Conflation and Scales

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1. Introduction

This paper compares two theories of scales in Optimality Theory. The aim is to identify the empirical phenomena that distinguish the two, and provide specific examples.

Prince & Smolensky (1993) present a theory of how scales are formally expressed in Optimality Theory. To summarize, for a scale | α ⟩ β ⟩ γ | there is a set of constraints || *γ » *β » *α ||. In this theory, it is crucial that the ranking between the constraints is fixed: this ensures that [γ] is more marked than [α] and [β] in every grammar. This approach will be called the 'Fixed Ranking' theory in the remainder of this paper.

The other theory discussed here will be called the 'Stringency' theory, after Prince (1997 et seq.). In the Stringency theory, a scale | α ⟩ β ⟩ γ | is formally expressed as a set of constraints with the form: || *{γ}, *{γ,β}, *{γ,β,α} ||. As an example, the constraint *{γ, β} assigns a violation for every instance of both [γ] and [β] in a candidate: [γγαβ] incurs three violations of *{γ,β}. The Stringency theory's constraints are not in a fixed ranking: like other OT constraints, their ranking is fully permutable. For a fuller discussion of Stringency theories, see Prince (1997 et seq.) and de Lacy (1997, 2002).

Both theories capture one aspect of scales: their hierarchical relations. In the Fixed Ranking theory, [γ] will always incur more serious violations than [β] because *γ always outranks *β. Thus, [γ] is universally more marked than [β]. The Stringency Theory gets the same result, though in a different way: [γ] is always more marked than [β] because there is no constraint that favors [β] over [γ] while there is some constraint that favors [γ] over [β]. In other words, every constraint that is violated by [β] is also violated by [γ] but not vice-versa. A fuller discussion is presented in section 2.

There is an important difference between the theories, though, found in 'category conflation'. To illustrate, one language may distinguish [γ] from [β]: it may actively avoid [γ] in favor of [β]. In a contrasting language, [γ] and [β] may be treated in the same way: neither is eliminated or avoided in favor of the other; in this case, [γ] and [β] have

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NELS 32

been conflated. As a more concrete example, stress in Gujarati actively avoids [ə] for high vowels (Cardona 1965, de Lacy 2002). In contrast, [ə] and high vowels are treated exactly the same in Nganasan, discussed in section 3: stress does not avoid the former for the latter. In Nganasan, the categories 'schwa' and 'high vowel' have been conflated for sonority purposes.[1]

The rest of this paper aims to show that the Fixed Ranking and Stringency theories make different predictions about certain types of conflation. Specifically, the Fixed Ranking theory is shown to be too restrictive – it is unable to produce all attested conflations. In contrast, the Stringency theory can produce all conflation patterns (Prince 1997 et seq., de Lacy 1999, 2002).

To summarize the findings, I will show that the Fixed Ranking theory cannot deal with systems in which there are two or more sets of conflated categories. For example, from the scale | δ 〉 γ 〉 β 〉 α |, the Fixed Ranking theory cannot account for a system in which δ conflates with γ, and β with α. I will also show that it cannot produce certain systems in which only marked categories have conflated.

Section 2 discusses the Fixed Ranking and Stringency theories in more detail. Sections 3 and 4 present cases of conflation in sonority-driven stress. Section 3 deals with systems with two or more conflations; section 4 discusses a specific type of system with conflation of marked categories.

A summary is presented in section 5.

2. Theories

This section describes the two theories under consideration, and presents an implementation of both for sonority-driven stress.

There are a number of languages in which the position of stress is influenced by segmental sonority (see Hayes 1995; Kenstowicz 1996; de Lacy 1997, 2002; Gordon 1999 for typological surveys). The vocalic part of the sonority scale is relevant in this paper.[2]

(1) *Vowel Sonority Scale*
| ə 〉 i,u 〉 e,o 〉 a |

Prince & Smolensky (1993) propose that the sonority scale combines with the prosodic elements 'syllable nucleus' and 'syllable margin' in constraints. Kenstowicz (1996) generalizes this proposal to include the foot head (Hd) and foot non-head (non-Hd).

For the Fixed Ranking theory, Kenstowicz (1996) presents the foot head and non-head constraints and their fixed rankings in (2) for sonority-driven stress.

(2) (a) || *Hd/ə » *Hd/i,u » *Hd/e,o » *Hd/a ||
(b) || *non-Hd/a » *non-Hd/e,o » *non-Hd/i,u » *non-Hd/ə ||

[1] For discussions of the typology of conflation for both sonority and tone, see de Lacy (1999, 2002).

[2] For justification of the hierarchy given in (1) for sonority-driven stress in particular see Kenstowicz (1996) and de Lacy (1997, 2002). For the vocalic part of the sonority hierarchy in general, see Parker (2002) and references cited therein.

The impermutability of the constraints' ranking produces an implicational universal: there is no language in which a less sonorous vowel attracts stress away from a more sonorous one. As an example, there is no language where stress seeks out [ə], ignoring more sonorous vowels [i u e o a]. If words with vowels of the same sonority have leftmost stress [páta], then stress would never be attracted to a non-leftmost syllable just in case it contained a schwa: *[patə́].

The reason that such a language cannot exist with the Fixed Ranking theory derives from the impermutable ranking. In order for stress to be attracted away from the left edge in *[patə́], some markedness constraint that favors stressed [ə] over stressed [a] must outrank the constraint that promotes left-edge alignment. In the fixed ranking theory, the only constraint that fits the bill is *Hd/a – this assigns a violation to [pátə], but not to *[patə́]. The problem is that *Hd/a is universally outranked by *Hd/ə – a constraint that favors stressed [a] over stressed [ə]. This fixed ranking renders *Hd/a inactive in the [pátə]~*[patə́] competition, dooming *[patə́].

The Stringency theory deals with the implicational relations in sonority-driven stress in quite a different way. The stringent constraints for sonority-driven stress are given in (3) (de Lacy 2002:ch.3).

(3) || *Hd/{ə}, *Hd/{ə,i,u}, *Hd/{ə,i,u,e,o}, *Hd/{ə,i,u,e,o,a} ||
|| *non-Hd/{a}, *non-Hd/{a,e,o}, *non-Hd/{a,e,o,i,u}, *non-Hd/{a,e,o,i,u,ə} ||

*[patə́] can never win with the Stringency constraints because there is no constraint that favors [ə́] over [á]; there is no constraint that assigns [á] a violation without also assigning [ə́] a violation. The implicational effect of the Stringency constraints can be seen in the quasi-tableau (4).

(4)

	*Hd/{ə}	*Hd/{ə,i,u}	*Hd/{ə,i,u,e,o}	*Hd/{ə,i,u,e,o,a}
á				*
é			*	*
í		*	*	*
ə́	*	*	*	*

Prince (1997 et seq.) observes that the constraints are in a type of harmonic bounding relation: for any pair of constraints, the violations assigned by one are a proper subset of those assigned by the other. The result is that ranking is irrelevant to the markedness relations between the elements (see Prince & Smolensky 1993:ch.9, Samek-Lodovici & Prince 1999 for discussion of harmonic bounding). No matter how the constraints are ranked, [ə́] will never be more harmonic than [í ú]; more generally, no stressed vowel will ever be favored over a more sonorous stressed vowel regardless of the *Hd/*x* constraints' ranking.

In short, both the Fixed Ranking and Stringency theories produce the correct hierarchical relations for scale. The following sections identify a phenomenon about which they differ: conflation.

3. Two-Category Conflation

This section discusses a sonority-driven stress system that has two sets of conflations. In one set, the categories [á] and [é ó] are treated alike, and in the other the sonority categories [í ú] and [ə́] are conflated. The Stringency theory will be shown to produce such two-category conflations, while the Fixed Ranking theory cannot.

Section 2.1 presents the relevant facts from the Uralic language Nganasan. Section 2.2 provides an analysis in terms of the Stringency theory. Section 2.3 discusses the Fixed Ranking approach.

3.1 Nganasan Stress

The Uralic language Nganasan (also called Tawgi or Tawgi-Samoyed) has a sonority-driven stress system. The description presented here is from Helimski (1998, p.c.), with data supplemented by Castrén (1854), Hajdú (1964), and Tereščenko (1979).[3]

Nganasan has the vowels in (5):[4]

(5) Nganasan Vowels

i y	ɨ	u
e	ə	o
		a

Syllables have the shape CV(V)(C). Nuclei may contain a diphthong or a long vowel.

Stress generally falls on a final [CV:] syllable, otherwise it appears on the penult (Helimski 1998:486).

(6) *Nganasan Default Penult Stress*

[kʲymá:] 'knife'	[kuhúmi] 'skin, hide'
[kóru?] 'house'	[bá:rbə] 'master, chief'
[kə́ndə?] 'sledge'	[bə.lóu.kə] 'a kind of moveable dwelling on runners'

However, stress can optionally fall on the antepenult if it contains a non-high vowel and the penult contains a high vowel or schwa.[5]

[3] See de Lacy (2002:ch.3) for a more in-depth discussion and analysis. I am indebted to E. Helimski for discussing the stress system with me and providing additional facts and data.

[4] There are some restrictions on vowels. For example, the front vowels do not appear in the first syllable after dentals. The mid vowel [o] only appears in non-initial syllables when flanked by labial sounds [b m], and non-initial [e] only occurs after palatals. Neither of these restrictions are significant for stress, so I will not discuss them further.

[5] While stress retraction to the antepenultimate syllable is optional, E.Helimski (p.c.) reports that it is the prevalent pattern. I will describe the grammar in which stress shift takes place here.

(7) *Antepenult Stress*

(i) Antepenult [e o], Penult [i y u ə ɨ]

[dʲémbiʔsʲi] 'dresses'	[tʲétəmtɨ] '4'
[ŋóndʲiʔə] 'goes out'	[hóðyʔə] 'writes'
[kóntudʲa] 'carries'	[hótədʲa] 'writes'

(ii) Retraction to [a], Penult [i y u ə ɨ]

[nákyryʔ] '3'	[ŋamʲátʲymə] '9'
[nánunə] 'locative 1sg pron.'	[tándudʲə] 'wider (attrib)'
[bárusʲi] 'devil'	[kánəmtu] 'which (in order)'
[ŋadʲágəjtʲy] '2 younger sisters'	[dʲákəgəj] 'two twins'
[hʲásɨrə] 'fishing rod'	[hʲásirɨ] 'fishing rod'

Importantly, [ə] and high vowels are not 'unstressable'. When there are no other vowels, stress does fall on them: e.g. [kə́ndəʔ] 'sledge', [kuhúmi] 'skin, hide'.

The Nganasan pattern shows that there is a distinction between [a e o] on the one hand and [i y u ə ɨ] on the other. Importantly, there are no distinctions within these sets. Stress does not retract from a penult [e o] onto a low vowel: e.g. [sʲajbómtɨ] '7th', *[sʲájbomtɨ]. Similarly, stress does not retract from a central vowel onto a high vowel.[6]

(8) *No retraction from central to high vowels*

[ŋilʲə́nɨ] 'below'	[ŋuʔə́ðuʔ] 'once'
[ŋɨtə́nə] 'I still'	[kuhuðə́mə] 'skin for me'
[hytə́ðə] 'trunk'	[kubutə́ndi] 'skin, hide'
[hursə́dʲi] 'returns'	[kubutə́tə] 'skin, hide'

In other words, Nganasan has two conflations: it conflates mid with low vowels for stress purposes, and high with central vowels.[7] To restate the stress system in sonority terms: stress seeks out a low or mid vowel, otherwise falls on a high or central vowel.

3.2 Stringency Analysis

Words with vowels of the same sonority show that the default position for stress is the penult: e.g. [kuhúmi] 'skin, hide'. Default stress placement is produced by the following constraints:

[6] Stress does not retract from a high vowel to a central vowel either: [nənsúʔə] 'stands up', *[nə́nsuʔə]; [nəðúʔə] 'scours', [tənʲíni] 'there {locative}'. Such retraction does not occur in any language.

[7] While this pattern has also been reported for Moksha Mordvin (Kenstowicz 1996 and references cited therein), my investigations have not been able to confirm its validity, especially in relation to the conflation of [ə] and high vowels. Some dialects (e.g. the 'Received' or 'Standard' dialect) do not allow the relevant data (i.e. words with [CəC{i,u}]. In others dialects with the necessary wordforms, stress avoids from [ə] to fall on high vowels, showing that they are not conflated (Jack Reuter p.c.).

(9) ALIGNFTR "The right edge of every foot must be aligned with the right edge of a PrWd." (McCarthy & Prince 1993)
FTBIN "Every foot is binary at the syllabic or moraic level." (P&S 1993)[8]
TROCHEE "Every foot is left-headed." (P&S 1993)

Feet are always trochaic in Nganasan, indicating that TROCHEE is undominated. The role of FTBIN is to ban monomoraic – i.e. 'degenerate' – feet. As shown in the tableau below, FTBIN and ALIGNFTR effectively require a final trochee:

(10) Nganasan default stress

/kuhumi/	FTBIN	ALIGNFTR
☞ (a) ku(húmi)		
(b) (kúhu)mi		*!
(c) kuhu(mí)	*!	

Stress does not fall on the penult when two conditions are met: (i) the penult contains a high or central vowel and (ii) the antepenult contains a non-high vowel. In the Stringency theory, the avoidance of high vowels and schwa in stressed syllables is expressed by the constraint *Hd/{ə,i,u}. This constraint is violated when a foot head – i.e. the stressed syllable – contains a high vowel or anything less sonorous – a schwa in this case.

The avoidance of stressed high vowels and schwa, forces the foot to retract from the right edge of the PrWd: i.e. [(hótə)dʲa] 'writes', [(kóntu)dʲa] 'carries'. Such a footing violates ALIGNFTR, indicating that *Hd/{ə,i,u} must outrank ALIGN:

(11)

/kontudʲa/	*Hd/{ə,i,u}	ALIGNFTR
☞ (a) (kóntu)dʲa		*
(b) kon(túdʲa)	*!	

The constraint *Hd/{ə,i,u} is violated by candidate (b) because it contains a stressed high vowel. In contrast, (a) avoids violating this constraint by stressing a mid vowel. I emphasize at this point that '{i,u}' is an abbreviation for 'peripheral high vowels': i.e. [i y ɯ u]. This ranking therefore accounts for antepenult stress in words like [(náky)ryʔ] as well. The same ranking also accounts for the fact that stress avoids [ə] for mid and low vowels: *[ho(tə́dʲa)] loses to [(hótə)dʲa] because the former candidate violates *Hd/{ə,i,u}.

The ranking presented above accounts for the fact that stress avoids a penult high vowel or schwa only when the antepenult contains a mid or low vowel. If the antepenult contained a high vowel or schwa, there would be no reason to stress it since doing so would not improve on violations of *Hd/{ə,i,u}.

[8] I assume that feet are maximally disyllabic – trisyllabic and unbounded feet do not exist (Hayes 1995).

(12)

/dʲygusa/	*Hd/{ə,i,u}	ALIGNFTR
(a) (dʲýgu)sa	*	*!
☞ (b) dʲy(gúsa)	*	

The tableau above shows that ALIGNFTR can be decisive in choosing the winner when more than one candidate incurs equal violations of the sonority-stress constraints.

The ranking in (12) is relevant for conflation. Since *Hd/{ə,i,u} assigns the same violations to candidates (a) and (b), the vowels [ý] and [ú] are conflated for stress purposes; they are treated in exactly the same way. In Nganasan, high vowels and schwa are similarly conflated. In words with an initial high vowel and schwa in the penult, for example, stress falls on the penult as usual: e.g. [hursə́dʲi] 'returns'. The present ranking accounts for this pattern:

(13)

/hursədʲi/	*Hd/{ə,i,u}	ALIGNFTR
(a) (húrsə)dʲi	*	*!
☞ (b) hur(sə́dʲi)	*	

Crucially, both candidates (a) and (b) incur the same violations of *Hd/{ə,i,u}. Since *Hd/{ə,i,u} is not decisive, the violations of ALIGNFTR become relevant, favoring the penult-stressed (b).

In short, by assigning the same violations to stressed schwa and high vowels, *Hd/{ə,i,u} effectively conflates the two categories. Since neither is preferred over the other, the footing constraints take over, preferring the default stress position.

Therefore, for stressed high vowels and schwa to be treated the same, it is crucial that no constraint that favors one over the other outranks ALIGNFTR. More concretely, the constraint *Hd/{ə} must be ranked below the footing constraints. Since *Hd/{ə} favors stressed high vowels over stressed schwa, any other ranking would make an unwanted distinction between the two categories:

(14)

/hursədʲi/	ALIGNFTR	*Hd/{ə}
(a) (húrsə)dʲi	*!	
☞ (b) hur(sə́dʲi)		*

As the tableau shows, the constraint *Hd/{ə} is crucially inactive – it does not make a decision as to the winning candidate. At this point, it is possible to make a general statement about conflation: if two categories are conflated, there is no active constraint that favors one over the other.

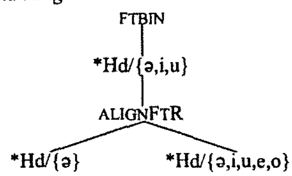
Although stress avoids the less sonorous high vowels and schwa for the more sonorous mid and low vowels, it makes no distinction between the latter types. Stress does not avoid a mid-vowel penult for a low vowel: e.g [sʲajbómtɨ] '7th'. Stress does not avoid a low vowel penult for a mid vowel either: e.g. [koná?a] 'goes'. As discussed above, two categories are distinct when no active constraint assigns them different violations. Therefore, since the constraint *Hd/{ə,i,u,e,o} favors [á] over [é] and [ó], it must be outranked by ALIGNFtR:

(15)

/sʲajbomtɨ/	ALIGNFTR	*Hd/{ə,i,u,e,o}
☞ (a) sʲaj(bómtɨ)		*
(b) (sʲájbom)tɨ	*!	

To summarize, the ranking needed to deal with conflation of the low-sonority categories in Nganasan is as in (16):[9]

(16) *Nganasan Ranking*



The Nganasan ranking involves a general constraint outranking a more specific one, dubbed 'Anti-Paninian' in Prince (1997 et seq.). Prince observes that rankings that produce conflation all contain some Anti-Paninian aspect to them.

In the ranking above, ALIGNFTR acts as the 'constraint inactivator' – all *Hd/*x* constraints ranked below it have no effect on the outcome. Only *Hd/{ə,i,u} outranks ALIGNFTR, so only the distinctions that *Hd/{ə,i,u} makes are visible in Nganasan. Since *Hd/{ə,i,u} makes no distinction between [ə́] and stressed high vowels, these categories are conflated; the same is true for the distinction between stressed mid and low vowels. The only distinction that the constraint does make is between schwa/high vowels vs mid/low vowels, so only this distinction is visible.

3.3 Fixed Ranking Analysis

The discussion in section 3.2 showed that two categories are conflated when they are assigned the same violations by active constraints. For example, stressed schwa and high vowels are conflated in Nganasan because the only relevant active constraint is *Hd/{ə,i,u} and it assigns the same violations to both types. I repeat the relevant tableau below:

(17)

/hursədʲi/	*Hd/{ə,i,u}	ALIGNFTR
(a) (húrsə)dʲi	*	*!
☞ (b) hur(sə́dʲi)	*	

[9] FTBIN must outrank *Hd/{ə,i,u} to prevent *[ŋu(ðá)] from winning over [(ŋúða)] 'berry'.

The observation that conflation comes about when two categories incur the same violations of active constraints necessitates that a theory of scales have freely rankable constraints. To illustrate this point, this section examines a Fixed Ranking analysis with the constraints || *Hd/ə » * Hd/i,u » * Hd/e,o » * Hd/a ||.

In the Fixed Ranking theory, no constraint assigns the same violations to both [ə́] and [í ú]. Therefore, the two categories cannot be conflated with just these constraints. Tableau (18) illustrates these points; since stressed high vowels are favored over [ə́], the ranking incorrectly predicts that stress will always avoid [ə] for high vowels.

(18)

/hursədʲi/	*Hd/ə	*Hd/i,u	ALIGNFTR
☞ (a) (húrsə)dʲi		*	*
(b) hur(sə́dʲi)	*!		

There is no ranking of the constraints above that can produce the result attested in Nganasan. The only other option is to rank both *Hd/ə and *Hd/i,u below ALIGNFTR. However, such a ranking eliminates all sensitivity to sonority; stress is incorrectly predicted to always fall on the penult:

(19)

/kanəmtu/	ALIGNFTR	*Hd/ə	*Hd/i,u
(a) (kánəm)tu	*!		
☞ (b) ka(nə́mtu)		*	

There is no way to fix the problem identified above by introducing other constraints. It is crucial in Nganasan that some active constraint (or constraints) favor [é ó á] over [ə́ í ú] while no active constraint favors [í ú] over [ə́]. While the Fixed Ranking theory has constraints that do the former, those same constraints do not satisfy the latter condition.

To put the observation above in slightly different terms, the problem with constraints in a fixed ranking is that they place implicational relations between conflations. For example, if the ranking || *Hd/ə » *Hd/i,u || were universal, no language could both avoid stressed high vowels and conflate them with [ə́]. Expanding on this point, if schwa is conflated with high vowels, then no constraint that favors the latter over the former can be active. Therefore *Hd/i,u must be inactive. However, if *Hd/ə is inactive, then every lower-ranked constraint is also inactive, including *Hd/i,u. The ultimate effect is that if [ə́] and [í ú] are conflated in a Fixed Ranking analysis, the stress system cannot be sensitive to sonority at all. In other words, this theory predicts that if category *x* is actively penalized by some constraint, *x* is not conflated with any other category.

In summary, the Fixed Ranking theory cannot produce conflation of 'marked' categories – i.e. the categories 'schwa' and 'high vowels' for stress.

3.4 The Conflation Generalization

This aim of this section is to generalize the conclusion of the previous section, identifying exactly which conflations the Fixed Ranking theory can and cannot do.

Although the Fixed Ranking theory cannot provide an adequate account of the type of conflation found in Nganasan, it can effectively deal with many other types of conflation. For example, it can deal with a system in which unmarked categories are conflated. For example, in the ranking || ALIGNFTR » *Hd/e,o » *Hd/a ||, no distinction is made between mid and low vowels: stress falls on the penult, regardless of the relative sonority of the antepenult. In tableau (20), stress does not retract from the lower sonority mid vowel [e] to the higher sonority low vowel [a].

(20)

/pateki/	ALIGNFTR	*Hd/e,o	*Hd/a
(a) (páte)ki	*!		*
☞ (b) pa(téki)		*	

The reason that the categories 'stressed mid vowel' and 'stressed low vowel' are conflated in (20) is that all the constraints that distinguish them are inactive.

The Fixed Ranking theory can also produce certain conflations of unmarked categories, though by more indirect means than above. The *Hd/*x* constraints cannot conflate unmarked categories without also conflating them with the marked ones. So, they cannot conflate [ə́] and [í ú] without also conflating these categories with [á] and [é ó] (shown in section 3.3). However, the *non-Hd/*x* constraints can produce marked-category conflation, a point discussed in more detail in de Lacy (1999).

The relevant constraints in conflation of marked categories refer to the unstressed syllable: || *σ̆/a » *σ̆/e,o » *σ̆/i,u » *σ̆/ə ||. If all the *Hd/*x* constraints are inactive – dominated by ALIGNFTR, in this case, and only *σ̆/a and *σ̆/e,o are active of the *σ̆ constraints, then the marked stress categories 'high vowels' and 'schwa' can be conflated, as shown in tableau (21) (also see de Lacy 1999, Prince 1999).

(21)

/pitəki/	*σ̆/a	*σ̆/e,o	ALLFTR	*σ̆/i,u	*σ̆/ə
(a) (pítə)ki			*!	*	*
☞ (b) pi(tə́ki)				* *	

Candidate (21a) violates the constraint *σ̆/ə because it has an unstressed ə; candidate (b) violates *σ̆/i,u twice because it has two unstressed high vowels. However, none of these violations matter: ALLFTR renders the *σ̆/i,u and *σ̆/ə constraints inactive, so conflating the categories they refer to.

The reason that the *σ̆/*x* constraints can be used to produce marked-end conflation is because the conflation of high vowels and schwa is the *unmarked* end of the scale in terms of the *σ̆/*x* constraints: the most unmarked unstressed vowel is schwa, then high vowels, and so on.

To generalize, Fixed Ranking theories can do unmarked-category conflation: conflation of the contiguous set of categories starting with the least marked element. The reason that the *Hd/*x* constraints can conflate [á] and [é ó] is because in terms of the *Hd/*x* constraints [á] and [é ó] are the least marked categories. The reason that the *σ̆/*x* constraints can conflate [ə́] and [í ú] is more complex, but ultimately derives from the same reason: [ə̆] and [ĭ ŭ] are the least marked categories in terms of the *σ̆/*x* constraints, and so can be conflated in the Fixed Ranking theory.

The result of the discussion above is that – with both *Hd/*x* and *σ̆/*x* constraints – the Fixed Ranking theory can deal with all systems in which there is a single set of conflated categories. The table below summarizes this result. 'Active constraints' are those that are crucial in deciding the winner.

(22) Conflation: Fixed Ranking Theory with *σ́/*x* and *σ̆/*x* Constraints

Categories				*Active Constraints*
ə	i/u	e/o	a	*σ́/ə » *σ́/{i,u} » *σ́/{e,o}
ə	i/u	e/o	a	*σ́/ə, *σ̆/a
ə	i/u	e/o	a	*σ́/ə » *σ́/{i,u}
ə	i/u	e/o	a	*σ́/ə
ə	i/u	e/o	a	*σ̆/a » *σ̆/{e,o}
ə	i/u	e/o	a	*impossible*
ə	i/u	e/o	a	*σ̆/a
ə	i/u	e/o	a	none

The one gap in the table is the Nganasan system: the only system with two conflations: [ə́]~[í ú] and [é ó]~[á]; all others have just one set of conflated categories (or none). This property points to a general result: even with both the *σ́/*x* and *σ̆/*x* constraints, the Fixed Ranking theory cannot produce systems with two or more conflations.

In short, in order to conflate [ə́] with high vowels there can be no active constraint that distinguishes the two. This requires *σ́/ə to be inactive, and hence all the *σ́/*x* constraints to be inactive. Therefore, all the conflations must be done by means of the *σ̆/*x* constraints.

The *σ̆/*x* constraint that distinguishes [ə́] from [í ú] is *σ̆/{i,u}, as shown above. Hence, it must be inactive. However, *σ̆/{e,o} must be active in order to distinguish high vowels and schwa from mid vowels, shown in tableau (23).

(23)

/kontudʲa/	*σ̆/a	*σ̆/e,o	ALLFTR
(a) kon(túdʲa)	*	*!	
☞ (b) (kóntu)dʲa	*		*

However, a problem arises: since *σ̆/{e,o} is active, *σ̆/{a} must also be active. Since these two constraints distinguish stressed mid vowels from low vowels, the ranking requires the categories 'mid vowel' and 'low vowel' to be distinct. Thus, mid vowels and low vowels cannot be conflated if high vowels and schwa are also conflated, as shown below.

North East Linguistics Society, Vol. 32 [2002], Art. 7

(24)

/sʲajbomtɨ/	*σ̆/a	*σ̆/e,o	ALLFTR
(a) sʲaj(bómtɨ)	*!		
☞ (b) (sʲájbom)tɨ		*	*

The problem just described results from the general property of constraint activation: if a constraint C is active, then all constraints that are in a fixed ranking above it are also active. If a constraint is active and distinguishes x from all other categories, then x cannot be conflated with any other category. Since *σ̆/{e,o} must be active in Nganasan, *σ̆/a must also be active. If *σ̆/a is active, then [á] cannot be conflated with any other category. To generalize: relative to a set of constraints that mention scale S, if category c is not conflated with category d and d is more marked than c on S, then x is not conflated with any category in S. The net result is that there can only be one conflation per system.

Although I have only discussed the *σ́/*sonority* and *σ̆/*sonority* constraints here, the result generalizes to all sets of structurally complementary scale-referring markedness constraints. So, for any set of fixed-ranking constraints with the form $*\Sigma/x$, where Σ is a constituent and x some scale category, if there is a corresponding set of constraints $*\Sigma'/x$, where Σ' is every relevant structural position except for Σ, then the combined effect of the two constraints allows for every system with just one set of conflated categories. For example, in the sonority-driven stress case the position 'stressed syllable' (Hd) and unstressed syllable (σ̆) are perfectly complementary – every syllable is either one or the other.

(25) *Structurally-Complementary Scale Constraints in a Fixed Ranking: Conflation*
For a scale S
and two sets of constraints C_1, C_2 on S.
(1) C_1's members have the form $*\Sigma/x$,
Σ is a structural position, $x \in S$.
(2) C_2's members have the form $*\Sigma'/x$,
Σ' is every relevant structural position except for Σ
(3) for all $x,y \in S$, if $\| *\Sigma/x \gg *\Sigma/y \|$ then $\| *\Sigma'/y \gg *\Sigma'/x \|$
Then the only restriction in conflation on scale S wrt Σ is that:
(1) if x is conflated with y and
(2) if z is conflated with some category,
then z is conflated with x and y.

The clauses (1)-(3) stipulate that the condition only applies to scales that have two sets of constraints: one set refers to the scale in a position Σ (i.e. $*\Sigma/x$), and the other set refers to the complementary position Σ' (just as Hd and σ̆ are complementary). Condition (3) requires the two sets of constraints to refer to the scale hierarchy in a complementary fashion. For example, the *Hd/x constraints treat [a] as the least marked element, while the *σ̆/x constraints treat [a] as the most marked element.

The final clause states that there can only be one conflation per system. So, if x and y are conflated at all, they are conflated with each other. This follows for the reasons discussed above.

The point of stating the conclusions as in (25) is to generalize the result beyond sonority-driven stress. It applies to all sonority-influenced prosodification, including – for example – syllabification; (25) also applies to other scales, such as the tone scale (de Lacy 1999, to appear).

The empirical implication of this section is that proof for the Stringency theory almost entirely relies on evidence from 4-step scales. If a scale has less than three members, there will be no system with two or more conflations, and so the Fixed Ranking theory will be empirically adequate for conflations on that scale. This makes the Nganasan system crucial evidence for the Stringency theory.

However, not all evidence for the Stringency theory rests on ≥2-conflation systems. The result summarized in (25) only applies when there are two sets of structurally complementary constraints on the same scale. The next section deals with a situation in which there is only one set of constraints, showing that the Fixed Ranking theory cannot produce marked-category conflation in such a situation.

4. Marked conflation without complementary constraints

One of the general results from section 3 is that constraints in a fixed ranking cannot produce marked-category conflation. In the specific case when there are two structurally complementary sets of constraints – e.g. *Hd/*x* and *ŏ/*x* – the adverse implications of this fact are almost eliminated, as shown above. However, there are some cases where there is only a single set of constraints and no structurally complementary set. In this case, the fact that fixed ranking theories cannot conflate marked categories proves fatal.

One such case is found in the stress system of Kiriwina (also called Kilivila) (see de Lacy 2002:ch.4 for more detail). Kiriwina is remarkable in that the sonority of the stressed syllable does not determine where stress falls. Instead, it is the sonority of the non-head syllable of the foot that is crucial in stress placement.

I will argue that Kiriwina's stress system needs constraints that refer to the non-head position of a foot and its sonority preferences. Moreover, I will argue that there is no set of constraints that refer to the complementary structural position – i.e. the complement of 'foot non-head'. Since Kiriwina has marked-category conflation, it therefore proves beyond the scope of the Fixed Ranking theory to produce.

Section 4.1 describes the Kiriwinian stress system. Section 4.2 presents an analysis in Stringency terms. Section 4.3 discusses the Fixed Ranking approach to Kiriwina.

4.1 Description

Kiriwina is spoken in the Trobriand Islands and in the Milne Bay province of Papua New Guinea. The description and data presented here come from Lawton's (1993) and Senft's (1986) grammars (hereafter L and S respectively).

Kiriwina has five vowels [i e a o u], and a syllable structure of (C)V(V)(C). Bivocalic nuclei are the diphthongs [ai au ei eu oi ou] (S12, 20). Mid vowels almost never occur word-finally, a fact that will prove to have some relevance later on (Senft p.24).[10]

Increased amplitude and duration are the primary correlates of stress (L43). L also notes some allophonic variation conditioned by stress (p.18). Stress usually falls on a final bimoraic syllable (i.e. CVV(C), CVC), otherwise on the penult:

(26) *Default Stress in Kiriwina*

(i) Final Heavy Syllable (CVV(C), CVC)
ivabodaním 'he came last walking'
bakám 'I will eat'
tauáu 'hey, men!'
lakatupói 'I have asked'
idói '(a boat) brings something'

(i) Else penult

idóya 'it drifts'	imomkóli 'he tasted (it)'
dumdabógi 'early dawn'	ambáisa 'where?'
péula 'strong'	náu?u 'nose plug'

However, stress falls on the antepenultimate syllable in one situation: when the penult contains a high vowel and the ultima contains [a] (L45, S25):

(27) ['CVC{i,u}Ca] in Kiriwina

(i) 'CVCiCa

lámila 'outrigger log'	katusawásila 'clear throat'
vigim-kóvila 'to complete'	laódila 'jungle'
mígila 'the face'	luko-sísiga {clan name}
kúlia 'cooking pot'	tomméikita 'selfish person'

(ii) 'CVCuCa

pákula 'blame'	méguva 'white magic'
lasíkula 'pull canoe'	búluva 'thong tying door'
lúguta 'yam type'	

In contrast, stress does not retract when the penult contains a non-high vowel (28i), or when the ultima contains a high vowel (28ii):

(28) (i) CV'C{é,ó,á}Ca

tomtomóta	'dumb'
idója	'it drifts'
kawála	'canoe pole'
bonára	'shelf (in house)'

[10] Senft states that mid vowels "are rarely found in word-final position, except when used in poetic and emphatic forms." I found no tokens in his data with final mid vowels that were marked for stress.

(ii) CV'CVC{i,u}

italoiísi 'farewell (s.o.)' mtumwátu 'shaggy'
meúu 'it has blown unceasingly' igibulúi 'he is angry at'
ikoisúvi 'he puts in' msimwési grass type
imomkóli 'he tasted (it)' mlópu 'cave'
dumdabógi 'early dawn' mdowáli 'housefly'
gugulombwailígu 'the meeting I love'

I have not cited any forms of the shape CVCVC{e,o} since word-final mid vowels are banned. Even so, I will show that there is evidence that mid vowels as foot non-heads are as undesirable as low vowels.

Alternations support the description of stress above. L99 observes that focus is marked by replacing the final vowel of verbs with a high vowel: e.g. [lumkola] 'feel', [lumkoli] 'feel {with focus}'. In words with a penult high vowel and an [a] ultima, L reports that this change causes stress to appear on the penult, though he does not give any transcriptions of examples.

4.2 Stringency Analysis

To account for the default stress pattern, I adopt an analysis in which a quantity-sensitive trochaic foot is aligned as close to the right PrWd boundary as possible: i.e. [ba(kám)], [tau(áu)], [i(dóya)], [imom(kóli)], [am(bái)sa]. Forms like [am(bái)sa] show that Kiriwina is quantity-sensitive, so feet have the form (CVX) (e.g. [ba(kám)], [tau(áu)]), or (CVCV) (e.g. [i(dóya)]). There is no evidence that feet are ever iambic or that degenerate feet are allowed. Therefore, the constraints TROCHEE and FTBIN are undominated in this language (see section 3 for definitions).

FTBIN must outrank ALLFTR in Kiriwina, as shown by the following tableau.

(29)

/nau?u	FTBIN	ALLFTR
(a) (náu?u)	*!	
(b) nau(?ú)	*!	
☞ (c) (náu)?u		*

The only candidate to satisfy both FTBIN and ALLFTR is [na(ú?u)], a candidate that fatally violates constraints on syllabification.

I suggest that the motivation for antepenultimate stress in Kiriwina is constraints on foot non-heads. Kiriwina aims to avoid a high sonority foot non-head, where 'high sonority' refers to both mid and low vowels. In /lamila/, for example, the incorrect output form *[la(míla)] has a foot with a very high sonority non-head: [a]. In contrast, none of the foot non-heads in the attested form [(lámi)la] are more sonorous than the high vowel [i]. The relevant constraints are provided in (3), section 2.

The constraint *non-Hd/{e,o,a} is active in Kiriwina: this constraint assigns a violation to a candidate if a foot non-head has more sonority than a high vowel. To deal with a form like [mígila], *non-Hd/{e,o,a} must outrank ALLFTR:

(30)

/migila/	*non-Hd/{e,o,a}	ALLFTR
☞ (a) (mígi)la		*
(b) mi(gíla)	*!	

The constraint *non-Hd/{e,o,a} must refer specifically to the non-head of a foot. The only other option is for it to refer to unstressed syllables: *σ̆/{e,o,a}. However, this will not produce the right result: both (a) and (b) above incur the same violations of *σ̆/{e,o,a} since they both contain unstressed [a].

It is crucial that the constraint *non-Hd/{e,o,a} be active in Kiriwina. This constraint assigns feet of the form (CVC{e,o}) the same violations as (CVCa) feet, explaining why words like [i(dója)] have penultimate stress rather than antepenultimate *[(ído)ja]. In the present approach, this is because antepenultimate stress will not improve the non-head's sonority significantly enough: *[(ído)ja] still has a high sonority foot non-head:

(31)

/idoja/	*non-Hd/{e,o,a}	ALLFTR
(a) (ído)ja	*	*!
☞ (b) i(dója)	*	

[idója] also provides evidence for the ranking of *non-Hd/a, a constraint that penalizes feet with [a] non-heads. The word *idója* shows that *non-Hd/a cannot be active. If it were, [i(dója)] should be less harmonic than *[(ído)ja]:

(32)

/idoja/	*non-Hd/{e,o,a}	*non-Hd/a	ALLFTR
💣 (a) (ído)ja	*		*
(b) i(dója)	*	*!	

The point made above is that both (CVC{e,o}) and (CVCa) feet are conflated in Kiriwina: they are equally disharmonic. So, any constraint that distinguishes them – such as *non-Hd/a – must be inactive.

The ranking of the other non-head constraint *non-Hd/{i,u,e,o,a} is not determinable. Since it assigns the same violations to all feet, it does not figure in stress placement.

The ranking above accounts for all the other facts of Kiriwina stress.[11] As noted above, stress does not retract to the antepenult when the final vowel is non-low: e.g. [igibu(lú.i)], [mdo(wáli)], [m(lópu)]. The reason for the lack of retraction is that the feet in these words do not have any non-heads with unacceptably high sonority – none violate *non-Hd/{e,o,a}.

[11] The ranking also predicts that words ending in mid vowels will undergo stress retraction; however, no words allow final mid vowels so there is no way to test this prediction.

(33)

/igibului/	*non-Hd/{e,o,a}	ALLFTR
☞ (a) igibu(lúi)		
(b) igi(búlu)i		*!

The ranking also accounts for the fact that stress does not retract when the penult contains a non-high vowel and the ultima a low vowel: e.g. [bo(nára)]. In such words, retraction would not improve the foot non-head's sonority: *[(bóna)ra].

These words also show why an approach that entirely relies on *Hd/*x* constraints will not work. *Hd/*x* constraints are only useful when competing candidates differ in stressed syllable sonority. In Kiriwina, there are many cases where candidates do not differ in stressed syllable sonority, yet the antepenultimate form wins. For example, the two prime competitors from /migila/ are [(mígi)la] and *[mi(gíla)]. Both candidates incur exactly the same *Hd/*x* violations since both have stressed high vowels. So, since the *Hd/*x* constraints do not favor one candidate over the other, the choice of winner should fall to ALLFTR, incorrectly predicting that the penultimate-stressed candidate should win. The difference between [(mígi)la] and *[mi(gíla)] is clearly not in their heads, but in the sonority of the foot non-head.

4.3 Fixed Ranking Analysis

The fixed ranking approach encounters an immediate problem: conflation of the marked categories 'mid vowel' and 'low vowel'. As shown by [i(doja)], it is as undesirable to have a mid vowel non-head as a low vowel one; if low vowel non-heads were most undesirable, the output should be *[(ído)ja]. The problem is that in terms of foot non-heads 'low vowel' and 'mid vowel' are the marked categories. Section 3 established that if two marked categories were conflated in the structural position Σ, then no constraint of the form *Σ/*x* could produce that conflation.

In Kiriwina, then, the *non-Hd/*x* constraints cannot be active. The ranking || *non-Hd/a » *non-Hd/{e,o} » *non-Hd/{i,u} || predicts that if *non-Hd/{e,o} is active, then so is *non-Hd/a, and that consequently, [a] non-heads will be less desirable than mid vowel non-heads. I illustrate with the tableau below:

(34)

/idoja/	*non-Hd/a	*non-Hd/e,o	ALLFTR
💣 (a) (ído)ja		*	*
(b) i(dója)	*!		

If only *non-Hd/{e,o} outranked ALLFTR, the result would be the same: *[ídoja] would win. If *non-Hd/{a} were outranked by ALLFTR, the language would be insensitive to sonority altogether.

The solution to the marked-category conflation problem in section 3 was to invoke a set of constraints that referred to the structurally complementary position: i.e. 'unstressed syllable' for the 'stressed syllable' constraints. The same cannot be done for

Kiriwina, though. The structurally complementary position of the foot non-head is not just the foot head, but the foot head *and* unfooted syllables.

To expand on this point, constraints that refer to foot heads alone *Hd/*x* will fail to make the right distinction between [(mígi)la] and *[mi(gíla)], as explained under tableau (30): the two candidates incur the same violations of the *Hd/*x* constraints so the decision will pass to ALIGNFTR, so incorrectly favoring *[mi(gíla)].

To favor [(mígi)la] over *[mi(gíla)], the constraint needs to ban [i] in both head and unfooted positions at the same time. This, the [í] of [(mígi)la] will incur a single violation while *[mi(gíla)] will incur two – one for the head [í] and one for the unfooted [i]; this correctly favors the former over the latter.

However, the form of the constraint is highly suspect: it treats 'head of foot' and 'unfooted syllable' as a natural class. Moreover, it has pathological effects: it promotes high sonority in unfooted syllables, predicting a language in which vowels become *more* sonorous in that position – the exact opposite of what is attested (see Crosswhite 2000, de Lacy 2002: chs.4, 9). In short, such a constraint is untenable.

In conclusion, the Fixed Ranking theory is unable to deal with Kiriwina for two reasons. One is that it has marked-category conflation. The other is that the constraints that control Kiriwina's stress refer to the position 'foot non-head' and there is no set of constraints that refers to the exact complement of that position.

5. Summary

The aim of this paper was to identify the empirical phenomena that distinguish the Fixed Ranking and Stringency approach to scales.

Section 3 identified a limitation of the Fixed Ranking theory's constraints: they do not allow for conflation of marked categories. For example, the constraints on the sonority of stressed syllables do no allow conflation of the marked categories [ə́] and [í ú], as in Nganasan.

However, the empirical implications of this restriction are occasionally not visible in a fully articulated Fixed Ranking theory. If there is a set of constraints that refers to the complementary structural position – in this case 'unstressed syllables' – then the marked categories can be conflated. This follows if what is marked for one structural position is unmarked for its complementary structural position, just as [ə] is marked in stressed position, but unmarked in unstressed position.

However, even when there are two sets of constraints that refer to complementary structural positions it is impossible for the Fixed Ranking theory to produce a system with two or more conflations – like Nganasan's conflation of [á]~[é ó] and [í ú]~[ə́]. In short, the Fixed Ranking theory cannot produce systems with two or more separate conflations.

Moreover, section 4 presented a case where there was only one set of relevant constraints, and no set that referred to a complementary structural category. In this case, the relevant constraints referred to the foot non-head position and there are no constraints that refer to the exact complement of that position (i.e. a conglomeration of the foot heads and unfooted syllables). In this case, the Fixed Ranking approach is unable to produce marked-category conflation.

I conclude with one final issue: is it the fixed ranking in the Fixed Ranking theory that prevents it from conflating marked categories, or is it the form of the constraints? In other words, could one have stringent constraints in a fixed ranking and effectively deal with marked-category conflation (e.g. || *Hd/{ə} » *Hd/{ə,i,u} » *Hd/{ə,i,u,e,o} ||? The answer is no. The problem with fixed rankings is that they set up implicational relations for conflation; since there are no such implicational relations – any conflation can take place – full ranking permutability is an absolute necessity when it comes to marked-category conflation. To underscore this point, the table below presents a brief conflation typology for sonority-driven stress (also see Prince 1999). For a full exploration of the typology of conflation, see de Lacy (2002:ch.3,4).

(35)

Categories				*Languages*
ə	i/u			Kobon (Davies 1981, Kenstowicz 1996)
ə	i/u	e/o		Gujarati (Cardona 1965, de Lacy 2002)
ə	i/u			Asheninca (Payne 1990)
ə	i/u	e/o	a	Yil (Martens & Tuominen 1977)
ə	i/u	e/o		-
ə	i/u	e/o	a	Nganasan (Helimski 1998, de Lacy 2002)
ə	i/u	e/o	a	Kara (Schlie & Schlie 1993, de Lacy 1997)
ə	i/u	e/o	a	all vowels are treated the same

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