Mongolian Stress, Licensing, and Factorial Typology[*]

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June 1997

This paper examines the analysis and typology of prominence-based stress systems, which do not call on binary rhythms but depend solely on factors such as syllable weight or sonority, peripherality, and nonfinality in locating stress (Prince 1983, 1990; Prince & Smolensky 1993). Four prominence-driven constraints are defined which position stress independent of foot structure. Pursuing the optimality-theoretic hypothesis that typology derives from factorial constraint ranking, it is established that reranking accurately captures attested variation, and further, that the range of prominence-driven patterns is richer than previous conceptions, including variation in nonfinality effects. Two important empirical and theoretical findings are presented. First, new data from East Mongolian dialects are introduced, correcting a misinterpretation of the Khalkha stress pattern and illuminating the analysis with a case uniquely employing all four prominence-driven constraints. Second, opposite-edge default is argued to be a categorical licensing effect, informed by the typological result that nonfinality only fails to cooccur with opposite-side systems when the default is to the right. This finds new evidence for Zoll's (1996) licensing account of conflicting directionality and offers an argument against alternative foot-based analyses.

It has been well-documented that many stress systems are based on a binary foot structure. This paper turns its focus to the complement of the foot-based stress systems: the patterns which make use only of relative prominence in locating stress peaks. These systems thus do not call on binary rhythms but are purely prominence-driven, where prominence depends on factors contributing to increased salience, such as syllabic weight or sonority, peripherality, and nonfinality (for discussion of the separation of prominence and rhythmic structure see Prince 1983,

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1990; Prince & Smolensky 1993). The analysis of prominence-driven stress is examined in close connection with the typology of these patterns. Taking as a starting point the analysis of familiar edgemost prominence-driven patterns in Optimality Theory, this investigation pursues the optimality-theoretic hypothesis that typology derives from factorial constraint ranking, establishing that the rankings of a small number of optimality-theoretic constraints accurately capture attested variation. Combining theoretical predictions with careful attention to language data, it is revealed that the typology of prominence-driven stress patterns is richer than previously supposed, incorporating variation in nonfinality effects. Two types of nonfinality effects are examined: an obligatory one in which stress is never final and a nonobligatory one in which nonfinality is revoked just in case the final syllable is the heaviest in the word (see Prince & Smolensky 1993 on Hindi); the latter effect is problematic for derivational approaches but it is explained in Optimality Theory with the conception of constraints as ranked and violable. A welcome result of the prominence-based analysis is its success in predicting the occurrence of nonfinal but not peninitial stress in unbounded systems, a property which emerges as accidental in foot-driven accounts.

Two striking new findings form the focal points of this study. The first is empirical in nature. New data introduced here from East Mongolian dialects play an important role in completing the typology of opposite-edge default systems with revokable nonfinality, providing a crucial case of the kind of pattern which convergently employs all four of the basic constraints utilized in prominence-driven systems. These data make a significant correction to an earlier misinterpretation of Khalkha stress and contribute to the documentation of Mongolian languages. The second point is a theoretical one, illuminated by a typological argument. On the subject of default-to-opposite-side stress systems, it is shown that the gap of opposite-side patterns combining nonfinality and rightward default argues for analyzing opposite-edge default as a categorical licensing effect. This finds new evidence for Zoll's (1996) proposal that conflicting directionality arises under conditions where marked prosodic structure must be licensed by a prosodically strong position, as the licensing-based account derives the correct shape for the expanded typology in contrast to alternative foot-based or gradient alignment analyses of opposite-edge default.

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The paper is organized as follows. First, section 1 establishes the background, presenting the constraint hierarchies utilized to capture the default-to-same-side systems. Two nonfinality effects are derived simply from different rankings of a nonfinality constraint, and a preliminary factorial typology based on three optimality-theoretic constraints is exhibited. Section 2 turns to the East Mongolian stress data, laying out the descriptive facts of its nonfinality effect and opposite-edge default and showing its unique analytical significance in the range of default-to-opposite patterns. Section 3 further pursues the analysis of opposite-side default and adduces typological evidence to argue that this phenomenon is a categorical licensing effect. Section 4 derives the revised and expanded prominence-based typology, incorporating the licensing constraint. Finally, section 5 examines multiple stresses in prominence-driven systems, culminating in the analysis of East Mongolian secondary stress, and section 6 presents the conclusion.

1. Background: default-to-same-side stress

In general, stress patterns orient the stress peak towards a word-edge (see, for example, Prince 1983). When word-edge alignment for stress is tempered by sensitivity to syllable strength without making use of binary rhythmic structure, the resulting pattern corresponds to what is traditionally known as unbounded (quantity-sensitive) stress (Hayes 1981, 1995). In parametrized metrical theory, the most well-studied of these systems have been organized into a four-way typology derived from two binary parameters (Hayes 1981, 1995; Prince 1983, 1985). The first parameter reflects the sensitivity to syllable strength by requiring that stress fall on the leftmost/rightmost strong (e.g. heavy) syllable in the word, and the second parameter reflects the edge-seeking nature of stress by fixing the stress peak on the leftmost/rightmost syllable in words with no strong syllables. A summary of this classification is given in (1) using terminology from Prince (1985).

(1) Default-to-Same-Side:

L/L: Stress falls on the leftmost strong syllable, otherwise on the leftmost syllable.

R/R: Stress falls on the rightmost strong syllable, otherwise on the rightmost syllable.

Default-to-Opposite-Side:

L/R̄: Stress falls on the leftmost strong syllable, otherwise on the rightmost syllable.

R/L̄: Stress falls on the rightmost strong syllable, otherwise on the leftmost syllable.

These systems are 'unbounded' in the sense that there are no limits on the distance between the main stress and the word edge towards which it is oriented. These unbounded spans have sometimes been analyzed as feet with no limits on syllable membership (see, for example, Prince 1980; Hayes 1981, 1995; Hammond 1986); however the thesis here is that unbounded systems assign stress independent of foot structure and are driven by prominential constraints only.

Throughout the history of metrical theory, default-to-same-side versus default-to-opposite stress have required somewhat different analytical treatment, and this difference persists in Optimality Theory. This section focuses on same-side default patterns, which can be derived quite straightforwardly in Optimality Theory from the interaction of edge-seeking and peak-prominence constraints. First I exemplify the analysis of these patterns and then expand the analysis to incorporate the interaction of same-side default with two kinds of nonfinality effects, using just three constraints. I explore the prominence basis of these constraints and pursue the full extent of their interaction, exhibiting the resulting optimality-theoretic factorial typology.

A characteristic quality of same-side default patterns is their quantity sensitivity. A constraint on peak-prominence, given in (2), captures this aspect of the stress systems (Prince & Smolensky 1993: 39; cf. McCarthy & Prince 1986: 9; cf. also Hayes 1995 on prominence grids).

(2)   PK-PROM: Peak (x) ≻ Peak (y) if |x| > |y|.

By PK-PROM, an element **x** makes a better peak than an element **y** if the intrinsic prominence of **x** is greater than that of **y**. The relative prominence of a syllable may be determined on the basis of various factors. For some languages it is sonority (in some cases corresponding to a full versus reduced vowel distinction), for others, syllable length or weight, and yet others, pitch or tone (see Kenstowicz 1993, 1994, 1995 for discussion of the sensitivity of PK-PROM to quality as well as quantity). Normally only one of these factors is grammaticalized for the purpose of making distinctions of intrinsic prominence for stress in a language. The peak-prominence constraint is not

strictly binary, but can assess scalar evaluations of the relative harmony of elements as peaks. As Prince & Smolensky (1993: 134) point out, the assessment of peak harmony can be translated into binary constraints with a peak constraint hierarchy derived from a harmony scale of all possible peak elements. Each of the three factors contributing to prominence listed above will correspond to its own constraint hierarchy. For ease of exposition, I collapse these hierarchies in (2) and I formulate this as a scalar constraint rather than separate binary constraint hierarchies. A violation of this constraint will be incurred each time stress fails to fall on (one of) the strongest syllable(s) in the word.

As Prince & Smolensky (1993: 38-39) have outlined, ranking the peak-prominence constraint over a peak-alignment constraint generates the default-to-same-side unbounded patterns.[1] The peak-alignment constraint is as in (3), reformulating the EDGEMOST constraint of Prince & Smolensky (1993) in the generalized alignment formulation of McCarthy & Prince (1993).

(3)   ALIGN (Pk, L/R, PrWd, L/R)   (henceforth ALIGN L/R (Pk, PrWd))

    For all Peaks there exists some Prosodic Word such that the left/right edge of the Peak and the left/right edge of the Prosodic Word are shared.[2]

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[1] Hyman (1977a: fn. 9) makes the antecedent suggestion that these systems involve conflict between a demarcative function for stress and attraction of stress to syllables with greater duration.

[2] A conceivable alternative to aligning the prominence-peak is to align the head syllable, that is, the one bearing main stress, to the prosodic word. Either this formulation or the one in (3) seems a viable choice. On a related matter, one might question whether it is necessary to refer to the edges of the prominence-peak (or head syllable). This issue does not arise for Prince & Smolensky (1993: 39), because their EDGEMOST constraint is formulated such that it aligns a prominence-peak at the left/right edge of a word. The only edge referred to in this constraint is the word-edge. Yet McCarthy & Prince's enriched version of the general EDGEMOST constraint (termed ALIGN) refers to the edges of both arguments. To preserve uniformity with the formulation of alignment, I will refer to the edges of prominence-peaks here, although the only cases I will be concerned with are ones in which both left or both right edges of the prominence-peak and prosodic word are matched. It seems improbable that a mismatch in edges would ever be required, as the prominence-peak is the head of the prosodic word and thus is contained within it. I leave as an

The ranking is illustrated with the schematic forms below, for a language stressing the rightmost strong (H) syllable, otherwise the rightmost weak (L) syllable. Since the stress assignment is right-oriented, the peak-alignment constraint that will be needed is ALIGN R (Pk, PrWd). This constraint will have to be ranked below PK-PROM in order to build in the quantity sensitivity of the system. The effect of this ranking is shown in (4) for a form containing heavy and light syllables. PK-PROM rules out candidate (b), stressing the final light, because stress fails to fall on one of the most prominent syllables in the word. ALIGN R (Pk, PrWd) then chooses the candidate stressing the rightmost of the heavy syllables. Notice the gradient interpretation of the violations of the peak-alignment constraint; this kind of interpretation is crucial to deciding between candidates (a) and (c).

(4)   PK-PROM >> ALIGN R (Pk, PrWd)

H H L	PK-PROM	ALIGN R (Pk, PrWd)
☞ (a) H H́ L		σ
(b) H H Ĺ	*!	
(c) H́ H L		σσ!

(5) shows how the constraint ranking realizes final stress in a weak-syllable word. Because all syllables in such a form have the same level of intrinsic prominence, the PK-PROM constraint does not come into play, and alignment produces stress on the rightmost syllable.

(5)   Weak-syllable form.

L L	PK-PROM	ALIGN R (Pk, PrWd)
☞ (a) L Ĺ		
(b) Ĺ L		σ!

Default-to-same-side patterns which are left oriented may be analyzed similar to the right-oriented ones: the alignment constraint need simply be set to the left rather than the right. Languages stressing the rightmost strong syllable otherwise the rightmost syllable include Aguacatec (Mayan, Guatemala; McArthur & McArthur 1956), and Golin (Chimbu, New Guinea; Bunn & Bunn 1970 cited in Hayes 1995: 278). Examples Hayes (1995: 297) lists of leftmost strong else leftmost languages are Amele (Gum, Papua New Guinea; Roberts 1987); Au

open question how best to formulate head alignment.

(Torricelli, New Guinea; Scorza 1985); Indo-European accent: Sanskrit, Russian, Lithuanian (Halle & Kiparsky 1977, 1981; Halle & Vergnaud 1987); Lhasa Tibetan (Odden 1979); Lushootseed (Salishan, Washington; Hess 1976, Odden 1979); Murik (lower Sepik, New Guinea; Abbott 1985); and Yana (Hokan, northern California; Sapir & Swadesh 1960). Kenstowicz (1994: 4-5) also gives the example of Mordwin (Mokshan dialect; Finno-Ugric, central Russia; Tsygankin & DeBaev 1975).

For both of the same-side patterns, stress assignment is analyzed independent of foot structure as arising through the interaction of PK-PROM and peak-alignment constraints. These constraints have in common the goal that stress fall in a prominent position. The alignment constraint drives stress towards a word-edge syllable. Word edges have been accorded a special status by various analysts. Phonologists working in the Praguean tradition, such as Trubetzkoy (1939: 277), Jakobson et al. (1952), Martinet (1960: 87), and Garde (1968: 98) claim that stress can have a demarcative function, that is, in some languages stress signals a word boundary. Hyman (1977a: 41) suggests that in systems with demarcative stress, locating stress in initial or final position is conceptually natural, because it requires less calculation on the part of the hearer and listener than locating stress on a syllable near but not at the word edge. Further, Prince (1983: 90) suggests that the factors of firstness and lastness contribute to prominence. These explanations have in common the claim that situating stress on word-edge syllables is motivated by the salience of this position. The prominence basis of the PK-PROM constraint is obvious: it demands that stress fall on a syllable with the greatest inherent strength (e.g. length). Same-side default unbounded stress patterns are thus analyzed here as those in which a strong syllable draws stress away from a word edge when needed to satisfy the imperative of stressing one of the strongest syllables.

1.1 *Two types of nonfinality effects*

Traditionally, unbounded stress has been descriptively characterized as presenting the straightforward edge-default variants outlined above. Yet some languages complicate this pattern with a nonfinality effect, yielding an expanded typology. I turn now to these cases.

First I examine languages in which stress is oriented to the right. Sindhi, an Indo-Aryan

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language of India, provides an example of a nonfinality effect overlaid on a rightmost strong else rightmost syllable pattern. The primary stress pattern of Sindhi is a theoretically significant one, because the nonfinality effect is overridden just in case the only heavy syllable is final. The stress system is such that if there is only one heavy syllable in a word, it is stressed (6a); otherwise the rightmost heavy syllable is stressed, skipping the last (6b); and if there are no heavy syllables, the penultimate syllable is stressed (6c) (Khubchandani 1969, see also Stowell 1979: 70). Closed syllables and syllables with long vowels are heavy in Sindhi. Khubchandani lists the vowel set [i e ɛ a ɔ o u] as phonetically long and the set [ɪ ə ʊ] as phonetically short.

(6)   *Sindhi*

    a. L H́   [ɖʱəgó]   'ox'

        H́ L   [sválʊ]   'question'

        L H́ L   [ɣʊlámʊ]   'slave'

        H́ L L   [sə́hkəɳʊ]   'to gasp'

        L L H́ L L   [dɪkʰɪdʒə́nɖəɽʊ]   'one (m.) getting anointed'

    b. H́ H   [kúɽmi]   'farmer'

        H H́ H   [kʰolĭnda]   'they will open (trans.)'

        H́ L H   [ócɪto]   'sudden'

        H́ L L H   [mókɪlɪɳo]   'to be sent'

        H L H́ H   [mokɪláɳi]   'farewell'

        H H H H́ L L [kʰolaraĭndəɽʊ]   'one who gets x open'

        H H H H H́ H [kʰolaraindjű̃sî]   'we (f.) shall get x opened'

        H H H H H H́ L [kʰolaraindasű̃sɪ] 'we (m.) shall get x open from him/her/them'

    c. Ĺ L   [bʱítɪ]   'wall'

        L Ĺ L   [ʊtʰə́lə]   'inundation'

In Sindhi, PK-PROM and right peak alignment interact with a NONFINALITY constraint (Prince & Smolensky 1993: 40; cf. Hung 1994):

(7)   NONFINALITY: The prosodic head of the word does not fall on the word-final syllable.

Along with Prince & Smolensky (1993: 40), I assume that the syllable with main stress is a head of the prosodic word, so when main stress is word final, NONFINALITY is violated. Other versions of NONFINALITY have been proposed which hold at the mora level (Kenstowicz 1994: 22) or foot level (Prince & Smolensky 1993: 43), and Prince & Smolensky (1993: 52) have proposed a collapsed version holding at all levels of the prosodic hierarchy. What will be needed for our purposes is a NONFINALITY constraint simply holding at the syllable level, and this formulation will prove to accurately characterize a typology of prominence-driven stress. This is consistent with the findings of Kubozono (1997), who argues that NONFINALITY must be decomposed into constraints holding at separate prosodic levels to explain Japanese accent patterns.

The constraint hierarchy for Sindhi is PK-PROM >> NONFINALITY >> ALIGN R (Pk, PrWd). This ranking preserves the PK-PROM over ALIGN R relation we have seen for rightmost strong else rightmost patterns, and it places NONFINALITY over alignment to produce the nonfinality effect.

The effect of this constraint ranking is illustrated below. First, (8) demonstrates how ranking NONFINALITY over ALIGN R (Pk, PrWd) captures the nonfinality effect. The selection of the optimal candidate with nonfinal stress in (a) over the candidate in (b) with final stress shows that it is more important to have nonfinal stress than it is to perfectly satisfy alignment. The right-orienting effect of the alignment constraint is evident in the comparison of (a) and (c). Once NONFINALITY is satisfied by stressing a nonfinal syllable, ALIGN R (Pk, PrWd) selects the rightmost of the nonfinal syllables, which in this case are otherwise equally eligible stress bearers.

(8)   NONFINALITY >> ALIGN R (Pk, PrWd)

H H H kʰolinda	NONFINALITY	ALIGN R (Pk, PrWd)
☞ (a) H H́ H		σ
(b) H H H́	*!	
(c) H́ H H		σσ!

(9) exemplifies the theoretically-novel effect derived by ranking PK-PROM over NONFINALITY. With this ranking, satisfying peak-prominence is paramount, so a final syllable will be stressed if it is the only heavy. This kind of nonfinality effect, in which quantity sensitivity wins over avoiding final stress, I will refer to as quantity-sensitive nonfinality.

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(9)   PK-PROM >> NONFINALITY

L H dʰəgo	PK-PROM	NONFINALITY
☞ (a) L H́		*
(b) Ĺ H	*!	

(10) illustrates the need for ranking PK-PROM over ALIGN R (Pk, PrWd), although by transitivity this ranking must hold anyway. In a form where a choice must be made between stressing a heavy syllable or a better-aligned light syllable, this ranking ensures that PK-PROM is respected, and the heavy syllable wins, so stressing a nonfinal heavy in (a) is selected over stressing a nonfinal light in (b) which better satisfies alignment.

(10)   PK-PROM >> ALIGN R (Pk, PrWd)

H L H ocɪto	PK-PROM	NONFINALITY	ALIGN R (Pk, PrWd)
☞ (a) H́ L H			σσ
(b) H Ĺ H	*!		σ
(c) H L H́		*!	

This analysis of Sindhi finds support for Prince & Smolensky's account of Hindi stress (dialect described by Kelkar 1968; Indo-Aryan, India), which makes use of the same constraint ranking (1993: 40-42). Kelkar's Hindi provides another example of quantity-sensitive nonfinality in a system stressing the rightmost strong else rightmost syllable, but the pattern is complicated by a contrast between three levels of syllable weight. The important common factor in the Sindhi and Hindi stress patterns is the <u>violability</u> of the nonfinality effect. In these languages, final stress occurs only when forced by the need to stress the strongest available syllable. The optimality-theoretic NONFINALITY constraint, which is formulated as a well-formedness condition on the position of prosodic heads (see Prince & Smolensky 1993: 41), is well-suited to capturing this kind of nonfinality effect: the violability is derived straightforwardly through constraint ranking. In derivational approaches, however, an alternative parametric notion of extrametricality where the final syllable is rendered metrically invisible cannot derive revokable nonfinality, because extrametricality is fixed. A stipulation would have to be added to the effect of 'except when the final syllable is the only heavy syllable in the word' (see Downing 1995 for a related argument; on

extrametricality as an invisibility device see, for example, Hayes 1979, 1981, 1982, 1995; Harris 1983; Poser 1984, 1986; Inkelas 1990). Another alternative to consider is simply final segment extrametricality (Hayes 1981, 1995). The secondary stress pattern of Sindhi is revealing on this point. Khubchandani describes secondary stresses as falling on heavy syllables when they do not receive primary stress. A secondary stress on a final heavy syllable would be unexpected under final segment extrametricality but could be explained under the optimality-theoretic analysis proposed here, because the final segment is never metrically invisible. An analysis of a secondary stress pattern like that of Sindhi will be presented in section 5.

Optimality Theory predicts the occurrence of violable nonfinality effects; yet it also predicts patterns in which nonfinality is always respected. Western Cheremis, a Finno-Ugric language spoken in Russia, provides a counterpart to Sindhi, differing only in the respect that stress is never final. As described by Itkonen (1955: 28) and noted in Hayes (1995: 297), Western Cheremis stresses the rightmost nonfinal strong syllable (11a), and in forms with no nonfinal strong syllables, the rightmost nonfinal syllable is stressed, even when the final syllable is strong (11b). Full vowels constitute strong syllables in Western Cheremis, while reduced vowels count as weak.

(11)   *Western Cheremis*

    a. H́ H   [óʃma]   'sand'

        H́ L   [kórnə]   'road'

        H́ L L   [kórnəʃtə]   'road' (inessive)

        H́ L H   [βáʃtəlam]   'I laugh'

        H H́ L   [oʃmáʃtə]   'sand' (inessive)

    b. Ĺ L   [pə́rə]   'go in!'

        Ĺ H   [pə́ra]   'go in' (pres. 3. sg.)

        L Ĺ L   [pərə́ʃəm]   'I went in'

        L Ĺ H   [əmə́ltem]   'I throw my shade on'

Because nonfinality in Western Cheremis is always respected, the analysis of Western Cheremis differs from that of Sindhi by reversing the ranking of NONFINALITY and PK-PROM,

giving the constraint hierarchy, NONFINALITY >> PK-PROM >> ALIGN R (Pk, PrWd).

(12) shows the crucial difference in the nonfinality effect. Here NONFINALITY is ranked over PK-PROM, because it is more important in Western Cheremis to satisfy nonfinality by stressing a weak nonfinal syllable than it is to respect peak-prominence by stressing a final strong syllable. Nonfinality thus holds in all forms, regardless of final syllable strength. This kind of nonfinality effect I will refer to as quantity-insensitive nonfinality.

(12)   NONFINALITY >> PK-PROM

L H pəra	NONFINALITY	PK-PROM
☞ (a) L᷄ H		*
(b) L H᷄	*!	

The tableau in (13) illustrates the effect of PK-PROM dominating ALIGN R (Pk, PrWd). In the candidates shown here, the undominated NONFINALITY constraint is respected and a choice must be made between two nonfinal syllables. Stressing a strong syllable wins out over stressing a better-aligned weak one, so peak-prominence must supercede alignment.

(13)   PK-PROM >> ALIGN R (Pk, PrWd)

H L H βaʃtəlam	NONFINALITY	PK-PROM	ALIGN R (PK, PRWD)
☞ (a) H᷄ L H			σσ
(b) H L᷄ H		*!	σ

The difference between stress in Sindhi and Western Cheremis thus comes out simply as the result of different rankings of NONFINALITY.

If stress patterns with nonfinality are to be viewed as members of a typology derived by purely prominence-driven constraints, we must consider in what way nonfinality contributes to prominence. Hyman (1977a) offers some interesting insights on this matter. In a comprehensive survey of the stress patterns of 300 languages, Hyman finds that the number of languages with predominantly penultimate stress (77 languages) is comparable to the number with final stress (97 languages). On the other hand, patterns with second-syllable stress (12 languages) are much rarer than those with initial stress (114 languages). These findings show that the salience of penultimate or nonfinal stress cannot be a consequence solely of its proximity to a word-edge but must have

some other basis. Hyman suggests that the explanation has to do with the phonetic realization of stress. He notes that pitch-change, especially a pitch fall, is the most effective cue of stress-prominence, corresponding to the demarcative initial raising and final lowering of pitch. Hyman observes that nonfinal stress favors the perceptibility of a final pitch fall, because the pitch-change is realized over two syllables, enhancing the pitch-differential, and is not diminished by word-final weakening effects. Consequently, while the final syllable is prominent by actually being at a word-edge, a near-final syllable is prominent by virtue of enhancing perceptibly of the word-edge emphasis. This points to a plausible prominence basis for nonfinality, although it needs to be strengthened by further empirical investigation. Importantly, a parallel comparison does not hold between initial and peninitial stress. Since the initial syllable is already followed by another syllable to enhance perception of a pitch fall, no benefit is gained by shifting stress to the second syllable, in fact, this would produce a more complex pitch pattern with a rising contour. A prominence-driven account thus derives the rarity of systems with predominantly second-syllable stress.[3]

We have established that nonfinality, both the quantity sensitive and quantity insensitive versions, occurs with each type of system stressing the rightmost strong syllable, but we must also examine cases stressing the leftmost strong syllable. First I consider a pattern stressing the leftmost strong else the leftmost with quantity-sensitive (revokable) nonfinality. Such a system will not in fact be distinguishable from a leftmost strong else leftmost system without nonfinality. With quantity-sensitive nonfinality, a nonfinality effect will not be apparent in words with strong syllables, because it is the <u>leftmost</u> strong syllable which is stressed, and the leftmost strong will

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[3] Although peninitial stress is relatively rare, the counterpart to nonfinality, a noninitiality effect, has been observed in some languages, e.g. Kashaya (Buckley 1994), Dakota (Hayes 1987; Kennedy 1994), Winnebago (Alderete 1995), Northwest Mari (Cheremis) (Kenstowicz 1994; but see Zoll 1997 for an alternative analysis), (see also Hayes 1995 for discussion). For some cases a NONINITIAL constraint has been proposed (see, e.g., Kennedy 1994; Kenstowicz 1994; Alderete 1995); however, since stressing a noninitial syllable does not enhance initial demarcative perceptibility, this constraint must be distinguished from the prominence-based constraints.

be stressed even when it is final. Furthermore, since stress falls in the initial position when there are no strong syllables, the right-oriented nonfinality effect will not emerge in weak-syllable forms. The same-side leftmost systems with quantity-sensitive nonfinality are thus not a gap in the typology, but simply do not contrast with the corresponding systems without a nonfinality effect.

In a system stressing the leftmost strong else leftmost, nonfinality will be apparent when the effect is quantity insensitive (obligatory). Kashmiri, an Indo-Aryan language of India, provides an example of such a system. Kashmiri contrasts three levels of syllable weight: light (L = CV), closed (C = CVC), and heavy (H = CV:). The stress pattern of Kashmiri is such that stress falls on the heaviest nonfinal syllable (14a), and in the event of a tie, the leftmost candidate wins (14b). Stress is never final in the word (Kenstowicz 1993 citing Bhatt 1989. No glosses are provided).

(14)   *Kashmiri*

a. Ĺ C   [nójid]   C H́ C   [masrá:wun]

   Ĺ H   [sála:m]   H́ C C   [bá:gambar]

   Ć C   [mátlab]   L Ć L L   [mukáddima]

   H́ H   [dá:na:]   L L Ć L L   [junivársiti]

   L Ć C   [nirándʒan]   L L H́ L   [maharə́:ni]

   Ć L C   [rə́phvarukh]   L H́ L L   [mulá:heza]

   L Ć H   [nojídgi:]   C L H́ C   [nandiké:ʃor]

   L H́ C   [zitó:vuh]   C H́ L L   [aŋgó:lika]

   H́ L H   [ʃá:rika:]   C H́ C H   [narpí:rasta:n]

b. Ĺ L L   [phíkiri]   H́ H L L   [ná:ra:zagi]

   Ĺ L L C   [sírinagar]   L H́ H L   [mahá:ra:zi]

   Ĺ L L L H   [páharadari:]   H́ H C   [ní:ra:zan]

   L Ć C L C   [bagándarladin]   C L H́ H C   [ardonó:ri:ʃor]

   Ć C H   [gánpaθja:r]   H́ H H   [dé:vi:li:]

The stress pattern of Kashmiri resembles that of Western Cheremis in being basically quantity sensitive and unbounded and in having a quantity-insensitive nonfinality effect. The ranking for

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Kashmiri will be the same as that of Western Cheremis, but in Kashmiri, peak-alignment will be set to the left rather than to the right: NONFINALITY >> PK-PROM >> ALIGN L (Pk, PrWd).

1.2   *A preliminary factorial typology*

We have now seen that two kinds of nonfinality in same-side default unbounded systems are derived with two rankings of PK-PROM and NONFINALITY, as summarized in (15). In each of these systems, the alignment constraint is ranked lowest.

(15)   a. <u>PK-PROM >> NONFINALITY</u> >> ALIGN EDGE (Pk, PrWd): Stress edgemost strong syllable else edgemost syllable (same side) with quantity-sensitive nonfinality.

b. <u>NONFINALITY >> PK-PROM</u> >> ALIGN EDGE (Pk, PrWd): Stress edgemost strong syllable else edgemost syllable (same side) with quantity-insensitive nonfinality.

(15) gives only two of the six possible rankings of the three constraints. Prince & Smolensky hypothesize that language typologies are derived from factorial constraint ranking (1993: 84). We thus expect the four remaining rankings (in fact eight if we examine both left and right peak alignment) to yield attested systems. I will now show that in the four remaining rankings, the force of at least one of the three constraints is neutralized, because of its low-ranked position. It will emerge that the systems derived by the remaining rankings correspond to familiar stress patterns.

First consider the cases in which the peak-alignment constraint outranks the other two. Restricting our attention for the moment to just right peak alignment, this occurs in two rankings:

(16)   a.   ALIGN R (Pk, PrWd) >> PK-PROM >> NONFINALITY

b.   ALIGN R (Pk, PrWd) >> NONFINALITY >> PK-PROM

In both of these rankings, the right alignment constraint is undominated, so it is always respected. This ranking neutralizes the effect of both PK-PROM and NONFINALITY, because stress is consistently located at the right edge even though this violates NONFINALITY and may fail to locate stress on the strongest syllable in the word. Since the undominated ranking of the alignment constraint neutralizes the effect of PK-PROM and NONFINALITY, these lower-ranked constraints will not interact with each other, and both (16a) and (16b) realize the same stress pattern: one in which stress is uniformly final. Similarly, these rankings with a left-alignment constraint will

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generate uniform initial stress. Initial and final stress patterns occur in many languages (see Hyman 1977a). Foot structure will be needed for those systems which also have a binary secondary stress pattern, but the ones which have only a single stress may be grouped with the purely prominence-driven patterns, as derived by the above constraint rankings. Examples of final stress patterns without secondary stresses occur in Uzbek (Altaic, Uzbekistan: Poppe 1962) and Yavapai (Yuman, central Arizona; Kendall 1976), and for initial stress, examples occur in Tinrin (Melanesian; Osumi 1995) and Yeletnye (East Papuan; Henderson 1975).

Two more rankings remain to be examined. These are the ones in which the alignment constraint dominates just one of PK-PROM and NONFINALITY and is itself dominated by the other:

(17)   a.   NONFINALITY >> ALIGN R (Pk, PrWd) >> PK-PROM

        b.   PK-PROM >> ALIGN R (Pk, PrWd) >> NONFINALITY

Consider first the ranking in (17a). In this case NONFINALITY outranks ALIGN R (Pk, PrWd), so there will be a nonfinality effect. In addition, the alignment constraint dominates PK-PROM, so stress assignment will be quantity insensitive. This means that stress will never be drawn away from the penultimate position in order to stress a heavier syllable. This pattern occurs in the Yawelmani dialect of Yokuts (California; Kroeber 1907, 1963; Newman 1944; Archangeli 1988). (18) illustrates how the ranking yields regular penultimate stress.

(18)   NONFINALITY >> ALIGN R (Pk, PrWd) >> PK-PROM

H L H	NONFINALITY	ALIGN R (Pk, Prwd)	PK-PROM
☞ (a) H Ĺ H		σ	*
(b) H L H́	*!		
(c) H́ L H		σσ!	

The corresponding ranking with alignment set to the left yields quantity-insensitive initial stress, as stressing the first syllable satisfies both NONFINALITY and ALIGN L (Pk, PrWd).

In the final ranking, in (17b), PK-PROM is undominated, so the most intrinsically prominent syllable in the word will always be stressed. When there is a tie for the most prominent syllable, the force of ALIGN R (Pk, PrWd) will cause stress to fall on the rightmost candidate. Because alignment outranks NONFINALITY, there will be no nonfinality effect. This ranking thus yields a

pattern stressing the rightmost strong syllable, else the rightmost syllable, without nonfinality. We noted earlier that this pattern occurs in Aguacatec and Golin, and the effect of ranking PK-PROM over ALIGN R (Pk, PrWd) where NONFINALITY had no force was illustrated in (4-5). The same ranking with left alignment gives a system stressing the leftmost strong, else leftmost syllable.

The typology derived from the factorial ranking of the three constraints, NONFINALITY, ALIGN EDGE (Pk, PrWd), and PK-PROM, is summarized below. This typology contains six basic constraint hierarchies, and adding in left versus right alignment, there are 12 rankings, of which eight produce different patterns. The rankings are organized so that quantity-insensitive systems, in which alignment dominates PK-PROM, are given first. Quantity-sensitive systems, where PK-PROM dominates alignment, then follow. In each set, only NONFINALITY moves in its ranking with respect to the other constraints. The placement of NONFINALITY is highlighted with underlining.

(19)   Preliminary factorial typology of prominence-driven stress

ALIGN EDGE (Pk, PrWd) >> PK-PROM: Quantity-insensitive systems

Right alignment

i.   <u>NONFINALITY</u> >> ALIGN R (Pk, PrWd) >> PK-PROM
        Always penultimate stress. Example: *Yawelmani.*

ii.   ALIGN R (Pk, PrWd) >> <u>NONFINALITY</u> >> PK-PROM
        Always final stress. Examples: *Uzbek, Yavapai.*

iii.   ALIGN R (Pk, PrWd) >> PK-PROM >> <u>NONFINALITY</u>
        Always final stress (no contrast with (ii)).

Left alignment

iv.   <u>NONFINALITY</u> >> ALIGN L (Pk, PrWd) >> PK-PROM
        Always initial stress. Examples: *Tinrin, Yeletnye.*

v.   ALIGN L (Pk, PrWd) >> <u>NONFINALITY</u> >> PK-PROM
        Always initial stress (no contrast with (iv)).

vi.   ALIGN L (Pk, PrWd) >> PK-PROM >> <u>NONFINALITY</u>
        Always initial stress (no contrast with (iv) or (v)).

PK-PROM >> ALIGN EDGE (Pk, PrWd): Quantity-sensitive systems

Right alignment

vii.   <u>NONFINALITY</u> >> PK-PROM >> ALIGN R (Pk, PrWd)
        Stress falls on rightmost strong nonfinal syllable, else rightmost nonfinal syllable.
        Stress is never final. Example: *Western Cheremis.*

viii.   PK-PROM >> <u>NONFINALITY</u> >> ALIGN R (Pk, PrWd)
        Stress falls on rightmost strong nonfinal syllable, else rightmost nonfinal syllable.
        If the only strong syllable is final, stress is final. Examples: *Sindhi, Hindi.*

ix. PK-PROM >> ALIGN R (Pk, PrWd) >> NONFINALITY
Stress falls on rightmost strong syllable, else rightmost syllable.
Examples: *Aguacatec, Golin.*

Left alignment

x. NONFINALITY >> PK-PROM >> ALIGN L (Pk, PrWd)
Stress falls on leftmost strong nonfinal syllable, else leftmost syllable.
Stress is never final. Example: *Kashmiri.*

xi. PK-PROM >> NONFINALITY >> ALIGN L (Pk, PrWd)
Stress falls on leftmost strong syllable, else leftmost syllable. Examples: *Murik, Amele, Au, Indo-European accent, Lhasa Tibetan, Lushootseed, Yana, Mordwin (Makshan dialect).*

xii. PK-PROM >> ALIGN L (Pk, PrWd) >> NONFINALITY
Stress falls on leftmost strong syllable, else leftmost syllable (no contrast with (xi)).

2. Default-to-opposite-side stress as a licensing effect: the stress pattern of East Mongolian.

The typology of the previous section revealed intriguing interactions of nonfinality with same-side default stress. I now turn to systems where stress in weak-syllable forms is drawn to the opposite edge from the one in strong-syllable forms. I will argue that these systems too can fall under a prominence-based account without reference to foot structure; yet interestingly, default-to-opposite-side stress is not derived by only making use of the three constraints used to derive the same-side default patterns: a further constraint most be evoked here. The stress pattern of East Mongolian, which combines nonfinality with opposite-edge default, will prove to be an important example of the kind of pattern that actively employs all four constraints in a single system. I begin by establishing the analysis of simple opposite-side systems without nonfinality.

Selkup, an Ostyak-Samoyed language of West Siberia, provides an example of default-to-opposite-side stress. Selkup stress falls on the rightmost syllable with a long vowel (20a), otherwise on the initial syllable (20b) (Idsardi 1992: 10; data is from Halle & Clements 1983: 189; the source for both is Kuznecova et al. 1980).

(20) *Selkup*

a. L H́   [qummí:]   'our friend'

   L L H́   [kanaŋmí:]   'our dog'

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	L L L H́	[pynakɨsɔ́ː]	'giant!'
	H́ L	[sǽːqɨ]	'black'
	L H́ L	[qumóːqɪ]	'two human beings'
	L L H́ L	[ilɨsɔ́ːmɨt]	'we lived'
	H́ L L	[qóːkɨtɨlʲ]	'deaf'
	H H́ L	[uːcɔ́ːmɨt]	'we work'
	L H L H́	[qumoːqlɪlíː]	'your two friends'
	H L H́ L	[uːcɨkkóːqɪ]	'they two are working'
b.	Ĺ L	[qúmmɨn]	'human being' (gen.)
	Ĺ L L	[ámɨrna]	'eats'
	Ĺ L L L	[qólʲcɨmpatɨ]	'found'

Opposite-edge default stress cannot be captured with just with the constraints we have made use of so far. We will see later that PK-PROM plays a reduced role in these systems; what we require now is a constraint drawing stress to the opposite side that takes effect only in weak-syllable forms. Zoll (1995) proposes an account based on the notion of licensing which achieves this result. Zoll examines a range of cases in which certain marked prosodic structure must fall at a word edge in order to be licensed. She argues that stressed light syllables count as marked prosodic structure and proposes to treat stress falling at the opposite edge in weak-syllable forms as a licensing effect. In the opposite-edge systems then, the conflicting directionality of stress arises because the licensing edge is in opposition to the main stress alignment constraint.

Following Itô & Mester (1995), who propose to characterize consonant licensing in terms of alignment to the left edge of a syllable, Zoll initially formalizes word-edge licensing as alignment. The kind of constraint required for opposite-edge default to the left is given in (21).

(21)   ALIGN ($\acute{\sigma}_\mu$ L, PrWd, L)   (Henceforth ALIGN L ($\acute{\sigma}_\mu$, PrWd))

For all Stressed Light Syllables there exists some Prosodic Word such that the left edge of the Stressed Light Syllable and the left edge of the Prosodic Word are shared.

This constraint formalizes the claim that the left edge of the word licenses a stressed light syllable

(cf. Garrett on "L-Markedness" 1996: 38, and for some related insights see Hewitt & Crowhurst 1996, who propose an analysis making use of constraint conjunction). In broader terms, this constraint encodes the generalization that only inherently strong syllables (e.g. ones with a long vowel, greater sonority, prominent tone) ever draw stress away from a word edge.

Zoll ranks left-edge licensing over right peak alignment to derive a pattern stressing the rightmost heavy syllable else the leftmost. (22) shows that in a form containing at least one heavy syllable, it is possible to satisfy the left-edge licensing constraint vacuously by stressing a heavy syllable, because there is no stressed light syllable to incur a licensing violation. Peak-alignment then determines the placement of stress, and the candidate stressing the rightmost heavy wins. Notice that in contrast to the gradient interpretation of peak-alignment, I have reckoned violations of the licensing constraint categorically. While this is not crucial here, this distinction is not made trivially. The significance of this interpretation of licensing will become apparent when we consider opposite-edge systems with nonfinality.

(22)   ALIGN L (σ́μ, PrWd) >> ALIGN R (Pk, PrWd)

L H L H qumo:qlılɪ:	ALIGN L (σ́μ, PrWd)	ALIGN R (Pk, PrWd)
☞ (a) L H L H́		
(b) L H Ĺ H	*!	σ
(c) L H́ L H		σ!σ
(d) Ĺ H L H		σ!σσ

(23) illustrates how stress is located at the opposite-edge in weak-syllable words. In such forms, stress must fall on a light syllable, so the highly-ranked left-edge licensing constraint selects the candidate with initial stress.

(23)   Opposite-edge default

L L L amɨrna	ALIGN L (σ́μ, PrWd)	ALIGN R (Pk, PrWd)
☞ (a) Ĺ L L		σσ
(b) L L Ĺ	*!	

Other languages Hayes (1995: 296) lists as examples stressing the rightmost strong syllable otherwise the leftmost syllable are Chuvash (Turkic, Russia; Krueger 1961), Huasteco (Mayan, Mexico; Larsen & Pike 1949), and Kuuku-Yaʔu (Pama-Nyungan, Cape York, Australia;

Thompson 1976). The reverse pattern, stressing the leftmost strong syllable, otherwise the rightmost occurs in Kwakwala, (Kwakiutl, Wakashan, British Columbia; Zec 1994: 32-38 drawing on Boas 1947). The constraint hierarchy needed for Kwakwala stress simply reverses the edge settings of Selkup: ALIGN R ($\acute{\sigma}_{\mu}$, PrWd) >> ALIGN L (Pk, PrWd).[4]

In this account of opposite-edge stress, just the licensing constraint in combination with a peak-alignment constraint is sufficient to capture the stress pattern. Notice that PK-PROM does not play a crucial role in stress placement in these systems. However, we will see evidence of the need for PK-PROM in the opposite-edge system of East Mongolian, where there is a nonfinality effect.

For stress patterns which are oriented in the same direction in strong- and weak-syllable forms, there is no need to make use of a licensing constraint. We have already seen evidence for this in section 1, where PK-PROM and ALIGN EDGE (Pk, PrWd) were sufficient to capture same-side systems. In fact, for the same-side systems, we must make use of PK-PROM. On their own the licensing constraint and the peak-alignment constraint cannot yield the same-side quantity-sensitive patterns (see Zoll 1995). A same-side analysis parallel to that for opposite-side systems would make use of the ranking ALIGN R ($\acute{\sigma}_{\mu}$, PrWd) >> ALIGN R (Pk, PrWd) for a right-oriented pattern. Yet this ranking actually produces a quantity-insensitive pattern of always final stress:

(24)   ALIGN R ($\acute{\sigma}_{\mu}$, PrWd), ALIGN R (Pk, PrWd)

L H H L	ALIGN R ($\acute{\sigma}_{\mu}$, PrWd)	ALIGN R (Pk, PrWd)
☞ (a) L H H Ĺ		
(b) L H H́ L		σ!
(c) L H́ H L		σ!σ
(d) Ĺ H H L	*(!)	σ(!)σσ

As (24) shows, stressing a final syllable perfectly satisfies both licensing and peak-alignment,

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[4] Hayes (1995: 297) also cites the Yaz'va dialect of Komi (Finno-Ugric, Russia; Itkonen 1955; Lytkin 1961) as a language stressing the leftmost strong syllable, otherwise the rightmost syllable, but Harms (1983) shows that Komi stress is not assigned on the basis of any surface weight distinction and exhibits complexities derived from historical and other considerations.

so the candidate with final stress wins, even though this means stressing a light syllable rather than a heavy elsewhere in the word. The dotted line between the two constraint columns indicates that either ranking of the two constraints will result in selection of the same candidate. The same constraints with alignment set to the left will similarly produce a pattern of always initial stress. These patterns of stress consistently falling at one edge are the same as those captured in the factorial typology in (19) by ALIGN EDGE (Pk, PrWd) outranking all other constraints.

2.1   *East Mongolian stress*

I next present new data from two East Mongolian dialects (Altaic) which provide a unique example of an opposite-edge default pattern combined with quantity-sensitive nonfinality. These data prove to be theoretically significant, because they are the only cases of the kind of pattern which shows the activity of both ALIGN EDGE ($\acute{\sigma}_\mu$, PrWd) and PK-PROM at once. A long-standing misinterpretation of the Khalkha stress pattern is also corrected.

I first examine Khalkha, which is spoken in eastern Mongolia and considered to be the standard dialect of Mongolian. In the theoretical literature, Khalkha has often been cited as an example of a same-side default stress system in which the leftmost strong syllable is stressed, otherwise the leftmost syllable (see, for example, Hayes 1981, 1995; Prince 1983; Hammond 1986; Halle & Vergnaud 1987; Idsardi 1992). However, the stress pattern of Khalkha is in fact crucially different from the early descriptions of this system. The description that appears in the theoretical literature is based on the work of Street (1963: 62), who refers to the early grammar of Poppe (1951: 13). Yet this early description of Khalkha stress has since been found to be mistaken, and Bosson (1964) and Poppe (1970) have provided a corrected description. Poppe's description and exemplification of Khalkha stress (1970: 47) is given in (25). In these examples, two adjacent nonidentical vowels, e.g. [ae], signify a diphthong.

(25)   a.   'Words containing no geminate vowel phonemes or diphthongs have the stress on the initial syllable.'
Ĺ L   [áxa]   'brother'
Ĺ L L   [únʃisan]   'having read'
Ĺ L   [xáda]   'mountain'

b. 'Words containing one geminate vowel phoneme or one diphthong have the stress on the geminate vowel or diphthong, respectively.'

L H́   [dalá́e]   'sea'

L H́   [galúː]   'goose'

c. 'Words containing more than one geminate vowel phoneme or diphthong have the stress on the penultimate geminate vowel or diphthong.'

L H́ H   [morióːroː]   'by means of his own horse'

L H H́ H   [dalaegáːraː]   'by one's own sea'

The description in (25a-b) agrees with the early description of Khalkha stress as being a leftmost strong else leftmost pattern. However, the part of the description that appears in (25c) reveals an important difference: in forms with more than one heavy syllable (a syllable with a long vowel or diphthong), stress falls on the penultimate heavy syllable rather than on the leftmost one. The crucial form which distinguishes the corrected description from the early one is dalaegáːra: 'by one's own sea'; all of the other forms given are consistent with either description. This considerable overlap in the output of the two patterns is likely a source of the system at first being mistaken for the simpler same-side left-oriented system.

Bosson gives a description of Khalkha stress similar to that of Poppe's, confirming the correction. Bosson states that 'if the word contains several syllables with long vowels, the stress falls on the penultimate long vowel' (1964: 21). Note that both Poppe and Bosson characterize the stressed syllable as the 'penultimate' heavy, and in each of the examples provided with more than one heavy syllable, the stressed syllable happens to fall in the penultimate position in the word. The question thus arises whether the 'penultimate' heavy syllable is intended to refer to the rightmost nonfinal heavy (e.g. H H H̲ L L) or whether it is the second last of the heavy syllables in the word, regardless of whether all heavy syllables are nonfinal (e.g. H H̲ H L L). My own research with a native speaker of Khalkha and consultation with James Bosson (p.c. 1994) concerning Khalkha stress indicates that stress falls on the rightmost nonfinal heavy syllable, whether it is the

penultimate syllable in the word or not.[5] This pattern is illustrated in (26) which shows various heavy-light configurations. The data from this investigation also reveal a secondary emphasis of heavy syllables and the initial syllable. This is indicative of a secondary stress on heavy syllables, as supported by the description of Street (1963: 63). There is documentation of initial syllable emphasis in the form of greater duration and greater clarity of articulation (Street 1963: 62; also Bosson p.c.), but pitch effects are somewhat variable. Svantesson (1990) finds that the initial syllable tends to exhibit a raised or lowered fundamental frequency: there is generally a dip in pitch on this syllable, although for some speakers there is an initial pitch peak when the initial syllable is heavy. Because of this variability, I only tentatively posit initial enhancement as a secondary stress peak here. I have recorded the initial emphasis below with a secondary stress mark, but it is conceivable that it may be analyzed in some other way. I return to this question in section 5.

(26)   *Khalkha*

H́ H̀	[á:rù:l]	'dry cheese curds'
H́ L H̀	[úitgartàe]	'sad'
L̀ H́ L H̀	[dòló:dugà:r]	'seventh'
H̀ H́ L L	[bàegú:lagdax]	'to be organized'
L̀ H̀ H́ L	[xǿndì:rý:len]	'to separate' (modal)
H̀ H́ H̀	[ù:rtáegà:r]	'angrily'
H̀ H́ L H̀	[bàigú:llagà:r]	'by means of the organization'
L̀ H̀ H́ L H̀	[ùlà:nbá:tarà:s]	'Ulaanbaatar' (ablative)
L̀ H̀ H̀ H́ L	[ùlà:nbà:trí:nxan]	'the residents of Ulaanbaatar'

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[5] Recordings were made of the Khalkha forms as read by a native speaker of Khalkha Mongolian, over 40 years of age, who was born in Mongolia and spent most of his life living in the city of Ulaanbaatar. The forms were read in isolation and also in the sentence [xyn 'X' gev] 'someone said "X"'. The recordings were made in November 1994 using a portable cassette recorder (Sony TCS-430). The forms were digitalized using MacRecorder, and phonetic analysis was performed using Signalyze 2.0 software. Stress was evaluated in terms of pitch, duration, and intensity.

The corrected description of Khalkha stress is given in (27).

(27)   Khalkha stress (corrected description):

      (i)   Primary stress falls on the last syllable if it is the only heavy syllable;

      (ii)   Otherwise primary stress falls on the rightmost nonfinal heavy syllable.

      (iii)   If there are no heavy syllables, primary stress falls on the initial syllable.

      (iv)   Heavy syllables and (possibly) the initial syllable receive secondary stress when not primary by (i-iii).

From the corrected description, it has emerged that rather than being a left-oriented stress system with default to the same side, Khalkha stress is in fact basically right-oriented with nonfinality and default to the opposite edge.

With the description of Khalkha stress established, its implications for the typology and analysis of opposite-default stress can be examined. For now I will consider only the analysis of the primary stress pattern; an analysis of secondary stress will be presented in section 5. The primary stress pattern is basically right-oriented; yet this rightward stress is modulated by a quantity-sensitive nonfinality effect: stress is final only if there is just one strong syllable and it is final. In addition to these features, Khalkha stress exhibits conflicting directionality, as stress is initial in weak-syllable forms. For the analysis of this stress pattern, we already have all the constraints that we need. Since stress is basically right oriented, the analysis will require the ALIGN R (Pk, PrWd) constraint, and the conflicting directionality necessitates an initial syllable licensing constraint ALIGN L ($\acute{\sigma}_\mu$, PrWd). In order to capture the quantity-sensitive nonfinality effect, the NONFINALITY constraint will be needed as well as PK-PROM.

We are now in a position to establish the complete ranking for Khalkha stress. First, because there is a nonfinality effect, NONFINALITY must outrank ALIGN R (Pk, PrWd), as we have seen for all right-oriented systems with nonfinality. The effect of this ranking is illustrated in (28), with a form in which all syllables are of equal weight. The selection of the candidate with nonfinal stress in (a) over the candidate with final stress in (b) shows that locating stress fall on a nonfinal syllable outweighs perfect satisfaction of alignment.

(28)   NONFINALITY >> ALIGN R (Pk, PrWd)

H H H uːrtaegaːr	NONFINALITY	ALIGN R (Pk, PrWd)
☞ (a) H H́ H		σ
(b) H H H́	*!	

Next, the conflicting directionality is achieved by ranking the leftmost licensing constraint for stressed light syllables over the right peak-alignment constraint. As shown in (29), this ranking produces initial stress in a weak-syllable form. The dotted line between the first two constraint columns signifies that NONFINALITY and the licensing constraint are not crucially ranked with respect to each other.

(29)   ALIGN L (σ́μ, PrWd) >> ALIGN R (Pk, PrWd)

L L L unʃisan	NONFINALITY	ALIGN L (σ́μ, PrWd)	ALIGN R (Pk, PrWd)
☞ (a) Ĺ L L			σσ
(b) L Ĺ L		*!	σ
(c) L L Ĺ	*(!)	*(!)	

In a form with only weak syllables, PK-PROM plays no role in determining the placement of stress; however, in a strong-syllable form, the force of PK-PROM becomes apparent. (30) demonstrates that PK-PROM must be ranked above NONFINALITY in order to realize the quantity-sensitive version of nonfinality. In this example we see that when the only heavy syllable in a word is final, the heavy syllable gets the stress. This is the context in which nonfinality is overriden.

(30)   PK-PROM >> NONFINALITY

L H galuː	PK-PROM	NONFINALITY	ALIGN L (σ́μ, PrWd)	ALIGN R (Pk, PrWd)
☞ (a) L H́		*		
(b) Ĺ H	*!			σ

Finally, (31) shows that stressing the rightmost of the potential heavy syllables (nonfinal) can be attributed to either PK-PROM or the licensing constraint dominating ALIGN R (Pk, PrWd). The ranking is apparent from comparison of candidates (a) and (b). Here in a form where a nonfinal syllable is stressed, both PK-PROM and the left-edge licensing constraint ensure that a heavy syllable gets stressed rather than a light one, even when the light syllable is better aligned. There is no crucial ranking to be established between PK-PROM and ALIGN L (σ́μ, PrWd); the linear tableau

format is ambiguous in representing this aspect of the constraint hierarchy.

(31)   PK-PROM, ALIGN L ($\acute{\sigma}_\mu$ PrWd) >> ALIGN R (Pk, PrWD)

H H L H baigu:llaga:r	PK-PROM	NONFINALITY	ALIGN L($\acute{\sigma}_\mu$, PrWd)	ALIGN R (Pk, PrWd)
☞ (a) H H́ L H				σσ
(b) H H Ĺ H	*(!)		*(!)	σ
(c) H H L H́		*!		
(d) H́ H L H				σσσ!

The focal theoretical result here is that Khalkha stress presents the kind of case which demands our full arsenal of prominence-based constraints, bearing out the optimality-theoretic prominence-driven account. The ranking for the Khalkha pattern is summarized in (32). The left-edge licensing constraint dominates only the peak-alignment constraint and is unranked with respect to the other two constraints. The PK-PROM over NONFINALITY over ALIGN R (Pk, PrWd) ranking parallels that needed for the same-side right-oriented systems with quantity-sensitive nonfinality, such as that found in Sindhi. The opposite-edge system of Khalkha thus differs from its same-side counterparts only in having the additional licensing constraint outranking peak-alignment.

(32)   Khalkha: PK-PROM >> NONFINALITY >> ALIGN R (Pk, PrWd)

ALIGN L ($\acute{\sigma}_\mu$, PrWd)↗

Another East Mongolian language, Buriat, provides a second example of a rightmost heavy else leftmost pattern with quantity-sensitive nonfinality. The following data are from the same study as that outlined for Khalkha. Findings are consistent with the description of Buriat given by Poppe (1960: 19) and again clarify the interpretation of 'penultimate' heavy syllable. Like Khalkha, primary stress falls on the last syllable if it is the only heavy in the word, otherwise on the rightmost nonfinal heavy, otherwise on the initial syllable. Secondary stress falls on heavy syllables and (possibly) the initial syllable when they do not receive primary stress.

(33)   *Buriat*

Ĺ L   [xáda]   'mountain'

L̀ H́   [xàdá:r]   'through the mountain'

H́ H̀   [bó:sò:]   'bet, wager'

27

L̀ H́ H̀	[dàláigà:r]	'by sea'
L̀ H́ H̀	[mòrʲó:rò:]	'by one's own horse'
L̀ H̀ H́ H̀	[dàlàigá:rà:]	'by one's own sea'
L̀ H́ L H̀	[xùdá:lingdà:]	'to the husband's parents' (collective)
H̀ H́ L L L	[tà:rú:lagdaxa]	'to be adapted to'
H̀ H́ L	[ø̀:gʃǿ:xe]	'to act encouragingly'
L̀ H̀ H́ L	[nàmà:tú:lxa]	'to cause to be covered with leaves'
H̀ L H́ H̀	[xỳ:xengé:rè:]	'by one's own girl'
H̀ H́ L L L	[tà:rú:lagdaxa]	'to be adapted to'
H̀ L H̀ H́ L	[bù:zanù:dí:je]	'steamed dumplings' (acc.)

It should be noted that in Khalkha and Buriat words with two adjacent nonfinal heavy syllables (e.g. of the form L H̲ H̲ L), it was sometimes found that phonetic correlates for primary stress were distributed over two heavy syllables: the one I have indicated as receiving primary stress and the adjacent preceding one marked as receiving secondary stress. For example in one pronunciation of [xøndi:ry:len] 'to separate' (modal) (L H H L), both the syllable [di:] and the syllable [ry:] received a similar degree of raised pitch and increased length and intensity, which may be annotated as [xøndi::˥ry::˥len] ([˥] marks high pitch on the preceding vowel, [::] marks extra length). In some pronunciations of [ula:nba:tri:nxan] 'the residents of Ulaanbataar' (L H H H L), the distribution of stress correlates was less even, with higher pitch and amplitude falling on [ba:] and increased duration falling on the vowel in [tri:n]: [ula:˧nba:˥tri::˧nxan] ([˧] marks lower pitch). This lack of convergence of the phonetic correlates of stress echoes some of the findings of the instrumental study of Mongolian stress performed by Svantesson (1990). A distribution of stress/tone prominences over different syllables has also been documented for various Scandinavian languages, such that a high tone may surface adjacent to the syllable carrying main stress (see Lorentz 1995 and references therein). Interestingly, the distributivity in Mongolian was not observed in words where the two nonfinal heavies were nonadajacent. Thus, in [xy:xenge:re:] 'by one's own girl' (H L H H), primary stress correlates clearly converged on the rightmost

nonfinal heavy syllable [ɡeː] and were not initiated in the nonadjacent heavy syllable [xyː]: [xyːˈxenɡeːːˈ˥reː˦]. This phenomenon seems to suggest that phonetic stress correlates can be anticipated or partially displaced when a secondary stressed syllable immediately precedes a primary stressed one. I will leave this matter of variable distribution for further investigation.

2.2   *Other patterns*

Khalkha and Buriat offered examples of quantity-sensitive nonfinality in a system stressing the rightmost strong else the leftmost syllable, and in this pattern the force of each of the prominence-driven constraints was apparent. As we would expect, parallel systems with quantity-insensitive nonfinality are also attested, which I will now review. In these other patterns, it will emerge that the PK-PROM constraint is inactive.

Classical Arabic (Semitic) provides a case of quantity-insensitive nonfinality in a rightmost strong else leftmost pattern. As described by McCarthy (1979: 460) (see also Hayes 1979, 1981, 1995; Prince 1983), Classical Arabic stresses the rightmost nonfinal strong syllable (34a), otherwise the initial syllable (34b). Stress never falls on a final heavy syllable, where CVː and CVC qualify as heavy syllables. McCarthy notes that a superheavy syllable (CVːC, CVCC) can attract final stress, but these syllables have a very limited distribution in that they can only occur in pausal forms that occur before major syntactic breaks. The fact that final superheavy syllables attract stress thus seems not to deny the basic nonfinal stress pattern of Classical Arabic but is instead a feature of the prosodically-special syntactic pausal position.

(34)   *Classical Arabic*

a. L Ĥ L L   [juʃáːriku]   'he participates'

L Ĥ H   [kitáːbun]   'book' (nom. sg.)

Ĥ L L H   [mámlakatun]   'kingdom' (nom. sg.)

L H Ĥ H   [manaːdíːluː]   'kerchiefs' (nom.)

b. Ĺ L L H   [bálaħatun]   'date' (nom. sg.)

Ĺ L L   [kátaba]   'he wrote'

The quantity-insensitive nonfinality effect of Classical Arabic will require the now familiar ranking: NONFINALITY >> PK-PROM, as we have already seen for Western Cheremis (12). With the exception of this ranking of NONFINALITY, the constraint hierarchy will parallel the one established for Khalkha and Buriat, giving the hierarchy in (35).

(35)   Classical Arabic: NONFINALITY >> PK-PROM, ALIGN R (Pk, PrWd)

ALIGN L (σ́μ, PrWd)↗

It is important to note that the ranking of PK-PROM and the peak-alignment constraint is not fixed here, as the licensing constraint dominating ALIGN R (Pk, PrWd) is sufficient to capture the quantity-sensitivity of the system without PK-PROM playing a crucial role (see (22)).

Eastern Cheremis, a Finno-Ugric language spoken in Russia, is a language with stress variants resembling the rightmost nonfinal pattern of Classical Arabic. In their description of Eastern Cheremis stress, Sebeok and Ingemann (1961: 9) observe that two stress patterns are available in each form: stress may either fall on the final syllable (even if the final syllable is weak) or it may fall on the rightmost nonfinal strong syllable (36a); if there are no strong syllables, the variation is between final and initial stress (36b). Strong syllables are ones with full vowels, while weak syllables are those with schwa.

(36)   *Eastern Cheremis*

(a)	Final stress	Nonfinal stress	
H Ĺ / H́ L	[tolə́n]	[tólən]	'coming'
H Ĺ / H́ L	[pørtə́ʃ]	[pǿrtəʃ]	'into the house'
H Ĺ / H́ L	[kitʃə́m]	[kítʃəm]	'his hand' (acc.)
H H́ / H́ H	[piré]	[píre]	'wolf'
H H́ / H́ H	[ergé]	[érge]	'boy'
H H́ / H́ H	[kukʃó]	[kúkʃo]	'dry'
H H Ĺ / H H́ L	[ʃlapaʒə́m]	[ʃlapáʒəm]	'his hat' (acc.)
H L H́ / H́ L H	[pygəlmǿ]	[pýgəlmø]	'cone'
H H H́ / H H́ H	[opsaʃté]	[opsáʃte]	'in the door'
H L L H́ / H́ L L H	[kidəʃtəʒé]	[kídəʃtəʒe]	'in his hand'

30

(b) Final stress Initial stress

L L Ĺ / Ĺ L L [tələzón] [tóləzən] 'moon's'

Eastern Cheremis stress can be characterized as varying between a rightmost nonfinal heavy else leftmost pattern and uniform final stress. This falls out straightforwardly from variation in the ranking of the peak-alignment constraint. The unbounded stress pattern with nonfinality and conflicting directionality is like that of Classical Arabic and can be captured with the same constraint ranking, given in (37a), where ALIGN R (Pk, PrWd) is ranked lowest. On the other hand, for the quantity-insensitive final stress pattern, right peak alignment is always respected, at the cost of the other three constraints. Consequently, for the final stress variants ALIGN R (Pk, PrWd) has simply raised from a dominated to an undominated position, as in (37b). It would appear that Eastern Cheremis stress permits both rankings for peak-alignment.

(37) Eastern Cheremis stress

a. Nonfinal pattern: NONFINALITY >> PK-PROM, ALIGN R (Pk, PrWd)

ALIGN L (σ$_\mu$, PrWd)↗

b. Final pattern: ALIGN R (Pk, PrWd) >> NONFINALITY, PK-PROM, ALIGN L (σ$_\mu$, PrWd).

A similar effect takes place in the contrast between the stress patterns of the Erzyan and Mokshan dialects of Mordwin. Kenstowicz (1995: 31) notes that according to Tsygankin and DeBaev (1975) the Erzyan dialect has uniformly initial stress, While the Mokshan dialect stresses the leftmost strong syllable else leftmost syllable. Kenstowicz analyzes this as the Erzyan dialect simply reranking the left alignment constraint above PK-PROM, so that satisfying alignment supercedes the preference of stressing a strong syllable.

3. Licensing is categorical

We have now seen examples of opposite-edge systems with nonfinality and initial default and may turn to the question of whether their counterparts are attested stressing the leftmost strong syllable with default to the rightmost nonfinal syllable. This matter proves to have significant ramifications for the analysis of conflicting directionality. In the course of this investigation, I have

found no examples of such counterparts, either with quantity-sensitive or quantity-insensitive nonfinality.[6,7] From the point of view of the analysis of these systems, it would be easy to realize stress on the leftmost strong syllable with the prominence-based constraints, following the same treatment as the previous left-oriented and quantity-sensitive cases we have seen. However, when we try to derive the default to the opposite side we encounter surprising results.

The tableau in (38) shows a form composed of all weak syllables. The constraints that we would need under the opposite-edge licensing account are ALIGN L (Pk, PrWd) for the left orientation of stress in strong syllable forms, ALIGN R ($\acute{\sigma}_\mu$, PrWd) for the right-edge licensing, and NONFINALITY for the nonfinality effect. PK-PROM will also be needed if the nonfinality effect is quantity-sensitive, but this detail is irrelevant to the main point. What is important is that NONFINALITY must outrank ALIGN R ($\acute{\sigma}_\mu$, PrWd) to produce some nonfinality effect. This

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[6] Tahitian stress at first appeared to be an example of an unbounded system stressing the leftmost heavy syllable, else the rightmost with quantity-sensitive nonfinality (see the description of Tryon 1970), but Bickmore (1995) has since shown that stress in Tahitian is in fact limited to a three syllable window at the right edge of the word.

[7] The only report I am aware of that resembles this kind of system in any way is the description of Goroa that appears in Hayes 1981 (p. 119), which he infers from a list of Goroa words given in Seidel (1900). Hayes characterizes the Goroa stress pattern as: stress the leftmost long vowel or diphthong, otherwise stress a final closed syllable, otherwise stress the penult. In optimality-theoretic terms, such a pattern could be analyzed in terms of a nonfinality constraint at the moraic level (cf. Prince 1983 on final vowel or segment extrametricality). Notice that this description stands out from all of the other nonfinality effects we have seen in prominence-driven systems in describing a nonfinality effect at the moraic rather than at the syllabic level. If the description of this stress pattern were correct, then the forms in which the penult is stressed would appear to be a case where stress falls simply near the opposite-edge in weak syllable forms. However, the accuracy of this description is highly questionable: first, the pattern is simply inferred by Hayes, rather than being corroborated by Seidel; second, the data itself needs to be verified, as it was collected by Seidel from second hand sources which are not in complete agreement; and third, and most importantly, the proposed generalizations fail to account for stress in approximately 20% of the words given by Seidel, for example, gurúngura 'knee, érekini 'red-coloured stone', hápe: 'sand', ório: 'hip'.

nonfinality effect creates a complication for licensing, because if stress is nonfinal, ruling out candidate (c), then a light stressed syllable cannot occur at its licensing edge at the right. When licensing fails, the decision between candidates (a) and (b) is handed back over to the left peak alignment constraint, and stress in a weak-syllable word ends up back at the left side. We thus derive a same-side system rather than the opposite-edge one we set out to generate.

(38) NONFINALITY >> ALIGN R ($\acute{\sigma}_\mu$, PrWd) >> ALIGN L (Pk, PrWd)   (categorical licensing)

	L L L	NONFINALITY	ALIGN R ($\acute{\sigma}_\mu$ PrWd)	ALIGN L (Pk, PrWd)
☞ (a)	Ĺ L L		*	
(b)	L Ĺ L		*	σ!
(c)	L L Ĺ	*!		σσ

To achieve this result it is crucial that the licensing violation be reckoned categorically rather than gradiently. As a consequence of this interpretation, when alignment for licensing cannot be perfectly satisfied, all misaligned candidates will incur equivalent violations and determination of stress placement will fall to the force of some other constraint. If instead licensing violations were interpreted gradiently, candidate (b) would win over (a) by virtue of locating stress closest to the licensing edge, as illustrated in (39).

(39) NONFINALITY >> ALIGN R ($\acute{\sigma}_\mu$, PrWd) >> ALIGN L (Pk, PrWd)   (gradient licensing)

	L L L	NONFINALITY	ALIGN R ($\acute{\sigma}_\mu$, PrWd)	ALIGN L (Pk, PrWd)
(a)	Ĺ L L		σσ!	
☞ (b)	L Ĺ L		σ	σ
(c)	L L Ĺ	*!		σσ

With the categorical reckoning of licensing violations, a prominence-based constraint system cannot derive an opposite-edge pattern when the right side is the licensing edge and there is a requirement that stress be nonfinal. This interpretation thus correctly predicts that such systems will be unattested. On the other hand, a gradient interpretation of licensing offers no explanation for this gap in the typology. This difficulty offers an argument against any account of opposite-edge stress which employs a gradient alignment constraint to locate stress in weak-syllable forms.

The categorical interpretation of licensing violations is supported by the fact that all of the edge-licensing effects Zoll examines require that the marked prosodic structure actually appear <u>at</u> an edge and not just <u>near</u> an edge. Yet we are now faced with a conflict in our characterization of alignment violations in general. On the one hand, we have seen that violations of peak alignment must be interpreted gradiently, while on the other hand, violations of licensing alignment constraints must be categorical. It is conceivable that a categorical interpretation could be defined for specific sets of alignment constraints (see Merchant 1995, who argues for categorical alignment of morphological categories to phonological categories). Alternatively, it is possible that alignment is not the appropriate constraint with which to characterize categorical phenomena such as licensing.

In an independently-motivated step, Zoll (1996: 143) proposes a relevant revision to the characterization of licensing. Her argument is on the basis of Guugu Yimidhirr, which licenses heavy syllables only in the first foot of the word. She notes that this poses a problem for licensing as alignment, because in this language it is not a particular edge of the constituent which functions as the licensor, but instead licensing is achieved by simply belonging to the constituent. Zoll suggests replacing the purely edge-based alignment formulation of licensing with a constraint, COINCIDE, which requires the coincidence of marked structure with some constituent. Applying her formulation to the word-final licensing of a stressed light syllable gives the constraint in (40).

(40)   COINCIDE ($\acute{\sigma}_\mu$, Rightmost(σ, word))

      (i)   For all x (x is a stressed light syllable) $\rightarrow$ there exists y

               (y = Rightmost(σ, word) $\wedge$ Coincide (x, y)).

      (ii)   Assess one mark for each value of x for which (i) is false.

Coincide (x, y) will be true in one of three cases: if y=x, y dominates x, or x dominates y. For our purposes, only y=x will be relevant as there is no asymmetrical dominance relation between a stressed light syllable and a word-edge syllable.

Importantly, since the COINCIDE relation is interpreted as simply true or false of a given structure, it is violated only once by a stressed light syllable that does not fall at the licensing edge, regardless of the magnitude of misalignment. This formulation thus achieves the categorical

interpretation of licensing needed to exclude rightmost opposite default to a nonfinal syllable:

(41)   NONFINALITY >> COINCIDE (σ́μ, Rightmost(σ, word)) >> ALIGN L (Pk, PrWd)

L L L	NONFINALITY	COINCIDE (σ́μ, R(σ, word))	ALIGN L (Pk, PrWd)
☞ (a) Ĺ L L		*	
(b) L Ĺ L		*	σ!
(c) L L Ĺ	*!		σσ

Because a nonfinality effect obstructs the coincidence of default stress with the right edge of the word, categorical licensing offers an explanation for what would otherwise be the puzzling gap of opposite-edge patterns defaulting to the penult. If such patterns are found, there would be evidence in favor of using a gradient alignment constraint to locate stress at the opposite edge. However, in the absence of such cases, the typological evidence provides a firm argument for interpreting licensing as categorical: licensing is not about proximity to a position, it is about belonging or not belonging to a constituent.

4.   The revised factorial typology

Since we have now added a licensing constraint to our inventory of prominence-based constraints, we must again review the state of the typology, assuming factorial constraint ranking. Because we have four constraints, there will be 4! or 24 different rankings. Factor into this the left and right variants of the peak-alignment and licensing constraints, and we expect a total of 96 rankings. I will not attempt to list all these rankings here. Indeed, this will turn out to not be necessary, as a number of the constraints do not actually interact, and for those that do, the majority of the rankings do not yield new systems. I will thus simply identify which constraint rankings need to be examined and then determine which of these result in new stress patterns. We will find that actually only five new stress patterns are generated beyond those already captured in the three constraint typology outlined in section 1.2. Four of these patterns are those we have just seen exhibiting opposite-edge effects and the fifth is ruled out by a requirement that licensing not take place at a weak edge, that is, an edge which actually exhibits weakness in the stress system.

In the three constraint typology, we examined all the possible interactions of the constraints:

PK-PROM, NONFINALITY, and ALIGN EDGE (Pk, PrWd). The new constraint that we have added is the categorical licensing constraint COINCIDE EDGE (σ́μ, PrWd), so any new systems that we derive will result from the interaction of this constraint with the others. Accordingly, I will start by considering which of the three constraints have some conflict with the licensing constraint.

A constraint that does not conflict with COINCIDE EDGE (σ́μ, PrWd) is PK-PROM. This is because these two constraints have the related aim that stress fall on a prominent syllable. In any given form, it is possible to satisfy both of these constraints: in a form with at least one heavy syllable, both constraints will be satisfied if a heavy is stressed, and in a form with only light syllables, both constraints will be satisfied if a light syllable at the relevant word edge is stressed. Since these constraints do not conflict, any violation of one of them will result from the force of some other constraint.

The NONFINALITY constraint interacts with the licensing constraint when it is set to the right, but not when it is set to the left. Since left-edge licensing draws stress to the initial syllable, it will not lead to a conflict with satisfaction of NONFINALITY. On the other hand, right-edge licensing is antagonistic to the requirement that stress be nonfinal. When NONFINALITY outranks COINCIDE R (σ́μ, PrWd), stress will always be nonfinal, and the force of the peak-alignment constraint and perhaps PK-PROM will determine which nonfinal syllable gets stressed. Yet when the reverse ranking holds between the two constraints, licensing at the right edge of the word will succeed, at the cost of satisfying NONFINALITY.

The licensing constraint also conflicts with peak alignment, but only when the two constraints are set in opposite directions. When the two are set in the same direction, satisfaction of one will never lead to violation of the other. When the two constraints are set in opposite directions and peak alignment outranks licensing, there will be no licensing effect, as it will always be better to satisfy peak alignment than to license a stressed light syllable by moving the peak towards the opposite edge. On the other hand, when licensing outranks a peak-alignment constraint set in the opposite direction, licensing will win, deriving the opposite-edge effect in weak-syllable forms.

The licensing constraint interactions are summarized in (42).

(42)　　　　　Licensing constraint　　　　Other constraint　　　　Interaction

　　i.　　COINCIDE L (σ́μ, PrWd)　　PK-PROM　　　　　　No
　　ii.　　COINCIDE R (σ́μ, PrWd)　　PK-PROM　　　　　　No

　　iii.　COINCIDE L (σ́μ, PrWd)　　NONFINALITY　　　　No
　　iv.　COINCIDE R (σ́μ, PrWd)　　NONFINALITY　　　　Yes

　　v.　　COINCIDE L (σ́μ, PrWd)　　ALIGN L (Pk, PrWd)　No
　　vi.　COINCIDE R (σ́μ, PrWd)　　ALIGN L (Pk, PrWd)　Yes

　　vii.　COINCIDE L (σ́μ, PrWd)　　ALIGN R (Pk, PrWd)　Yes
　　viii.　COINCIDE R (σ́μ, PrWd)　　ALIGN R (Pk, PrWd)　No
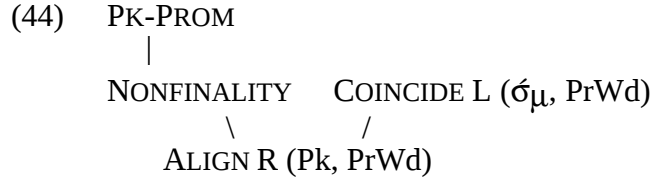
The rankings that have the potential to generate new systems are thus only (iv), (vi), and (vii), where licensing outranks a conflicting constraint.

First let us consider (vii), in which left-edge licensing outranks right peak alignment. The basic effect that this ranking has is to generate a rightmost strong else leftmost system, but the rankings of NONFINALITY and PK-PROM have the potential to complicate the stress pattern. Left-edge licensing does not interact with NONFINALITY or PK-PROM, so we need not be concerned with the ranking of these constraints with respect to licensing. Furthermore, as we have seen earlier, PK-PROM does not interact with ALIGN R (Pk, PrWd) in opposite-edge systems, since the licensing constraint already determines that the system will be quantity sensitive. Consequently, we only have to examine the possible rankings of NONFINALITY with respect to the ALIGN R (Pk, PrWd) and PK-PROM. This gives us three rankings. In the first, NONFINALITY outranks PK-PROM and right peak alignment, as in (43).

(43)　　NONFINALITY　COINCIDE L (σ́μ, PrWd)
　　　　　　/　　　\　　/
　　PK-PROM　ALIGN R (Pk, PrWd)
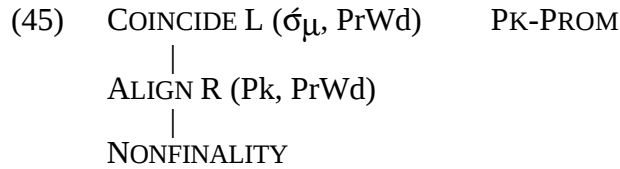
As we have seen in (35), this ranking yields the pattern of Classical Arabic, stressing the rightmost nonfinal strong syllable, otherwise the leftmost syllable, with nonfinality always respected.

The next ranking, places NONFINALITY below PK-PROM but above ALIGN R (Pk, PrWd):

(44) PK-PROM
         |
      NONFINALITY   COINCIDE L (σ́μ, PrWd)
            \   /
         ALIGN R (Pk, PrWd)

This is the ranking established for Khalkha and Buriat, in which the rightmost nonfinal heavy is stressed, otherwise a final heavy, otherwise the initial syllable.

In the third ranking, in (45), NONFINALITY is below ALIGN R (Pk, PrWd). Because the effect of the nonfinality constraint is neutralized in this position, its ranking in relation to PK-PROM has no effect, so PK-PROM has no crucial ranking.

(45) COINCIDE L (σ́μ, PrWd)   PK-PROM
            |
      ALIGN R (Pk, PrWd)
            |
      NONFINALITY

In a system with this ranking, there will be no apparent nonfinality effect, so we will derive the same result as just ranking COINCIDE L (σ́μ, PrWd) over ALIGN R (Pk, PrWd) on their own. As we have seen in (22-23), this ranking yields a system stressing the rightmost heavy, otherwise the leftmost, as found in Selkup.

Let us now consider ranking (vi) which places COINCIDE R (σ́μ, PrWd) over ALIGN L (Pk, PrWd). As with ranking (vii), the location of PK-PROM with respect to the licensing and peak-alignment constraints will not affect the outcome, so we need only examine the possible rankings of NONFINALITY. Because peak-alignment is now set to the left, the number of new systems derived by this ranking is fewer than the previous one. Since left peak alignment does not conflict with satisfaction of NONFINALITY, we need not be concerned with the relative ranking of these two constraints. Furthermore we have already seen in (38) that when NONFINALITY outranks a right-edge licensing constraint, the licensing effect fails, yielding a same-side system, such as those we are already able to derive in the three constraint typology. This leaves just one ranking to examine: the one in which the right-edge licensing constraint dominates NONFINALITY, given in (46). Notice that because the effect of NONFINALITY is neutralized by the higher ranked licensing constraint, the relative ranking of PK-PROM and NONFINALITY will not affect the outcome.

(46)   COINCIDE R (σ́μ, PrWd)   PK-PROM
            |
        ALIGN L (Pk, PrWd)
            |
        NONFINALITY

Similar to the ranking in (45), in (46) there will be no nonfinality effect, so we derive the same result as just ranking ALIGN R (σ́μ, PrWd) over ALIGN L (Pk, PrWd). This gives a leftmost strong syllable else rightmost system, as attested in Kwakwala.

The final constraint interaction from (42) to consider is (iv), which places COINCIDE R (σ́μ, PrWd) over NONFINALITY. With this ranking, right-edge licensing will succeed and nonfinality will fail. We have already seen that the three constraint typology can derive quantity-sensitive and quantity-insensitive systems without an apparent licensing or nonfinality effect, and the ranking in (46), combining right-edge licensing with left peak alignment, produces a system with conflicting directionality without nonfinality. The only new system that ranking COINCIDE R (σ́μ, PrWd) over NONFINALITY has the potential to produce is one which exhibits a nonfinality effect just in strong-syllable forms. This kind of system is derived by ranking right peak alignment below NONFINALITY:

(47)   COINCIDE R (σ́μ, PrWd)   PK-PROM
            |
        NONFINALITY
            |
        ALIGN R (Pk, PrWd)

In (47) the licensing constraint is placed above the others, so stress will fall at the right-edge of the word in weak-syllable forms. In strong-syllable forms, stress will also fall towards the right, because of ALIGN R (Pk, PrWd), but since this constraint is dominated by NONFINALITY, stress will fall on the rightmost nonfinal strong syllable rather than the final one. Stress will only be final in a strong syllable form when the only heavy syllable is final. This ranking would thus derive a system stressing the rightmost nonfinal strong syllable, otherwise a final strong syllable, otherwise the final syllable. As far as I know, no such system has ever been attested.

What is odd about the kind of system that (47) would derive is that it combines right-edge licensing with a nonfinality effect. Such a system contains the contradiction of treating the final syllable as prominent, because it licenses marked prosodic structure, at the same time as as treating

it as weak, as indicated by the nonfinality effect. I suggest that these systems do not occur simply because the rankings would violate the functional unity of the language. Thus, if an edge position exhibits some kind of weakening effect, such as nonfinality, it will not also be a licensor. Because only the right edge of a word is ever subject to weakening effects, we may conclude that while the left edge always has the potential to be a licensor, the right edge is only available as a potential licensor when it is not subject to weakening in the language.

With the system derived by the ranking in (47) discarded for independent reasons, we have just four new systems from the addition of licensing constraints. The three constraint typology is repeated in (48) followed by the four new patterns. Together, we now have 12 distinct patterns, comprising the typology of systems in which main stress is prominence-driven.

(48)   Revised factorial typology of prominence-driven stress

(i-viii) from three constraint typology (collapsing rankings that do not produce distinct patterns):
ALIGN EDGE (Pk, PrWd) >> PK-PROM:
Quantity-insensitive edge-based systems

Right alignment

i.   NONFINALITY >> ALIGN R (Pk, PrWd) >> PK-PROM
         Always penultimate stress. Example: *Yawelmani.*

ii.   ALIGN R (Pk, PrWd) >> NONFINALITY, PK-PROM
         Always final stress. Examples: *Uzbek, Yavapai.*

Left alignment

iii. ALIGN L (Pk, PrWd) >> PK-PROM
      (NONFINALITY may be ranked in any position)
         Always initial stress. Examples: *Tinrin, Yeletnye.*

PK-PROM >> ALIGN EDGE (Pk, PrWd):
Quantity-sensitive default-to-same-side systems

Right alignment

iv.   NONFINALITY >> PK-PROM >> ALIGN R (Pk, PrWd)
         Stress falls on rightmost strong nonfinal syllable, else rightmost nonfinal syllable.
         Stress is never final. Example: *Western Cheremis.*

v.   PK-PROM >> NONFINALITY >> ALIGN R (Pk, PrWd)
         Stress falls on rightmost strong nonfinal syllable, else rightmost nonfinal syllable.
         If the only strong syllable is final, stress is final. Examples: *Sindhi, Hindi.*

vi.   PK-PROM >> ALIGN R (Pk, PrWd) >> NONFINALITY
         Stress falls on rightmost strong syllable, else rightmost syllable.
         Examples: *Aguacatec, Golin.*

Left alignment

vii. NONFINALITY >> PK-PROM >> ALIGN L (Pk, PrWd)
  Stress falls on leftmost strong nonfinal syllable, else leftmost syllable.
  Stress is never final. Example: *Kashmiri.*

viii. PK-PROM >> NONFINALITY, ALIGN L (Pk, PrWd)
  Stress falls on leftmost strong syllable, else leftmost syllable. Examples: *Murik,*
  Amele, Au, Indo-European accent, Lhasa Tibetan, Lushootseed, Yana, Mordwin
  (Makshan dialect).

New patterns in (ix-xii) derived from interaction of licensing constraint:

COINCIDE EDGE ($\acute{\sigma}_\mu$, PrWd) >> ALIGN EDGE (Pk, PrWd):
Quantity-sensitive default-to-opposite-side systems
_____

Right alignment

ix. NONFINALITY >> PK-PROM, COINCIDE L ($\acute{\sigma}_\mu$, PrWd) >> ALIGN R (Pk, PrWd)
  (PK-PROM is not crucially ranked with respect to ALIGN R (Pk, PrWd))
   Stress falls on rightmost strong nonfinal syllable, else leftmost syllable. Stress is
   never final. Examples: *Classical Arabic, Eastern Cheremis (one variation).*

x. PK-PROM >> NONFINALITY, COINCIDE L ($\acute{\sigma}_\mu$, PrWd) >> ALIGN R (Pk, PrWd)
  (COINCIDE L ($\acute{\sigma}_\mu$, PrWd) is only crucially ranked with respect to ALIGN R (Pk, PrWd))
   Stress falls on rightmost strong nonfinal syllable, else final strong syllable, else
   leftmost syllable. Examples: *Khalkha, Buriat.*

xi. COINCIDE L ($\acute{\sigma}_\mu$, PrWd) >> ALIGN R (Pk, PrWd) >> NONFINALITY
  (PK-PROM may be ranked in any position)
   Stress falls on rightmost strong syllable, else leftmost syllable. Examples: *Selkup,*
   Chuvash, Huasteco, Kuuku-Yaʔu.

Left alignment

xii. COINCIDE R ($\acute{\sigma}_\mu$, PrWd) >> ALIGN L (Pk, PrWd) >> NONFINALITY
  (PK-PROM may be ranked in any position)
   Stress falls on leftmost strong syllable, else rightmost syllable. Example: *Kwakwala.*

4.1 *Discussion of alternatives*

The analysis presented here posits a typology of stress patterns where stress is assigned purely

on the basis of prominence-driven constraints without calling on foot structure. Several previous

accounts of unbounded stress patterns have made use of unbounded feet (see, for example, Prince

1980; Hayes 1981, 1995; Hammond 1986; Kenstowicz 1994, 1995). In parametrized metrical tree

theory, these feet can be either quantity insensitive, in which case syllable weight is irrelevant,

quantity sensitive, in which case non-head nodes of the foot may not dominate a strong syllable, or

they may be obligatory branching, in which case the head node of the foot must dominate a strong

syllable and non-head nodes may not dominate a strong syllable (Hayes 1981; see Hammond 1986 for a revision of the obligatory-branching parameter). Differences in unbounded stress patterns are then analyzed as a consequence of the foot type (in combination with settings of left or right headedness). For example, in the analysis outlined by Hayes (1981) an unbounded quantity-insensitive foot generates uniform initial or final stress. For opposite-edge systems, a quantity-sensitive unbounded foot is constructed. The quantity-sensitive foot sweeps across the word from one edge and is arrested by the first strong syllable it encounters. Because a strong syllable cannot be dominated by a weak node, this syllable must form the head, and foot construction ends. In weak-syllable words, the opposite-edge default is derived by the foot sweeping all the way to the other side of the word, with the final syllable it encounters forming the head. In same-side systems, an obligatory-branching foot expands from one word edge until it encounters the first strong syllable, paralleling the opposite-side analysis of strong-syllable words. In words with no strong syllables, no foot can be constructed (there is no strong syllable to head the foot), so just word-tree construction takes place. Heading the word-tree on the side from which foot construction takes place derives the same-side default.

In more recent work in the framework of Optimality Theory, Kenstowicz generates a single unbounded foot in each word through the interaction of foot and head alignment constraints and a violable foot-binarity constraint. His analysis mimics the effect of the quantity-sensitive parameter to yield opposite-edge stress by ranking the constraint requiring that syllables be parsed into a foot below constraints prohibiting strong vowels in a foot trough (1994: 23-25, 1995: 24-25).

While the unbounded foot has been sufficient to generate the basic unbounded stress systems, objections to the theoretical construct of unbounded feet have been raised. Prince (1985) argues that unbounded feet should be eliminated. He observes that unboundedness, driven by maximality, has an edge-seeking function, but reference to edges is required anyway for other devices in the theory, and the work performed by unbounded metrical constituents can be achieved with binary feet and stray adjunction. Another concern is that while certain non-stress-related phenomena, such as reduplication, tone patterns, language games, expletive insertion, and word-minimality

requirements, have provided independent support for bounded (binary) foot constituency (McCarthy 1982; McCarthy & Prince 1986, 1988, 1990; Itô & Mester 1992, Itô et al. 1995, Leben 1996), no such evidence has been found to support an unbounded foot as a prosodic constituent (see also Blevins 1992 for discussion). Furthermore, Hayes (1995: 299) raises the point traced back to Wheeler (1979) that extrametricality of an unbounded foot is unattested. The analysis proposed here assumes that stress assignment in so-called unbounded patterns is prominence-driven, independent of foot structure, and thus, no unbounded feet need be posited.

In an attempt to eliminate unbounded feet as a primitive notion of the theory, Prince (1985) proposes to make use of only bounded feet in the analysis of unbounded quantity-sensitive stress. He shows that it is possible to capture the default-to-same-side systems straightforwardly by simply retaining the obligatory-branching parameter. However, the opposite-side patterns do not succumb to reanalysis as readily without the mechanism of unbounded foot expansion to drive stress to the opposite edge. To force stress to default to the opposite side, Prince posits a foot built noniteratively at the opposite edge in addition to the iterative building of obligatory branching feet to pick out the heavy syllables.

While the bounded foot account resolves the issues raised by using unbounded feet, new questions arise. One serious problem is that the presence of an opposite-edge initial foot predicts that default could be not only to the initial syllable (trochee), but also to the peninitial syllable (iamb). However, default-to-peninitial stress is not a substantiated canonical pattern, so this analysis overgenerates. In contrast, the categorical licensing analysis of opposite-edge default is not faced with this dilemma, because a stressed light syllable must actually fall at an edge to be licensed. If licensing fails, the stressed syllable will be drawn back to the other word edge by the force of the peak-aligment constraint. Using just the prominence-driven constraints, peninitial default cannot be derived. Another concern for bounded foot accounts is the analysis of forms such as those consisting of a light syllable followed by a heavy in a language defaulting to the initial syllable. Consider, for example, a form [Ĺ H] in Classical Arabic, which stresses the rightmost heavy else leftmost syllable with quantity-insensitive nonfinality. There are two ways of footing

this form: either [(Ĺ) H], with a degenerate foot, or [(Ĺ H)] with a quantity-insensitive trochee; both possibilities do not conform to any principles of rhythmic grouping in a language with quantity-sensitive stress. This signals that binary footing is not what underlies this kind of stress pattern.

The factorial typology derived here locates penultimate stress independent of foot structure. For such patterns Hayes (1981: 55) proposes a binary, quantity-insensitive trochee at the right edge of the word (see also Archangeli 1988: 162). A single bounded foot can be generated in Optimality Theory with a constraint aligning all feet to the right of the prosodic word: ALIGN (Ft, R, PrWd, R). When this constraint outranks the requirement that all syllables be parsed into feet (PARSE σ; Prince & Smolensky 1993: 58), it will produce one right-aligned foot, corresponding to the word stress. Only one foot will appear in the output, as any additional feet would incur violations with respect to the foot-alignment constraint. This outcome is illustrated in (49) for a trochaic foot form.

(49)   ALIGN (Ft, R, PrWd, R) >> PARSE σ

σ σ σ σ	ALIGN (Ft, R, PrWd, R)	PARSE σ
☞ (a) σ σ (σ́ σ)		**
(b) (σ σ) (σ́ σ)	σ!σ	
(c) σ σ σ σ		***!*

Notice that the same constraints in a language with an iambic foot form would produce a final stress pattern with a single bounded foot. Similarly, a left-alignment constraint would realize initial stress with a trochee and second-syllable stress with an iamb. A question raised by these kinds of structures is whether the single foot performs any function other than locating the (near)-edge stress. To my knowledge, no such argument has been put forward. Prince (1983: 90, 1990) argues that prominence is separable from rhythmic structure. Binary feet contribute to rhythmic structure, yet the edge stress patterns do not appear to have any true rhythmic pattern, so the foot structure cannot be motivated on this basis. We have already seen that penultimate and initial/final stress can be derived purely in terms of prominence-based considerations. I hypothesize that foot structure is only posited when there is a binary secondary stress pattern (i.e. when the word is footed through) or when some other phonological phenomenon provides independent evidence for a binary constituent at the word edge (see Barker 1989 for a similar claim concerning Turkish

stress and foot structure). Under this hypothesis, peninitial stress, which cannot serve as the primary locus of a prominence-driven pattern, will most commonly occur only with alternating secondary stresses and perhaps in a few rare cases exhibiting a noninitiality effect, however one chooses to analyze them. Understanding the explanation for this hypothesis is an area that requires further work, as there is nothing at present in the theory to rule out isolated feet at a word edge.

A drawback of both the bounded and unbounded foot analyses of the various stress patterns has to do with the typology of nonfinal default that is predicted. These analyses are capable of generating the four core unbounded quantity-sensitive systems, combining leftmost/rightmost strong syllable with leftmost/rightmost default. These approaches are thus able to produce both the same-side and opposite-side systems without drawing on licensing. Assuming that these approaches also adopt some mechanism to capture the two kinds of nonfinality effects we have seen in unbounded systems, we would then derive a typology in which each of the four core patterns is expected to occur with each of the two kinds of nonfinality. Yet this typology overgenerates: it cannot explain the fact that patterns stressing the leftmost strong syllable else the rightmost nonfinal one are unattested, while all of the other systems occur. In addition, under the bounded foot analysis, we expect it to be possible that stress default to the antepenult in a system with nonfinality, a pattern which never occurs. On the other hand, the asymmetry in attested systems with nonfinality is explained under the licensing account, because unlike the foot-based accounts, opposite-side patterns are analyzed as having a special requirement on the location of stressed light syllables: a designated word edge. It thus correctly predicts that licensing at the right (and opposite) edge will <u>not</u> cooccur in a system with nonfinality. Since same-side systems need not be analyzed in terms of licensing, the account also explains why stress <u>can</u> fall on a nonfinal light syllable when stress defaults to the same-side.

The prominence-driven analysis proposed here, which makes use of ranked and violable constraints in Optimality Theory and of the notion of licensing of marked prosodic structure, has desirable consequences for the analysis of 'unbounded' stress systems. Not only does it enable us to eliminate the problems created by allowing unbounded feet in the theory or using bounded feet

solely as edge-markers, but it also accurately predicts the range of attested systems. In addition to generating the core unbounded patterns without nonfinality, it predicts the types of nonfinality and default that can occur and explains what would otherwise be a puzzling asymmetry in the opposite-edge systems exhibiting a nonfinality effect.

5. Secondary stress in prominence-driven systems: the role of *GRIDSTRUC

So far the analysis has focused only on main stress. However, in some prominence-driven stress patterns, such as the system of East Mongolian introduced here, there are secondary stresses which are also prominentially-based rather than rhythmically-structured. In this section, I briefly outline how systems with multiple stresses can be analyzed without recourse to footing.

The Gommu dialect of Koya, a Dravidian language of India described by Tyler (1969: 32-33), provides a simple system in which strong syllables receive secondary stress. In Koya, main stress is initial and secondary stress falls on all noninitial syllables with long vowels. The pattern of stress is illustrated in (50). Sounds transcribed as retroflex in this data are actually post-alveolar without retroflexion.

(50) *Koya*

Ĺ L	[gínne]	'cup'
Ĺ L	[béske]	'when'
Ĺ H̀ L	[ɔ́ndòːɾu]	'everyone'
H́ L	[áːki]	'leaf'
H́ L	[táːto]	'mother's father'
H́ L L	[káːpuɾam]	'residence'
H́ L H̀ L	[kóːɖavàːli]	'sickle'
H́ H̀ L	[púːŋgàːɾi]	'flower'

Like the previous stress systems we have examined, Koya stress can be analyzed as driven purely by prominence, because only elements with intrinsic prominence (heavy syllables) and elements at a word edge are stressed. What separates Koya from the kinds of patterns we have already seen is that it permits more than one stress in a word.

I suggest that the difference between systems allowing only a single stress and systems allowing multiple stresses arises as a consequence of the ranking of constraints on the location of stress peaks and a constraint *GRIDSTRUC, in (51).

(51)   *GRIDSTRUC: Do not have grid marks.

*GRIDSTRUC is a constraint of the *STRUC family (Prince & Smolensky 1993: 25; cf. *STRESS proposed by Garrett 1996: 7), and it incurs a violation for each grid mark. *GRIDSTRUC will thus penalize each stress in a word, and it will only be wholly unviolated in a word with no stress at all. Yet in general, lexical words require at least one stress. This can be seen as driven by the correspondence between lexical words and prosodic words along with the requirement that a prosodic word have a (unique) head. The correspondence is accounted for with the constraint: LX ≈ PR which requires that a lexical word also be a prosodic word (Prince & Smolensky 1993: 43). For the head requirement, I assume a constraint, HEADEDNESS(PrWd), which requires that a prosodic word have one and only one head (cf. the constraint WORDS NEED STRESS proposed by Garrett 1996: 7). The headedness constraint is one of a family of constraints requiring that prosodic constituents have a head. In languages with prominence-driven stress, the head of the prosodic word will be the syllable with main stress. All of the cases I will be considering satisfy both LX ≈ PR and HEADEDNESS(PrWd), so I attribute them undominated ranking.

A language which assigns only a single stress per word will be one in which *GRIDSTRUC is dominated by HEADEDNESS(PrWd) and *GRIDSTRUC dominates any constraints mandating stresses. One such constraint is the weight-to-stress principle, given in (52) (following Prince 1990; Prince & Smolensky 1993).

(52)   WEIGHT-TO-STRESS PRINCIPLE (WSP): Strong syllables are stressed.

The WSP is clearly an example of a prominence-driven stress constraint. If this constraint were unviolated in a word, all the strong syllables would receive stress (either main or secondary). This constraint will conflict with *GRIDSTRUC in a form containing heavy syllables, as illustrated in (53) with a schematic form.

(53)   LX ≈ PR, HEADEDNESS(PrWd) >> *GRIDSTRUC >> WSP

H H L	LX ≈ PR HEADEDNESS(PrWd)	*GRIDSTRUC	WSP
☞ (a) Ĥ H L		*	*
(b) Ĥ H̀ L		**!	
(c) H H L	*!		**
(d) H H Ĺ		*	**!

With *GRIDSTRUC ranked over WSP, the optimal candidate will be one with just one heavy syllable stressed. The undominated headedness constraint rules out candidate (c), which stresses no syllable. Gradient interpretation of *GRIDSTRUC violations then selects candidates (a) and (d) over candidate (b), because (a) and (d) have fewer stresses. Once HEADEDNESS(PrWd) and *GRIDSTRUC have determined that there will be just one stress in the optimal form, the WSP constraint ensures that it is a heavy syllable that gets stress, because this will incur minimal WSP violations. Note that nothing in this tableau requires that the first heavy rather than the second get stress in the winning candidate; this decision will fall to the force of some other constraint.

While ranking *GRIDSTRUC over WSP produces a system with a single stress, the reverse ranking produces multiple stresses. This ranking is needed for Koya, in which all strong syllables are stressed. For Koya we also need to make use of a peak-alignment constraint to situate a stress on the initial syllable. Because the initial stress is the main stress, the alignment constraint will be one aligning the peak forming the head of the prosodic word: ALIGN L (PḰ, PrWd) (the head peak is abbreviated here as PḰ, this could also be written as σ́). Since the left-alignment constraint will incur violations of *GRIDSTRUC, it will have to outrank *GRIDSTRUC, along with WSP, giving the hierarchy: WSP, ALIGN L (PḰ, PrWd) >> *GRIDSTRUC

The ranking is illustrated in (54). The undominated constraints, LX ≈ PR and HEADEDNESS(PrWd), are not shown in this or subsequent tableaux.

(54)   WSP, ALIGN L (Ṕ́K, PrWd) >> *GRIDSTRUC

H H L puːŋgaːri	WSP ALIGN L (ṔK, PrWd)	*GRIDSTRUC
☞ (a) H́ H̀ L		**
(b) H́ H L	*!(WSP)	*
(c) H̀ H́ L	*!(ALIGN L)	**
(d) H́ H̀ L̀		***!

The winning candidate satisfies both WSP and ALIGN L (ṔK, PrWd), although incurring two violations of *GRIDSTRUC. Candidates (b) and (c) each lose because they fail to satisfy one of WSP and ALIGN L (ṔK, PrWd). Candidate (d) loses, because of an extra stress, falling on the final light syllable. Note that stressing a light syllable does not violate WSP. The WSP constraint is violated only by unstressed strong syllables. Other languages exhibiting a stress pattern like that of Koya are Waalubal (Bandjalang, Australia; Crowley 1978, Hammond 1986) and Cayapa, (Ecuadorian Indian; Lindskoog & Brend 1962: 39).

It may be observed that the work performed by PK-PROM and WSP overlap to some extent. Because WSP requires that heavy syllables be stressed, it can be used to ensure that stress falls on a heavy syllable rather than a light one, as we saw, for example, in the contrast between (53a) and (53d), where achieving minimal violation of WSP meant a heavy syllable got stressed, even though not all heavy syllables were stressed. This effect of choosing to stress a heavy syllable rather than a light one is something PK-PROM was used for earlier. Where PK-PROM performs a unique role is in making scalar kinds of evaluations between syllables as peak bearers, as needed for example in Kashmiri, where there is a ternary weight distinction. Kenstowicz (1994, 1995) also identifies cases, such as Kobon, where evaluation of the best peak bearer in a binary foot is evaluated across a multi-valued sonority hierarchy (five levels in Kobon). WSP is not formulated to make these kinds of evaluations. Note also that PK-PROM cannot replace WSP, because PK-PROM only compares the values of peak bearers, but does not require that all good peak bearers be stressed, as needed for Koya. In single stress systems it appears that WSP does not play a crucial role. It may be that the partial redundancy between WSP and PK-PROM is something that should

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ultimately be eliminated, but I will not pursue that here.

In the Koya-type of pattern, all strong syllables are stressed, but main stress may fall on a weak rather than a strong syllable if a weak syllable occurs at the stressed edge. These systems thus obey WSP but may violate PK-PROM. Next I consider cases where all strong syllables are stressed, and main stress always falls on a strong syllable when there is one in the word. These are systems satisfying both WSP and PK-PROM. Kuuku-Yaʔu is a language in which stress falls on the rightmost strong syllable (long vowel), otherwise the initial syllable. Kuuku-Yaʔu has the additional complexity of assigning secondary stress to all strong syllables and the initial syllable when they do not receive main stress. The pattern is illustrated in (55) (Thompson 1976).[8]

(55)　*Kuuku-Yaʔu*

H́ L	[páːla]	'behind'
H́ L L	[wíːmumu]	'large number of ants'
H̀ H́ L	[mùːmáːɲa]	'rub'
L̀ H́ L	[wàcáːja]	'permit'
L̀ H́ L L L	[pìtáːɲctimana]	'understand'
L̀ L H́ L	[tàwuráːlu]	'with a knife'
L̀ L L H́ L L L	[pìtalpitáːɲcimaŋka]	'always understanding'
Ĺ L	[páma]	'Aboriginal person'

As established in section 2, the main stress pattern of Kuuku-Yaʔu can be captured by ranking COINCIDE L (σ_μ, PrWd) over ALIGN R (Pk, PrWd). Although all forms obey PK-PROM, the ranking of this constraint is not crucial. Since there are also secondary stresses in the language, we will have to reformulate the right-alignment constraint so that it refers to the main stress only, i.e. ALIGN R (Pḱ, PrWd). As in Koya, the secondary stress on heavy syllables can be realized by ranking WSP over *GRIDSTRUC. The secondary stress on the initial syllable can be achieved with an alignment constraint of the form ALIGN L (PrWd, Pk). This constraint requires that the left edge

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[8] Thompson also reports secondary stress on post-tonic syllables. Hayes (1995: 296) suggests that this may be attributable to a pitch effect.

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of every prosodic word be aligned with the left edge of some peak; it thus is satisfied in any word with an initial primary or secondary stress. Because the first argument is PrWd and not peak, it will not incur violations for any additional peaks that are noninitial in the word. Since ALIGN L (PrWd, Pk) forces a secondary stress in words with strong syllables, it too must dominate *GRIDSTRUC. The complete constraint hierarchy is given in (56) and illustrated in (57).

(56)   Kuuku-Yaʔu: WSP, ALIGN L (PrWd, Pk) >> *GRIDSTRUC
            COINCIDE L (σ́μ, PrWd) >> ALIGN R (Pḱ, PrWd)

(57)   Secondary stress in Kuuku-Yaʔu

L H L L L pitaːɲctimana	WSP ALIGN L (PrWd, Pk) COINCIDE L (σ́μ, PrWd)	*GRIDSTRUC ALIGN R (Pḱ, PrWd)
☞ (a) L̀ H́ L L L		**(GRID) ***(Align R)
(b) L H́ L L L	*!(ALIGN L (Prwd, Pk))	*(GRID) ***(Align R)
(c) Ĺ H L L L	*!(WSP)	*(GRID) ****(Align R)
(d) Ĺ H̀ L L L		**(GRID) ****!(Align R)

Candidate (a) wins by assigning main stress to the heavy syllable and secondary stress to the initial light. Candidate (b) loses because it fails to stress the initial syllable, and (c) loses because it fails to stress the heavy syllable. Candidate (d) is ruled out because it incurs a greater violation of main stress alignment than (a).

(58) illustrates the opposite-edge default. Here the undominated left-edge licensing constraint draws main stress to the initial syllable, at the cost of satisfying right peak alignment.

(58)   Opposite-edge default

L L pama	WSP ALIGN L (PrWd, Pk) COINCIDE L (σ́μ, PrWd)	*GRIDSTRUC ALIGN R (Pḱ, PrWd)
☞ (a) Ĺ L		*(GRID) *(Align R)
(b) L Ĺ	*!(COINCIDE L (σ́μ, PrWd)) *(ALIGN L (PrWd, Pk))	*(GRID)

Notice that in this tableau the selection of the candidate with initial stress in (58) could also be

attributed to the force of ALIGN L (PrWd, Pk) if it were to outrank right peak alignment. It is relevant to question whether this left-alignment constraint is redundant. Surely it is no coincidence that the strong-edge which licenses a stressed light syllable in weak-syllable forms should also receive some emphasis even when it does not bear primary stress. It is conceivable that some other manifestation of the inherent strength of the initial position has been mistaken for a secondary stress peak, and we could dispense with the ALIGN L (PrWd, Pk) constraint. Further research is needed to determine what is the appropriate course to take. Note that if we take the reports of an initial secondary stress to be correct, Kuuku-Yaʔu provides further evidence against the bounded foot-based analysis of opposite-edge stress. The foot structure that this analysis would be forced to posit for a word consisting of a light syllable followed by a heavy would be (L̀) (H́). Once again, the initial degenerate foot is not motivated by principles of rhythmic grouping in a quantity-sensitive system.

As we saw in (26) and (33), the stress pattern of Khalkha and Buriat resembles Kuuku-Yaʔu, except that Khalkha and Buriat have the additional complication of quantity-sensitive nonfinality. The analysis of main stress in Khalkha and Buriat requires the ranking PK-PROM >> NONFINALITY, COINCIDE L ($\acute{\sigma}_\mu$, PrWd) >> ALIGN R (Pk, PrWd) (where the left-edge licensing constraint is ranked only with respect to ALIGN R (Pk, PrWd)). The secondary stress pattern can be analyzed similar to that of Kuuku-Yaʔu, but on the basis of the only tentative secondary stress on the initial syllable, ALIGN L (PrWd, Pk) is omitted here. As mentioned in relation to Kuuku-Yaʔu, it is questionable whether an enhancement of the initial syllable in this kind of pattern needs to be analyzed as a secondary stress peak. For the East Mongolian forms, it is conceivable that an initial syllable faith constraint (after Beckman 1996) could explain the avoidance of vowel reduction in the first syllable. The ranking summary is given in (59).

(59)   Khalkha and Buriat: WSP >> *GRIDSTRUC

PK-PROM >> NONFINALITY, COINCIDE L ($\acute{\sigma}_\mu$, PrWd) >> ALIGN R (Ṕḱ, PrWd)

The effect of the ranking in a word with heavy syllables is illustrated in (60).

(60)   Secondary stress in Khalkha

H H H u:rtaegaːr	WSP PK-PROM COINCIDE L (ɕμ, PrWd)	NONFINALITY	*GRIDSTRUC ALIGN R (Ṕ, PrWd)
☞ (a) H̀ H́ H̀			***(GRID) *(Align R)
(b) H̀ H̀ H́		*!	***(GRID)
(c) H̀ H́ H	*!(WSP)		**(GRID) *(Align R)
(d) H́ H̀ H̀			***(GRID) **!(Align R)

For the most part, secondary stress in Khalkha and Buriat follows in exactly the same way as it does in Kuuku-Yaʔu. What is of interest about the secondary stress pattern in Khalkha and Buriat stress is the nonfinality effect. We have already seen in section 1.1 how ranking PK-PROM over NONFINALITY achieves final main stress just when the final syllable is the only strong syllable in the word. In candidate (a) we see that even when a final syllable receives secondary stress, NONFINALITY is still satisfied, because the head of the prosodic word is nonfinal. NONFINALITY is only violated when main stress is final, as in (b). Like in Sindhi (section 1.1), the stress pattern for this form emphasizes the need for final syllable material to be metrically visible in languages exhibiting a nonfinality effect. Any account which analyzed nonfinality as the result of excluding the final syllable from the metrical domain could not account for the East Mongolian stress pattern.

6   Conclusion

In this paper I have argued for a typology of prominence-driven stress, independent of foot structure, in which different stress patterns are analyzed as arising from different rankings of prominence-based constraints on the location of stress. The typology derived from factorial ranking of the prominence-based constraints combines both quantity-sensitive and quantity-insensitive prominence-driven systems and accurately reflects the range of attested patterns. The range of patterns in the typology has proven to be greater than previous conceptions, in particular expanding to encompass systems with quantity-sensitive and quantity-insensitive nonfinality. In this context, the East Mongolian stress pattern is an important one, providing a case which draws

widely on the range of prominence-based constraints and bearing out the predictions of the factorial typology. Deriving prominence-driven systems through constraint ranking also produces the welcome theoretical consequences of eliminating the need to posit unbounded metrical constituents and enabling revokable nonfinal stress effects to be captured without stipulation. Furthermore, the categorical licensing constraint account of opposite-edge systems makes an important contribution to realizing the right shape of the typology, explaining the otherwise unexpected gap of opposite-edge patterns combining nonfinality with stress defaulting to the right. Extension of the prominence-driven stress typology to prominence-sensitive secondary stress follows straightforwardly.

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