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*A restrictive theory of metrical stress**

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Focusing on weight-insensitive binary stress systems, the article presents an approach to metrical stress that is more restrictive than standard approaches and more accurate in its predictions. The proposal's restrictiveness derives from a set of constraints and structural assumptions that run counter to prevailing theories' fundamental principles. For example, the proposed account assumes strict succession between prosodic categories, ensuring that syllables are exhaustively parsed into feet. It tolerates improper bracketing of prosodic categories, allowing feet to overlap and to share entries on the metrical grid. Finally, it makes the foot–stress relationship violable, allowing feet to remain stressless under appropriate rankings. The article examines each of these assumptions and demonstrates how they combine to more accurately predict attested typologies.

1 Introduction

The standard approach[1] to metrical stress fails to obtain a close match between predicted and attested typologies. Especially problematic are its predictions concerning iambic–trochaic asymmetries – asymmetries that arise in the attested typology when an attested trochaic pattern does not have an attested iambic counterpart or when an attested iambic pattern does not have an attested trochaic counterpart. The standard account's

* The approach to metrical stress proposed here has benefited from the insights of numerous colleagues. I am indebted to Akin Akinlabi, Eric Baković, Laura Benua, Paul de Lacy, Ben Hermans, Ed Keer, Nicole Nelson and Bruce Tesar. I am especially indebted, however, to Alan Prince, whose extensive comments and suggestions have led to improvements in every aspect of the proposal. Any faults remaining are my own responsibility.

[1] In referring to the 'standard approach', I mean to indicate a prominent collection of work in the optimality-theoretic framework that is essentially an adaptation of the earlier classical accounts. Included in this collection would be McCarthy & Prince (1993a), Crowhurst & Hewitt (1995) and subsequent similar proposals that are based on the alignment framework and that assume weak layering, proper bracketing and a one-to-one correspondence between feet and stress. This collection, however, would not include proposals like Kager (2001) or McCarthy (2002), which address issues similar to those addressed below. Although these proposals share the structural assumptions of the standard approach, the role of alignment is significantly reduced.

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failure in this context is not an inability to obtain the attested patterns. It is an inability to exclude the unattested patterns. The approach proposed here is the foundation for a more restrictive theory.

To clarify the issues involved in predicting iambic–trochaic asymmetries, it helps to refer to Prince's (1983) notion of the 'Perfect Grid', a metrical grid with neither clash nor lapse of gridmark entries. Although iambic–trochaic asymmetries are typically described in terms of foot type and footing directionality (see Kager 1993, McCarthy & Prince 1993b and Hayes 1995, among others), describing them in terms of the Perfect Grid provides a clearer picture of their distribution. As we shall see below, patterns that conform to the Perfect Grid never exhibit asymmetries. All such patterns are attested, whether they are iambic or trochaic. Patterns that depart from the Perfect Grid, however, typically exhibit asymmetries. If an attested trochaic pattern contains clash or lapse, it will have an unattested iambic mirror image. If an attested iambic pattern contains clash or lapse, it will have an unattested trochaic mirror image. As one example, the trochaic language Passamaquoddy (LeSourd 1993) stresses the initial syllable and every even-numbered syllable counting from the right, resulting in a clash exactly at the left edge in odd-parity forms. There is apparently no attested language with the mirror-image iambic pattern. Such a language would stress the ultima and every even-numbered syllable counting from the left, resulting in a clash exactly at the right edge in odd-parity forms. As a second example, the trochaic language Pintupi (Hansen & Hansen 1969) stresses every odd-numbered syllable counting from the left, except the ultima. This produces a lapse exactly at the right edge in odd-parity forms. There is apparently no attested language with the mirror-image iambic pattern. Such a language would stress every odd-numbered syllable counting from the right, except the initial syllable. This would produce a lapse exactly at the left edge in odd-parity forms.

As I hope to frame the issue here, predicting iambic–trochaic asymmetries means confining departures from the Perfect Grid to appropriate positions. Clash can occur in certain positions but not in others, and lapse can occur in certain positions but not in others. As we shall see below, the proposed account is much more effective than the standard account when it comes to restricting clash and lapse. The standard account routinely obtains both the attested and unattested patterns in pairs such as those described above. The proposed account, however, is able to obtain the attested patterns while excluding the unattested patterns.

The article proceeds as follows. In the remainder of this section, I will discuss the proposal's individual components. I will present each of the key conditions, constraints and structural configurations and mention their most significant functions. We will see that the proposal makes several departures from the standard account. Among these are a requirement of strict succession between prosodic categories, the toleration of improper bracketing, and the possibility of stressless feet. §2 presents an analysis of the Perfect Grid patterns, the binary patterns that do not

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exhibit iambic–trochaic asymmetries. It examines the multiple roles of alignment constraints in the proposed account, and it examines the proposal's resources for avoiding clash and lapse. §3 demonstrates how the proposal obtains attested departures from the Perfect Grid and how it excludes unattested departures. Crucial to the analysis are the asymmetric formulations of the INITIALGRIDMARK and NON-FINALITY constraints (introduced below). These two constraints are the proposal's only devices for introducing clash and lapse in binary systems. §4 examines the standard account and identifies the particular properties that make it less restrictive. §5 presents some additional advantages obtained under the proposed account, beyond predicting iambic–trochaic asymmetries and §6 contains a summary and concluding remarks.

1.1 Structural assumptions

The proposal's restrictiveness derives from a set of constraints and structural assumptions that run counter to prevailing theories' fundamental principles. First, where standard accounts tolerate weak layering between prosodic categories (see Itô & Mester 1992 and McCarthy & Prince 1993a, among others), the proposed account requires strict succession. Moras must be constituents of syllables, syllables must be constituents of feet, and feet must be constituents of prosodic words. In the present context, strict succession's most important role is to eliminate the possibility of unfooted syllables.

Second, the proposed account preserves a distinction between the metrical grid and the prosodic hierarchy, allowing each to maintain its own internal prominence relationships. This contrasts with prevailing approaches, which typically follow one of two courses. They either take entries on the metrical grid to be the heads of prosodic categories (as in the bracketed grids of Halle & Vergnaud 1987 and Hayes 1995) or they reject the metrical grid altogether, making allowances to interpret the head syllables of feet as stressed. The latter option can be found in recent optimality-theoretic accounts (see, for example, Crowhurst 1996).

In the proposed account, metrical prominence is expressed in the relative height of gridmark columns. Gridmark columns indicate stress (or, more precisely, relative degrees of stress). Prosodic prominence is expressed using a system of prosodic heads. A head is the most prominent immediate constituent of a prosodic category – for example, the head syllable of a foot. We can think of syllables that are heads as the possible locations for stress and of heads that correspond to gridmark columns as the actual locations of stress. The formal separation of the two systems allows the theory to refer to heads and gridmarks independently.

Third, standard accounts insist that prosodic categories maintain proper bracketing (see Liberman 1975, Itô & Mester 1992 and Kenstowicz 1995, among others), but the proposed account frequently utilises the structures illustrated in (1). (In illustrations of proposed structures throughout the article, vertical association lines indicate prosodic heads.)

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(1) a. *Intersecting trochees* b. *Intersecting iambs*



The structures in (1), which I will refer to as INTERSECTIONS, are improperly bracketed feet that share a syllable.

Finally, following Selkirk (1980), standard accounts insist that feet and stress maintain a one-to-one correspondence, but the proposed account often requires that feet share a stress, as in (2a), and sometimes requires that feet remain stressless, as in (2b). (The gridmark in (2a) is a foot-level gridmark. I omit the metrical grid's base level throughout the article.)

(2) a. *Gridmark sharing* b. *Stressless foot*



I will refer to the type of configuration in (2a) as a GRIDMARK-SHARING configuration. Since the two feet both have a foot-level gridmark within their domain, both are stressed. I will refer to the type of configuration in (2b) as a STRESSLESS FOOT. A stressless foot is a foot that does not have a foot-level gridmark within its domain.

Although intersection and gridmark sharing have never been components of a mainstream linguistic theory, the remainder of the assumptions presented above have been features of previous proposals. Strict succession, for example, is not a feature of current approaches, but it was included in Selkirk's (1984) Strict Layer Hypothesis and adopted in numerous subsequent accounts. The separation of the metrical grid and the prosodic hierarchy is similar in spirit, if not in actual execution, to the original proposals of Liberman (1975) and Liberman & Prince (1977). Stressless feet, or at least the possibility of stressless feet, can be found in the proposals of Hayes (1987), Tyhurst (1987), Hung (1993, 1994), Selkirk (1995) and Crowhurst (1996).

Given the differences between the proposed and standard assumptions, representations of even the most basic stress patterns will also be different. Consider, for example, the stress pattern of Choctaw (Nicklas 1972, 1975), which stresses every even-numbered syllable counting from the left, except the ultima.[2]

(3) a. pisa
b. čipísa
c. čipísali
d. čipísačíli

The examples in (3) are combinations of /pisa/ 'to see', /či-/ 'you (OBJ)', /-či/ 'CAUS' and /-li/ 'I (SUBJ)'.

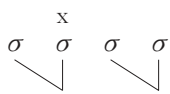
[2] The Choctaw pattern may be perturbed by the presence of heavy syllables. Choctaw is also an iambic lengthening language. I will not address these issues here.

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Standard accounts would assign the type of structure in (4a) to Choctaw's even-parity forms, but the proposed account would assign the type of structure in (4b).

(4) a. *Standard structure* b. *Proposed structure*

$(\sigma\acute{\sigma})\,\sigma\,\sigma$

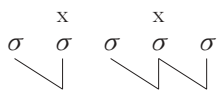


The standard structure exhibits weak layering and a one-to-one correspondence between feet and stress. The proposed structure exhibits strict succession and a stressless foot. Stressless feet are the proposal's primary device for producing strings of stressless syllables.

For odd-parity forms, standard accounts would assign the type of structure in (5a), but the proposed account would assign the type of structure in (5b).

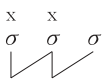
(5) a. *Standard structure* b. *Proposed structure*

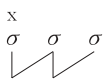
$(\sigma\acute{\sigma})(\sigma\acute{\sigma})\,\sigma$

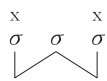


The standard structure exhibits weak layering, proper bracketing and a one-to-one correspondence between feet and stress. The proposed structure exhibits strict succession, improper bracketing and a stress shared between two feet. The primary role of intersection and gridmark sharing[3] in the proposed account is to provide an alternative to monosyllabic feet for parsing the odd syllable of odd-parity forms.

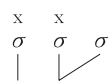
[3] Gridmark sharing implies intersection, but intersection does not imply gridmark sharing. For example, each of the following are possible intersection configurations:

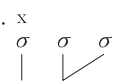
(i) a. 

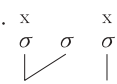
b. 

c. 

In Hyde (2001), I discussed several considerations that make intersections optimal even in configurations, like those in (i), that do not involve gridmark sharing. Since gridmark sharing is the focus here, I will not address these additional considerations. Throughout the article, configurations that might reasonably involve intersection without gridmark sharing are given an alternative structure that utilises a monosyllabic foot:

(ii) a. 

b. 

c. 

For example, (ii.a) is used in place of (i.a), (ii.b) is used in place of (i.b) and (ii.c) is used in place of (i.c).

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1.2 Conditions and constraints

I will distinguish throughout between CONDITIONS and CONSTRAINTS. Conditions are non-violable restrictions on the grammar's Gen component, and Gen cannot produce output candidates that fail these restrictions. Constraints are the violable and ranked requirements contained in the grammar's Eval component. They discriminate between the members of the candidate set that Gen produces.

The proposal includes the following five conditions:

(6) a. *Strict Succession* (adapted from Itô & Mester 1992)
Every prosodic category of level n ($\neq$the maximum level) is immediately dominated by a prosodic category of level $n+1$.

b. *Headedness*
For every prosodic category ($\neq$mora) of level n, there is a prosodic category of level $n-1$ designated as its head.

c. *Gridmark to Head*
Every entry on the metrical grid occurs within the domain of a prosodic head of the appropriate level.

d. *FootCap*
Feet are maximally disyllabic.

e. *HeadGap*
For every two adjacent syllables, one must be a foot-head.

Since the conditions in (6) are non-violable restrictions on Gen, forms that fail these conditions are not potential output candidates. (For this reason, such forms will never be included in tableaux that demonstrate analyses within the proposed framework.) The Strict Succession condition (6a) governs the hierarchical relationships between prosodic categories. In the present context, its most important function is to ensure the exhaustive parsing of syllables into feet. The Headedness condition (6b) ensures that all prosodic categories have heads. Although feet need not be stressed (associated with a foot-level gridmark), they must have a head syllable. The Gridmark to Head condition (6c) governs the relationship between gridmarks and prosodic heads. Gridmarks must correspond to heads, but heads need not correspond to gridmarks. The FootCap condition (6d) limits the maximum size of feet to two syllables. The proposal contains no specific minimality requirement. The HeadGap condition (6e) limits the distance between foot-heads to a single syllable.[4]

As in standard accounts, alignment constraints play a central role in the proposed account. Notice, however, that the constraints in (7) do not retain the standard alignment relationships between the edges of prosodic

[4] The HeadGap condition is similar to Selkirk's (1984) Lapse constraint and to the more recent proposals of Kager (1994), Green (1995) and Green & Kenstowicz (1995). As formulated here, however, the HeadGap condition crucially refers to the heads of feet rather than to gridmarks, feet or stressed syllables.

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words and the edges of feet. Instead, they are alignment relationships between the edges of prosodic words and the edges of foot-heads (see Green 1993 for a previous similar proposal) or between the edges of prosodic words and the edges of foot-level gridmarks.

(7) a. HDS-L
The left edge of every foot-head is aligned with the left edge of some prosodic word.

b. HDS-R
The right edge of every foot-head is aligned with the right edge of some prosodic word.

c. PRWD-L
The left edge of every prosodic word is aligned with the left edge of some foot-head.

d. PRWD-R
The right edge of every prosodic word is aligned with the right edge of some foot-head.

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

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

The alignment constraints in (7a–d) play a significant role in producing binary stress patterns. The foot-head alignment constraints (7a, b) align the edges of foot-heads with the edges of prosodic words, and the prosodic word alignment constraints (7c, d) align the edges of prosodic words with the edges of foot-heads. We shall see in §3 that alignment constraints referring to foot-heads are responsible for determining both foot type and footing directionality and that they also indirectly restrict the occurrence and position of intersections. The gridmark alignment constraints (7e, f), which align the edges of foot-level gridmarks with the edges of prosodic words, do not play a role in producing binary patterns. As we shall see in §5, gridmark alignment constraints allow the proposal to produce ternary and unbounded patterns.

Although alignment constraints are crucial in the proposed account, their influence will be limited. This means that the remaining constraint types will be significant factors in obtaining even the most basic stress patterns:

(8) a. MAPGRIDMARK
A foot-level gridmark occurs within the domain of every foot.

b. *CLASH (adapted from Prince 1983)
For any two gridmark entries on level n ($\neq$ the base level) there is an intervening entry on level $n-1$.

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c. INITIALGRIDMARK
A foot-level gridmark occurs over the leftmost syllable of a prosodic word.

d. NON-FINALITY (adapted from Prince & Smolensky 1993)
No foot-level gridmark occurs over the rightmost syllable of a prosodic word.

The MAPGRIDMARK constraint (8a) discourages stressless feet and the *CLASH constraint (8b) discourages adjacent stressed syllables. The INITIALGRIDMARK constraint (8c) requires stress on a prosodic word's initial syllable[5] and the NON-FINALITY constraint (8d) discourages stress on a prosodic word's final syllable.

Notice that none of the conditions and constraints in (6)–(8) directly restricts intersection or gridmark sharing, and, in this sense, these configurations are freely allowed. Although it may seem counterintuitive at this point, this situation is an important component of the proposal's restrictiveness. As we shall see in §2, a gridmark-sharing configuration is often an alternative to configurations that result in clash or lapse. Making this alternative freely available means that it is more difficult under the proposed account to produce departures from the Perfect Grid.

2 The Perfect Grid patterns

Systems that conform to the Perfect Grid have metrical patterns that contain neither clash nor lapse. Only four such patterns are possible, two trochaic and two iambic, and they are illustrated in (9).

(9) a. *Nengone*

x x x
σ σ σ σ σ σ

x x x
σ σ σ σ σ σ σ

b. *Araucanian*

x x x
σ σ σ σ σ σ

x x x
σ σ σ σ σ σ σ

c. *Maranungku*

x x x
σ σ σ σ σ σ

x x x x
σ σ σ σ σ σ σ

d. *Suruwaha*

x x x
σ σ σ σ σ σ

x x x x
σ σ σ σ σ σ σ

[5] INITIALGRIDMARK differs in three ways from an alignment constraint that might be thought to produce the same results. First, INITIALGRIDMARK cannot be vacuously satisfied. A foot-level gridmark must actually be present to satisfy the constraint. Second, gridmarks that occur away from the designated (left) edge do not incur INITIALGRIDMARK violations. Third, INITIALGRIDMARK has no sister constraint with the opposite directional specification. Such a constraint would require a foot-level gridmark on the final syllable of a prosodic word.

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I will refer to the (9a, b) patterns as the MINIMAL ALTERNATION patterns, since these contain the fewest gridmarks possible without involving a lapse configuration. I will refer to the (9c, d) patterns as the MAXIMAL ALTERNATION patterns, since these contain the most gridmarks possible without involving a clash configuration.

Since each of the Perfect Grid patterns is attested, this group does not contain iambic–trochaic asymmetries. The trochaic pattern (9a) is found in Nengone (Tryon 1967), which stresses every even-numbered syllable counting from the right. The iambic mirror image (9b) is exhibited by Araucanian (Echeverria & Contreras 1965), which stresses every even-numbered syllable counting from the left. The trochaic pattern (9c) is found in Maranungku (Tryon 1970), which stresses every odd-numbered syllable counting from the left. The iambic mirror image (9d) is exhibited by Suruwaha (Everett 1996), which stresses every odd-numbered syllable counting from the right.

2.1 Minimal alternation

Three issues must be addressed in analysing the minimal alternation patterns. The first is the determination of foot type. Nengone requires trochaic footing and Araucanian requires iambic footing. The second is the determination of footing directionality. Nengone requires leftward footing and Araucanian requires rightward footing. As we shall see in §2.1.1, foot type and footing directionality are both determined by the proposal's foot-head alignment constraints. The third issue is how to parse the odd syllable of odd-parity forms. The proposal offers two options. Odd syllables can be parsed with a monosyllabic foot, or they can be included in an intersection. (Given the Strict Succession condition, nonparsing is not an option.) We shall see in §2.1.2 that utilising an intersection to parse the odd syllable allows the minimal alternation patterns to avoid clash and lapse.

2.1.1 *Foot-head alignment*. The primary functions of the foot-head alignment constraints, HDS-L and HDS-R, are to reduce structure, influence foot type and influence footing directionality. Throughout the article, it will be important to keep in mind that these particular constraints refer to foot-heads (syllables with vertical association lines) and not to foot-level gridmarks. To help avoid any initial confusion on this point, in the discussion that follows I have omitted foot-level gridmarks from the tableaux.

Foot-head alignment constraints reduce structure because they demand a minimal number of foot-heads: the fewer the number of feet in a prosodic word, the fewer the number of foot-heads to incur violations. One method to minimise the number of feet is to make them as large as possible. A second method is to avoid intersections.

Together, the FootCap condition and the foot-head alignment constraints largely determine the size of feet. FootCap establishes a universal

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maximum of two syllables, and foot-head alignment encourages feet to occur at this disyllabic maximum whenever possible.[6] As the contrast between (10a) and (10c) illustrates, using disyllabic feet to parse a string of syllables requires fewer feet and produces fewer foot-head alignment violations than using monosyllabic feet. As a result, foot-head alignment restricts the occurrence of monosyllabic feet. HDS-R is used to demonstrate the preferences of foot-head alignment.

(10)

σσσσσσ	HDS-R
☞ a. σ σ σ σ σ σ	** ****
b. σ σ σ σ σ σ	* *** ****
c. σ σ σ σ σ σ	* ** *** **** *****

Foot-head alignment restricts the occurrence of intersections for similar reasons. As the contrast between (10a) and (10b) illustrates, using intersecting feet to parse a string of syllables requires more feet and produces more foot-head alignment violations than using non-intersecting feet.

Foot-head alignment, then, tends to eliminate the additional structure that accompanies monosyllabic feet and intersections. In even-parity forms, like those in (10), foot-head alignment eliminates such structures entirely. In odd-parity forms, foot-head alignment restricts intersections and monosyllabic feet to the single occurrence necessary to parse the odd syllable.

Foot-head alignment's influence over foot type is most easily demonstrated using even-parity forms. HDS-L prefers trochaic footing, and HDS-R prefers iambic footing:

(11)

σσσσσσ	HDS-L	HDS-R
a. σ σ σ σ σ σ	** ****	* *** *****
b. σ σ σ σ σ σ	* *** *****	** ****

In (11), the (a) candidate's trochaic footing allows it to perform better with respect to HDS-L. By positioning themselves at the left edges of the

[6] Foot-head alignment's tendency to eliminate monosyllabic feet only partially explains the absence of a specific foot-minimality requirement. Alignment effects do not account for minimal word phenomena, one of the primary motivations for foot minimality. As argued in Hyde (2001, forthcoming), however, minimal word phenomena can typically be obtained through NON-FINALITY constraints.

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individual feet, the foot-heads also position themselves as near as possible to the left edge of the prosodic word. For similar reasons, the (b) candidate's iambic footing allows it to perform better with respect to HDS-R.

In odd-parity forms, footing directionality also becomes an issue. Foot-head alignment not only restricts intersections and monosyllabic feet to the single instance necessary to parse the odd syllable, it also determines the position in which the intersection or monosyllabic foot occurs. Alignment constraints affect an intersection's position similarly to the way in which they affect a monosyllabic foot's position (see Crowhurst & Hewitt 1995). They prefer the concentration of structure that accompanies an intersection or monosyllabic foot to be as near as possible to the designated edge of alignment. HDS-L prefers that the intersection or monosyllabic foot occur at the prosodic word's left edge, as in (12a, b), and HDS-R prefers that the intersection or monosyllabic foot occur at the prosodic word's right edge, as in (12c, d).

(12)

σσσσσσσ	HDS-L	HDS-R
a. σ σ σ σ σ σ σ	* *** *****	* *** ***** ******
b. σ σ σ σ σ σ σ	* *** *****	* *** ***** ******
c. σ σ σ σ σ σ σ	* *** ***** ******	* *** *****
d. σ σ σ σ σ σ σ	* *** ***** ******	* *** *****

In conjunction with their preferences respecting foot type, then, HDS-L prefers footing that is both leftward and trochaic, and HDS-R prefers footing that is both rightward and iambic. Foot-head alignment, however, does not discriminate between intersections and monosyllabic feet in odd-parity forms. An intersection at the designated edge produces the same violations as a monosyllabic foot. To see why intersections are often preferred over monosyllabic feet, we must examine intersection's utility in avoiding clash and lapse.

2.1.2 *Gridmark sharing*. Intersection's effectiveness in avoiding clash and lapse is most easily demonstrated in considering the odd-parity forms of the minimal alternation patterns. In the minimal alternation patterns, foot-head alignment constraints determine foot type and footing directionality. HDS-L produces the leftward trochaic footing necessary for Nengone and HDS-R produces the rightward iambic footing necessary for Araucanian. Two additional constraints, MAPGRIDMARK and *CLASH, conspire to promote intersections over monosyllabic feet as the method for parsing odd syllables.

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Consider first the Nengone pattern, where stress occurs on every even-numbered syllable counting from the right:

(13) a. móm̥a ‘old man’
b. newáta ‘toe nail’
c. àčakáze ‘sorcerer’
d. wačàruwíwi ‘eel’

In Nengone’s odd-parity forms, HDS-L produces trochaic footing with either an intersection or a monosyllabic foot at the prosodic word’s left edge. The *CLASH and MAPGRIDMARK constraints promote a gridmark-sharing configuration over competing candidates with monosyllabic feet. As (14) demonstrates for a five-syllable form like (13d), /wačàruwíwi/, candidates that use a monosyllabic foot to parse the odd syllable must either tolerate clash, as in (d), or a stressless foot, as in (b) and (c). The stressless foot in candidate (c) results in a lapse configuration. A candidate that uses a gridmark-sharing configuration to parse the odd syllable, as in (a), avoids clash and stressless feet.

(14)

σσσσσ	HDS-L	*CLASH	MAPGM
☞ a. x x / σ σ σ σ σ	* ***		
b. x x / σ σ σ σ σ	* ***		*!
c. x x / σ σ σ σ σ	* ***		*!
d. x x x / σ σ σ σ σ	* ***	*!	

In (14), each candidate satisfies HDS-L as well as possible, given the form’s length. *CLASH excludes the adjacent stressed syllables of candidate (d), and MAPGRIDMARK excludes the stressless feet of candidates (b) and (c). Since its gridmark-sharing configuration satisfies MAPGRIDMARK and *CLASH simultaneously, the Nengone pattern in candidate (a) emerges as the winner. Had we considered an even-parity input, such as (13c), /àčakáze/, HDS-L would still have produced trochaic footing, but footing directionality and the choice between an intersection or a monosyllabic foot would not have been factors in the evaluation.

Next, consider the iambic mirror-image pattern of Araucanian, where stress occurs on every even-numbered syllable counting from the left:

(15) a. wulé ‘tomorrow’
b. ţipánto ‘year’
c. elúmuyù ‘give us’
d. elúaènew ‘he will give me’

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The Araucanian pattern is obtained by replacing the HDS-L constraint from (14) with HDS-R. In odd-parity forms, HDS-R establishes iambic footing with either an intersection or monosyllabic foot at the prosodic word's right edge. *CLASH and MAPGRIDMARK promote a gridmark-sharing configuration over competing candidates with monosyllabic feet. The tableau in (16) demonstrates this new ranking for a five-syllable form like (15d), /elúaènew/.

(16)

σσσσσ	HDS-R	*CLASH	MAPGM
☞ a. x x / σ σ σ σ σ	* ***		
b. x x / σ σ σ σ σ	* ***		*!
c. x x / σ σ σ σ σ	* ***		*!
d. x x x / σ σ σ σ σ	* ***	*!	

In (16), each candidate has optimal rightward foot-head alignment, given the form's length. The Acaucanian pattern in candidate (a) emerges as the winner, because its gridmark-sharing configuration simultaneously satisfies MAPGRIDMARK and *CLASH where the candidates with monosyllabic feet do not. Had we considered an even-parity input, such as (15c), /elúmuyù/, HDS-R would still have produced iambic footing, but footing directionality and the choice between an intersection or a monosyllabic foot would not have been factors in the evaluation.

Notice that the constraints in (14) and (16) are not crucially ranked. The (a) candidates actually harmonically bound the (b–d) candidates with respect to these particular constraints. This is an important factor in the proposal's restrictiveness, because it means that additional constraints would be necessary to obtain clash and lapse configurations like those in the (c, d) candidates. As we shall see in §3, the constraints in the proposed account that can actually produce clash or lapse can only produce them in a limited number of contexts. The proposal will be able to produce the trochaic (14c, d) configurations, for example, but it will not be able to produce the iambic (16c, d) configurations. Next, we examine the role of the prosodic word alignment constraints in producing the maximal alternation patterns.

2.2 Maximal alternation

In certain situations, the prosodic word alignment constraints, PRWD-L and PRWD-R, restrict foot-head alignment's ability to position foot-heads.

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The circumstance arises when a prosodic word alignment constraint dominates a foot-head alignment constraint with the opposite directional specification: either PrWd-L ≫ Hds-R or PrWd-R ≫ Hds-L. The conflicting directionality resulting from such rankings produces the maximal alternation patterns.

Like the minimal alternation patterns, the maximal alternation patterns avoid clash and lapse, but gridmark sharing is not the crucial factor in these cases. Maximal alternation avoids these configurations because conflicting alignment constraints distribute foot-heads in such way that there is no potential conflict between *Clash and MapGridmark. Since conflicting alignment does not produce adjacent foot-heads, there is no opportunity for clash. Since there is no opportunity for clash, there is also no need for the stressless feet that might be used to avoid clash.

Consider first the Maranungku pattern, where stress occurs on every odd-numbered syllable counting from the left:

(17) a. tíralk 'saliva'
b. mǽræpæ̀t 'beard'
c. yáŋarmàta 'the Pleiades'
d. láŋkaràtatì 'prawn'

The Maranungku pattern emerges when PrWd-L dominates Hds-R. In even-parity forms, this ranking produces the typical trochaic pattern, the same pattern produced by leftward foot-head alignment. The tableau in (18) demonstrates this for a four-syllable form like (17c), /yáŋarmàta/.

(18)

σσσσ	PrWd-L	Hds-R
☞ a. x x / σ σ σ σ		* ***
b. x x / σ σ σ σ	*!	**
c. x x / σ σ σ σ	(not a possible candidate)	

Although the trochaic candidate (a) does not perform as well as the iambic candidate (b) with respect to Hds-R, its trochaic footing positions a foot-head at the prosodic word's left edge, allowing it to satisfy the higher-ranked PrWd-L. Candidate (a) emerges as the winner. The type of form illustrated in (c), where an iamb follows a trochee, would also satisfy PrWd-L and would perform better than candidate (a) with respect to Hds-R. Example (c), however, has two syllables intervening between its first and second foot-heads. Since it fails the HeadGap condition, it cannot be considered as an output candidate.

In odd-parity forms, the pattern produced by conflicting alignment differs from the patterns that we have examined previously. As (19)

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demonstrates for a five-syllable form like (17d), /láŋkaràtatì/, the ranking PrWd-L ≫ Hds-R produces a foot pattern that exhibits neither optimal leftward nor optimal rightward foot-head alignment. The foot-heads of the optimal candidate (b) seem to be drawn in both directions at once.

(19)

σσσσσ	PrWd-L	Hds-R	*Clash	MapGM
a. x x σ σ σ σ σ		* *** ***!*		
☞ b. x x x σ σ σ σ σ		** ****		
c. x x σ σ σ σ σ	*!	* ***		

d. x x σ σ σ σ σ (not a possible candidate)

Candidate (a) exhibits the Nengone pattern. It has optimal leftward foot-head alignment, given the form's length. Candidate (c) exhibits the Araucanian pattern. It has optimal rightward foot-head alignment. In candidate (b), which exhibits the Maranungku pattern, the foot-heads are not optimally aligned in either direction. PrWd-L excludes candidate (c) because the prosodic word does not have a foot-head at its left edge. Candidates (a) and (b) both have foot-heads at the prosodic word's left edge, but Hds-R excludes candidate (a) because it has more violations than candidate (b). The Maranungku pattern in candidate (b) emerges as the winner. Since neither the optimal candidate nor its closest competitors violate MapGridmark or *Clash, their ranking is not a crucial factor here. The type of form illustrated in (d), where a trochee precedes two intersected iambs, would also satisfy PrWd-L, MapGridmark and *Clash, and would perform better than candidate (b) with respect to Hds-R. Since (d) has two syllables intervening between its first and second foot-heads, however, it fails the HeadGap condition and cannot be considered as an output candidate.

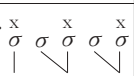
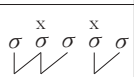
Next consider the iambic mirror-image pattern in Suruwaha, where stress occurs on every odd-numbered syllable counting from the right:

(20) a. mosá 'owl'
b. bàhotá 'to fight'
c. dakùhurú 'to put in the fire'
d. bìhawùhurá 'to fly'

The Suruwaha pattern is obtained by replacing the trochaic ranking PrWd-L ≫ Hds-R from (18) and (19) with the iambic ranking PrWd-R ≫ Hds-L. The tableau in (21) demonstrates the new ranking for a five-syllable form like (20d), /bìhawùhurá/.

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(21)

σσσσσ	PrWd-R	Hds-L	*Clash	MapGM
a. 		* *** ***!*		
☞ b. 		** ****		
c. 	*!	* ***		

Candidate (a) exhibits the Araucanian pattern, candidate (b) exhibits the Suruwaha pattern and candidate (c) exhibits the Nengone pattern. The Suruwaha pattern in candidate (b) emerges as the winner, because it has the best possible leftward foot-head alignment while maintaining a foot-head at the prosodic word's right edge. Had we considered an even-parity input, such as (20c), /dakùhurú/, the ranking PrWd-R ≫ Hds-L would have produced the typical iambic even-parity pattern, the same pattern produced by rightward foot-head alignment.

We have seen, then, that the proposal produces the four patterns that conform to the Perfect Grid. Since each of these patterns is attested, this is the desired result. The possibility of gridmark sharing was crucial in avoiding clash and lapse in the minimal alternation patterns, and conflicting alignment was crucial in avoiding clash and lapse in the maximal alternation patterns. Next, we turn to patterns that depart from the Perfect Grid, the patterns that exhibit iambic–trochaic asymmetries.

3 Departures from the Perfect Grid

The proposed account severely restricts clash and lapse. In fact, the considerations discussed above would eliminate clash and lapse entirely, if the proposal did not also provide specific mechanisms to introduce them. Given the proposal's structural assumptions, the constraints discussed in §2 – foot-head alignment, prosodic word alignment, MapGridmark and *Clash – are only capable of producing the four patterns that conform to the Perfect Grid. To obtain attested variations on the Perfect Grid patterns, we must also consider the InitialGridmark and Non-finality constraints. InitialGridmark and Non-finality are the only devices available to the proposed account for introducing clash and lapse in binary systems.

The relationship between InitialGridmark and Non-finality parallels the relationship between the familiar Onset and NoCoda constraints (Prince & Smolensky 1993). Like Onset, InitialGridmark requires certain material at the left edge of a certain domain. Onset requires a consonant at the left edge of a syllable and InitialGridmark requires a foot-level gridmark at the left edge of a prosodic word. Like NoCoda, Non-finality bans the same material from the right edge of the

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same domain. NoCoda bans consonants from the right edge of a syllable and Non-finality bans foot-level gridmarks from the right edge of a prosodic word.

Neither InitialGridmark nor Non-finality can be exclusively associated with either clash or lapse. InitialGridmark produces both clash and lapse and Non-finality produces both clash and lapse. The difference is that InitialGridmark produces clash or lapse near the left edge of a prosodic word and Non-finality produces clash or lapse near the right edge. The clash and lapse configurations produced by the two constraints, however, are not mirror images of each other. As we shall see in § 3.1, when InitialGridmark produces clash, it produces it exactly at the left edge of the prosodic word. When InitialGridmark produces lapse, it produces it one syllable removed from the left edge. As we shall see in §§ 3.2 and 3.3, when Non-finality produces clash, it produces it one syllable removed from the right edge of the prosodic word. When Non-finality produces lapse, it produces it either exactly at the right edge or immediately preceding the penult.

3.1 Initial gridmark patterns

InitialGridmark's asymmetric formulation allows the proposal to explain iambic–trochaic asymmetries like those in (22).

(22) a. *Passamaquoddy*

x x x
σ σ σ σ σ σ

x x x x
σ σ σ σ σ σ σ

b. *Anti-Passamaquoddy*

x x x
σ σ σ σ σ σ

x x x x
σ σ σ σ σ σ σ

c. *Garawa*

x x x
σ σ σ σ σ σ

x x x
σ σ σ σ σ σ σ

d. *Anti-Garawa*

x x x
σ σ σ σ σ σ

x x x
σ σ σ σ σ σ σ

In (22), the trochaic patterns are attested, but their iambic mirror images are unattested. The trochaic pattern (22a) is found in Passamaquoddy (LeSourd 1993), which stresses the initial syllable and every even-numbered syllable counting from the right:[7]

(23) a. wìcohkémal 'he helps the other'
b. wìcòhkekémo 'he helps out'
c. wìcohkètahámal 'he thinks of helping the other'
d. tèhsàhkwapàsoltíne 'let's walk around on top'

[7] The Passamaquoddy stress pattern may be perturbed by the presence of unstressable vowels. I do not consider such perturbations here.

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There is apparently no example of the iambic mirror image (22b). Anti-Passamaquoddy would stress the ultima and every even-numbered syllable counting from the left. The trochaic pattern (22c) is exhibited by Garawa (Furby 1974), which stresses the initial syllable and every even-numbered syllable counting from the right, except the peninitial syllable:[8]

(24) a. wátjimpàŋu ‘armpit’
b. kámalařìnji ‘wrist’
c. yákalàkalàmpa ‘loose’
d. ŋánkiřikìřimpàya ‘fought with boomerangs’

There is apparently no example of the iambic mirror image (22d). Anti-Garawa would stress the ultima and every even-numbered syllable counting from the left, except the penult.

Satisfying InitialGridmark sometimes requires violating either *Clash or MapGridmark, a consequence that cannot be avoided through gridmark sharing. The circumstance arises in odd-parity forms with leftward foot-head alignment, the configuration exhibited by Nengone's odd-parity forms in §2. Since such forms have two adjacent foot-heads at their left edge, stressing the first foot-head in addition to the second produces a clash exactly at the left edge of the prosodic word. Stressing the first and removing the stress from the second produces a stressless foot. This creates a lapse one syllable removed from the left edge.

When InitialGridmark produces clash in odd-parity forms, the result is the Passamaquoddy stress pattern. Assuming that Hds-L is highly ranked, the closest competitors have two adjacent foot-heads at the prosodic word's left edge. As (25) demonstrates for a seven-syllable form like (23d), /tèhsàhkwapàsoltíne/, ranking InitialGridmark and MapGridmark above *Clash ensures that both heads are stressed:

(25)

σσσσσσσ	Hds-L	InitGr	MapGM	*Clash
☞ a. x x x x / σ σ σ σ σ σ σ	* *** *****			*
b. x x x / σ σ σ σ σ σ σ	* *** *****		*!	
c. x x x / σ σ σ σ σ σ σ	* *** *****	*!		

[8] Furby distinguishes between three levels of stress. Primary stress is initial and secondary stress is penultimate. All intervening stresses are tertiary. Furby's tertiary stress is treated here as secondary stress.

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INITIALGRIDMARK excludes candidate (c), which exhibits the Nengone pattern, because its gridmark-sharing configuration does not position a gridmark over the initial syllable. MAPGRIDMARK excludes candidate (b), because leaving its second foot-head stressless means that its second foot is also stressless. The Passamaquoddy pattern in candidate (a), which only violates the low-ranked *CLASH, emerges as the winner. Had we considered an even-parity input, such as (23c), /wìcohkètahámal/, leftward foot-head alignment would not have produced two adjacent foot-heads, and there would have been no opportunity for clash. The result would have been the typical trochaic even-parity pattern.

When INITIALGRIDMARK produces a lapse in odd-parity forms, the result is the Garawa stress pattern. If we reverse the ranking in (25) between *CLASH and MAPGRIDMARK, satisfying INITIALGRIDMARK produces a stressless foot one syllable removed from the left edge of the prosodic word. The tableau in (26) demonstrates the new ranking for a seven-syllable form like (24d), /ŋánkiřikìřimpàya/.

(26)

σσσσσσσ	HDS-L	INITGR	*CLASH	MAPGM
a. x x x x / σ σ σ σ σ σ σ	* *** *****		*!	
☞ b. x x x / σ σ σ σ σ σ σ	* *** *****			*
c. x x x / σ σ σ σ σ σ σ	* *** *****	*!		

Assuming again that HDS-L is highly ranked, INITIALGRIDMARK excludes Nengone's gridmark-sharing configuration in candidate (c) and *CLASH excludes Passamaquoddy's clash configuration in candidate (a). This leaves the Garawa pattern in candidate (b), with its stressless foot and corresponding lapse configuration, as the winner. Had we considered an even-parity input, such as (24c), /yákalàkalàmpa/, HDS-L would not have produced adjacent foot-heads, and there would have been no occasion for lapse. The result would have been the typical trochaic even-parity pattern.

INITIALGRIDMARK produces attested departures from the Perfect Grid at the left edge of a prosodic word. It allows the proposal to obtain the Passamaquoddy and Garawa patterns as variations on the Nengone pattern. Because INITIALGRIDMARK is asymmetric, however, in that it only affects a prosodic word's left edge, it cannot produce similar departures from the Perfect Grid at a prosodic word's right edge. It does not allow the proposal to obtain the unattested anti-Passamaquoddy and anti-Garawa patterns. As (27) demonstrates, these iambic mirror images are harmonically bounded by Araucanian's gridmark-sharing configuration. Since

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we are now considering iambic patterns, HDS-R replaces HDS-L in the tableau.

(27)

σσσσσσσ	HDS-R	INITGR	MAPGM	*CLASH
☞ a. x x x / σ σ σ σ σ σ σ	* *** *****	*		
b. x x x x / σ σ σ σ σ σ σ	* *** *****	*		*!
c. x x x / σ σ σ σ σ σ σ	* *** *****	*	*!	

In (27), candidate (a) exhibits the Araucanian pattern, candidate (b) exhibits the anti-Passamaquoddy pattern and candidate (c) exhibits the anti-Garawa pattern. Since candidate (a) performs as well as candidate (b) with respect to HDS-R, INITIALGRIDMARK and MAPGRIDMARK, and better with respect to *CLASH, candidate (a) harmonically bounds candidate (b). Since candidate (a) performs as well as candidate (c) with respect to HDS-R, INITIALGRIDMARK and *CLASH, and better with respect to MapGridmark, candidate (a) also harmonically bounds candidate (c). The inability of INITIALGRIDMARK (or any other constraint in the proposal) to undermine gridmark sharing in this context is the crucial factor in producing the desired result.

INITIALGRIDMARK, then, allows the proposal to account for iambic–trochaic asymmetries like those in (22). It allows the proposal to obtain the Passamaquoddy and Garawa patterns without also obtaining their unattested iambic mirror images. The effects of NON-FINALITY result in similar predictions.

3.2 Iambic non-finality patterns

The NON-FINALITY constraint's asymmetric formulation allows the proposal to explain iambic–trochaic asymmetries like those in (28).

(28) a. *Anti-Choctaw*

x x
σ σ σ σ σ σ

x x x
σ σ σ σ σ σ σ

b. *Choctaw*

x x
σ σ σ σ σ σ

x x x
σ σ σ σ σ σ σ

c. *Anti-Aguaruna*

x x x
σ σ σ σ σ σ

x x x
σ σ σ σ σ σ σ

d. *Aguaruna*

x x x
σ σ σ σ σ σ

x x x
σ σ σ σ σ σ σ

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In (28), the iambic patterns are attested and the trochaic mirror images are unattested. The iambic pattern (28b) is found in Choctaw, which stresses every even-numbered syllable counting from the left, except the ultima (cf. (3) above):

(29) a. pisa
b. čipísa
c. čipísali
d. čipísačíli

There is apparently no example of the trochaic mirror image (28a). Anti-Choctaw would stress every even-numbered syllable counting from the right, except the initial syllable. The iambic pattern (28d) is found in Aguaruna (Payne 1990, Hung 1994), which stresses the penult and every even-numbered syllable counting from the left that precedes the penult:[9]

(30) a. ičínàka 'pot (NOM)'
b. ičínakàna 'pot (ACC)'
c. čaŋkínaŋùmìna 'your basket (ACC)'
d. čaŋkínaŋùminàki 'only your basket (ACC)'

There is apparently no example of the trochaic mirror image (30c). Anti-Aguaruna would stress the peninitial syllable and every even-numbered syllable counting from the right that follows the peninitial syllable.

In certain contexts, satisfying NON-FINALITY means violating either MAPGRIDMARK or HDS-R. One such context arises in the even-parity forms of systems with rightward foot-head alignment, systems like the iambic Araucanian from §2. In even-parity forms with iambic footing, final syllables are foot-heads and potential locations for stress. Since NON-FINALITY prohibits stress in this location, it requires a departure from the typical iambic even-parity pattern. Deleting the final stress produces a final stressless foot and a lapse configuration exactly at the right edge of the prosodic word. Shifting the final stress to the left produces a final trochee and a clash configuration one syllable removed from the right edge.

When NON-FINALITY creates a lapse in even-parity forms, the result is the Choctaw stress pattern. As (31) demonstrates for a four-syllable form like (29c), /čipísali/, ranking NON-FINALITY and HDS-R above MAPGRIDMARK produces a final stressless foot.

[9] Hung (1994) infers the positions of stress from the absence of vowel-reduction processes. Her account is based on Payne's (1990) description.

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(31)

σσσσ	Non-fin	Hds-R	MapGM
☞ a. x / σ σ σ σ		**	*
b. x x / σ σ σ σ		* **!	
c. x x / σ σ σ σ		* **!*	
d. x x / σ σ σ σ	*!	**	

Non-finality excludes the Araucanian pattern in candidate (d) with its stressed final iamb and Hds-R excludes both the final trochee of candidate (b) and the thoroughly trochaic candidate (c). Although the Choctaw pattern in candidate (a) violates MapGridmark with its stressless final iamb, MapGridmark is the lowest-ranked constraint, and candidate (a) emerges as the winner. Had we considered an odd-parity input, such as (29d), /čipísačíli/, a gridmark-sharing configuration would have avoided final stress, and there would have been no occasion for lapse.

When Non-finality creates a clash in even-parity forms, the result is the Aguaruna stress pattern. Non-finality and MapGridmark must both dominate Hds-R. This is sufficient to create a final trochee. Hds-R, in turn, must dominate *Clash. This ensures that the remaining feet will be iambs, preserving the desired clash configuration. The (32) tableau demonstrates the ranking Non-finality, MapGridmark ≫ Hds-R ≫ *Clash for a four-syllable form like (30a), /ičínàka/.

(32)

σσσσ	Non-fin	MapGM	Hds-R	*Clash
a. x / σ σ σ σ		*!	**	
☞ b. x x / σ σ σ σ			* **	*
c. x x / σ σ σ σ			* ***!	
d. x x / σ σ σ σ	*!		**	

Non-finality excludes the (d) candidate's Araucanian pattern and MapGridmark excludes the (a) candidate's Choctaw pattern. The decision between candidate (b) with its clash configuration and candidate (c) with its thoroughly trochaic footing is passed on to Hds-R. Because the Aguaruna pattern in candidate (b) has only one trochee where candidate

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(c) has two, it has fewer HDS-R violations and emerges as the winner. Had we considered an odd-parity input, such as (30b), /ičínakàna/, a gridmark-sharing configuration would have avoided final stress and there would have been no occasion for clash.

In iambic even-parity forms, NON-FINALITY produces departures from the Perfect Grid near the prosodic word's right edge. It allows the proposal to obtain the iambic Choctaw and Aguaruna patterns as variations on the Araucanian pattern. Since the mirror-image trochaic patterns are unattested, it is necessary to demonstrate that the proposal makes the correct predictions in this respect as well. NON-FINALITY demands that final syllables be stressless, but it says nothing about initial syllables. Since the proposal has no device in this context for creating stressless initial feet or stressed initial iambs, the anti-Choctaw and anti-Aguaruna patterns are harmonically bounded by the Nengone pattern from §2. Since we are now considering trochaic patterns, HDS-L replaces HDS-R in (33).

(33)

σσσσ	NON-FIN	HDS-L	MAPGM	*CLASH
☞ a. x x / σ σ σ σ		**		
b. x / σ σ σ σ		**	*!	
c. x x / σ σ σ σ		* **!		*!

In (33), candidate (a) exhibits the Nengone pattern, candidate (b) exhibits the anti-Choctaw pattern and candidate (c) exhibits the anti-Aguaruna pattern. Since candidate (a) performs as well as candidate (b) with respect to NON-FINALITY, HDS-L and *CLASH, and better with respect to MAP-GRIDMARK, candidate (a) harmonically bounds candidate (b). Since candidate (a) performs as well as candidate (c) with respect to NON-FINALITY and MAPGRIDMARK, and better with respect to HDS-L and *CLASH, candidate (a) also harmonically bounds candidate (c).

The NON-FINALITY constraint, then, allows the proposal to account for the iambic–trochaic asymmetries in (28). It makes available the iambic Choctaw and Aguaruna patterns without also making available their unattested trochaic mirror images. Although the standard account also uses NON-FINALITY to produce stress patterns like Choctaw and Aguaruna,[10] this is typically the full extent of NON-FINALITY's involvement in binary systems. NON-FINALITY emerges as a more central player in the proposed account in that it is also crucial in obtaining two attested trochaic patterns.

[10] See Kenstowicz (1995) for an analysis of Carib and McCarthy & Prince (1993b) for an analysis of Axininca Campa. Carib and Axininca Campa are similar to Choctaw and Aguaruna with respect to the phenomena under consideration.

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3.3 Trochaic non-finality patterns

NON-FINALITY's asymmetric formulation also allows the proposal to explain iambic–trochaic asymmetries like those in (34).

(34) a. *Pintupi*

x x x
σ σ σ σ σ σ

x x x
σ σ σ σ σ σ σ

b. *Anti-Pintupi*

x x x
σ σ σ σ σ σ

x x x
σ σ σ σ σ σ σ

c. *Piro*

x x x
σ σ σ σ σ σ

x x x
σ σ σ σ σ σ σ

d. *Anti-Piro*

x x x
σ σ σ σ σ σ

x x x
σ σ σ σ σ σ σ

Here, the trochaic patterns are attested, and the iambic mirror images are unattested. The trochaic pattern (34a) is found in Pintupi (Hansen & Hansen 1969), which stresses every odd-numbered syllable counting from the left, except the ultima:

(35) a. mát̪awàna 'through (from) behind'
b. púl̪iŋkàlatju 'we (sat) on the hill'
c. tjámulìmpatjùnku 'our relation'
d. t̪íl̪iřìŋulàmpatju 'the fire for our benefit flared up'

There is apparently no example of the iambic mirror image (34b). Anti-Pintupi would stress every odd-numbered syllable counting from the right, except the initial syllable. The trochaic pattern (34c) is exhibited by Piro (Matteson 1965), which stresses the penult and every odd-numbered syllable counting from the left that precedes the penult, except the antepenult:[11]

(36) a. tšìyaháta 'he cries'
b. sàlwayehkáta 'they visit each other'
c. pètšhitšìmatlóna 'they say they stalk it'
d. rùslunòtinitkána 'their voices already changed'

There is apparently no example of the iambic mirror image (34d). Anti-Piro would stress the peninitial syllable and every odd-numbered syllable counting from the right that follows the peninitial syllable, except the postpeninitial syllable.

The analysis of trochaic Pintupi parallels the analysis of iambic Choctaw and the analysis of trochaic Piro parallels the analysis of iambic Aguaruna. The crucial factor making parallel analyses possible is HDS-R's

[11] Matteson distinguishes between three levels of stress. The penultimate stress is primary, the initial stress is secondary and all intervening stresses are tertiary. Matteson's tertiary stress is treated here as secondary stress.

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role in obtaining both the iambic and trochaic patterns. In §2, we saw that the ranking PrWd-L ≫ Hds-R produces final stress in the odd-parity forms of Maranungku. Since this result conflicts with Non-finality, a highly ranked Non-finality constraint can create variations on this type. As in the iambic cases discussed above, satisfying Non-finality means violating either MapGridmark or Hds-R. If MapGridmark is violated, the result is a stressless foot at the prosodic word's right edge. If Hds-R is violated, the result is a stressed trochee in the same position.

When Non-finality produces a stressless final foot in odd-parity forms, the result is the Pintupi pattern. The (37) tableau demonstrates the ranking Non-finality, Hds-R ≫ MapGridmark for a five-syllable form like (35b), /púl̪iŋkàlatju/. It also demonstrates the effects of PrWd-L.

(37)

σσσσσ	PrWd-L	Non-fin	Hds-R	MapGM
☞ a. x x / σ σ σ σ σ			** ****	*
b. x x / σ σ σ σ σ			* ** ****!	
c. x x x / σ σ σ σ σ		*!	** ****	
d. x x / σ σ σ σ σ	*!		* ***	

Candidate (d) exhibits rightward foot-head alignment with gridmark sharing, as in Araucanian. It avoids final stress but is excluded by PrWd-L. Candidate (c) exhibits the Maranungku pattern. Since it has final stress, it is excluded by Non-finality. Candidate (b) avoids final stress with a final trochaic foot. Since this results in candidate (b) having one more Hds-R violation than candidate (a), Hds-R excludes candidate (b). The Pintupi pattern in candidate (a), with its stressless final foot, emerges as the winner. Had we considered an even-parity input, such as (35a), /mál̪awàna/, the ranking PrWd-L ≫ Hds-R would have produced the typical trochaic even-parity pattern. Since the final syllable would not have been a potential location for stress, there would have been no occasion for a stressless foot.

Pintupi parallels Choctaw in that a high-ranking Non-finality constraint produces a stressless final foot, resulting in lapse. There is also a trochaic parallel to Aguaruna. When Hds-R is violated instead of MapGridmark, the result is the Piro stress pattern. In the Piro case, however, the configuration produced by a stressed final trochee differs from that in Aguaruna. The trochee does not have to follow an iamb with the result being a clash configuration. Instead, it avoids clash by sharing a gridmark with a preceding trochee. This creates a lapse immediately preceding the penult. The tableau in (38) demonstrates the ranking Non-finality,

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MapGridmark ≫ Hds-R for a five-syllable form like (36b), /sàlwayehkáta/. It also illustrates the effects of PrWd-L and *Clash.

(38)

σσσσσ	PrWd-L	Non-fin	MapGM	Hds-R	*Clash
a. x x / σ σ σ σ σ			*!	** ****	
☞ b. x x / σ σ σ σ σ				* ** ****	
c. x x x / σ σ σ σ σ				* ** ****	*!
d. x x x / σ σ σ σ σ		*!		** ****	
e. x x / σ σ σ σ σ	*!			* ***	

PrWd-L excludes the (e) candidate's Araucanian pattern and Non-finality excludes the (d) candidate's Maranungku pattern. MapGridmark rejects the final stressless foot of the Pintupi pattern in candidate (a) for the final stressed trochees of candidates (b) and (c). The ranking of *Clash is not crucial here, but its presence gives the (b) candidate's gridmark-sharing configuration the advantage over the (c) candidate's clash configuration. The Piro pattern in candidate (b) emerges as the winner. Had we considered an even-parity input, such as (36a), /tšìyaháta/, the ranking PrWd-L≫Hds-R would have produced the typical trochaic even-parity pattern.

Although Non-finality allows the proposal to obtain the Pintupi and Piro patterns, it does not allow the proposal to obtain their unattested iambic mirror images. Since the proposal has no device in this context for creating stressless initial feet or stressed initial iambs, anti-Pintupi and anti-Piro are harmonically bounded by the Suruwaha pattern from §2. PrWd-L and Hds-R are replaced in (39) with the corresponding iambic pair PrWd-R and Hds-L:

(39)

σσσσσ	PrWd-R	Hds-L	Non-fin	MapGM
☞ a. x x x / σ σ σ σ σ		** ****	*	
b. x x / σ σ σ σ σ		** ****	*	*!
c. x x / σ σ σ σ σ		* ** ****!	*	

Candidate (a) exhibits the Suruwaha pattern, candidate (b) exhibits the anti-Pintupi pattern and candidate (c) exhibits the anti-Piro pattern. Since

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candidate (a) performs as well as candidate (b) with respect to PrWd-R, Hds-L and Non-finality, and better with respect to MapGridmark, candidate (a) harmonically bounds candidate (b). Because candidate (a) performs as well as candidate (c) with respect to PrWd-R, Non-finality and MapGridmark, and better with respect to Hds-L, candidate (a) also harmonically bounds candidate (c).

Non-finality, then, also allows the proposal to account for the iambic–trochaic asymmetries illustrated in (34). It makes available the attested Pintupi and Piro patterns, but it does not also make available their unattested iambic mirror images.

3.4 Summary

We have seen that the proposed account obtains each of the four patterns – Nengone, Araucanian, Maranungku and Suruwaha – that conform to the Perfect Grid. Since each of these patterns is attested, this is the desired result. We have also seen that the proposed account correctly predicts certain well-known iambic–trochaic asymmetries. These asymmetries occur in the group of binary patterns that depart from the Perfect Grid. Given the proposal's structural assumptions, departures from the Perfect Grid are severely restricted. Only two constraints can introduce clash or lapse in binary systems. First, the InitialGridmark constraint produced the Passamaquoddy and Garawa patterns without also producing the unattested anti-Passamaquoddy and anti-Garawa patterns. Next, the Non-finality constraint produced the Choctaw and Aguaruna patterns without also producing the unattested anti-Choctaw and anti-Aguaruna patterns. Finally, Non-finality also produced the Pintupi and Piro patterns without producing the unattested anti-Pintupi and anti-Piro patterns. In §4, we examine the predictions of the standard account with respect to these same binary systems.

4 The standard account

In §§2 and 3, we examined sixteen binary patterns. Ten were attested and six were not. The proposal correctly obtained the ten attested patterns and correctly excluded the six unattested patterns. In this section, we will see why the standard account does not produce similarly successful results.

The standard constraints in (40), based on McCarthy & Prince (1993a), will be important to the discussion.

(40) a. Parse-σ
All syllables must be parsed by feet.

b. FtBin
Feet must be binary under syllabic or moraic analysis.

c. AllFt-L
The left edge of every foot is aligned with the left edge of some prosodic word.

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d. ALLFT-R
The right edge of every foot is aligned with the right edge of some prosodic word.

e. FOOT-L
The left edge of every prosodic word is aligned with the left edge of some foot.

f. FOOT-R
The right edge of every prosodic word is aligned with the right edge of some foot.

g. TROCHEE
Feet are left-headed.

h. IAMB
Feet are right-headed.

Since the standard constraints and their interactions are familiar from the literature, I will not present them in detail. PARSE-σ discourages unfooted syllables and FTBIN discourages monosyllabic feet (since I am not considering heavy syllables as a factor here, FTBIN's moraic aspect will not be an issue). ALLFT-L and ALLFT-R draw feet towards the designated edge of a prosodic word. FOOT-L and FOOT-R position a single foot at the designated edge of a prosodic word. TROCHEE and IAMB determine foot type.

In the standard account, alignment constraints are an important factor in determining stress patterns because they decide the position of unfooted syllables and monosyllabic feet. All too often, however, alignment locates these structures in positions that create undesirable clash or lapse configurations.

To illustrate, an unfooted syllable occurs in odd-parity forms when FTBIN dominates PARSE-σ. ALLFT-L positions the unfooted syllable at the prosodic word's right edge:

(41) FTBIN ≫ PARSE-σ ≫ ALLFT-L

a. *Pintupi*	b. *Araucanian*
$(\acute{\sigma}\,\sigma)\,(\acute{\sigma}\,\sigma)\,(\acute{\sigma}\,\sigma)$	$(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})$
$(\acute{\sigma}\,\sigma)\,(\acute{\sigma}\,\sigma)\,(\acute{\sigma}\,\sigma)\,\sigma$	$(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,\sigma$

The result is the Pintupi pattern when footing is trochaic and the Araucanian pattern when footing is iambic. In a similar fashion, ALLFT-R positions the unfooted syllable at the prosodic word's left edge:

(42) FTBIN ≫ PARSE-σ ≫ ALLFT-R

a. *Nengone*	b. *Anti-Pintupi*
$(\acute{\sigma}\,\sigma)\,(\acute{\sigma}\,\sigma)\,(\acute{\sigma}\,\sigma)$	$(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})$
$\sigma\,(\acute{\sigma}\,\sigma)\,(\acute{\sigma}\,\sigma)\,(\acute{\sigma}\,\sigma)$	$\sigma\,(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})$

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The result is the Nengone pattern when footing is trochaic and the anti-Pintupi pattern when footing is iambic. Anti-Pintupi is unattested.

Positioning a single foot at the left edge and drawing all remaining feet to the right leaves the postpeninitial syllable unfooted in odd-parity forms:

(43) FtBin ≫ Parse-σ ≫ Foot-L ≫ AllFt-R

a. *Garawa*	b. *Anti-Piro*
(σ́ σ) (σ́ σ) (σ́ σ)	(σ σ́) (σ σ́) (σ σ́)
(σ́ σ) σ (σ́ σ) (σ́ σ)	(σ σ́) σ (σ σ́) (σ σ́)

The result is the Garawa pattern when footing is trochaic and the anti-Piro pattern when footing is iambic. Anti-Piro is unattested. Similarly, positioning a single foot at the right edge and drawing all remaining feet to the left leaves the antepenult unfooted in odd-parity forms:

(44) FtBin ≫ Parse-σ ≫ Foot-R ≫ AllFt-L

a. *Piro*	b. *Anti-Garawa*
(σ́ σ) (σ́ σ) (σ́ σ)	(σ σ́) (σ σ́) (σ σ́)
(σ́ σ) (σ́ σ) σ (σ́ σ)	(σ σ́) (σ σ́) σ (σ σ́)

The result is the Piro pattern when footing is trochaic and the anti-Garawa pattern when footing is iambic. Anti-Garawa is unattested.

When an unfooted syllable occurs in odd-parity forms, then, the standard account produces five attested patterns, but it also produces three unattested patterns. Monosyllabic feet, which occur in odd-parity forms under the ranking Parse-σ ≫ FtBin, create similar problems. They allow the standard account to produce three attested patterns, but they also allow it to produce an unattested pattern.

To illustrate, AllFt-L positions the monosyllabic foot at the prosodic word's left edge:

(45) Parse-σ ≫ FtBin ≫ AllFt-L

a. *Passamaquoddy*	b. *Suruwaha*
(σ́ σ) (σ́ σ) (σ́ σ)	(σ σ́) (σ σ́) (σ σ́)
(σ́) (σ́ σ) (σ́ σ) (σ́ σ)	(σ́) (σ σ́) (σ σ́) (σ σ́)

With trochaic footing, the result is the Passamaquoddy pattern, and, with iambic footing, the result is the Suruwaha pattern. In a similar fashion, AllFt-R positions a monosyllabic foot at the prosodic word's right edge:

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(46) PARSE-σ ≫ FTBIN ≫ ALLFT-R

a. *Maranungku*	b. *Anti-Passamaquoddy*
$(\acute{\sigma}\,\sigma)\,(\acute{\sigma}\,\sigma)\,(\acute{\sigma}\,\sigma)$	$(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})$
$(\acute{\sigma}\,\sigma)\,(\acute{\sigma}\,\sigma)\,(\acute{\sigma}\,\sigma)\,(\acute{\sigma})$	$(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,(\acute{\sigma})$

With trochaic footing, the result is the Maranungku pattern, but, with iambic footing, the result is the anti-Passamaquoddy pattern. Anti-Passamaquoddy is unattested.

Although the NON-FINALITY constraint plays a less prominent role in the standard account, it does allow the standard account to obtain three additional patterns. Two are attested, and one is unattested. To illustrate, when NON-FINALITY and FTBIN dominate PARSE-σ, and PARSE-σ dominates IAMB, the result is the Aguaruna pattern:

(47) NON-FIN, FTBIN ≫ PARSE-σ ≫ IAMB

Aguaruna

$(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,(\acute{\sigma}\,\sigma)$

$(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,\sigma$

When NON-FINALITY, IAMB and FTBIN all dominate PARSE-σ, leftward alignment of feet produces the Choctaw pattern:

(48) NON-FIN, IAMB, FTBIN ≫ PARSE-σ ≫ ALLFT-L

Choctaw

$(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,\sigma\sigma$

$(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,\sigma$

Given the same ranking, but with rightward alignment of feet, the result is the unattested anti-Choctaw pattern:

(49) NON-FIN, IAMB, FTBIN ≫ PARSE-σ ≫ ALLFT-R

Anti-Choctaw

$\sigma\,(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,\sigma$

$(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,(\sigma\,\acute{\sigma})\,\sigma$

Although the pattern in (49) is produced with iambs rather than trochees, stress would still occur on every even-numbered syllable counting from the right, except the initial syllable. As in the proposed account, NON-FINALITY does not allow the standard account to produce the unattested anti-Aguaruna pattern:

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(50) *Not predicted*

Anti-Aguaruna

$(\sigma\acute{\sigma})(\acute{\sigma}\sigma)(\acute{\sigma}\sigma)$

$\sigma(\acute{\sigma}\sigma)(\acute{\sigma}\sigma)(\acute{\sigma}\sigma)$

Aguaruna/anti-Aguaruna is the only iambic–trochaic asymmetry that the standard account predicts correctly.

The standard account, then, makes the wrong prediction in five of the sixteen cases that we have considered. It fails to exclude several unattested patterns, because it cannot restrict clash and lapse to appropriate positions. Three factors contribute to this situation. First, foot type and footing directionality are completely independent in the standard account. Foot alignment constraints determine footing directionality, but IAMB and TROCHEE determine foot type. This means that every foot pattern that alignment can produce is available in both iambic and trochaic versions. The second factor is weak layering. Tolerating unfooted syllables provides too many opportunities for lapse. Unfooted syllables, for example, produce the unattested anti-Pintupi, anti-Piro, anti-Garawa and anti-Choctaw patterns, patterns that are harmonically bounded in the proposed account. The final factor is the absence of alternatives to monosyllabic feet for parsing the odd syllable of odd-parity forms. The reliance on monosyllabic feet provides too many opportunities for clash. A monosyllabic foot, for example, produces the anti-Passamaquoddy pattern, a pattern that is harmonically bounded in the proposed account.

Although we have examined only a few patterns in detail, it should be clear why the proposed account is in general more restrictive than the standard account. There are only four possible patterns that conform to the Perfect Grid, and both the proposed account and the standard account produce all four. Obtaining additional patterns requires introducing either clash or lapse. The restrictions imposed under the proposed account, however, especially the restrictions imposed by the Strict Succession condition and the possibility of gridmark sharing, mean that clash and lapse are more effectively constrained under the proposed account and that the proposed account can produce fewer of these additional patterns. In general, then, the proposed account must be more restrictive than the standard account.[12]

[12] Kager (2001) presents a preliminary proposal addressing some of the same asymmetries discussed above. I want to mention it here, because it may present an alternative to both the proposed account and the standard account when a more mature version becomes available. Kager (2001) maintains the structural assumptions of the standard approach but diminishes the role of alignment, relying on constraints that license clash or lapse in certain positions to achieve directionality effects. The proposals about licensing lapse configurations seem to be in a more advanced stage than the proposals about licensing clash configurations. One apparent problem in the proposal, which Kager acknowledges, seems to derive at least partially from the fact that the proposal retains the standard structural assumptions. Weak layering helps to produce two gaps in the predicted typology. Although the role of alignment is diminished, and the positions of lapse are directly restricted, the proposal is still able to produce the unattested anti-Piro and anti-Garawa patterns.

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5 Justifying intersections

Although the proposal contains several departures from the standard account, it would not be possible in an article-length presentation to provide additional justification for each departure. I focus below on improper bracketing because I suspect that it will be the most controversial aspect of the proposal. Neither intersection nor gridmark sharing has ever been a component of a mainstream linguistic theory. Although the literature has not addressed the possibility of gridmark sharing, the rejection of intersection is long-standing and seems to be unanimous. For example, Liberman (1975), Itô & Mester (1992) and Kenstowicz (1995) have all explicitly rejected improper bracketing with respect to prosodic categories. Challenging such a firmly held assumption seems to require multiple lines of evidence, and we shall see below that there is abundant support for improper bracketing.

Despite its absence from the domain of prosodic structure, improper bracketing has emerged in other contexts. It plays a role in the theories of musical rhythm advanced by Cooper & Meyer (1960) and Lehrdahl & Jackendoff (1983). Lehrdahl & Jackendoff's account is especially significant because of its similarity to theories of linguistic rhythm. In morphology, haplology can be considered a case of improper bracketing where two morphemes share a segment or string of segments. This is especially clear in the coalescence analyses of Lawrence (1997) and de Lacy (2000). Kenstowicz' (1995) analogy between affricates and intersecting feet suggests that an affricate's specification as both [+continuant] and [−continuant] is a case of improper bracketing. Two feature specifications on the same tier share a timing slot, just as two feet would share a syllable. Finally, Itô & Mester (1992) argue that their ban on improper bracketing should not be taken to prohibit the segmental ambisyllabicity most often associated with gemination and flapping.

I have already provided substantial justification for improperly bracketed feet. Their role in restricting clash and lapse helps the theory to accurately predict iambic–trochaic asymmetries. The case for intersections is further strengthened, however, when we consider their usefulness in producing ternary patterns and when we consider their usefulness in explaining phenomena that are not directly related to stress. First, we will see in §5.1 that intersections account for certain lengthening effects in Wargamay and Yidiŋ. Although the relevant lengthening always occurs in a stressed syllable, we will see that lengthening cannot be explained by the position of stress. It can, however, be explained by the position of an intersection. Second, we will see in §5.2 that intersection helps to avoid certain types of insertion/deletion pathologies. The pathologies arise from general considerations concerning binary footing and are not associated with any particular stress pattern. Finally, in §5.3, we will see that intersection allows the proposal to produce ternary stress systems despite the assumptions of strict succession and maximally disyllabic footing. §5.3

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will also briefly examine the role of stressless feet in producing unbounded stress systems.

5.1 Lengthening effects

Since the influence of intersections can be detected in phenomena that are not directly related to stress, there is ample evidence for intersections beyond their role in producing binary stress patterns. The first line of additional evidence is based on an analogy between consonants that belong to two syllables, as in (51a), and syllables that belong to two feet, as in (51b).

(51) a. *Ambisyllabic consonant*



b. *Ambipodal syllable*



It has been suggested numerous times in the literature[13] that ambisyllabic consonants can be interpreted as phonetically long in some languages (true geminates in Persian, for example) and can be interpreted as phonetically short in other languages (flapping in English, for example). My suggestion here is that ambipodal syllables are subject to similar interpretations. They may be interpreted as phonetically short in some languages, as in most of the cases of intersection discussed above, and they may be interpreted as phonetically long in others.[14]

Interpreting ambipodal syllables as long allows intersection to account for certain lengthening effects in Yidiɲ (Dixon 1977a, b) and Wargamay (Dixon 1981), analogously to the way in which ambisyllabicity accounts for gemination. To illustrate, Yidiɲ lengthens the vowel in the penultimate syllable of odd-parity forms, as in (52a, b). Odd-parity forms are iambic and stress every even-numbered syllable counting from the left.

(52) a. galína→galíːna ‘go-PURP’
b. gudágudága→gudágudáːga ‘dog-REDUP-ABS’
c. gáliɲ ‘go-PRES’
d. gúdagágu ‘dog-PURP’
e. yadʸíːriɲál ‘walk about-GOING-TRANS-PRES’

[13] The literature bearing on gemination and ambisyllabicity is extensive. See Kahn (1976), Leben (1980), Borowsky *et al*. (1984), Giegerich (1992), Hammond & Dupoux (1996), Rubach (1996) and Spencer (1996), among numerous others.

[14] There are several ways to formulate a phonetic constraint that would produce lengthening in ambipodal syllables. My tentative suggestion is as follows:

(i) IntersectionLength
Vowels in ambipodal syllables are [+long].

Constraints with similar formulations might be used to interpret other cases of multiple linking.

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As (52c–e) illustrate, there is no parallel lengthening effect in even-parity forms.[15] Even-parity forms are typically trochaic,[16] as in (52c, d), but may be iambic if they contain a heavy syllable, as in (52e).

An analysis of Yidiŋ's odd-parity penultimate lengthening requires two components. There must be a device to produce the necessary lengthening, and there must be a method for selecting the desired syllable. The standard approach, which would assign odd-parity forms the type of structure in (53a), provides neither.

(53) a. *Odd parity* $(\sigma\acute{\sigma})(\sigma\acute{\sigma})\sigma$ b. *Trochaic even parity* $(\acute{\sigma}\sigma)(\acute{\sigma}\sigma)$ c. *Iambic even parity* $(\sigma\acute{\sigma})(\sigma\acute{\sigma})$

As (53a) illustrates, Yidiŋ's odd-parity forms would be parsed using a string of iambs followed by an unfooted syllable. The lengthened penult would be the head of the final iamb.

The standard approach encounters two problems. First, the standard structures provide no way to distinguish the penult of odd-parity forms from most other syllables, so the standard approach has no method to select the appropriate syllable for lengthening. It is not possible, for example, to provide a distinction based on stressed positions generally. Although the penult in odd-parity forms is stressed, many other syllables are also stressed, and these do not undergo lengthening. It is also not possible to provide a distinction based on the position of primary stress in particular. There are two reasons. First, there is no indication that primary stress is penultimate. Dixon denies that any one stress is more prominent than the others, and Hayes (1995) cites Hale (personal communication) in suggesting that the leftmost stress is primary. Second, even if lengthening happened to coincide with the primary stress of odd-parity forms, primary stress could not be associated with lengthening. Even-parity forms would also have primary stress, but they do not undergo lengthening. The only other straightforward option[17] seems to be a distinction based on footing, but this is impossible for similar reasons. Although the penult in odd-parity forms is footed, so are most other syllables, and these do not undergo lengthening. Although the penult in odd-parity forms occurs in the final foot in particular, syllables in the final feet of even-parity forms do not undergo lengthening.

[15] Some lengthening effects in Yidiŋ are the result of morphological or compensatory lengthening processes. This is the case for the long vowel in (52e). I do not consider such processes here.

[16] The Yidiŋ stress pattern, where footing is iambic in odd-parity forms and trochaic in even-parity forms, can be obtained in the proposed framework under the ranking NON-FINALITY, MAPGRIDMARK, *CLASH ≫ HDS-R. This simply reverses the positions of *CLASH and HDS-R from the ranking in tableau (32).

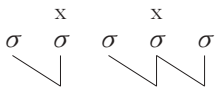
[17] In locating the syllable to be lengthened, the standard account might refer to 'a syllable adjacent to an unfooted syllable'. Allowing the grammar to make such a complex reference, however, is clearly undesirable. It is also unnecessary in light of the proposed alternative.

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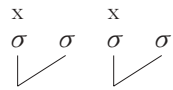
The second problem for the standard account is that standard structures do not provide for a lengthening device. Since footing is iambic in odd-parity forms, iambic lengthening may seem like an obvious candidate.[18] This option is unattractive, however, because it would not be the typically general effect observed in the canonical cases. Both feet in (53a) are iambs, but only one undergoes lengthening. Feet in even-parity forms are also sometimes iambic, as in (53c), but do not undergo lengthening.

Intersection allows the proposed approach to overcome these difficulties. In addition to the stressed/unstressed distinction, the proposed structures provide an ambipodal/non-ambipodal distinction. Odd-parity forms would be assigned the type of structure in (54a), where an intersection occurs at the prosodic word's right edge.

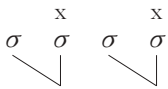
(54) a. *Odd parity*



b. *Trochaic even parity*



c. *Iambic even parity*



The proposed account can distinguish between the penultimate syllable of odd-parity forms and other syllables because it is the only syllable that is ambipodal. As discussed above, foot-head alignment constraints determine both the number of intersections that a form contains and the position in which intersections occur. Typically, odd-parity forms contain only a single intersection, explaining the number of lengthened syllables. Also typically, the intersection's position matches the direction of alignment (rightward in this case), explaining the lengthened syllable's position. Since even-parity forms usually do not contain intersections, as illustrated in (54b, c), the absence of lengthening in even-parity forms is expected. Intersection also provides the proposed account with the actual lengthening device. Just as additional length can be the interpretation when a segment belongs to two syllables, added length here arises because the penult in odd-parity forms belongs to two feet.

Under the proposed account, Yidiŋ's lengthening device is the phonetic interpretation of an ambipodal syllable as long, and appropriately positioning an intersection correctly selects the desired syllable. Under the standard account, iambic lengthening is a potential (though unattractive) device for lengthening, but there is no way to select the desired syllable.

[18] Perhaps with penultimate lengthening in mind, Hayes (1995) lists Yidiŋ as an iambic lengthening language.

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Wargamay presents a similar situation, but because Wargamay is trochaic, there is no possibility of invoking iambic lengthening as a potential lengthening device. Wargamay stresses every even-numbered syllable counting from the right, unless the initial syllable is heavy. If the initial syllable is heavy, as in (55e), stress will shift from a peninitial syllable to the initial syllable. The leftmost stress in a form is always the primary stress.

(55) a.	gagára→gagá·ra	'dilly bag'
b.	ɠuɽágay-mìri→ɠuɽá·gay-mìri	'Niagara Vale-FROM'
c.	báda	'dog'
d.	gígʸawùlu	'freshwater jewfish'
e.	gí:baɽa	'fig tree'

The relevant lengthening effect occurs in odd-parity forms with light initial syllables. As (55a, b) illustrate, the peninitial syllable lengthens in such cases.

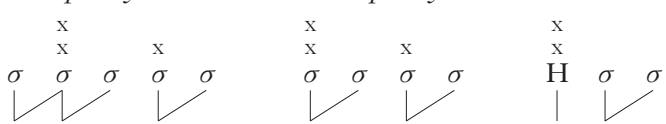
The standard account has neither a device to produce lengthening in odd-parity peninitial syllables nor a method to select the appropriate syllable. The structure that standard accounts would assign such forms is illustrated in (56a).

(56) a.	*Odd parity*	b. *Even parity*	c. *Initial heavy syllable*
	σ (σ́ σ) (σ̀ σ)	(σ́ σ) (σ̀ σ)	(H́) σ σ

Although lengthening always coincides with primary stress, primary stress does not always coincide with lengthening. Lengthening does not occur in even-parity forms or in odd-parity forms with initial heavy syllables. Since both have primary stress, primary stress cannot be a factor either in producing lengthening or in locating the syllable to be lengthened. Using a form's initial foot to locate the desired syllable is impossible for similar reasons. There seem to be no other straightforward options.

The proposed account would assign the type of structure in (57a) to Wargamay's odd-parity forms.

(57) a. *Odd parity* b. *Even parity* c. *Initial heavy syllable*



As in the Yidiŋ analysis, the interpretation of an ambipodal syllable as long provides the necessary lengthening. The intersection's location predicts the lengthened syllable's location. Alignment constraints (leftward in this case) determine the intersection's position. Since there would be no

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intersection in even-parity forms or in odd-parity forms with an initial heavy syllable, there is no lengthening in these types.

The standard account, then, provides neither a device for lengthening in Wargamay nor a method for locating the lengthened syllable. The proposed account provides both, just as it did for Yidiŋ. These results offer independent support for intersection, since they demonstrate that intersections can be detected apart from their effect on stress patterns.

5.2 Avoiding even-parity pathologies

The second line of supporting evidence is also not directly related to stress. Intersection allows the proposal to avoid a certain type of insertion/deletion pathology. In what I will refer to as EVEN-PARITY PATHOLOGIES, a single syllable is either added to an odd-parity input, as in (58a), or subtracted from an odd-parity input, as in (58b), in order to achieve exhaustive binary footing. In either case, the result is a system that allows only even-parity output forms:

(58) a. *Adding a syllable for even parity*

σσσσ	→	(σσ)(σσ)	even-parity input/even-parity output
σσσσσ	→	(σσ)(σσ)(σσ)	odd-parity input/even-parity output

b. *Subtracting a syllable for even parity*

σσσσ	→	(σσ)(σσ)	even-parity input/even-parity output
σσσσσ	→	(σσ)(σσ)	odd-parity input/even-parity output

Such pathologies are not directly related to any particular stress pattern. They arise from general considerations involving binary footing and might occur with either iambic feet or trochaic feet.

In the standard account, highly ranked FTBIN and PARSE-σ constraints demand that every syllable be in included in a disyllabic foot. (Since I will not be considering heavy syllables as a factor here, FTBIN's moraic aspect will not be an issue.) Two standard faithfulness constraints, adapted from McCarthy & Prince (1995), will also be relevant to the discussion:

(59) a. MAX
All material in the input is present in the output.

b. DEP
All material in the output is present in the input.

MAX is the constraint that prohibits syllable deletion and DEP is the constraint that prohibits syllable insertion.

The standard account produces even-parity pathologies because it cannot exhaustively parse odd-parity forms using only disyllabic feet. As illustrated in (60), in an odd-parity output candidate, the odd syllable must remain unparsed, as in candidate (c), or it must be parsed as

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a monosyllabic foot, as in candidate (d). If the syllable remains unparsed, it violates PARSE-σ, but if it is parsed as a monosyllabic foot, it violates FTBIN. The only way to satisfy both constraints is to avoid an odd syllable:

(60)

$\sigma\sigma\sigma\sigma\sigma$	FTBIN	PARSE-σ	DEP	MAX
☞ a. $(\sigma\sigma)(\sigma\sigma)$				*
☞ b. $(\sigma\sigma)(\sigma\sigma)(\sigma\sigma)$			*	
c. $(\sigma\sigma)(\sigma\sigma)\sigma$		*!		
d. $(\sigma\sigma)(\sigma\sigma)(\sigma)$	*!			

If FTBIN and PARSE-σ dominate MAX, the output will be smaller by one syllable than the odd-parity input, as in candidate (a). If FTBIN and PARSE-σ dominate DEP, the output will be larger by one syllable than the odd-parity input, as in candidate (b). If FTBIN and PARSE-σ dominate both faithfulness constraints, the ranking between MAX and DEP determines whether a syllable is added or subtracted. Any form that retains the odd syllable, as in candidates (c) and (d), violates either PARSE-σ or FTBIN.

The proposed account avoids even-parity pathologies because intersection allows it to exhaustively parse odd-parity forms using only disyllabic feet. Rather than leaving the odd syllable unparsed[19] or parsing it as a monosyllabic foot, the proposed account can include it in a binary foot intersecting another binary foot. Odd-parity outputs would satisfy both PARSE-σ and FTBIN, and there would be no reason to violate either MAX or DEP.

(61)

$\sigma\sigma\sigma\sigma\sigma$	FTBIN	PARSE-σ	DEP	MAX
☞ a. $\sigma\ \sigma\ \sigma\ \sigma\ \sigma$				
b. $\sigma\ \sigma\ \sigma\ \sigma$				*!
c. $\sigma\ \sigma\ \sigma\ \sigma\ \sigma\ \sigma$			*!	

Under the proposed account, the candidate that is faithful to the odd-parity input harmonically bounds competing even-parity candidates with respect to the relevant constraints.

Intersection, then, allows the proposed account to avoid even-parity pathologies where standard accounts cannot.[20] These results provide

[19] Given the Strict Succession condition, leaving the odd syllable unparsed is not actually an option in the proposed account.

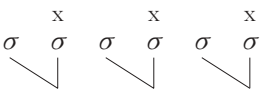
[20] The proposed account does not eliminate all insertion/deletion pathologies. As in the standard account, ranking an alignment constraint above MAX has the potential to reduce all output forms to a language's minimal word. If alignment results in

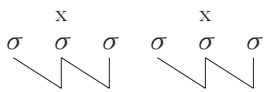
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additional evidence that intersections play an important role beyond their influence on individual stress patterns.

5.3 Ternary and unbounded patterns

Although binary patterns have been my focus here, I will briefly consider ternary and unbounded patterns. Given the Strict Succession and FootCap conditions, the proposal does not have access to traditional methods (non-parsing, ternary feet, unbounded feet) for producing such patterns, and it may not be obvious how the proposal would obtain them. The proposed account does, however, have access to intersections and stressless feet, and these suffice to replace the traditional methods:

(62) a.


b.


c.


In the proposed account, binary patterns result from stressed, non-intersected footing, as in (62a). Ternary patterns result from stressed, intersected footing, as in (62b).[21,22] Unbounded patterns result from stressless feet, as in (62c). Which configuration actually emerges in a particular language is determined by interactions between three constraint types: foot-head alignment, gridmark alignment and MapGridmark.

I have not discussed the gridmark-alignment constraints, FG-L and FG-R, to this point, because they do not play a role in producing binary

reduction to a single syllable, the result is unproblematic, since it is not difficult to find languages with only monosyllabic forms. The result is problematic, however, if alignment results in reduction to two syllables. I am aware of no language that allows disyllabic forms but not trisyllabic forms. In any case, this particular difficulty is not unique to the proposed account.

[21] Intersection with gridmark sharing, as in (62b), creates a configuration that is similar to an amphibrach, a ternary foot with a stressed syllable between two stressless syllables. Amphibrachs were utilised by Halle & Vergnaud (1987), for example, in their analysis of the ternary pattern of Cayuvava (Key 1961, 1967).

[22] An anonymous associate editor offers the intriguing suggestion that LH iambs be analysed as ternary footing. If the FootCap condition were strengthened to demand that feet be bimoraic, iambic parsing might then be represented with intersecting bimoraic feet. The representation would be similar to the configuration in (62b), using moras instead of syllables. The analysis would make ternary footing more common and has the potential to explain additional iambic–trochaic asymmetries that involve weight sensitivity. While the suggested analysis is intriguing, it will take some time to work out the details and explore the all of the consequences. This being the case, I have decided to leave this as project for future research and not to address the suggestion in greater detail here.

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systems. As we shall see below, if a gridmark-alignment constraint is ranked highly enough to affect a stress pattern at all, the ranking will produce a ternary or unbounded pattern rather than a binary pattern. Like foot-head alignment constraints, gridmark-alignment constraints have two effects. They establish directionality and reduce structure:

(63)

σσσσσσσ	FG-L	FG-R
a. x σ σ σ σ σ σ σ		******
b. x σ σ σ σ σ σ σ	******	
c. x x x x σ σ σ σ σ σ σ	** **** ******	** **** ******

The contrasting results for candidates (a) and (b) illustrate the constraints' directionality preferences. FG-L is satisfied when a single foot-level gridmark occurs at the left edge of a prosodic word, as in candidate (a). FG-R is satisfied when a single foot-level gridmark occurs at the right edge, as in candidate (b).[23] The results for candidate (c) illustrate the constraints' preference for a minimal number of gridmarks. Additional gridmarks always incur additional gridmark-alignment violations.

Since the interactions between foot-head alignment, gridmark alignment and MapGridmark are somewhat complex, it will be helpful to consider the preferences of the three constraint types individually. First, since MapGridmark requires that all feet have a foot-level gridmark within their domain, it will prefer the stressed footing of the binary (62a) or the ternary (62b) over the stressless footing of the unbounded (62c). Second, since foot-head alignment prefers a minimal number of intersections, it will prefer the binary (62a) or unbounded (62c) over the ternary (62b). Finally, since gridmark alignment prefers a minimal number of foot-level gridmarks, it will prefer the unbounded (62c) over the ternary (62b) and, in turn, will prefer the ternary (62b) over the binary (62a).

To illustrate how particular rankings resolve these competing preferences, consider first the case of binary stress patterns. Binary systems arise whenever both MapGridmark and foot-head alignment dominate gridmark alignment. Under such rankings, the need to reduce the number of gridmarks is outweighed by the need for feet to be stressed and by the need to avoid intersections. Hds-R and FG-R are used to illustrate in (64) and the following two tableaux.

[23] The gridmark alignment constraints can be vacuously satisfied when a candidate has no foot-level gridmarks to incur violations.

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(64)

σσσσσσ	MapGM	Hds-R	FG-R
☞ a. x x x / σ σ σ σ σ σ		** ****	** ****
b. x x / σ σ σ σ σ σ		* *** ***!*	* ****
c. x / σ σ σ σ σ σ	*!*	** ****	

In (64), MapGridmark excludes the stressless feet of the unbounded candidate (c). Because intersected footing requires more feet (and thus more foot-heads) to parse a form than non-intersected footing, Hds-R rejects the ternary candidate (b) for the binary candidate (a). Candidate (a) emerges as the winner. Producing any of the binary patterns discussed above, then, would require a low ranking for the gridmark-alignment constraints.

Consider next the case of ternary stress patterns. Ternary systems emerge when MapGridmark dominates gridmark alignment and gridmark alignment dominates foot-head alignment. Under such a ranking, the need for feet to be stressed outweighs the need to minimise the number of gridmarks, but the need to minimise the number of gridmarks outweighs the need to avoid intersections:

(65)

σσσσσσ	MapGM	FG-R	Hds-R
a. x x x / σ σ σ σ σ σ		** ****!	** ****
☞ b. x x / σ σ σ σ σ σ		* ****	* *** ****
c. x / σ σ σ σ σ σ	*!*		** ****

In (65), MapGridmark rejects the stressless feet of the unbounded candidate (c) for the stressed feet of the ternary candidate (b) and the binary candidate (a). Since non-intersected footing requires one gridmark for every two syllables where intersected footing only requires one gridmark for every three syllables, FG-R rejects the non-intersected footing of the binary (a) for the intersected footing of the ternary (b). Candidate (b) emerges as the winner.

The stress pattern of Chugach (Leer 1985a, b, c) is one ternary pattern that is easily analysed in terms of intersections:

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(66) a. atáka 'my father'
b. akútamék 'kind of food (ABL SG)'
c. atúqunikí 'if he (REFL) uses them'
d. pisúqutaqúni 'if he (REFL) is going to hunt'
e. mangársuqutáquní 'if he (REFL) is going to hunt porpoise'

Chugach stresses the second syllable in a form and every subsequent third syllable, given sufficient length. If two syllables remain after ternary alternation is no longer possible, as in (66b, e), the second is stressed. If only one syllable remains, as in (66a, d), it is unstressed.[24] The ranking in (65) is exactly the ranking that would produce the Chugach pattern. Although the tableau only demonstrates for a $3n$ form, the same ranking would produce the correct patterns for $3n+1$ and $3n+2$ forms. (See Hyde 2001 for a more thorough presentation. I omit the additional tableaux here.)

Finally, consider the case of unbounded stress patterns. Unbounded systems emerge whenever a gridmark-alignment constraint dominates MAPGRIDMARK. In such cases, the need to minimise the number of gridmarks outweighs the need for feet to be stressed. (The ranking of foot-head alignment is not crucial here, so I have omitted it from the tableau.)

(67)

σσσσσσ	FG-R	MAPGM
a. x x x / σ σ σ σ σ σ	*!* ****	
b. x x / σ σ σ σ σ σ	*! ****	
☞ c. x / σ σ σ σ σ σ		**

In (67), the stressless feet of the unbounded candidate (c) violate MAPGRIDMARK. Because these feet are stressless, however, candidate (c) has fewer foot-level gridmarks than either the binary candidate (a) or the ternary candidate (b), so that it better satisfies the higher-ranked FG-R. Candidate (c) emerges as the winner.

In the most basic unbounded stress patterns, a single stress occurs at one edge or the other of the prosodic word. The ranking in (67) would produce the pattern of Uzbek (Poppe 1962), which stresses the final syllable:

[24] The Chugach pattern may be perturbed due to several considerations involving heavy syllables. Chugach also exhibits lengthening in stressed syllables. I will not address these issues here.

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(68) a. *Uzbek*

aitdí	'he said'
kitobím	'my book'
aŋladilár	'they understood'

b. *Tinrin*

húːe	'white'
húsaːu	'sometimes'
ʂʉ́vehaɽu	'to like'

Replacing FG-R with FG-L in the (67) ranking would produce the pattern of Tinrin (Osumi 1995), which stresses the initial syllable.

Despite the Strict Succession and FootCap conditions, then, the proposal can produce ternary and unbounded patterns in addition to binary patterns. These are the three core types that a theory of metrical stress must provide. Since binary patterns are the focus of the article, I will not address ternary and unbounded patterns in further detail. Note, however, that Hyde (2001) contains preliminary but detailed analyses of both ternary and unbounded patterns within the proposed framework. The discussion also includes analyses of variations on unbounded patterns. For example, the discussion addresses regular penultimate stress, as in Yawelmani (Newman 1944, Kroeber 1963), regular antepenultimate stress, as in Macedonian (Comrie 1976), and stress on both the initial and penultimate syllables, as in Chimalapa Zoque (Knudson 1975). It also includes analyses of default-to-same-side systems, such as Murik (Abbott 1985) and Aguacatec (McArthur & McArthur 1956), and default-to-opposite-side systems, such as Kwakwala (Boas 1947) and Selkup (Kuznecova *et al*. 1980). More mature versions of these analyses are forthcoming.

6 Conclusion

In this article, I have demonstrated that the proposed account is more restrictive than the standard account because it more effectively constrains clash and lapse. The demonstration focused on iambic–trochaic asymmetries in a set of sixteen binary patterns. The patterns were divided into two groups: those that conform to the Perfect Grid and those that do not. The four patterns that conform to the Perfect Grid are all attested, so they do not exhibit iambic–trochaic asymmetries. Iambic–trochaic asymmetries are only found in the patterns that depart from the Perfect Grid. Since the proposed account restricts clash and lapse to appropriate positions, it can obtain the attested patterns within this group, and it can also exclude the unattested patterns. Although the standard account obtains the attested patterns, as well, it does not adequately restrict clash and lapse, so it cannot exclude the majority of unattested patterns.

The proposal's restrictiveness is obtained in rejecting several standard assumptions. First, where standard accounts tolerate weak layering between prosodic categories, the proposed account requires strict succession. Second, where standard accounts require proper bracketing, the

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proposed account tolerates improper bracketing. Third, where standard accounts maintain a one-to-one correspondence between feet and stress, the proposed account tolerates stressless feet and gridmark sharing. Finally, the proposed account maintains a distinction between prosodic structure and metrical structure, allowing the theory to refer to them independently.

Especially important in restricting clash and lapse are the requirement of strict succession and the possibility of intersection with gridmark sharing. Strict succession eliminates the unfooted syllables that all too often produce undesirable lapse configurations in the standard account. Gridmark sharing provides an alternative to monosyllabic feet for parsing the odd-syllable of odd-parity forms. Since monosyllabic feet often produce clash or require stressless feet to avoid clash, gridmark sharing helps to avoid these configurations.

Clash and lapse are sufficiently restricted under the proposed account that only two constraints can produce these configurations in binary systems. INITIALGRIDMARK introduces clash or lapse in appropriate positions at a prosodic word's left edge and NON-FINALITY introduces clash or lapse in appropriate positions at a prosodic word's right edge. INITIALGRIDMARK and NON-FINALITY allow the theory to obtain attested variations on the Perfect Grid patterns, but they do not also allow the theory to produce the unattested variations that are possible under standard accounts.

Although I have examined only a few systems in detail, the claim of greater restrictiveness is general. There are only four possible patterns that conform to the Perfect Grid, so that obtaining any additional patterns requires introducing either clash or lapse. Since the proposed account is more effective than the standard account in terms of restricting clash and lapse, it can produce fewer of these additional patterns.

REFERENCES

Abbott, Stan (1985). A tentative multilevel multiunit phonological analysis of the Murik language. *Papers in New Guinea Linguistics* **22**. 339–373.

Beckman, Jill, Laura Walsh Dickey & Suzanne Urbanczyk (eds.) (1995). *Papers in Optimality Theory*. Amherst: GLSA.

Boas, Franz (1947). *Kwakiutl grammar with a glossary of the suffixes*. *Transactions of the American Philosophical Society : New Series* **37:3**. 201–377.

Borowsky, Toni, Junko Itô & R. Armin Mester (1984). The formal representation of ambisyllabicity: evidence from Danish. *NELS* **14**. 34–48.

Comrie, Bernard (1976). Irregular stress in Polish and Macedonian. *International Review of Slavic Linguistics* **1**. 227–240.

Cooper, Grosvenor & Leonard Meyer (1960). *The rhythmic structure of music*. Chicago: University of Chicago Press.

Crowhurst, Megan (1996). An optimal alternative to Conflation. *Phonology* **13**. 409–424.

Crowhurst, Megan & Mark Hewitt (1995). Directional footing, degeneracy, and alignment. *NELS* **25**. 47–61.

de Lacy, Paul (2000). Morphological haplology and correspondence. In Paul de Lacy & Anita Nowak (eds.) *UMOP 24 : papers from the 25th reunion*. Amherst: GLSA. 51–88.

https://doi.org/10.1017/S0952675703004391 Published online by Cambridge University Press

Dixon, R. M. W. (1977a). *A grammar of Yidiɲ*. Cambridge: Cambridge University Press.
Dixon, R. M. W. (1977b). Some phonological rules in Yidin^{y}. *LI* **8**. 1–34.
Dixon, R. M. W. (1981). *Wargamay*. In R. M. W. Dixon & Barry J. Blake (eds.) *Handbook of Australian languages*. Vol. 2. Amsterdam: Benjamins. 1–144.
Echeverria, Max S. & Heles Contreras (1965). Araucanian phonemics. *IJAL* **31**. 132–135.
Everett, Daniel L. (1996). Prosodic levels and constraints in Banawa and Suruwaha. Ms, University of Pittsburgh. Available as ROA-121 from the Rutgers Optimality Archive.
Furby, Christine (1974). *Garawa phonology*. Canberra: Australian National University.
Giegerich, Heinz J. (1992). *English phonology: an introduction*. Cambridge: Cambridge University Press.
Green, Thomas (1993). *Configurational constraints in a generalized theory of phonological representation*. PhD dissertation, MIT.
Green, Thomas (1995). The stress window in Pirahã: a reanalysis of rhythm in Optimality Theory. Ms, MIT. Available as ROA-45 from the Rutgers Optimality Archive.
Green, Thomas & Michael Kenstowicz (1995). The Lapse constraint. Ms, MIT. Available as ROA-101 from the Rutgers Optimality Archive.
Halle, Morris & Jean-Roger Vergnaud (1987). *An essay on stress*. Cambridge, Mass.: MIT Press.
Hammond, Michael & Emmanuel Dupoux (1996). Psychophonology. In Jacques Durand & Bernard Laks (eds.) *Current trends in phonology: models and methods*. Salford: ESRI. 274–297.
Hansen, K. C. & L. E. Hansen (1969). Pintupi phonology. *Oceanic Linguistics* **8**. 153–170.
Hayes, Bruce (1987). A revised parametric metrical theory. *NELS* **17**. 274–289.
Hayes, Bruce (1995). *Metrical stress theory: principles and case studies*. Chicago: University of Chicago Press.
Hung, Henrietta (1993). Iambicity, rhythm, and non-parsing. Paper presented at the Rutgers Optimality Workshop, Rutgers University. Available as ROA-9 from the Rutgers Optimality Archive.
Hung, Henrietta (1994). *The rhythmic and prosodic organisation of edge constituents*. PhD dissertation, Brandeis University. Available as ROA-24 from the Rutgers Optimality Archive.
Hyde, Brett (2001). *Metrical and prosodic structure in Optimality Theory*. PhD dissertation, Rutgers University. Available as ROA-476 from the Rutgers Optimality Archive.
Hyde, Brett (forthcoming). NonFinality.
Itô, Junko & Armin Mester (1992). Weak layering and word binarity. Ms, UCSC.
Kager, René (1993). Alternatives to the iambic–trochaic law. *NLLT* **11**. 381–432.
Kager, René (1994). Ternary rhythm in alignment theory. Ms, Utrecht University. Available as ROA-35 from the Rutgers Optimality Archive.
Kager, René (2001). Rhythmic directionality by positional licensing. Handout from the 5th Holland Institute of Linguistics Phonology Conference, University of Potsdam. Available as ROA-514 from the Rutgers Optimality Archive.
Kahn, Daniel (1976). *Syllable-based generalizations in English phonology*. PhD dissertation, MIT.
Kenstowicz, Michael (1995). Cyclic *vs.* non-cyclic constraint evaluation. *Phonology* **12**. 397–436.
Key, Harold H. (1961). Phonotactics of Cayuvava. *IJAL* **27**. 143–150.
Key, Harold H. (1967). *Morphology of Cayuvava*. The Hague: Mouton.
Knudson, Lyle M. (1975). A natural phonology and morphophonemics of Chimalapa Zoque. *Papers in Linguistics* **8**. 283–346.

https://doi.org/10.1017/S0952675703004391 Published online by Cambridge University Press

Krauss, Michael (ed.) (1985). *Yupik Eskimo prosodic systems : descriptive and comparative studies*. Fairbanks: Alaska Native Center.
Kroeber, A. L. (1963). Yokuts dialect survey. *University of California Archaeological Records* **11**. 177–251.
Kuznecova, A. N., E. A. Xelimskij & E. V. Gruskina (1980). *Očerki po sel'kupkomu jazyku*. Moscow: Izdatel'stvo Moskovskogo Universiteta.
Lawrence, Wayne P. (1997). Haplology and vowel underspecification. In S. Haraguchi (ed.) *Report of the special research project for the typological investigation of the languages and cultures of the east and west*. Tsukuba: University of Tsukuba. 381–388.
Leben, William R. (1980). A metrical analysis of length. *LI* **11**. 497–509.
Leer, Jeff (1985a). Prosody in Alutiiq (the Koniag and Chugach dialects of Alaskan Yupik). In Krauss (1985). 77–133.
Leer, Jeff (1985b). Evolution of prosody in the Yupik languages. In Krauss (1985). 135–157.
Leer, Jeff (1985c). Toward a metrical interpretation of Yupik prosody. In Krauss (1985). 159–172.
Lehrdahl, Fred & Ray Jackendoff (1983). *A generative theory of tonal music*. Cambridge, Mass.: MIT Press.
LeSourd, Philip S. (1993). *Accent and syllable structure in Passamaquoddy*. New York: Garland.
Liberman, Mark (1975). *The intonational system of English*. PhD dissertation, MIT. Published 1979, New York, Garland.
Liberman, Mark & Alan S. Prince (1977). On stress and linguistic rhythm. *LI* **8**. 249–336.
McArthur, Harry & Lucille McArthur (1956). Aguacatec phonemes within the stress group. *IJAL* **22**. 72–76.
McCarthy, John (2002). Against gradience. Ms, University of Massachusetts, Amherst. Available as ROA-510 from the Rutgers Optimality Archive.
McCarthy, John & Alan Prince (1993a). Generalized alignment. *Yearbook of Morphology 1993*. 79–153.
McCarthy, John & Alan Prince (1993b). *Prosodic Morphology I : constraint interaction and satisfaction*. Ms, University of Massachusetts, Amherst & Rutgers University.
McCarthy, John & Alan Prince (1995). Faithfulness and reduplicative identity. In Beckman *et al*. (1995). 249–384.
Matteson, Esther (1965). *The Piro* (*Arawakan*) *language*. Berkeley: University of California Press.
Newman, Stanley (1944). *Yokuts language of California*. New York: Viking Fund.
Nicklas, Thurston Dale (1972). *The elements of Choctaw*. PhD dissertation, University of Michigan, Ann Arbor.
Nicklas, Thurston Dale (1975). Choctaw morphophonemics. In James M. Crawford (ed.) *Studies in southeastern Indian languages*. Athens: University of Georgia Press. 237–250.
Osumi, Midori (1995). *Tinrin grammar*. Honolulu: University of Hawai'i Press.
Payne, David (1990). Accent in Aguaruna. In Doris Payne (ed.) *Amazonian linguistics : studies in lowland South American languages*. Austin: University of Texas Press. 161–184.
Poppe, Nicholas (1962). *Uzbek newspaper reader*. Bloomington: Indiana University.
Prince, Alan (1983). Relating to the grid. *LI* **14**. 19–100.
Prince, Alan & Paul Smolensky (1993). *Optimality Theory : constraint interaction in generative grammar*. Ms, Rutgers University & University of Colorado, Boulder.
Rubach, Jerzy (1996). Shortening and ambisyllabicity in English. *Phonology* **13**. 197–237.
Selkirk, Elisabeth O. (1980). The role of prosodic categories in English word stress. *LI* **11**. 563–605.

https://doi.org/10.1017/S0952675703004391 Published online by Cambridge University Press

Selkirk, Elisabeth O. (1984). *Phonology and syntax: the relation between sound and structure*. Cambridge, Mass: MIT Press.
Selkirk, Elisabeth O. (1995). The prosodic structure of function words. In Beckman *et al*. (1995). 439–469.
Spencer, Andrew (1996). *Phonology: theory and description*. Oxford & Cambridge, Mass.: Blackwell.
Tryon, Darrell T. (1967). *Nengone grammar*. Canberra: Australian National University.
Tryon, Darrell T. (1970). *An introduction to Maranungku*. Canberra: Australian National University.
Tyhurst, James J. (1987). Accent shift in Seminole nouns. In Pamela Munro (ed.) *Muskogean linguistics*. Los Angeles: Department of Linguistics, UCLA. 161–170.

https://doi.org/10.1017/S0952675703004391 Published online by Cambridge University Press