reduced vowels in default-to-opposite systems like Chuvash (Krueger 1961) and Eastern

For translating vowel sonority into syllable weight, I adopt an approach outlined in Kenstowicz 1994.[6] The approach assumes the set of $*V_{\mu\mu}$ constraints in (9) with the universal ranking in (10).

(9) $*V_{\mu\mu}$ constraints
  a. $*[a]_{\mu\mu}$
  All low peripheral vowels are monomoraic.
  b. $*[e, o]_{\mu\mu}$
  All mid peripheral vowels are monomoraic.
  c. $*[i, u]_{\mu\mu}$
  All high peripheral vowels are monomoraic.
  d. $*[ə]_{\mu\mu}$
  All mid central vowels are monomoraic.
  e. $*[ɨ]_{\mu\mu}$
  All high central vowels are monomoraic.

(10) Universal ranking
  $*[ɨ]_{\mu\mu}$ >> $*[ə]_{\mu\mu}$ >> $*[i, u]_{\mu\mu}$ >> $*[e, o]_{\mu\mu}$ >> $*[a]_{\mu\mu}$

The $*V_{\mu\mu}$ constraints discourage forms where various classes of vowels have multimoraic status. Constraints (a-c) refer to peripheral vowels, distinguishing between low, mid, and high, and constraints (d-e) refer to central vowels, distinguishing between mid and high. The universal ranking is based on the relative sonority of the vowel classes to which the individual constraints refer.[7] Constraints referring to classes with lesser sonority occupy higher positions in the ranking, and constraints referring to classes with greater sonority occupy lower positions. As a result, vowels with greater sonority are more compatible with multimoraic status than vowels with lesser sonority, and this allows the proposal to measure the sonority of a particular vowel in terms of its potential for multimoraic status. In Mokshan (Tsygankin and Debaev 1975, Kenstowicz 1996), for example, the peripheral vowel [a] is more prominent than the central vowel [ɨ]. The universal ranking in (10) helps to explain this situation, if stress is required to fall on syllable with a p-heavy vowel. When stress must fall on a multimoraic vowel, [a] is more prominent than [ɨ], simply because multimoraic [a] violates a lower ranked constraint than multimoraic [ɨ].

For such an approach to work, however, it is necessary to posit a weaker relationship than typically assumed between a vowel's mora count and its phonetic duration. Mokshan, for example, does not have long vowels, so it is necessary to prevent the multimoraic status of stressed vowels from automatically translating into additional length. This being the case, I follow Borowsky, Itô, and Mester (1984) and Hyde (2002) in their stance on the relationship between multiple linking and phonetic duration. Although the grammar's phonetic component always requires multiple linking to interpret an element with the additional duration necessary to create a

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Cheremis (Sebeok and Ingemann 1961), and Kenstowicz (1994) utilizes a similar distinction in his analysis of Aljutor (Kodzasov and Muravjova 1980).

[6] Kenstowicz 1994 is an earlier version of Kenstowicz 1996. The approach described below is taken from the earlier version, where Kenstowicz attempts to explain a correlation between vowel sonority and lengthening in Aljutor. The later version does not attempt to explain this correlation.

[7] See Kenstowicz (1996) for an explanation of how the sonority scale is derived.

long/short contrast, such interpretations are not universal. Individual languages may ignore multiple linking and interpret all segments as short. Since moras are an abstract measure of phonological weight rather than a concrete measure of phonetic duration,[8, 9] applying this position to moraic linking should not be especially problematic.

In the remainder of the article, we will see how the three claims outlined above combine to form a uniform account of prominence sensitivity. Section 2 introduces the core conditions and constraints that produce unbounded stress patterns in the Hyde 2002, 2003 framework, the framework adopted here, by examining some of the simpler prominence-insensitive systems. Sections 3 and 4 demonstrate how NonFinality produces prominence sensitivity in weight-based systems, and Section 5 demonstrates how the analysis can be extended to prominence sensitivity in sonority-based systems. Section 6 contains a summary and concluding remarks.

2. Prominence-Insensitive Systems

To introduce some of the additional constraints that play an important role in unbounded stress systems, I will first examine some of the more basic prominence-insensitive patterns. In the simplest patterns, stress occupies the initial syllable, as in Tinrin (Osumi 1995), or the final syllable, as in Uzbek (Poppe 1962):

(11) Tinrin
  a. húːe ‘white’
  b. húsaːu ‘sometimes’
  c. ʂɯ̥́veharu ‘to like’

(12) Uzbek
  a. aitdí ‘he said’
  b. kitobím ‘my book’
  c. aŋladilár ‘they understood’

(13) Yawelmani
  a. sapsábits ‘mouse’
  b. goːlánkil ‘king snake’
  c. melikáno ‘white man’

A simple variation on final stress is a pattern where stress occurs on the penult, as in Yawelmani (Newman 1944, Kroeber 1963).

Since the adopted framework assumes that exhaustive parsing and maximally disyllabic footing are nonviolable, neither nonparsing nor unbounded feet are options for producing the strings of stressless syllables characteristic of unbounded patterns.

[8] Although Hayes (1995) assumes that mora count is a measure of duration, he takes care in characterizing this duration as ‘abstract’ and ‘phonological’ rather than phonetic.

[9] In general, mora count is, at best, only weakly related to phonetic length. If the relationship between mora count and phonetic duration was not fairly weak, then we would expect all monomoraic syllables to have the same duration, all bimoraic syllables to have the same duration, all trimoraic syllables to have the same duration, and so on, regardless of their segmental content and other relevant factors. In languages like Murik (Abbott 1985), for example, where V syllables and CVCC syllables both count as light and are likely monomoraic, we would expect both types to have the same phonetic duration despite the three additional segments in the latter.

The requirement that feet be stressed, however, is violable, and stressless feet are the framework's primary device for producing strings of stressless syllables.[10] The constraints in (14) will play an important role in all unbounded stress systems.

(14) a. MapGM(F)
A foot-level gridmark occurs within the domain of every foot.

b. x_F-L
The left edge of every foot-level gridmark is aligned with the left edge of some prosodic word.

c. x_F-R
The right edge of every foot-level gridmark is aligned with the right edge of some prosodic word.

MapGM(F) governs the relationship between feet and stress, requiring that each foot be associated with a foot-level gridmark. The alignment constraints x_F-L and x_F-R have two roles. First, they have a directionality effect. x_F-L prefers that foot-level gridmarks occur as near as possible to the prosodic word's left edge, and x_F-R prefers that they occur as near as possible to the prosodic word's right edge. By targeting a grid column's foot-level entries, foot-gridmark alignment can affect the position of the column as a whole,[11] meaning that it can affect the position of primary stress, as well as the position of secondary stress. Second, when foot-gridmark alignment dominates MapGM(F), it has a structure reducing effect. It can strip foot-level gridmarks from all feet that would not position them at the designated edge. This produces stressless feet and the strings of stressless syllables characteristic of unbounded patterns.

To illustrate, ranking x_F-L above MapGM(F) produces the initial stress of the Tinrin pattern. x_F-L positions the foot-level entry supporting primary stress at the prosodic word's left edge and removes any additional foot-level entries:

(15)

σσσσ	x_F-L	MapGM(F)
☞ a. x x x x x x (σ σ)(σ σ)		*
b. x x x x (σ σ)(σ σ)		**!
c. x x x x x x (σ σ)(σ σ)	*!*	*
d. x x x x x x x (σ σ)(σ σ)	*!*	

[10] For discussion of these assumptions, see Hyde (2001, 2002), and sources cited therein.

[11] This is due to Prince's (1983) requirement that grid columns be continuous. Allowing a constraint to affect the position of a foot-level entry without also affecting the position of the entries above it would leave a hole in the grid column.

In (15), x_F-L excludes candidates (c, d), because each has a foot-level gridmark away from the prosodic word's left edge. MapGM(F) excludes candidate (b), because it leaves both feet stressless, giving it one more violation than candidate (a). Although the optimal candidate (a) leaves its second foot stressless, violating MapGM(F), positioning its single gridmark column over the initial syllable allows (a) to satisfy the higher ranked x_F-L.

In a similar fashion, ranking x_F-R above MapGM(F) produces the final stress of the Uzbek pattern:

(16)

σσσσ	x_F-R	MapGM(F)

☞ a.
            x
            x
x x x x
(σ σ)(σ σ)
		*

b. x x x x (σ σ)(σ σ)		**!
c. x x x x x x (σ σ)(σ σ)	*!*	*
d. x x x x x x x (σ σ)(σ σ)	*!*	

In (16), x_F-R positions the foot-level entry supporting primary stress at the prosodic word's right edge and removes any additional foot-level entries.

The penultimate stress of Yawelmani is a simple variation on final stress that can be produced when the additional constraints in (17) dominate x_F-R.

(17) a. MapGM(ω)
A prosodic word-level gridmark occurs within the domain of every prosodic word.

b. NFin(x_F, σ, ω) (adapted from Prince and Smolensky 1993)
No foot-level gridmark occurs over the final syllable of a prosodic word.

MapGM(ω) word governs the relationship between prosodic words and stress, requiring that every prosodic word be associated with a prosodic word-level gridmark. NFin(x_F, σ, ω) requires that final syllables be stressless.

When MapGM(ω) and NFin(x_F, σ, ω) both dominate x_F-R, NFin(x_F, σ, ω) bans stress from the prosodic word-final syllable, but MapGM(ω) ensures that each form has a primary stress. Under these conditions, a single gridmark column over the penult best satisfies x_F-R:

(18)

σσσσ	MapGM(ω)	NFin(x_F, σ, ω)	x_F-R	MapGM(F)
☞ a. x x x x x x (σ σ)(σ σ)			*	*
b. x x x x x x (σ σ)(σ σ)			**!	*
c. x x x x x x x (σ σ)(σ σ)			* *!**	
d. x x x x x x (σ σ)(σ σ)		*!		*
e. x x x x (σ σ)(σ σ)	*!			**

In (18), MapGM(ω) excludes the completely stressless candidate (e) because the prosodic word does not contain a prosodic word-level gridmark. Since MapGM(F) ranks too low to preserve a misaligned stress in this situation, a high-ranking MapGM(ω) is necessary to prevent x_F-R from being vacuously satisfied. NFin(x_F, σ, ω) excludes candidate (d) because a foot-level gridmark occupies the prosodic word-final syllable, and x_F-R excludes candidates (b, c) because each has a foot-level gridmark further to the left than necessary to avoid the final syllable. The (a) candidate's single penultimate stress emerges as the winner.

The constraints just examined play similar roles in prominence-sensitive systems. x_F-L and x_F-R will continue to produce strings of stressless syllables by creating MapGM(F) violations.[12] They will also retain significant influence over a language's directional orientation, establishing the default edge in both default-to-same-side systems and default-to-opposite-side systems. In Sections 3 and 4, we will consider a series of case studies to illustrate how NonFinality constraints promote prominence sensitivity in a wide variety of weight-based systems. Section 3 examines stress's sensitivity to p-weight in default-to-same-side systems, demonstrating how the proposal produces two-way contrasts in syllable weight and how it handles certain three-way contrasts where superheavy syllables are not a factor. Section 4 examines stress's sensitivity to m-weight in default-to-opposite-side systems and in systems where superheavy syllables help to create three-way contrasts.

3. Prosodic Weight in Default-to-Same-Side Systems

In default-to-same systems, stress occupies the prominent syllable, if one is available, nearest a given edge. If no prominent syllable is available, stress occupies a

[12] In the interests of space, I will not continue to indicate violations of the low-ranked MapGM(F) in the remaining tableaux. I will still be assuming, however, that each stress corresponds to a foot and that strings of stressless syllables result from stressless feet.

nonprominent syllable at the same edge. Below, we will examine the roles that NonFinality and p-weight play in such systems. NonFinality makes stress sensitive to a basic two-way distinction in p-weight, and this distinction helps to capture not only two-way contrasts in prominence but certain types of three-way contrasts as well.

3.1 Two-Way Contrasts: Murik and Yana

To produce default-to-same systems with two-way contrasts in syllable weight, the prominence-insensitive rankings from Section 2 are modified as in (19), so that NFin(x_F, μ, σ) 'no stress on syllable-final moras' dominates foot-gridmark alignment. The (19a) ranking produces left-oriented systems, and the (19b) ranking produces right-oriented systems.

(19) a. Left default
MapGM(ω) >> NFin(x_F, μ, σ) >> x_F-L
b. Right default
MapGM(ω) >> NFin(x_F, μ, σ) >> x_F-R

Under both rankings, the high-ranking MapGM(ω) ensures that each form contains a stressed syllable, preventing foot-gridmark alignment from being vacuously satisfied. When p-heavy syllables are present, NFin(x_F, μ, σ) ensures that stress occupies a p-heavy syllable – where it can avoid a syllable-final mora – and foot-gridmark alignment draws stress to the p-heavy syllable nearest the default edge. When p-heavy syllables are absent, NFin(x_F, μ, σ) cannot be satisfied, and foot-gridmark alignment positions stress over the p-light syllable nearest the default edge.

To illustrate, consider Yana (Sapir and Swadesh 1960) and Murik (Abbott 1985), two left-oriented default-to-same languages with two-way contrasts in prominence. In both languages, bimoraic CVV syllables are prominent, and monomoraic CV syllables are nonprominent. The difference between them is their treatment of CVC syllables:

(20) Yana[13]

CVV, CVC > CV	a.	haláalaʔi	'barberry'
	b.	nigídsasinʒa	'I go to another house'
	c.	nisáatinʒa	'it is said I went away'
	d.	hac'aʒídp'aa	'Angelica Tomentosa'
CV	e.	méc'i	'coyote'
	f.	írik'i	'ear ornaments'

[13] Sapir and Swadesh do not give examples of the Yana stress pattern. Stress in the example forms in (20) is inferred from their description. Also, though they are not represented in (20), Yana allows diphthongs, and these are described as attracting stress just like long vowels.

(21) Murik

CVː > CVC, CV	a.	sáːk^{h}o	'wait'
	b.	gaíːn	'canoe'
	c.	numaɾóːgo	'woman'
	d.	anənp^{h}aɾɛ́ːt^{h}	'lightning'
CVC, CV	e.	dámag	'garden'
	f.	dák^{h}anɨmp	'post'

In Yana, as indicated in (20), stress occupies the leftmost CVV or CVC syllable, if one is available. Otherwise, it occupies the leftmost CV syllable. Since CVC syllables pattern with CVV syllables in counting as prominent, CVC is bimoraic in Yana just like CVV. In Murik, as indicated in (21), stress occupies the leftmost CVː syllable, if one is available. Otherwise, it occupies the leftmost CVC or CV syllable. Since CVC syllables pattern with CV syllables in counting as nonprominent, CVC is monomoraic in Murik just like CV.

I will return to an account of the differing status of CVC syllables in Section 3.2. For now, however, we can focus on CVV and CV syllables to examine the basic bimoraic/monomoraic contrast common to both languages. As demonstrated in (22), in forms that contain bimoraic syllables, the left-oriented default-to-same ranking from (19a) positions stress on the leftmost.[14]

(22)

CV.CVV.CV.CVV.CV	NFin(x_F, μ, σ)	x_F-L
☞ a. x x x x x x x μ μ μ μ μ μ μ | |/ | |/ | σ σ σ σ σ		*
b. x x x x x x x μ μ μ μ μ μ μ | |/ | |/ | σ σ σ σ σ		**!*
c. x x x x x x x x μ μ μ μ μ μ μ | |/ | |/ | σ σ σ σ σ		* *!**
d. x x x x x x x μ μ μ μ μ μ μ | |/ | |/ | σ σ σ σ σ	*!	

[14] In this and the remaining tableaux, only candidates that satisfy the high-ranked MapGM(ω) are considered.

In (22), the second and fourth syllables are p-heavy, and the first, third, and fifth are p-light. NFin(x_F, μ, σ) 'no stress on syllable-final moras' ensures that stress occupies a p-heavy syllable, and x_F-L ensures that stress occupies the leftmost p-heavy syllable. NFin(x_F, μ, σ) excludes the default stress of candidate (d) because the supporting foot-level entry occurs over a p-light syllable and, therefore, over a syllable-final mora. x_F-L excludes candidates (b, c) because each has a foot-level entry further to the right than necessary to satisfy NFin(x_F, μ, σ). Candidate (a), where a single gridmark column occupies the leftmost multimoraic syllable, emerges as the winner.

When p-heavy syllables are absent, and stress must occupy a p-light syllable, NFin(x_F, μ, σ) fails to distinguish between the candidates, and x_F-L aligns stress to the default edge:

(23)

<table>
<tr><th>CV.CV.CV.CV.CV</th><th>NFin(xF, μ, σ)</th><th>xF-L</th></tr>
<tr><td>☞ a. x
x
x x x x x
μ μ μ μ μ
| | | | |
σ σ σ σ σ</td><td>*</td><td></td></tr>
<tr><td>b.   x
    x
x x x x x
μ μ μ μ μ
| | | | |
σ σ σ σ σ</td><td>*</td><td>*!*</td></tr>
<tr><td>c.   x
        x
x x x x x
μ μ μ μ μ
| | | | |
σ σ σ σ σ</td><td>*</td><td>*!***</td></tr>
</table>

In (23), all syllables are p-light, so each candidate violates NFin(x_F, μ, σ). Because stress must occupy a p-light syllable, it fails to avoid a syllable-final mora. The decision falls to x_F-L, which excludes the (b, c) candidates' misaligned gridmark columns, and the (a) candidate's initial stress emerges as the winner.

We have seen, then, that the ability of NFin(x_F, μ, σ) to detect the difference between multimoraic syllables and monomoraic syllables allows the proposal to produce default-to-same systems that have two-way contrasts in prominence. The (19a) ranking produces a left-default system using x_F-L to establish the default edge and the higher ranked NFin(x_F, μ, σ) to shift stress to the nearest p-heavy syllable, when one is available. The (19b) ranking would produce a right-default system in a similar fashion. x_F-R would establish the default edge, and NFin(x_F, μ, σ) would shift stress to the nearest available p-heavy syllable.

3.2 Three-Way Contrasts

Some languages appear to require a three-way contrast in prominence, even though the types of syllables involved are typically taken to offer only a two-way contrast in syllable weight. In other words, they maintain a three-way contrast using only monomoraic syllables and bimoraic syllables. The additional contrast does not seem to arise because the languages recognize ‘superheavy’ trimoraic syllables. Below, we will consider two examples: Kashmiri (Bhatt 1989, Kenstowicz 1993) and Maori (Biggs 1961, Hohepa 1967, Bauer 1993, de Lacy 1997).

Kashmiri’s three-way contrast is between CVː, CVC, and CV syllables. CVː syllables are more prominent than CVC syllables, and CVC syllables are more prominent than CV syllables:

(24) Kashmiri

Nonfinal CVː > CVC, CV	a.	muláːheza
	b.	ardonóːriːšor
Nonfinal CVC > CV	c.	bigándarladin
	d.	noyídgiː
CV	e.	phíkiri
	f.	sírinagar
	g.	páharadariː

As (24) illustrates, Kashmiri is a left-oriented default-to-same language that prohibits final stress. It stresses the leftmost nonfinal CVː syllable, as in (24a, b), if one is available. If nonfinal CVː syllables are absent, as in (24c, d), it stresses the leftmost nonfinal CVC syllable. If nonfinal CVC syllables are absent, as in (24e-g), it stresses the leftmost CV syllable.

Maori’s three-way contrast is between syllables with long vowels, syllables with diphthongs, and syllables with single short vowels. Long vowels are more prominent than diphthongs, and diphthongs are more prominent than single short vowels:

(25) Maori[15]

CVː	a.	túː.iː	‘parson bird’
CVː > CV_iV_j, CV	b.	au.áː	‘herring’
	c.	tau.áː	‘ridge’
	d.	ku.ríː	‘dog’
	e.	we.hi.kéː	‘whiskey
CV_iV_j	f.	tái.tei	‘Thursday’
CV_iV_j > CV	g.	ku.áu	‘beard’
	h.	tu.ái.na	‘twine, string’
CV	i.	tá.ŋa.ta	‘man, person’
	j.	kú.a.nu	‘cold’

As illustrated in (25), Maori is also a left-oriented default-to-same language. It stresses the leftmost syllable containing a long vowel, as in (25a-e), if one is available. When long vowels are absent, it stresses the leftmost syllable containing a diphthong, as in (25f-h). When diphthongs are absent, it stresses the leftmost syllable containing a single short vowel, as in (25i, j).

The problem, then, is to account for three-way contrasts that arise in situations where a three-way distinction in mora count seems unlikely. There are two options. The first is to allow the p-weight of certain syllable types to vary according to con-

[15] The Maori examples are from de Lacy (1997). The forms in (25e, f, h) are loanwords.

text. This is the option taken in Kashmiri. The second is to distinguish final from nonfinal twice. This is the option taken in Maori.

3.2.1 Long Vowels and Codas in Kashmiri

We can think of Kashmiri's three-way contrast as two separate two-way contrasts. The first contrast arises when CV: syllables are present. In this context, CV: syllables are prominent, and CVC and CV syllables are nonprominent. The second contrast arises when CV: syllables are absent. In this context, CVC syllables are prominent, and CV syllables are nonprominent. The problem, then, is to account for the varying status of CVC syllables. Since CVC syllables must be nonprominent – and, therefore, p-light – in the first context, but prominent – and, therefore, p-heavy – in the second, it is necessary to provide a mechanism that allows the moraic status of CVC syllables to vary as required.

What is needed is a constraint that discourages a bimoraic status for CVC syllables without also discouraging the bimoraic status of CV: syllables. The $*C_\mu$ constraint, which prohibits moraic consonants, achieves the desired result:

(26) $*C_\mu$
Consonants are nonmoraic.

When $*C_\mu$ ranks between NFin(x_F, μ, σ) 'no stress on syllable-final moras' and x_F-L, as in (27), the moraic status of codas can vary according to context.

(27) Kashmiri Ranking
MapGM(ω), NFin(x_F, σ, ω) >> NFin(x_F, μ, σ) >> $*C_\mu$ >> x_F-L

Since $*C_\mu$ dominates x_F-L, coda consonants cannot be moraic simply for the purpose of positioning stress closer to the prosodic word's left edge. If a CV: is available to carry the stress, a CVC syllable cannot be bimoraic, even if it occurs further to the left. Since $*C_\mu$ is dominated by NFin(x_F, μ, σ), however, a coda consonant may be moraic to allow stress to occur over a p-heavy syllable. If no CV: syllable is available, a CVC syllable can be bimoraic in order to carry the stress. Notice also that NFin(x_F, σ, ω) 'no stress on prosodic word-final syllables' is present in the (27) ranking. Since it dominates NFin(x_F, μ, σ) 'no stress on syllable-final moras', stress cannot be attracted to the final syllable, even if the final syllable happens to be the only prominent syllable.

To illustrate more clearly how the ranking produces the appropriate contrasts for Kashmiri, consider the situation where a (C)VC syllable occurs to the left of a CV: syllable. As (28) demonstrates, using a form like (24b), /ardonóːriːšor/, the (C)VC syllable cannot be bimoraic, so the CV: syllable carries the stress.

(28)

VC.CV.CV:.CV:.CVC	NFin(x_F, μ, σ)	$*C_\mu$	x_F-L
☞ a. x x x x x x x μ μ μ μ μ μ μ μ | | |/ |/ | V C . C V . C V . C V . C V C			**
b. x x x x x x x μ μ μ μ μ μ μ μ μ | | | |/ |/ | V C . C V . C V . C V . C V C		*!	
c. x x x x x x x μ μ μ μ μ μ μ μ | | |/ |/ | V C . C V . C V . C V . C V C	*!		

In (28), NFin(x_F, μ, σ) 'no stress on syllable-final moras' excludes the (c) candidate's stressed (C)VC syllable. Since the (C)VC syllable is p-light, stress cannot avoid the syllable-final mora. Stressing the same syllable in candidate (b), p-heavy this time, satisfies NFin(x_F, μ, σ). $*C_\mu$ excludes (b), however, because a moraic coda is necessary to make the (C)VC syllable p-heavy. By stressing a CVː syllable further to the right, the optimal candidate (a) incurs more x_F-L violations, but it also satisfies $*C_\mu$ without violating NFin(x_F, μ, σ).

Next, consider a case where CVː syllables are absent. As (29) demonstrates, using a form like (24c), /bigándarladin/, a CVC syllable can be bimoraic to avoid the situation where a p-light syllable would carry the stress.

(29)

CV.CVC.CVC.CV.CVC	NFin(x_F, μ, σ)	$*C_\mu$	x_F-L
☞ a. x x x x x x x μ μ μ μ μ μ | | | | | | C V . C V C . C V C . C V . C V C		*	*
b. x x x x x x x μ μ μ μ μ | | | | | C V . C V C . C V C . C V . C V C	*!		*
c. x x x x x x x μ μ μ μ μ | | | | | C V . C V C . C V C . C V . C V C	*!		

In (29), candidate (b) stresses a monomoraic CVC syllable, and candidate (c) stresses a monomoraic CV syllable. NFin(x_F, μ, σ) excludes both because stress fails to avoid a syllable-final mora. In contrast, the optimal candidate (a) stresses a bimoraic CVC syllable. Although the moraic coda violates *C_μ, it allows (a) to satisfy the higher ranked NFin(x_F, μ, σ).[16]

The key to Kashmiri, then, is to allow the p-weight of CVC syllables to vary according context. When *C_μ ranks between NFin(x_F, μ, σ) 'no stress on syllable-final moras' and x_F-L, CVC syllables can be bimoraic when CV: syllables are absent, in order to position stress on a multimoraic syllable, but they cannot be bimoraic when a CV: syllable is present in order to shift stress further to the left. Note also that the *C_μ constraint helps to account for the differing status of CVC syllables in languages like Murik and Yana, discussed in Section 3.1:

(30) Rankings of *C_μ

a.	NonFin(x_F, μ, σ) >> x_F-L >> *C_μ	CVV, CVC > CV (Yana)
b.	*C_μ >> NonFin(x_F, μ, σ) >> x_F-L	CVV > CVC, CV (Murik)
c.	NonFin(x_F, μ, σ) >> *C_μ >> x_F-L	CVV > CVC > CV (Kashmiri)

To ensure that CVC syllables pattern with CVV syllables in Yana, we would rank *C_μ below x_F-L. CVC syllables could be bimoraic both to position stress on a p-heavy syllable and to shift stress further to the left. To ensure that CVC syllables pattern with CV syllables in Murik, we would rank *C_μ above NFin(x_F, μ, σ). CVC syllables could never be bimoraic, either to position stress on a p-heavy syllable or to shift stress further to the left.

3.2.2 Long Vowels and Diphthongs in Maori

As mentioned above, Maori's three-way contrast is between syllables containing long vowels, syllables containing diphthongs, and syllables containing a single short vowel. It is simple enough for NFin(x_F, μ, σ) 'no stress on syllable-final moras' to capture the contrast between monomoraic CV syllables and bimoraic CV_iV_j and CV: syllables. The difficulty arises in capturing the contrast between CV_iV_j syllables and CV: syllables.

Following a suggestion from de Lacy (1997), the key is to consider the difference in p-weight of the syllables' constituent vowels. CV: syllables have a bimoraic vowel where CV_iV_j syllables have monomoraic vowels. A NonFinality constraint like NFin(x_F, μ, V) can detect this difference:

(31) NFin(x_F, μ, V)

No foot-level gridmark occurs over the final mora of a vowel.

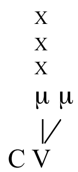
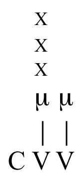
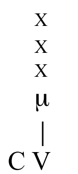
Since NFin(x_F, μ, V) bans stress from vowel-final moras, it prefers that stress occur over the bimoraic vowel of a CV: syllable.

We can use NFin(x_F, μ, σ) 'no stress on syllable-final moras', then, to distinguish bimoraic CV: and CV_iV_j syllables from monomoraic CV syllables, and we can use NFin(x_F, μ, V) 'no stress on vowel-final moras' to distinguish the bimoraic vowels of CV: syllables from the monomoraic vowels of CV_iV_j syllables:

---

[16] When no nonfinal CV: or CVC syllable is available, the ranking returns stress to the default (left) edge. I omit the additional tableau.

(32)

	NFin(x_F, μ, σ)	NFin(x_F, μ, V)
a. 		
b. 		*
c. 	*	*

When the effects of NFin(x_F, μ, σ) combine with those of NFin(x_F, μ, V), as illustrated in (32), CVː syllables like candidate (a) are most prominent because stress can avoid both a syllable-final mora and a vowel-final mora. CV_iV_j syllables like candidate (b) will be less prominent because stress can avoid a syllable-final mora but not a vowel-final mora. CV syllables like candidate (c) will be least prominent because stress can avoid neither a vowel-final mora nor a syllable-final mora.

To produce the appropriate results for Maori, then, we would rank NFin(x_F, μ, σ) 'no stress on syllable-final moras' and NFin(x_F, μ, V) 'no stress on vowel-final moras' both above x_F-L, as in (33).

(33) Maori Ranking
MapGM(ω) >> NFin(x_F, μ, σ), NFin(x_F, μ, V) >> x_F-L

Because the weight-sensitive NonFinality constraints dominate x_F-L, their combined preferences will take priority over alignment considerations. Stress will fall on an available CVː syllable, even when a CV_iV_j syllable occurs further to the left. In the absence of CVː syllables, stress will fall on an available CV_iV_j syllable, even when a CV syllable occurs further to the left.

To illustrate, consider the situation where a CV_iV_j syllable occurs to the left of a CVː syllable, as in (25c), /tau.áː/. The (33) ranking stresses the CVː syllable.

(34)

$CV_iV_j.CV\text{:}$	NFin(x_F, μ, σ)	NFin(x_F, μ, V)	x_F-L
☞ a. x x x x μ μ μ μ | | |/ C V V . V			*
b. x x x x μ μ μ μ | | |/ C V V . V		*!	

In (34), both candidates satisfy NFin(x_F, μ, σ) 'no stress on syllable-final moras' because both stress a multimoraic syllable. The (b) candidate's stressed CV_iV_j syllable, however, is excluded by NFin(x_F, μ, V) 'no stress on vowel-final moras', because the stress occurs over a monomoraic vowel. The (a) candidate, with its stressed CV: syllable, correctly emerges as the winner.

Next, consider the situation where a CV_iV_j syllable is present but CV: syllables are absent. As (35) demonstrates using a form like (25g), /ku.áu/, the ranking stresses the CV_iV_j syllable, even when a CV syllable occurs further to the left.

(35)

$CV.V_iV_j$	NFin(x_F, μ, σ)	NFin(x_F, μ, V)	x_F-L
☞ a. x x x x μ μ μ | | | C V . V V		*	*
b. x x x x μ μ μ | | | C V . V V	*!	*	

In (35), both candidates violate NFin(x_F, μ, V) 'no stress on vowel-final moras', because both stress a monomoraic vowel, and the decision falls to NFin(x_F, μ, σ). NFin(x_F, μ, σ) 'no stress on syllable-final moras' excludes the (b) candidate's default stress because it occupies a monomoraic syllable. The (a) candidate, with its stressed CV_iV_j syllable, correctly emerges as the winner.[17]

To summarize, distinguishing between final and nonfinal twice, once in the syllable domain and once in the vowel domain, produces Maori's three-way contrast. Since NFin(x_F, μ, σ) detects a two-way p-weight distinction in syllables, it distinguishes bimoraic CV: and CV_iV_j syllables from monomoraic CV syllables. Since

[17] In forms that contain only CV syllables, like (25i), /tá.ŋa.ta/, each of the closest competitors would violate both NonFinality constraints, and x_F-L would return stress to the default edge.

NFin(x_F, μ, V) detects a two-way p-weight distinction in individual vowels, it distinguishes the bimoraic vowels in CV: syllables from the monomoraic vowels in CV and CV_iV_j syllables. When the two distinctions combine, the desired three-way contrast emerges. Next, we examine the role that m-weight plays in default-to-opposite systems and systems where superheavy syllables form a separate level of prominence.

4. Metrical Weight

In the adopted framework, there are two requirements that govern how moras map to the metrical grid. The first is the nonviolable Head Mora Condition, given in (36a). The Head Mora Condition requires that the head moras of syllables map to the metrical grid. Since it is nonviolable, every syllable in every output candidate must have at least one mora-level entry within its domain.

(36) a. Head Mora Condition
The head mora of every syllable corresponds to a mora-level gridmark.

b. MapGM(μ)
Every mora corresponds to a mora-level gridmark.

The second requirement is the violable MapGM(μ) constraint, given in (36b). Because it makes the broader demand that moras in general correspond to mora-level entries, MapGM(μ) is responsible for mapping nonhead moras. Since MapGM(μ) is violable, however, its ranking determines whether or not such mappings actually occur.

Although head moras will always map to the grid, then, nonhead moras may or may not, and the potential discrepancy between moras and mora-level gridmarks offers a means to distinguish between different types of p-heavy syllables. Since mora-level gridmarks must correspond to individual moras, m-heavy syllables will also always be p-heavy. However, since individual moras may or may not correspond to mora-level gridmarks, p-heavy syllables may be either m-heavy or m-light. A p-heavy syllable will be m-light when only its head mora maps to the grid, but it will be m-heavy if any of its nonhead moras are also mapped. The ability of NonFinality constraints to detect this difference allows the proposal to account for the conflicting directionality found in default-to-opposite systems. It also allows the proposal to distinguish bimoraic syllables from trimoraic syllables in systems where the latter create a separate level of prominence.

4.1 Default-to-Opposite-Side Systems

Default-to-opposite systems resemble default-to-same systems in that stress shifts from the default edge to a prominent syllable, when one is available. In default-to-opposite systems, however, stress shifts to the prominent syllable furthest from the default edge. For example, in Selkup (Kuznecova et al. 1980, Halle and Clements 1983), bimoraic CV: syllables are prominent, and monomoraic CVC and CV syllables are nonprominent:

(37)	CV: > CVC, CV	a.	kanaŋmíː	'our dog'
		b.	uːcɔ́ːmɨt	'we work'
		c.	qumoːqlɪlíː	'your two friends'
	CVC, CV	d.	ámɨrna	'eats'
		e.	qólʲcɨmpatɨ	'found'

When CVː syllables are present, Selkup stresses the rightmost, as in (37a-c). When CVː syllables are absent, it stresses the leftmost CVC or CV syllable, as in (37d, e).

To produce such systems, conflicting directionality must be introduced, so that stress aligns in one direction when it can occupy a prominent syllable but aligns in the opposite direction when it must occupy a nonprominent syllable. The ability of NFin(x_F, x_μ, σ), repeated in (38), to detect distinctions in m-weight plays a central role in achieving this result.

(38) NFin(x_F, x_μ, σ)
No foot-level gridmark occurs over the final mora-level gridmark of a syllable.

NFin(x_F, x_μ, σ) has two roles in default-to-opposite systems. The first is to ensure that stress occupies a p-heavy syllable, when one is available. Since NFin(x_F, x_μ, σ) prefers that stress occupy an m-heavy syllable, in an effort to avoid a syllable-final mora-level gridmark, and since m-heavy syllables must also always be p-heavy, it also prefers that stress occupy a p-heavy syllable.

The second role of NFin(x_F, x_μ, σ) is to create a distinction in m-weight between stressed p-heavy syllables and all other types. This is accomplished in conjunction with the mora-gridmark alignment constraints in (39).

(39) a. x_μ-L
The left edge of every mora-level gridmark is aligned with the left edge of some prosodic word.

b. x_μ-R
The right edge of every mora-level gridmark is aligned with the right edge of some prosodic word.

Like foot-gridmark alignment, mora-gridmark alignment has a structure reducing effect. When it ranks between NFin(x_F, x_μ, σ) and MapGM(μ), as in the basic default-to-opposite rankings in (40), it strips mora-level entries from nonhead moras, but only from nonhead moras in unstressed syllables. Since NFin(x_F, x_μ, σ) requires stressed syllables to be multipositionally mapped, stressed p-heavy syllables will retain the entries over their nonhead moras.

(40) a. Left default
MapGM(ω) >> NFin(x_F, x_μ, σ) >> x_μ-R >> x_F-L, MapGM(μ)

b. Right default
MapGM(ω) >> NFin(x_F, x_μ, σ) >> x_μ-L >> x_F-R, MapGM(μ)

The result is that stressed p-heavy syllables will be distinguished from all other types by their m-heavy status:

(41) a. Stressed bimoraic b. Unstressed bimoraic c. Stressed monomoraic d. Unstressed monomoraic

```
a.  x         b.          c.  x        d.
    x                         x
    x x           x           x            x
    μ μ           μ μ         μ            μ
    |/            |/          |            |
    σ             σ           σ            σ
```

Since the concentration of mora-level entries in an m-heavy syllable is subject to mora-gridmark alignment's directional effects, we can introduce conflicting directionality simply by ranking a mora-gridmark alignment constraint above the foot-gridmark alignment constraint with the opposite directional specification.

To illustrate, the left-default ranking (40a), where x_μ-R dominates x_F-L, produces the Selkup pattern. In a form where CV: syllables are present, like (37c), /qumoːqlɪlɪ́ː/, the ranking stresses the rightmost:

(42)

CV.CV:.CV.CV:	NFin(x_F, x_μ, σ)	x_μ-R	x_F-L	MapGM(μ)
☞ a. `            x` `            x` `x  x     x  x x` `μ  μ μ   μ  μ μ` `| |/	|/` `σ σ σ σ`		* ** ***	***	*
b. `            x` `            x` `x  x x   x  x x` `μ  μ μ   μ  μ μ` `| |/	|/` `σ σ σ σ`		* ** ** **!*	***	
c. `   x` `   x` `x  x x   x  x` `μ  μ μ   μ  μ μ` `| |/	|/` `σ σ σ σ`		* ** ** **!*	*	*
d. `   x` `   x` `x  x     x  x` `μ  μ μ   μ  μ μ` `| |/	|/` `σ σ σ σ`	*!	* ** ***	*	**
e. `x` `x` `x  x     x  x` `μ  μ μ   μ  μ μ` `| |/	|/` `σ σ σ σ`	*!	* ** ***		**

In (42), NFin(x_F, x_μ, σ) excludes the (e) candidate's stressed p-light syllable and the (d) candidate's stressed p-heavy syllable. Although the (d) candidate's stressed syllable is p-heavy, it is monopositionally-mapped, and stress fails to avoid the syllable-final mora-level gridmark. Next, x_μ-R excludes candidates (b, c). Making the first CVː syllable m-heavy, whether stressed or unstressed, positions a concentration of mora-level gridmarks further than necessary from the right edge. The optimal candidate (a) stresses the rightmost CVː syllable, which is also the candidate's only m-heavy syllable. This satisfies x_μ-R as well as possible without violating the higher ranked NFin(x_F, x_μ, σ).

When CVː syllables are absent, the same ranking returns stress to the default edge. The (43) tableau demonstrates using a form like (37e), /q̇ól[j]cɨmpatɨ/.

(43)

CVC.CVC.CV.CV	NFin(x_F, x_μ, σ)	x_μ-R	x_F-L
☞ a. x x x x x x μ μ μ μ | | | | σ σ σ σ	*	***	
b. x x x x x x μ μ μ μ | | | | σ σ σ σ	*	***	*!**

In (43), every syllable in both candidates is monomoraic and m-light, so they perform equally well on x_μ-R. Also, since both candidates must stress an m-light syllable, both violate NFin(x_F, x_μ, σ). The decision passes to x_F-L, which excludes candidate (b) because its gridmark column occurs further to the right, and candidate (a) emerges as the winner.

In default-to-opposite systems, then, NFin(x_F, x_μ, σ) positions stress over a p-heavy syllable, when one is available, by insisting that stress occupy an m-heavy syllable. Although foot-gridmark alignment continues to establish the default edge, mora-gridmark alignment introduces conflicting directionality by drawing the concentrations of mora-level gridmarks in stressed m-heavy syllables towards the edge opposite the default edge.

4.2 Three-Way Contrasts Involving Superheavy Syllables

In the languages that we will examine next, NFin(x_F, x_μ, σ) 'no stress on syllable-final mora-level gridmarks' detects differences in m-weight created by other NonFinality constraints, and these differences allow the proposal to distinguish trimoraic syllables from bimoraic syllables.

(44)

a. Monomoraic	b. Bimoraic	c. Trimoraic
x μ | σ	x μ μ |/ σ	x x μ μ μ |// σ

As illustrated in (44), when syllable-final nonhead moras cannot map to the grid, trimoraic syllables can still be multipositionally mapped, so they can be stressed without violating NFin(x_F, x_μ, σ). Bimoraic syllables, however, must be monopositionally mapped, just like monomoraic syllables, so they cannot be stressed without violating NFin(x_F, x_μ, σ). This difference accounts for the third level of prominence created by superheavy syllables in languages like Classical Arabic and Kelkar's Hindi. We examine Classical Arabic in Section 4.2.1 and Kelkar's Hindi in Section 4.2.2.

4.2.1 Final Trimoraic Syllables in Classical Arabic

Classical Arabic (Abul-Fadl 1961, Wright 1971, McCarthy 1979) is a default-to-opposite language with a three-way prominence contrast. It distinguishes between trimoraic CVVC and CVCC syllables, bimoraic CVV and CVC syllables, and monomoraic CV syllables:[18]

(45) Final CVVC, CVCC > CVV, CVC, CV	a.	kaatibáat	'female writers (nom.)'
	b.	billáur	'crystal (nom.)'
Nonfinal CVV, CVC > CV	c.	kitáabun	'book (nom.)'
	d.	manaadíilu	'kerchiefs (nom.)
	e.	yušáariku	'he participates'
	f.	mámlakatun	'kingdom (nom.)'
CV	g.	kátaba	'he wrote'
	h.	bálahatun	'date (nom.)'

Trimoraic syllables occur only in word-final position and only in phrase-final words. If a trimoraic syllable is present, it is stressed, as in (45a, b). If trimoraic syllables are absent, stress occupies the rightmost nonfinal bimoraic syllable, as in (45c-f). If nonfinal bimoraic syllables are absent, stress occupies the leftmost monomoraic syllable, as in (45g, h).

Classical Arabic parallels Kashmiri in that its three-way contrast can be broken down into two two-way contrasts. In final position, trimoraic syllables are prominent, and bimoraic and monomoraic syllables are nonprominent. In nonfinal positions, where trimoraic syllables are excluded, bimoraic syllables are prominent, and monomoraic syllables are nonprominent. The key, then, is to allow the m-weight of bimoraic syllables to vary according to their status as final or nonfinal. When a bimoraic syllable is final, it must be m-light like a monomoraic syllable. When a bimoraic syllable is nonfinal, however, it must be able to be m-heavy like a trimoraic syllable.

To allow the m-weight of final syllables to vary depending on their position, we insert an additional NonFinality constraint, NFin(x_μ, μ, ω), given in (46), into a default-to-opposite ranking so that it dominates NFin(x_F, x_μ, σ), as in (47). The ranking in (47) is a left-default ranking, the type required for Classical Arabic.

(46) NFin(x_μ, μ, ω)
No mora-level gridmark occurs over the final mora of a prosodic word.

(47) Classical Arabic ranking
MapGM(ω), NFin(x_μ, μ, ω) >> NFin(x_F, x_μ, σ) >> x_μ-R >> x_F-L, MapGM(μ)

NFin(x_μ, μ, ω) prohibits prosodic word-final moras from being associated with mora-level gridmarks. Because it ranks above NFin(x_F, x_μ, σ) 'no stress on syllable

[18] Thanks to Hanaa Kilany of Washington University for providing glosses for (45a, b).

final mora-level gridmarks' it limits the latter's ability to promote multipositional mapping in final syllables. Final trimoraic syllables can map multipositionally while still avoiding an entry on the prosodic-word final mora, and this allows them to attract stress. Final bimoraic syllables, however, must map monopositionally to avoid an entry on the prosodic word-final mora, and this prevents them from attracting stress.

To illustrate how the ranking produces the appropriate contrasts for Classical Arabic, consider a case where the final syllable is trimoraic. Since trimoraic final syllables can map multipositionally, without violating NFin(x_μ, μ, ω) 'no mora-level entries on prosodic word-final moras', they can carry stress without violating NFin(x_F, x_μ, σ) 'no stress on syllable-final mora-level gridmarks', and x_μ-R can draw the gridmark column into final position. The (48) tableau demonstrates using a form like (45a), /kaatibáat/.

(48)

CVV.CV.CVVC	NFin (x_μ, μ, ω)	NFin (x_F, x_μ, σ)	x_μ-R	x_F-L	MapGM (μ)
☞ a. x x x x x x μ μ μ μ μ μ |/ | |// σ σ σ			* **	**	**
b. x x x x x x x μ μ μ μ μ μ |/ | |// σ σ σ			* ** *!*		*
c. x x x x x x μ μ μ μ μ μ |/ | |// σ σ σ		*!	* **		**
d. x x x x x x x μ μ μ μ μ μ |/ | |// σ σ σ	*!		* **	**	*

In (48), NFin(x_μ, μ, ω) 'no mora-level entries over prosodic word-final moras' excludes candidate (d), because the final mora of the final syllable corresponds to a grid entry. Next, NFin(x_F, x_μ, σ) 'no stress on syllable-final mora-level gridmarks' excludes the stressed bimoraic syllable of candidate (c). Since the bimoraic syllable is monopositionally mapped, stress fails to avoid the syllable-final mora-level gridmark. x_μ-R excludes the stressed bimoraic syllable of candidate (b). Mapping the nonfinal bimoraic syllable multipositionally creates a concentration of mora-level entries further than necessary from the right edge. In the optimal candidate (a), two of the three moras in the stressed final syllable map to the grid. Stress avoids the syllable-final mora-level gridmark, satisfying NFin(x_F, x_μ, σ), without mapping the prosodic word-final mora and violating NFin(x_μ, μ, ω). Since the concentration of mora-level gridmarks in the stressed syllable occurs as far to the right as possible, (a) is also able to better satisfy x_μ-R.

Next, consider a case where the final syllable is bimoraic. NFin(x_μ, μ, ω) ‘no mora-level entries over prosodic word-final moras’ ensures that the bimoraic final syllable is monopositionally mapped, so x_μ-R cannot draw stress into final position. Crucially, however, NFin(x_μ, μ, ω) does not affect the potential m-weight of nonfinal syllables. Since nonfinal bimoraic syllables can still map multipositionally, stress can shift to the rightmost, when one is available. The (49) tableau demonstrates using a form like (45c), /kitáabun/.

(49)

CV.CVV.CVC	NFin (x_μ, μ, ω)	NFin (x_F, x_μ, σ)	x_μ-R	x_F-L	MapGM (μ)

☞ a.
   x
   x
x x x x
μ μ μ μ μ
| |/ |/
σ σ   σ
			* * **	*	*

b. x x x x x μ μ μ μ μ | |/ |/ σ σ σ		*!	* **		**
c. x x x x x μ μ μ μ μ | |/ |/ σ σ σ		*!	* **	**	**
d. x x x x x x μ μ μ μ μ | |/ |/ σ σ σ	*!		* **	**	*

In (49), NFin(x_μ, μ, ω) ‘no entries over prosodic word-final moras’ excludes candidate (d), because the bimoraic final syllable is multipositionally mapped. NFin(x_F, x_μ, σ) ‘no stress over syllable-final mora-level gridmarks’ excludes the (c) candidate’s final stress and the (b) candidate’s default initial stress. In both cases, the stress occupies a monopositionally mapped syllable. The optimal candidate (a) stresses a nonfinal bimoraic syllable. Since the stressed syllable is nonfinal, it can be multipositionally mapped without positioning an entry over the prosodic word-final mora.[19]

[19] In forms that contain neither trimoraic syllables nor nonfinal bimoraic syllables, x_F-L returns stress to the default edge. I omit the additional tableau.

To summarize, Classical Arabic's three-way contrast can be thought of as two two-way contrasts. In final position, trimoraic syllables are prominent and bimoraic and monomoraic syllables nonprominent. In nonfinal position, bimoraic syllables are prominent and monomoraic syllables nonprominent. The proposal captures both contrasts with a two-way distinction in m-weight, using NFin(x_μ, μ, ω) 'no entries over prosodic word-final moras' to vary the potential m-weight of bimoraic syllables according to context.

4.2.2 Trimoraic Syllables in Kelkar's Hindi

Although NFin(x_F, x_μ, σ) 'no stress on syllable-final mora-level gridmarks' still plays a crucial role, the situation in Kelkar's Hindi (Kelkar 1968, Hayes 1995) is a bit different. First, Kelkar's Hindi is a default-to-same system,[20] so conflicting directionality and mora-gridmark alignment are not significant factors. Second, the prominence contrasts are uniform in all positions. Trimoraic CVVC and CVCC syllables can occur in any position, and they are always more prominent than bimoraic CVV and CVC syllables. In turn, bimoraic CVV and CVC syllables are always more prominent than monomoraic CV syllables:

(50) Stress on single most prominent syllable

CVVC, CVCC > CVV, CVC, CV	a.	dʒanáːb	'sir'
	b.	musalmáːn	'Muslim'
CVV, CVC > CV	c.	kidʰár	'which way'
	d.	rupiáː	'rupee'

(51) Stress on rightmost nonfinal most prominent syllable

CVVC, CVCC > CVV, CVC, CV	a.	aːsmáːndʒaːh	'highly placed'
	b.	áːsmãːdʒaːh	'highly placed (var.)'
CVV, CVC > CV	c.	roːzáːnaː	'daily'
	d.	kaːríːgariː	'craftsmanship'
CV	e.	samíti	'committee'

As illustrated in (50), when there is a single most prominent syllable, it is stressed, regardless of its position. As illustrated in (51), however, when there is a tie for most prominent syllable, stress occupies the rightmost nonfinal.

As in Maori, the key to the three-way contrast in Kelkar's Hindi is to distinguish final from nonfinal twice. However, where Maori makes the distinction with respect to the same elements in different domains – with respect to moras in both the syllable domain and the vowel domain – Kelkar's Hindi makes the distinction with respect to different elements within the same domain. It distinguishes final moras from nonfinal moras and final mora-level gridmarks from nonfinal mora-level gridmarks, both within the domain of the syllable. In other words, a syllable's p-weight and m-weight are both relevant to the position of stress in Kelkar's Hindi.

The necessary contrasts in m-weight are created by an additional NonFinality constraint, NFin(x_μ, μ, σ), given in (52).

[20] Kelkar mentions secondary stresses, which I have omitted here. Kelkar's Hindi is treated as a simple default-to-same system for the purpose of illustration. In principle, it would not be too difficult to modify the analysis to accommodate secondary stress.

(52) NFin(x_μ, μ, σ)

No mora-level gridmark occurs over the final mora of a syllable.

By banning mora-level gridmarks from syllable-final moras, NFin(x_μ, μ, σ) prevents bimoraic syllables from being multipositionally mapped but still allows multipositional mapping for trimoraic syllables. This is the same distinction that NFin(x_μ, μ, ω) 'no mora-level entries on prosodic word-final moras' creates for final syllables in Classical Arabic. Since NFin(x_μ, μ, σ) applies to syllables generally, however, the distinction is not limited to final position in this case.

Given the appropriate mappings, NFin(x_F, μ, σ) 'no stress on syllable-final moras' can be used to detect differences in p-weight, and NFin(x_F, x_μ, σ) 'no stress on syllable-final mora-level gridmarks' can be used to detect differences in m-weight. The combined effects of the two constraints produce the appropriate three-way contrast:

(53)

	NFin(x_F, μ, σ)	NFin(x_F, x_μ, σ)
a. x x x μ μ μ |/ / σ		
b. x x μ μ |/ σ		*
c. x x μ | σ	*	*

As indicated in (53), trimoraic syllables like candidate (a) will be most prominent because stress can avoid both the syllable-final mora and the syllable-final mora-level gridmark. Bimoraic syllables like candidate (b) will be less prominent because stress can avoid the syllable-final mora but not the syllable-final mora-level gridmark. Finally, monomoraic syllables like candidate (c) will be least prominent because stress can avoid neither the syllable-final mora nor the syllable-final mora-level gridmark.

To produce the Kelkar's Hindi pattern, we begin by ranking NFin(x_F, σ, ω) above x_F-R. As mentioned in Section 2, NFin(x_F, σ, ω) prohibits foot level gridmarks over prosodic word-final syllables. Ranking it above x_F-R prevents alignment from pulling stress onto the final syllable, establishing the penult as the default position. We can then implement the appropriate type of weight sensitivity by ranking NFin(x_μ, μ, σ) 'no mora-level entries over syllable-final moras', NFin(x_F, μ, σ) 'no stress on syllable-final moras', and NFin(x_F, x_μ, σ) 'no stress on syllable-final mora-level gridmarks' all above NFin(x_F, σ, ω) and x_F-R, as in (54). This gives weight sensitivity priority over the default position.

(54) Kelkar's Hindi Ranking
MapGM(ω), NFin(x_μ, μ, σ) >> NFin(x_F, x_μ, σ), NFin(x_F, μ, σ) >> NFin(x_F, σ, ω) >> x_F-R, MapGM(μ)

By ranking NFin(x_F, σ, ω) between the weight-sensitive NonFinality constraints and x_F-R, we allow a form to stress its final syllable when it is also the single most prominent syllable, but a form may not stress its final syllable, when there is a tie for most prominent, simply to position stress further to the right.

In illustrating how (54) produces the appropriate contrasts for Kelkar's Hindi, I will use examples where there is a tie for most prominent syllable. First, consider a case where multiple trimoraic syllables are available. As (55) demonstrates, using a form like (51b), /á:smã:dʒa:h/, the ranking stresses the rightmost nonfinal.

(55)

CVVC.CVV.CVVC	NFin (x_μ, μ, σ)	NFin (x_F, x_μ, σ)	NFin (x_F, μ, σ)	NFin (x_F, σ, ω)	x_F-R
☞ a. x x x x x x x μ μ μ μ μ μ μ μ σ σ σ					**
b. x (final σ) x x x x x x μ μ μ μ μ μ μ μ σ σ σ				*!	
c. x (second σ) x x x x x x μ μ μ μ μ μ μ μ σ σ σ		*!			*
d. x (second σ) x x x x x x x μ μ μ μ μ μ μ μ σ σ σ	*!				*

In (55), NFin(x_μ, μ, σ) 'no mora-level entries over syllable-final moras' excludes the (d) candidate's stressed bimoraic syllable. Since the bimoraic syllable is multipositionally mapped, a mora-level gridmark occupies the syllable-final mora. Next, NFin(x_F, x_μ, σ) 'no stress over syllable-final mora-level gridmarks excludes the (c) candidate's stressed bimoraic syllable. Since the bimoraic syllable is monopositionally mapped in this case, stress fails to avoid a syllable-final mora-level gridmark. Since the remaining candidates stress trimoraic syllables, both satisfy NFin(x_F, μ, σ) 'no stress on syllable-final moras', and the decision falls to NFin(x_F, σ, ω) 'no stress on prosodic word-final syllables'. NFin(x_F, σ, ω) excludes the (b) candidate's final stress, and candidate (a) emerges as the winner.

Next, consider a case where multiple bimoraic syllables are present but trimoraic syllables absent. As (56) demonstrates, using a form like (51d), /kaːrí̵ːgariː/, the ranking stresses the rightmost nonfinal bimoraic syllable.

(56)

CVV.CVV.CV.CVV	NFin (x_μ, μ, σ)	NFin (x_F, x_μ, σ)	NFin (x_F, μ, σ)	NFin (x_F, σ, ω)	x_F-R
☞ a. x (over σ2) x (over σ2) x x x x μ μ μ μ μ μ μ |/ |/ | |/ σ σ σ σ	*	*			**
b. x (over σ1) x (over σ1) x x x x μ μ μ μ μ μ μ |/ |/ | |/ σ σ σ σ	*	*			***!
c. x (over σ4) x (over σ4) x x x x μ μ μ μ μ μ μ |/ |/ | |/ σ σ σ σ	*	*		*!	
d. x (over σ3) x (over σ3) x x x x μ μ μ μ μ μ μ |/ |/ | |/ σ σ σ σ	*	*	*!		*
e. x (over σ2) x (over σ2) x x x x x x x μ μ μ μ μ μ μ |/ |/ | |/ σ σ σ σ	**!**				**

In (56), candidate (e) is excluded by NFin(x_μ, μ, σ) 'no entries over syllable-final moras' because its bimoraic syllables are multipositionally mapped. Since the remaining candidates must stress a monopositionally mapped syllable, each violates NFin(x_F, x_μ, σ) 'no stress over syllable-final mora-level gridmarks', and the evaluation proceeds to NFin(x_F, μ, σ) 'no stress over syllable final moras'. NFin(x_F, μ, σ) excludes the (d) candidate's stressed monomoraic syllable, leaving the stressed bimoraic syllables in candidates (a-c). NFin(x_F, σ, ω) 'no stress on prosodic word-final syllables' excludes candidate (c), because it has final stress, and x_F-R excludes candidate (b), because the gridmark column occurs further to the left than necessary to avoid final stress. Candidate (a), which stresses the rightmost nonfinal bimoraic syllable, emerges as the winner.[21]

We have seen, then, how differences in gridmark mapping help to produce systems like Kelkar's Hindi where trimoraic syllables form a separate level of prominence. When mora-level gridmarks are banned from syllable-final moras, trimoraic syllables are still potentially m-heavy while bimoraic syllables must be m-light. This allows NFin(x_F, x_μ, σ) 'no stress on syllable-final mora-level gridmarks' to distinguish between them, creating an additional level of prominence.

4.3 Summary

In Sections 3 and 4, we saw how NonFinality helps to produce prominence sensitivity in weight-based systems. Section 3 examined default-to-same systems, and demonstrated how the proposal produces basic two-way prominence contrasts and how it handles certain three-way contrasts where trimoraic syllables are not a factor. Section 4 examined stress's sensitivity to gridmark mapping in default-to-opposite systems and in systems where trimoraic syllables help to establish three-way contrasts. Next, we extend the analysis to sonority-based systems, which often display more contrasts in prominence than weight-based systems. Section 5 demonstrates that an analysis based on p-weight and m-weight, combined with the effects of the $*V_{\mu\mu}$ constraints, can produce two, three, and even five levels of prominence.

5. Vowel Sonority

As discussed in Section 1.3, the proposal incorporates sonority-based systems into its weight-based approach by using Kenstowicz' (1994) $*V_{\mu\mu}$ constraints to translate vowel sonority into syllable weight. At first glance, it might seem that the approach would be inadequate on empirical grounds. We have seen that it can produce three-way contrasts using two-way distinctions in weight-based systems, but sonority-based systems can involve up to five-way contrasts. Such doubts can be overcome, however, once we realize that the possible contrasts are already incorporated into the universal ranking of the $*V_{\mu\mu}$ constraints. When the proposal translates sonority into syllable weight, it simply fixes the number of contrasts appropriate for a particular language and renders them in a form that NonFinality constraints can detect.

The number of contrasts is fixed for a particular language by combining the ranking of $*V_{\mu\mu}$ constraints with the ranking NonFinality >> gridmark alignment:

(57) Vowel sonority contrasts
- a. Two levels
  $*V_{\mu\mu}$ >> $*V_{\mu\mu}$ >> NonFinality >> Alignment >> $*V_{\mu\mu}$ >> $*V_{\mu\mu}$ >> $*V_{\mu\mu}$
- b. Three levels
  $*V_{\mu\mu}$ >> $*V_{\mu\mu}$ >> NonFinality >> $*V_{\mu\mu}$ >> Alignment >> $*V_{\mu\mu}$ >> $*V_{\mu\mu}$
- c. Five levels
  NonFinality >> $*V_{\mu\mu}$ >> $*V_{\mu\mu}$ >> $*V_{\mu\mu}$ >> $*V_{\mu\mu}$ >> $*V_{\mu\mu}$ >> Alignment

In general, as indicated in (57), the vowels mentioned in the $*V_{\mu\mu}$ constraints that dominate NonFinality will form a single level of prominence, and the vowels mentioned in the $*V_{\mu\mu}$ constraints dominated by gridmark alignment will form a single

[21] When a form has only monomoraic syllables, like (51e), /samîti/, the ranking returns stress to its default position over the penult.

level of prominence. There will also be a separate level of prominence for each *$V_{\mu\mu}$ constraint that ranks between NonFinality and gridmark alignment. Examples of the schemas in (57a-c) are examined in Sections 5.1 - 5.3.

5.1 Two-Way Contrast: Mokshan

Mokshan (Tsygankin and Debaev 1975, Kenstowicz 1996) presents an example of a two-way sonority-based contrast. It has a left-oriented default-to-same system where the mid and low peripheral vowels [e, o, ä, a] are prominent, and the high peripheral vowels [i, u] and the central vowel [ɨ] are nonprominent:

(58) [e, o, ä, a]	a.	rámasak	'you buy it'
	b.	kélas'kä	'fox'
	c.	nóldasak	'you release it'
[e, o, ä, a] > [i, u, ɨ]	d.	tɨrgádat	'you fight'
	e.	tušɨndát	'you go away'
	f.	k'él'ɨpl'ɨms	'to widen'
[i, u, ɨ]	g.	púvɨndɨms	'to press'
	h.	pɨ́s't'ɨrdɨms	'to roll with the feet'
	i.	kúlit'i	'in that ash'

When a form contains only nonprominent vowels, as in (58g-i), Mokshan stresses the initial syllable. When prominent vowels are present, as in (58a-f), stress shifts to the leftmost syllable containing a prominent vowel.

Since Mokshan maintains two levels of prominence, the ranking of *$V_{\mu\mu}$ constraints must be divided at a single point, as in the (57a) schema. NFin(x_F, μ, σ) 'no stress on syllable-final moras' is used as the weight-sensitive NonFinality constraint, and x_F-L is the alignment constraint used to establish the default edge:

(59) Mokshan ranking

*[ɨ]$_{\mu\mu}$ >> *[ə]$_{\mu\mu}$ >> *[i,u]$_{\mu\mu}$ >> NFin(x_F, μ, σ) >> x_F-L >> *[e,o]$_{\mu\mu}$ >> *[a]$_{\mu\mu}$

As indicated in (59), *[ɨ]$_{\mu\mu}$, *[ə]$_{\mu\mu}$, and *[i, u]$_{\mu\mu}$ all dominate NFin(x_F, μ, σ) and x_F-L, and NFin(x_F, μ, σ) and x_F-L both dominate *[e, o]$_{\mu\mu}$ and *[a]$_{\mu\mu}$. In the discussion that follows, we will see how this ranking establishes [i, u, ɨ] and [e, o, ä, a] as separate levels of prominence, with the latter being more prominent than the former.

First, consider how the set of central vowels and high peripheral vowels are established as a single level of prominence. Since *[ɨ]$_{\mu\mu}$, *[ə]$_{\mu\mu}$, and *[i, u]$_{\mu\mu}$ all dominate NFin(x_F, μ, σ), [i, u, ɨ] cannot be made multimoraic for the purpose of avoiding stress on a syllable-final mora. This being the case, when a form contains only central vowels or high peripheral vowels, the ranking *[ɨ]$_{\mu\mu}$ >> *[ə]$_{\mu\mu}$ >> *[i, u]$_{\mu\mu}$ fails to determine the position of stress, and the decision falls to the lower ranked x_F-L. The tableau (60) demonstrates using a form like (58a), /púvɨndɨms/.

(60)

Cu.CɨC.CɨCC	*[ɨ]$_{\mu\mu}$	*[ə]$_{\mu\mu}$	*[i, u]$_{\mu\mu}$	NFin(x_F, μ, σ)	x_F-L
☞ a. x x x x x μ μ μ | | | u ɨ ɨ				*	
b. x x x x x μ μ μ | | | u ɨ ɨ				*	*!
c. x x x x x μ μ μ μ |/ | | u ɨ ɨ			*!		
d. x x x x x μ μ μ μ | |/ | u ɨ ɨ	*!				*

In (60), *[ɨ]$_{\mu\mu}$ excludes candidate (d), because its stressed syllable contains a multimoraic [ɨ], and *[i, u]$_{\mu\mu}$ excludes candidate (c), because its stressed syllable contains a multimoraic [u]. Since the remaining candidates both stress monomoraic vowels, violating NFin(x_F, μ, σ), the decision falls to x_F-L. x_F-L excludes candidate (b) because its gridmark column occurs further to the right, and candidate (a) emerges as the winner.

Next, consider how the mid and low peripheral vowels are established as a single level of prominence. Since NFin(x_F, μ, σ) dominates both *[e, o]$_{\mu\mu}$ and *[a]$_{\mu\mu}$, the vowels [e, o, ä, a] can all be multimoraic to allow stress to avoid a syllable-final mora. Since x_F-L also dominates *[e, o]$_{\mu\mu}$ and *[a]$_{\mu\mu}$, alignment will determine which vowel must be bimoraic before the ranking *[e, o]$_{\mu\mu}$ >> *[a]$_{\mu\mu}$ can realize its preference for a bimoraic low peripheral vowel. The (61) tableau demonstrates using a form like (58b), /kélas’kä/.

(61)

Ce.CaC.Cä	NFin(x_F, μ, σ)	x_F-L	*[e, o]$_{\mu\mu}$	*[a]$_{\mu\mu}$
☞ a. x x x x x μ μ μ μ |/ | | e a ä				*
b. x x x x x μ μ μ μ | |/ | e a ä		*!	*	
c. x x x x x μ μ μ | | | e a ä	*!			
d. x x x x x μ μ μ | | | e a ä	*!	*		

In (61), NFin(x_F, μ, σ) excludes the stressed monomoraic syllables of candidates (c, d). Candidate (a) satisfies NFin(x_F, μ, σ) at the expense of *[e, o]$_{\mu\mu}$, and candidate (b) satisfies NFin(x_F, μ, σ) at the expense of *[a]$_{\mu\mu}$. Since x_F-L dominates both *$V_{\mu\mu}$ constraints, however, they do not have a chance to contribute to the evaluation. x_F-L excludes the (b) candidate's stressed [a], because its gridmark column is further to the right, and the (a) candidate's stressed [e] emerges as the winner.

Finally, because *[ɨ]$_{\mu\mu}$, *[ə]$_{\mu\mu}$, and *[i, u]$_{\mu\mu}$ dominate NFin(x_F, μ, σ) but *[e, o]$_{\mu\mu}$ and *[a]$_{\mu\mu}$ do not, the level consisting of central vowels and high peripheral vowels is less prominent than the level consisting of mid and low peripheral vowels. As (62) demonstrates, using a form like (58d), /tɨrgádat/, [e, o, ä, a] can be bimoraic to satisfy the requirement that stress avoid a syllable-final mora, but [i, u, ɨ] cannot.

(62)

CɨC.Ca.CaC	$[\text{ɨ}]_{\mu\mu}$	$[\text{ə}]_{\mu\mu}$	$[\text{i, u}]_{\mu\mu}$	NFin (x_F, μ, σ)	x_F-L	$[\text{i, u}]_{\mu\mu}$	$[\text{a}]_{\mu\mu}$

☞ a.
    x
    x
x x x
μ μμ μ
| |/ |
ɨ a a
					*		*

b.
        x
        x
x x x
μ μ μμ
| | |/
ɨ a a
					**!		*

c. x x x x x μ μ μ | | | ɨ a a				*!			
d. x x x x x μμ μ μ |/ | | ɨ a a	*!						

In (62), $*[\text{ɨ}]_{\mu\mu}$ excludes the (d) candidate's stressed [ɨ], because it is multimoraic, and NFin(x_F, μ, σ) excludes the (c) candidate's stressed [ɨ], because it is monomoraic. The remaining candidates both stress a multimoraic [a], but x_F-L excludes candidate (b) because its gridmark column occurs further to the right. This leaves candidate (a), which stresses the leftmost [a], as the winner.

In examining Mokshan, then, we have seen how the proposal produces a two-way sonority-based contrast. When we insert NFin(x_F, μ, σ) and x_F-L between $*[\text{i, u}]_{\mu\mu}$ and $*[\text{e, o}]_{\mu\mu}$, [e, o, ä, a] may be bimoraic in order to stress a leftmost multimoraic syllable, but [i, u, ɨ] may not.

5.2 Three-Way Contrast: Chukchee

Chukchee (Skorik 1961, Krause 1979, Kenstowicz 1996) provides an example of a three-way sonority-based contrast. The mid and low peripheral vowels [e, o, a] are more prominent than the high peripheral vowels [i, u], and the high peripheral vowels [i, u] are more prominent than the mid central vowel [ə]. The forms most helpful in illustrating the contrast have suffixes with segmental content sufficient to form a syllable following the base.[22] In such forms, Chukchee exhibits a right-oriented default-to-same system confined to the base's final two syllables:[23]

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[22] In unaffixed forms and forms where affixes do not contain sufficient material to provide a syllable following the base, Chukchee typically stresses the base's penultimate syllable. This is due to the effects of a high-ranking NonFinality constraint like NFin(x_F,

(63) [e, o, a] > [i, u], [ə]	a.	wéni-wen	'bell (abs. sg.)'
	b.	céri-cer	'dirt (abs. sg.)'
	c.	nuté-nut	'land (abs. sg.)'
	d.	piŋé-piŋ	'snowfall (abs. sg)'
	e.	tátləŋ-ək	'to answer'
	f.	rócgəp-ək	'to enervate'
[i, u] > [ə]	g.	pipíqəlg-ən	'mouse'
[e, o, a]	h.	qorá-ŋə	'reindeer (abs. sg.)'
	i.	jatjól-te	'fox (abs. pl.)'
[i, u]	j.	tití-ŋə	'needle (abs. sg.)'
[ə]	k.	rətkgə́t-ək	'to get stuck'
	l.	rəmə̣́t-ək	'to wash up'

When the base's final two syllables have vowels that differ in prominence, as in (63a-g), Chukchee stresses the syllable containing the most prominent vowel. When the base's final two syllables have vowels are that equal in prominence, as in (63h-l), Chukchee stresses the final syllable.

To produce Chukckee's three-way contrast, we split the ranking of $*V_{\mu\mu}$ constraints at two points, as in the (57b) schema, so that a single $V_{\mu\mu}$ constraint intervenes between NonFinality and gridmark alignment:

(64) Chukchee ranking

$*[ɨ]_{\mu\mu}$ >> $*[ə]_{\mu\mu}$ >> NFin(x_F, μ, σ) >> $*[i, u]_{\mu\mu}$ >> x_F-R >> $*[e, o]_{\mu\mu}$ >> $*[a]_{\mu\mu}$

As in Mokshan, the vowels mentioned in the $*V_{\mu\mu}$ constraints that dominate NonFinality – in this case, central vowels – form the lowest level of prominence, and vowels mentioned in the $*V_{\mu\mu}$ constraints dominated by Alignment – in this case, mid and low peripheral vowels – form the highest level of prominence. An intermediate level is formed by the high peripheral vowels mentioned in the $*V_{\mu\mu}$ constraint ranked between NFin(x_F, μ, σ) and x_F-R. These vowels may be multimoraic in order to avoid stressing a syllable-final mora, but they cannot be multimoraic simply for the purpose of moving stress further to the right. In other words, high peripheral vowels can be multimoraic like mid and low peripheral vowels, but they can be multimoraic in fewer contexts.

To illustrate how the ranking produces the required three levels of prominence, consider the case where the final two syllables of the base contain a high peripheral vowel and a central vowel. As (65) demonstrates, using a form like (63g), /pipíqəlg-

σ, ω) 'no stress on prosodic word-final syllables'. An exception is when stress occurs on the ultima to avoid a penultimate [ə], as in /ətlá/ 'mother' and /ɤənún/ 'middle'. This exception provides further support for [ə] being the least prominent vowel. A form may violate NFin(x_F, σ, ω) to avoid stressing [ə] but not to avoid stressing the more prominent vowels.

[23] We can restrict stress to a two-syllable window by positioning the prosodic word's head foot appropriately. In Chukchee, we would align the head foot with the base's right edge. A similar consideration arises in the analysis of Kobon below.

ən/, high peripheral vowels are more prominent than central vowels because the former can become multimoraic to avoid stressing a syllable-final mora but the latter cannot.

(65)

Ci.Ci.CəCC-	$*[\text{ɨ}]_{\mu\mu}$	$*[\text{ə}]_{\mu\mu}$	NFin(x_F, μ, σ)	$*[\text{i, u}]_{\mu\mu}$	x_F-R
☞ a. x (on 2nd syllable) x (on 2nd syllable) x x x μ μμ μ | |/ | i i ə				*	*
b. x (on 3rd syllable) x (on 3rd syllable) x x x μ μ μ | | | i i ə			*!		
c. x (on 3rd syllable) x (on 3rd syllable) x x x μ μ μμ | | |/ i i ə		*!			

In (65), $*[\text{ə}]_{\mu\mu}$ excludes candidate (c) because its stressed syllable contains a multimoraic [ə]. NFin(x_F, μ, σ) excludes candidate (b), because its stressed syllable is monomoraic, and stress fails to avoid a syllable-final mora. Although the optimal candidate (a) violates $*[\text{i, u}]_{\mu\mu}$ and x_F-R, stressing a multimoraic [i] satisfies the higher ranked NFin(x_F, μ, σ) without violating $*[\text{ə}]_{\mu\mu}$.

Next, consider a case where the base's final two syllables contain a high peripheral vowel and a nonhigh peripheral vowel. High peripheral vowels are less prominent than mid and low peripheral vowels, because a high peripheral vowel cannot be multimoraic to shift stress to the right when a mid or low peripheral vowel is available. As (66) demonstrates, using a form like (63a), /wéni-wen/, a mid or low peripheral vowel must be stressed even if it occurs further to the left.

(66)

Ce.Ci-	NFin(x_F, μ, σ)	*[i, u]$_{\mu\mu}$	x_F-R	*[e, o]$_{\mu\mu}$	*[a]$_{\mu\mu}$
☞ a. x x x x μ μ μ |/ | e i			*	*	
b. x x x x μ μ μ | |/ e i		*!			
c. x x x x μ μ | | e i	*!				

In (66), NFin(x_F, μ, σ) excludes candidate (c), because its stressed syllable is monomoraic, and stress fails to avoid a syllable-final mora. *[i, u]$_{\mu\mu}$ excludes candidate (b) because its stressed syllable contains a multimoraic [i]. The optimal candidate (a) violates *[e, o]$_{\mu\mu}$ with its multimoraic [e] and x_F-R with its retracted stress. Stressing a multimoraic [e], however, satisfies the higher ranked NFin(x_F, μ, σ) without violating *[i, u]$_{\mu\mu}$.

In examining Chukchee, then, we have seen how the proposal produces a three-way sonority-based contrast. Central vowels are least prominent, because they cannot be made multimoraic to allow stress to avoid a syllable-final mora. High peripheral vowels have intermediate prominence, because they can be made multimoraic in the absence of mid and low peripheral vowels to avoid stress on a syllable final mora, but they cannot be made multimoraic simply to shift stress closer to the right edge. Mid and low peripheral vowels are most prominent, because they can always be made multimoraic, either to avoid stress on a syllable-final mora or to shift stress closer to the right edge.

5.3 Five-Way Contrast: Kobon

Our final example of sonority sensitivity is Kobon (Davies 1981, Kenstowicz 1996), a language with a five-way sonority contrast. Least prominent in Kobon is the high central vowel [ɨ]. More prominent is the mid central vowel [ə], then the high peripheral vowels [i, u], and then the mid peripheral vowels [e, o]. Most prominent is the low peripheral vowel [a]. The prominence contrasts are most easily seen in unaffixed words, which confine stress to the final two syllables:

(67) [a] > [e, o, i, u, ə, ɨ]	a.	hagápe	'blood'
	b.	kɨdolmáŋ	'arrow type'
	c.	ki.á	'tree species'
	d.	ái.ud	'story'
	e.	wái.əŋ	'cassowary'
	f.	áñɨm#áñɨm	'to lightening'
[e, o] > [i, u, ə, ɨ]	g.	mó.u	'thus'
	h.	si.óg	'bird species'
	i.	gɨró#gɨró	'to talk' – of mother pig to piglet.
[i, u] > [ə, ɨ]	j.	galínəŋ	'bird species'
	k.	ɫú.əɫ	'horizontal house timbers'
	l.	mú.is	'edible fungus species'
[ə] > [ɨ]	m.	gɨsə́#gɨsə́	'to tap'
[i, u]	n.	dúbu#dúbu	'to make noise by footsteps'
	o.	jínup#jínup	'to make squeaking noise, bird, rat'
[ɨ]	p.	kɨjɨ́gɨl	'tattoo'

When the final two syllables contain vowels that differ in prominence, as in (67a-m), Kobon stresses the syllable with the most prominent vowel. When the final two syllables contain vowels that are equal in prominence, as in (67n-p), Kobon stresses the leftmost.

In an analysis of Kobon, two issues must be addressed. The first is which particular NonFinality constraint is involved. Unlike Mokshan and Chukchee, Kobon has diphthongs, and we can assume that both vowels in a sequence are moraic, so that syllables containing diphthongs will always be at least bimoraic. Since diphthongs do not seem to affect stress, however, we will focus on the p-weight of the individual vowels, much like we did for Maori in Section 3.2.2.[24] NFin(x_F, μ, V) 'no stress on vowel-final moras' is the appropriate choice here.

[24] Since [a] is the only vowel that can be initial in a Kobon diphthong, focusing on the weight of vowels rather than syllables is not actually necessary in this case. The mora accompanying the second vowel would always be added to a syllable with [a], redundantly ensuring that such syllables are prominent. I focus on individual vowels here because the analysis points to a solution for a potential difficulty for the proposed account. The difficulty arises in languages like Lushutseed (Hess 1976, Odden 1979) which have sonority-based contrasts but also appear to have phonemic vowel length distinctions. It seems as if the proposed account would have to use multimoraic status to represent both phonemic length and vowel sonority in the same language. This creates two problems. First, some multimoraic vowels would be phonetically long while others would not. Although I have argued that it should not be problematic for the phonetics to interpret the length of multimoraic vowels differently in different languages, it is much less desirable to allow for differing interpretations within the same language. Second, a syllable with a long vowel might attract stress even when syllables with more sonorous short vowels are available. We can overcome both problems if we treat the apparent long vowels in these systems as sequences of homorganic short vowels. We can then use NonFinality constraints that apply to the vowel domain to focus on individual vowels, ignoring the additional weight of syllables with homorganic sequences, much like we can ignore the additional weight of syllables with diphthongs. Other options are available, but this seems to be one of the most promising.

The second issue is how to obtain the appropriate number of prominence levels. Since Kobon has five levels, the simplest method is to position each of the five *V$_{\mu\mu}$ constraints between NonFinality and gridmark alignment, as in the (57c) schema.

(68) Kobon ranking
NFin(x_F, μ, V) >> *[ɨ]$_{\mu\mu}$ >> *[ə]$_{\mu\mu}$ >> *[i, u]$_{\mu\mu}$ >> *[e, o]$_{\mu\mu}$ >> *[a]$_{\mu\mu}$ >> x_F-L

In (68), neither gridmark alignment nor NonFinality divides the ranking of *V$_{\mu\mu}$ constraints into smaller sections. The high-ranked NonFinality constraint requires all stressed vowels to be multimoraic, and the low-ranked alignment constraint cannot interfere with the *V$_{\mu\mu}$ constraints' preferences with respect to which vowels should be multimoraic. This means that the *V$_{\mu\mu}$ constraints are free to establish the maximum number of prominence contrasts.

Although the ranking creates five levels of prominence, in the interests of space, I will provide only two tableau to illustrate how the contrasts are established. The remaining contrasts are established in a similar fashion. First, consider a case where a form's final two syllables contain [ɨ] and [ə]. As (69) demonstrates, using a form like (67m), /gɨsə́#gɨsə́/, high central vowels and mid central vowels form two separate levels of prominence, with mid central vowels being more prominent.

(69)

Cɨ.Cə	NFin (x_F, μ, V)	*[ɨ]$_{\mu\mu}$	*[ə]$_{\mu\mu}$	*[i, u]$_{\mu\mu}$	*[e, o]$_{\mu\mu}$	*[a]$_{\mu\mu}$	x_F-L
☞ a. x x x x μ μ μ | |/ ɨ ə			*				*
b. x x x x μ μ μ |/ | ɨ ə		*!					
c. x x x x μ μ | | ɨ ə	*!						

In (69), NFin(x_F, μ, V) excludes the (c) candidate's stressed [ɨ], because it is monomoraic, and stress fails to avoid a vowel-final mora. *[ɨ]$_{\mu\mu}$ excludes the (b) candidate's stressed [ɨ], because it is multimoraic. This leaves the (a) candidate's stressed multimoraic [ə] as the winner. The low-ranked alignment constraint, x_F-L, does not contribute to the evaluation.

Next, consider a case where the final two syllables of a form contain [o] and [a]. As the (70) tableau demonstrates, using a form like (67b), /kɨdolmáŋ/, mid peripheral vowels and low peripheral vowels form two separate levels, with the low vowels being more prominent.

(70)

Cɨ.CoC.CaC	NFin (x_F, μ, V)	*[ɨ]$_{μμ}$	*[ə]$_{μμ}$	*[i, u]$_{μμ}$	*[e, o]$_{μμ}$	*[a]$_{μμ}$	x_F-L
☞ a. x x x x μ μ μ | |/ o a						*	*
b. x x x x μ μ μ |/ | o a					*!		
c. x x x x μ μ | | o a	*!						

In (70), NFin(x_F, μ, V) excludes the (c) candidate's stressed [o] because it is monomoraic, and stress fails to avoid the vowel-final mora. *[e, o]$_{μμ}$ excludes the (b) candidate's stressed [o] because it is multimoraic. The (a) candidate's stressed multimoraic [a] emerges as the winner.

In examining Kobon, then, we have seen that the proposal can also produce a five-way sonority-based contrast. Positioning all of the *V$_{μμ}$ constraints between NonFinality and gridmark alignment creates five separate levels of prominence. Because there are no intervening constraints that can cause the individual levels specified by the *V$_{μμ}$ constraints to merge, they are free to establish the maximum number of prominence contrasts.

6. Summary and Conclusion

The article outlined three criteria that a general theory of prominence-sensitive stress should meet: it should not endow the grammar with a significant ability to count moras, it should provide a uniform mechanism that makes stress prominence-sensitive, and it should provide the different types of prominence with a uniform representation. Taking them up in reverse order, the proposal provides a uniform representation for syllable weight and vowel sonority simply by translating the latter into the former. Although the proposal posited two types of syllable weight – p-weight and m-weight – it is not the case that one type of weight applies to one type of prominence but not the other.[25]

The representations of p-weight and m-weight are also sufficiently similar that a uniform mechanism can detect them. P-weight is measured by the number of moras

[25] Although the examples of sonority-based systems in Section 5 were all default-to-same systems and did not require the involvement of m-weight, m-weight would be necessary to introduce conflicting directionality in sonority-based default-to-opposite systems like Chuvash (Krueger 1961) and Eastern Cheremis (Sebeok and Ingemann 1961).

contained within a particular domain (syllable or vowel), and m-weight is measured by the number of mora-level gridmarks contained within a particular domain (syllable or vowel). P-light domains contain one mora and p-heavy domains more than one. Similarly, m-light domains contain one mora-level gridmark and m-heavy domains more than one.

The NonFinality family of constraints provides the uniform mechanism that detects the *one*/*more-than-one* distinction upon which both types of weight are based. By banning stress from domain-final moras, NonFinality ensures that stress occupies a p-heavy domain. Similarly, by banning stress from domain-final mora-level gridmarks, NonFinality ensures that stress occupies an m-heavy domain. In turning even the basic *one*/*more-than-one* distinction into a *final*/*nonfinal* distinction, the proposal meets the criterion that the grammar have no significant ability to count moras (or mora-level gridmarks).

The proposal was tested against a variety of prominence-sensitive systems. Some were sonority-based and others weight-based. Some exhibited only two levels of prominence and others three or more levels. In Section 3, we saw how NonFinality's sensitivity to p-weight helps to produce weight-based default-to-same systems. It accounts for two-way contrasts in languages like Murik and Yana and three-way contrasts in languages like Kashmiri and Maori. Allowing a coda's moraic status to vary according to context helps to account for Kashmiri's coda-sensitive three-way contrast, and focusing on the p-weight of individual vowels, as well as syllables, accounts for Maori's diphthong-sensitive three-way contrast.

In Section 4, we saw how NonFinality's sensitivity to m-weight allows the proposal to produce weight-based default-to-opposite systems and systems where three-way contrasts involve superheavy syllables. In default-to-opposite systems like Selkup, m-weight's ability to distinguish stressed p-heavy syllables from other syllables allows the proposal to introduce conflicting directionality. In languages with superheavy syllables, like Classical Arabic and Kelkar's Hindi, m-weight allows the proposal to distinguish trimoraic syllables from bimoraic syllables without having to distinguish between *two* and *more-than-two*.

I extended the weight-based analysis to sonority-based systems in Section 5. By appropriately positioning NonFinality and gridmark alignment in relation to the universally ranked $*V_{\mu\mu}$ constraints, the proposal accounts for Mokshan's two-way contrast, Chukchee's three-way contrast, and even Kobon's five-way contrast.

Having developed a uniform approach to the canonical cases, the next step is to explore the possibility of extending the analysis to additional cases of prominence-sensitive stress. Hayes (1995) lists onset sensitivity and tone sensitivity as additional members of this class. Of these additional types, onset sensitivity is a marginal phenomenon, and its inclusion with the canonical cases seems dubious. Although Pirahã (Everett and Everett 1984, Everett 1988) is arguably a right-oriented default-to-same system confined to a trisyllabic window, there seem to be no cases of onset-sensitive default-to-opposite systems. For the few systems with onset-sensitive stress, it makes more sense simply to align head syllables with consonants (see Hyde, forthcoming) or with particular features of consonants than to try to incorporate the phenomenon into a general approach to prominence sensitivity.

The second type, tone sensitivity, seems to be a more promising candidate. Although it also appears to be fairly rare, it can at least be found in both default-to-same and default-to-opposite systems (see de Lacy 1999). Also, since moras are often considered to be the tone-bearing unit (see Odden 1995, for discussion), tones may parallel syllables and vowels in that they have the moraic associations necessary to make a weight-based analysis plausible. I leave to future research, however, the question of whether or not we can actually incorporate tone sensitivity into the general approach presented above.

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