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*Conflicting directionality**

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1 Introduction

Certain kinds of complex phenomena serve as testing and proving grounds in phonology as theories develop and change. Cases of what I will call CONFLICTING DIRECTIONALITY,[1] exemplified by the stress pattern in Selkup (Ostyak-Samoyed) in (1), constitute one such phenomenon (Halle & Clements 1983, Idsardi 1992). This pattern, first discussed for Eastern Cheremis by Kiparsky (1973) (from Itkonen 1955), has informed all major theories of stress (Hayes 1981, 1995, Prince 1983, Halle & Vergnaud 1987, Kenstowicz 1995, Halle & Idsardi 1995, among others). Descriptively, in Selkup the *rightmost* heavy (CVV) syllable receives the stress (1a), but if the word contains no heavy syllables, it is the *leftmost* syllable which is stressed (1b). The term CONFLICTING DIRECTIONALITY describes this elsewhere relationship between the right and left edges of a word. No theory of stress is complete if it cannot account for this pattern.[2]

(1) *Selkup stress* (Halle & Clements 1983: 189)

a. *stress rightmost heavy syllable*

pünakisə́ː	'giant!'
uːcikkóːqɪ	'they two are working'
uːcɔ́ːmit	'we work'
úːciqo	'to work'

b. *otherwise stress leftmost light syllable*

qólʸcimpati	'found'
kárman	'pocket'
ǘŋŋinti	'wolverine'
sə́ri	'white'

A similar pattern for Japanese mimetic palatalisation (Hamano 1986, Mester & Itô 1989) in (2) illustrates a segmental version of conflicting directionality. Mimetic palatalisation targets the *rightmost* non-*r* coronal consonant. If there are none then the palatalising feature links to the *leftmost* segment. In (2a), where both consonants are coronal, palatalisation targets the medial consonant *s* while in (2b) the rightmost coronal is initial, so it is palatalised. As shown in (2c, d), however, in the absence of a non-*r* coronal the floating palatal attaches to the leftmost consonant. Thus in (2c) palatalised *poko* yields *pʸoko* 'jumping around imprudently'. In (2d), where the medial segment is *r*, palatalisation also targets the leftmost consonant, yielding *k*^{y}*oro* 'look around indeterminately'. In addition to the implications of the conflicting directionality here for the principles of association that govern floating features, the exceptional behaviour of *r* has posed an important challenge for theories of underspecification and segment structure.

(2) *Japanese mimetic palatalisation* (data from Mester & Itô 1989)

	Rightmost non-r *coronal*			
a.	/dosa/	do**š**a-do**š**a		'in large amounts'
b.	/toko/	**č**oko-**č**oko		'childish small steps'
	Leftmost labial, velar and r			
c.	/poko/	**p**^{y}oko-**p**^{y}oko	*po**k**^{y}o	'jumping around imprudently'
d.	/koro/	**k**^{y}oro-**k**^{y}oro		'look around indeterminately'

There are two reasons why it is important to have a look at conflicting directionality in the framework of Optimality Theory (McCarthy & Prince 1993b, Prince & Smolensky 1993). First, the limits of parallel output evaluation in Optimality Theory force reassessment of phenomena like these for which previous analyses have relied on serial rule application. More importantly, however, the analysis proposed here offers new insights into the problem which went unnoticed in previous frameworks. The descriptive similarity between the two phenomena is obvious, but because stress and segmental phenomena are treated differently by most theories a unified account has been elusive. However, in Optimality Theory, placement of stress and placement of segmental material are both governed by a single family of ALIGN constraints (McCarthy & Prince 1993a), opening the door to a unified account. In this paper I will argue that in both of these cases conflicting directionality arises from the opposition between the preferred edge of association for a morphological or prosodic unit *vs.* the restricted licensing of complex or marked structure only in strong positions. In other words, positional restrictions on marked structure play an important role in complex directionality effects. This analysis reveals the relationship between the Japanese and Selkup patterns and their connection to other phenomena governed by general principles of licensing, and establishes a model for handling such effects in a declarative framework such as Optimality Theory. Unlike previous analyses using rules of association, the proposed account will correctly limit the predicted patterns of association to just those attested in the literature.[3]

2 Analysis of mimetic palatalisation

In most previous analyses of conflicting directionality in stress, one basic generalisation stands out; namely, one of the directionality statements in the algorithm mentions a peripheral constituent, usually one that is word-initial. This element may be specially designated to serve as the head of a foot or to receive an extra projection on the grid (Kiparsky 1973, Prince 1983, Halle & Vergnaud 1987, Halle & Idsardi 1995, Hayes 1995). The unified solution to conflicting directionality proposed for both the melodic and prosodic cases draws on this insight of inherent peripheral 'prominence' from the stress analysis. We turn first to mimetic palatalisation.

2.1 Analysis

The Japanese mimetic vocabulary, which includes onomatopoeic words and ideophones, constitutes a colourful part of the lexicon. Many of the mimetic words are formed by reduplication, as shown in (3). In addition, palatalisation may occur, leading to a slight shift in meaning which Hamano (1986) characterises as 'uncontrolledness'. As stated above, palatalisation targets the rightmost non-*r* coronal ((2a, b), (3a–e)); otherwise it surfaces on the initial consonant ((2c, d), (3f)).

(3) *Mimetic forms* (Tsujimura 1996: 94)

a.	kata-kata	'homogeneous hitting sound'
	ka**č**a-ka**č**a	'non-homogeneous clattering sound'
b.	kasa-kasa	'rustling sound, dryness'
	ka**š**a-ka**š**a	'noisy rustling sound of dry objects'
c.	pota-pota	'dripping, trickling, drop by drop'
	po**č**a-po**č**a	'dripping in large quantities'
d.	zabu-zabu	'splashing'
	ǰabu-**ǰ**abu	'splashing indiscriminately'
e.	noro-noro	'slow movement'
	ñoro-**ñ**oro	'(snake's) slow wriggly movement'
f.	poko-poko	'up and down movement'
	p^{y}oko-**p**^{y}oko	'jumping around imprudently'

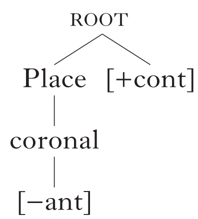
Consider the range of well-formed outputs of the process in (4). The palatalised consonants which are restricted to the leftmost, i.e. word-initial, position are those which are marked by a secondary palatal articulation. Significantly this set includes the labials, the velars and *r*.[4] These contrast with the other coronals, whose palatalised counterparts suffer only a change in place or manner of their primary articulation, becoming alveopalatal fricatives and affricates (Mester & Itô 1989: n. 23).[5]

(4) t → č s → š n → ñ Compare: b^y, k^y, ɾ^y, etc.
d → ǰ z → ǰ

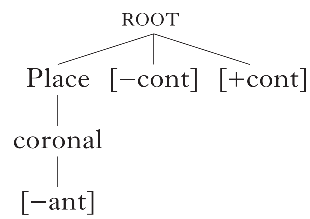
I follow Mester & Itô (1989: 287) in characterising the palatalising morpheme as the floating feature [−anterior].[6] They propose that the feature links directly to an available coronal node as in (5a, b). Where none exists, the floating feature triggers the generation of a vocalic coronal node (5c, d).[7] The form in (5c), *poko*, requires node generation because there are no coronal consonants. In (5d), although the flap is coronal, it has no [−anterior] counterpart in Japanese. Therefore the feature can be realised only on a secondary vocalic coronal gesture.[8]

(5) *Partial representations of palatalised segments*

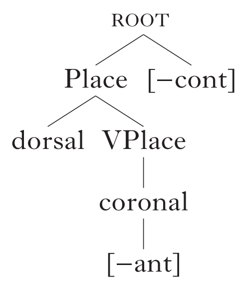
a. Alveopalatal fricative [š]



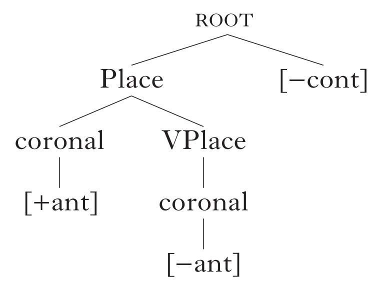
b. Alveopalatal affricate [č]



c. Palatalised non-coronal [k^{y}]



d. Palatalised *r* [ɾ^{y}]



Clements & Hume's (1995) typology of segments (drawing on Sagey 1986) allows a precise distinction between these two classes of palatalised segments, based on the number of major place features each contains. Specifically, SIMPLE SEGMENTS and CONTOUR SEGMENTS, such as the affricates *č* and *ǰ*, which have a single major articulator feature (5a, b), contrast with COMPLEX SEGMENTS, where there are two or more simultaneous oral tract constrictions (5c, d). In this category Clements & Hume (1995) include clicks, multiply articulated stops and nasals, and segments with a secondary articulation.[9] This observation now provides a motivation for exclusive palatalisation of initial consonants in the absence of a non-*r* coronal elsewhere in the word. I propose that this follows from a licensing condition (Itô 1987, Goldsmith 1990, Itô & Mester 1993, Steriade 1995) which allows complex segments only peripherally (following Vennemann 1972, Hooper 1976, Foley 1977, Brasington 1982), in this case only at the beginning of a word.

How should this licensing condition be formalised? 'Initial consonant', whether first in a word, foot or accented syllable, does not correspond to any constituent in current representations. But within the ALIGNMENT theory of McCarthy & Prince (1993a), a formal mechanism does exist for referring to the left edge. Following Itô & Mester (1994) (see also Lombardi 1995), prosodic licensing effects can then be implemented as alignment constraints. The requisite constraint for this case appears in (6).[10] This states that all complex segments should be found at the left edge of the prosodic word: that is, in initial position. Violations are assessed for each segment which intervenes between the complex segment and the left edge of the word.

(6) ALIGN-L(Complex Segment, PWd): Complex segments are initial
Formally: ∀ Complex segments ∃ Prosodic Word such that a complex segment coincides with the leftmost segment in the Prosodic Word

The analysis proposed here relates the Japanese mimetic pattern to other examples of licensing cross-linguistically where marked structure is limited to word-initial position. The most striking of these is !Xóõ (Traill 1985, Spaelti 1992), where 111 segments, primarily different kinds of clicks, are licensed in prosodic word-initial position, while only six appear intervocalically and only two word-finally. Likewise, more marked structure is limited to initial position in languages as diverse as Efik (Hyman 1990), Kukuya (Paulian 1975, Hyman 1987) and Ancient Greek (Steriade 1995). More contrast, thus more complexity, is licensed in constituent-initial positions. Beckman (1995) reaches similar conclusions with respect to indirect licensing of marked vowels.

The ALIGN constraint in (6) optimises complex segments in initial position. However, mimetic palatalisation has a general orientation toward the right edge of the word. Thus the left ALIGN of marked segments conflicts with a more general constraint shown in (7), which states that the [−anterior] consonant should surface as close to the *end* of the word as possible. Marks are assessed for each segment which intervenes between the [−anterior] segment and the right edge of the word. It is this opposition which gives rise to the phenomenon of conflicting directionality.

(7) ALIGN-R([−ant] segment, PWd): [−ant] is a suffix
Formally: ∀ [−anterior] segments ∃ Prosodic Word such that the [−anterior] segment coincides with the rightmost segment in the Prosodic Word[11]

The ranking of the two constraints is given in (8). The licensing condition, ALIGN-L, must outrank the general ALIGN-R constraint since right ALIGN will be sacrificed to avoid violation of the licensing condition.

(8) ALIGN-L(CompSeg, PWd) $\gg$ ALIGN-R([−ant], PWd)

The effect of this ranking is illustrated by the tableau in (9) for a word whose only coronal is initial. The candidate in (9a) best satisfies the ALIGN-R constraint, but is not optimal since it violates the more highly ranked ALIGN-L constraint for complex segments. Therefore the form in (9b), where the initial coronal is palatalised, is the winner.

(9) {toko, [−ant]}

	ALIGN-L(CompSeg, PWd)	ALIGN-R([−ant], PWd)
a. tokʸo	*!	
☞ b. čoko		***

The ALIGN-R constraint exerts its muscle in (10), where the base has two coronal consonants. Since coronals yield non-complex palatalised segments there is no pressure against palatalising the rightmost consonant in (10a). This ranking generates the ‘rightmost coronal’ pattern.

(10) *Palatalisation targets rightmost coronal* {dosa, [−ant]}

	ALIGN-L(CompSeg, PWd)	ALIGN-R([−ant], PWd)
☞ a. doša		*
b. ǰosa		*!**

(11) illustrates the targeting of the leftmost consonant in the absence of a non-*r* coronal. In *poko*, both consonants would have complex palatalised counterparts. Because the ALIGN constraint on complex segments is high, the violation caused by the medial complex segment in (11a) is fatal. The form in (11b), where the leftmost non-coronal is targeted, is optimal. Thus arises the leftmost non-coronal pattern.

(11) *Palatalisation targets leftmost of the two non-coronals* {poko, [−ant]}

	ALIGN-L(CompSeg, PWd)	ALIGN-R([−ant], PWd)
a. pokʸo	*!	*
☞ b. pʸoko		***

The coronal *r* patterns with the non-coronals, because, like palatalised velars and labials, the palatalised *r* is a complex segment [rʸ]. As shown by the tableau in (12), its behaviour is governed by the ALIGN constraint, which licenses complex segments initially. The candidate in (12a) is ruled out because the rightmost consonant, being a palatalised *r*, violates the highest constraint.

(12) r *patterns with non-coronals because* rʸ *is complex* {koro, [−ant]}

	ALIGN-L(CompSeg, PWd)	ALIGN-R([−ant], PWd)
a. korʸo	*!	*
☞ b. kʸoro		***

Finally, a PARSE(Feature) constraint[12] in (13) outranks ALIGN-R. Consequently, the palatalising feature will link even when alignment cannot be perfectly satisfied. As shown by the tableau in (14), the form in (14b) is optimal since it realises [−anterior] despite the resulting violations of alignment.

(13) Parse(Feature): an input feature is parsed in the output (Prince & Smolensky 1993)

(14) {toko, [−ant]}

	Parse(F)	Align-R([−ant], PWd)
a. toko	*!	
☞ b. čoko		***

Additional data from Japanese mimetic palatalisation (from Mester & Itô 1989: 284) allows us to rank Parse(F) with respect to Align-L as well (15a). The initial consonants in these forms cannot host the palatalising feature due to an unviolated constraint against palatalised onsets preceding *e* (15b) (Mester & Itô 1989). If Align-L ranked below Parse(F) the medial consonant would be palatalised in these cases, but it is not. A complex segment either appears initially or not at all. Therefore Align-L outranks the faithfulness constraint.

(15) a.

		violates *C^ye	*violates licensing*
keba-keba	'gaudy'	*k^yeba-k^yeba	*keb^{y}a-keb^{y}a
neba-neba	'sticky'	*n^yeba-n^yeba	*neb^{y}a-neb^{y}a
gebo-gebo	'gurgling'	*g^yebo-g^yebo	*geb^{y}o-geb^{y}o
teka-teka	'shining'	*čeka-čeka	*tek^{y}a-tek^{y}a

b. *C^ye (Mester & Itô 1989: 283)
e is not preceded by a palatalised (i.e. [−ant]) consonant

As shown in the tableau in (16), the high-ranking phonotactic constraint rules out (16a), since *k^ye* does not constitute a legitimate sequence. Of the remaining candidates, (16c) emerges as optimal, indicating that it is worse to violate complex segment alignment than for the floating feature not to surface.

(16) {keba, [−ant]} → keba

	*C^ye	Align-L(CompSeg, PWd)	Parse(F)
a. k^yeba	*!		
b. keb^{y}a		***!	
☞ c. keba			*

(17) provides the full ranking of the constraints discussed for Japanese mimetic palatalisation. It is the conflict between the left-edge licensing of complex segments and the right-edge orientation of the affix which gives rise to conflicting directionality.

(17) *The ultimate ranking*

*C^ye, Align-L(CompSeg, PWd) ≫ Parse(F) ≫ Align-R ([−ant], PWd)

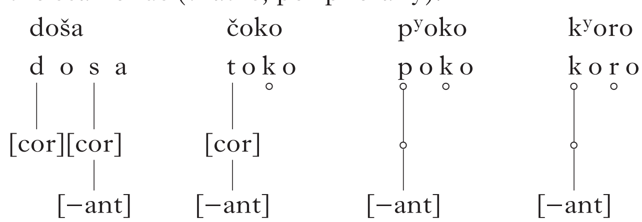
2.2 Implication for underspecification

Conflicting directionality in Japanese mimetics thus emerges from antagonism between two constraints pushing toward opposite edges. An important consequence of this proposal is that it undermines what has been considered to be a strong argument for contrastive underspecification. Mester & Itô (1989) argue that the behaviour of *r* in mimetic palatalisation constitutes an argument *against* radical underspecification (Archangeli 1988, Pulleyblank 1988, Archangeli & Pulleyblank 1989), but *for* a theory of contrastive underspecification (Clements 1987, Steriade 1987). Their account is sketched below in (18). In a right-to-left scan, the palatalising feature targets the first non-*r* coronal it encounters. This yields palatalisation of the medial segment in a word like *doša* 'in large amounts', but the peripheral segment if the rightmost consonant is not a coronal. In the absence of non-*r* coronals, then, the feature docks by default to the left edge. Under that analysis, the reason that *r* patterns with the non-coronals is that it lacks an underlying coronal specification, since the place of *r* is not contrastive in the Japanese consonant inventory (cf. Steriade 1995). The lack of an underlying coronal specification removes *r* from the class of coronal segments underlyingly, and thus from the set of eligible coronals in the right-to-left scan. The special behaviour of this *r* has become a standard argument for contrastive underspecification.

(18) *Japanese* (Mester & Itô 1989)

a. Associate palatalising feature to the first non-*r* coronal encountered moving right to left.

b. *Default Docking*
If none is encountered then link the feature to the edge where the scan ends (that is, peripherally).



The current proposal instead relates the seeming transparency of *r* to its surface form, attributing its exceptional patterning with the non-coronals as a consequence of the complexity of its palatalised counterpart, a solution corroborated by the well-known resistance of *r* to palatalisation cross-linguistically (Bhat 1978: 66), which appears to be independent of inventory considerations. Thus the behaviour of *r* does not provide an argument for underspecification, a result which is in accord with much recent work arguing against both contrastive and radical underspecification, including that of Mohanan (1991), McCarthy & Taub (1992), Smolensky (1993), Steriade (1995), Inkelas (1994) and Itô *et al.* (1995).

3 More melodic conflicts in directionality: tone

While conflicting directionality, attested in a variety of unrelated languages, constitutes one of a set of basic stress options (see below), Japanese mimetic palatalisation has been considered the exclusive melodic representative of this phenomenon.[13] The present analysis reveals, however, that conflicting directionality is very common in at least one domain of melodic association: tone. In particular, this section will demonstrate that tone patterns derivable by the rules of association described by the Association Convention (19) of Goldsmith (1976) arise from a conflict between general left-edge orientated tone linking and right-edge licensing of contour tones.

(19) *Rules of association* (from Goldsmith 1976)

a. Assign each tone to a TBU left-to-right, one-to-one.

b. If there are more TBUs than tones, spread the rightmost tone onto the remaining TBU(s).

c. If there are more tones than TBUs link the remaining tone(s) to the rightmost TBU.

Mende, with five different underlying tone melodies, constitutes the classic example of this pattern (Leben 1971, 1978, Goldsmith 1976, etc.). Where the number of tones matches the number of tone-bearing units they link one-to-one, as in *ngílà* 'dog', from /ngila, HL/ (21a). A shortage of TBUs results in the formation of a contour tone on the word-final syllable, as in *nyàhâ* 'woman' (21b), while a shortage of tones triggers spreading of the rightmost tone as in *ndàvúlá* 'sling' (21c).[14]

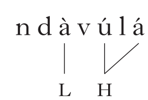
(20) *Mende* (Leben 1978: 186)

	one syllable		*two syllables*		*three syllables*	
H	kɔ́	'war'	pɛ́lɛ́	'house'	háwámá	'waistline'
L	kpà	'debt'	bɛ̀lɛ̀	'trousers'	kpàkàlì	'tripod chair'
HL	mbû	'owl'	ngílà	'dog'	félàmà	'junction'
LH	mbǎ	'rice'	fándè	'cotton'	ndàvúlá	'sling'
LHL	mbǎ̂	'companion'	nyàhâ	'woman'	nìkílì	'groundnut'

(21) a. One-to-one association

b. Too many tones → final contour

c. Too many TBUs → rightmost tone spreads



3.1 Analysis

In optimality-theoretic terms, the Mende pattern reflects the interaction of a hierarchy of violable constraints governing tone association. First, the existence of contour tones reflects the importance of the faithfulness constraint PARSE(Tone) (22). This ensures that every tone has a TBU. One asterisk is assessed for each input tone which is not linked to a TBU.

(22) PARSE(Tone) (after Prince & Smolensky 1993)
Every tone has a TBU
Formally: ∀x(If x is a tone then x is linked to a TBU)

As the tableau in (23) shows, a shortage of TBUs forces either deletion of extra underlying tones, violating PARSE(Tone) (23b–d) or the association of multiple tones to a single TBU. PARSE(Tone) favours the form in (23a), with the contour tone.

(23) /mba, LH/ → mbǎ 'rice'

		PARSE(TONE)	
☞ a. L͡H	mbǎ		*L͡H is complex*
b. H	mbá	*!	*L not in output*
c. L	mbà	*!	*H not in output*
d. ∅	mba	**!	*L, H not in output*

A second constraint, SPEC(Tone), dictates that every TBU has a tone (24). Each toneless TBU counts as a violation.

(24) SPEC(Tone) (after Prince & Smolensky 1993)
Every TBU has a tone
Formally: ∀x(If x is a TBU then x is specified for tone)

From /ngila, HL/, where the number of tones matches the number of vowels, the optimal output distributes the tones to both syllables (25a). These two constraints together yield one-to-one association where the number of tones equal the number of TBUs.

(25) /ngila, HL/ → ngílà 'dog'

		PARSE(TONE)	SPEC(TONE)	
☞ a. HL	ngílà			
b. ∅ H͡L	ngilâ		*!	*1st syllable unspecified*
c. H͡L ∅	ngîla		*!	*2nd syllable unspecified*

Where there are more TBUs than tones, satisfaction of PARSE and SPEC requires some tone to spread. Optimality-theoretic analyses of autosegmental spreading (Bickmore 1994, Tranel 1995a, b, Myers & Carleton 1996, Akinlabi in press, *inter al.*) *generally invoke an alignment constraint to* *force assimilation*.[15] *The requisite* ALIGN constraint is given below in (26). A violation is assessed for each TBU which intervenes between the leftmost association of the tone in question and the left edge of the word. In (27), the candidate with a contour tone on the initial syllable best satisfies ALIGN-L, (27c), but is ruled out by the higher ranking SPEC (Tone). In the optimal candidate, *ndàvúlá* (27a), the tones link as close to the left edge as possible. This results in what looks like linking from left to right and spreading of the final tone.

(26) ALIGN-L(Tone, PWd)

A tone is linked to the leftmost TBU

Formally: ∀ tone ∃ Prosodic Word such that leftmost TBU linked to the tone coincides with the leftmost TBU in the Prosodic Word

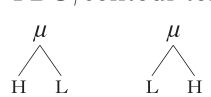
(27) SPEC(Tone) ≫ ALIGN(Tone-L, PWd-L)

		SPEC(Tone)	ALIGN-L(Tone)	
☞ a. LHH	n d à v ú l á L H		*	*one TBU intervenes between* ú *and the left edge*
b. *LLH	n d à v ù l á L H		**!	*two TBUs intervene between* á *and the left edge*
c. L͡H ∅ ∅	n d ǎ v u l a L H	**!		*two TBUs have no tone*

It should be obvious from the tableau in (27), however, that ALIGN-L(Tone) makes exactly the wrong prediction for the placement of contour tones, which are always final. ALIGN-L(Tone) favours placement of tones as far to the left as possible. Therefore where there are extra tones an *initial* contour best satisfies ALIGN-L. Contour tones, however, must be aligned to the *final* syllable. Parallel to the cases of conflicting directionality discussed above, this pattern necessitates the introduction of an alignment constraint specific to marked structure (28), in this case one which will align contour tones to the right, as shown in (29). 'TBU/contour tone' indicates the configuration where the TBU dominates a branching tone.[16]

(28) *Branching TBUs are marked*

TBU/contour tone



(29) ALIGN-R(TBU/contour, PWd)

Contours are linked to the rightmost TBU

Formally: ∀ TBU/contour ∃ Prosodic Word such that the TBU/contour coincides with the rightmost TBU in the Prosodic Word

The tableau in (30) illustrates the work done by ALIGN-R(Contour). Violations are assessed in (30b) because the contour tone resides on the first syllable. In the optimal form (30a), *nyàhâ*, licensing is satisfied by the final contour.

(30) /nyaha, LHL/ → nyàhâ

		ALIGN-R(Contour)	
☞ a. L H͡L	n y à h â (L H L)		*â coincides with the rightmost TBU*
b. *L͡H L	n y ǎ h à (L H L)	*!	*one TBU intervenes between ǎ and the right edge*

As above, the surface conflicting directionality reflects the ranking of licensing over more general alignment. In (31), (a) is optimal because the marked contour tone is licensed there on the final syllable, whereas it is not licensed in (31b). The greater distance of tones from the left edge in (31a) is irrelevant since ALIGN-L sits lower down in the hierarchy.

(31) /nyaha, LHL/ → nyàhâ

		ALIGN-R(Contour)	ALIGN-L(Tone)
☞ a. L H͡L	n y à h â (L H L)		**
b. *L͡H L	n y ǎ h à (L H L)	*!	

Where the number of tones exceeds the number of TBUs (32) neither of the possible tone-spread patterns violates the contour licensing constraint. In this case ALIGN-L adjudicates between the candidates, optimising the form in which all tones link as close to the left edge as possible (32a).

(32) ALIGN-R(Contour) ≫ ALIGN-L(Tone)

		ALIGN-R(Contour)	ALIGN-L(Tone)	
☞ a. LHH	n d à v ú l á (L H)		*	*one TBU intervenes between ú and the left edge*
b. *LLH	n d à v ù l á (L H)		**!	*two TBUs intervene between á and the left edge*

(33) summarises the constraint hierarchy which derives the pattern covered by the association rules in (19) above. The necessary ranking of right-edge alignment of contour tones over a more general constraint aligning tones to the left yields a surface conflicting directionality which

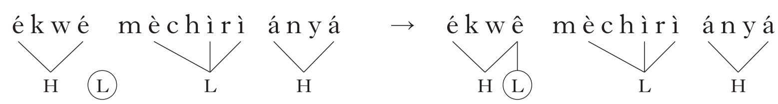
constitutes the mirror-image parallel of the Japanese mimetic palatalisation.

(33) Parse(Tone), Spec(Tone), Align-R(Contour) ≫ Align-L(Tone)

3.2 Tone absorption

Cross-linguistic patterns of contour simplification favour the licensing view of contour placement. In a Goldsmith-style analysis final contours are merely an artefact of left-to-right association. This predicts that a contour which arises word-internally will remain there. Under the present analysis, on the other hand, a licensing (alignment) constraint allows contour tones only on final syllables, predicting that word-internal contours should simplify when the licensing constraint ranks high. The very common process of TONE ABSORPTION (Hyman & Schuh 1974), which reduces word-internal contours to simple tones in many African tone languages, supports the licensing analysis of contour placement over the strictly directional view. Clark (1983), for example, shows that contour placement is not simply an artefact of directional association, but results rather from a special affinity between contour tones and final syllables. Compare two potentially contour-forming processes in Ohuhu Igbo ((34)–(36)). The first links a floating low tone to the final syllable of the subject in an affirmative statement (34), creating a H͡L contour at the end of a word, here on *ékwê* (Clark 1983: 47).

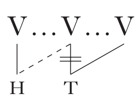
(34) *Ohuhu Igbo Affirmative L-linking* (Clark 1983: 47)



'Ekwe shut his eyes'

Clark contrasts the operation in (34) with three other processes that potentially create contours word-internally. In negative relative constructions, for example, a verb-initial H tone spreads one syllable to the right (Clark 1983: 45), delinking the tone it finds there (35). (36) provides some data.

(35) *Relative clause H-tone spread and contour simplification*



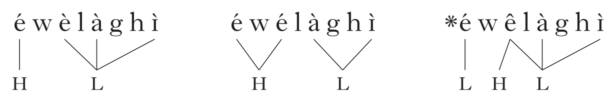
(36)

		main clause	*relative clause*	
a.	H-stem verb	émꜜéchígí	éméchꜜígí	'didn't shut'
b.	L-stem verb	éwèlàghì	éwélàghì	'didn't take home'
c.	HL-stem verb	átꜜóbhàghì	átóbhàghì	'didn't throw in'

The presence of downstep on the second syllable in (36a) and (36c) indicates the delinking of L which results from contour prevention. (37) illustrates the avoidance of a word-internal contour tone for the L stem. Spreading of a high tone onto a low-toned syllable potentially produces a falling tone. Yet while word-final syllables tolerate contour tones word-internal syllables do not. Here delinking of the L tone from the second syllable avoids the potential HL. This follows directly from an analysis where contours are licensed only on final syllables, whereas the traditional rule-based account requires a seemingly unmotivated rule of contour simplification.

(37) *L-stem verbs*

main clause   *relative clause*



4 Extension to stress patterns

The proposed analysis of conflicting directionality straightforwardly derives the Japanese mimetic palatalisation, while revealing it to be a more pervasive autosegmental pattern than previously thought. Unlike existing rule-based analyses, this framework handles conflicting directionality in stress as well. Selkup (Halle & Clements 1983, Idsardi 1992) constitutes a typical example (see the data in (1)). Recall that the *rightmost* heavy (CVV) syllable receives the stress (1a), but if there are no heavy syllables, it is the *leftmost* syllable which is stressed (1b).

Following the model established for Japanese, the general ALIGN-L constraint in (38a), which optimally aligns the stressed syllable with the right end of the word, must be in opposition to a licensing constraint which aligns marked prosodic structure to the left edge. I propose that the marked structure in this case is a LIGHT STRESS-BEARING SYLLABLE.[17] The existence of languages which lengthen stressed short vowels, such as those presented in Hayes (1985), provides strong support for the contention that light syllables with stress are indeed marked. (38b) spells out the ALIGN-L constraint, which has the effect of licensing stressed light syllables only word-initially. One mark is assessed for each syllable which intervenes between the stressed syllable and the designated edge of the word.

(38) a. *Constraint governing placement of stressed syllable*

ALIGN-R($\acute{\sigma}$, PWd)

Stressed syllable should be word-final

Formally: $\forall\ \acute{\sigma}\ \exists$ Prosodic Word such that the stressed syllable coincides with the rightmost syllable in the Prosodic Word

b. *Licensing of monomoraic stressed syllables*
ALIGN-L($\acute{\sigma}_{\mu}$, PWd)
Light stressed syllable should be word-initial
Formally: ∀ $\acute{\sigma}_{\mu}$ ∃ Prosodic Word such that the light stressed syllable coincides with the leftmost syllable in the Prosodic Word

As in Japanese, the licensing constraint must rank above the more general ALIGN-R constraint, since right ALIGN will be violated to preserve licensing. The tableaux in (39) and (40) show how this generates the correct pattern for Selkup. The form in (39) contains two heavy syllables. In (39a) the rightmost syllable is light. It cannot be stressed, since this would violate the high-ranking licensing constraint. Since the other syllables are both heavy they vacuously pass the ALIGN-L constraint. In the optimal form in (39b) the rightmost heavy syllable bears the stress, since this causes the fewest violations of ALIGN-R.[18]

(39) uːcɔ́ːmɨt 'we work'

	ALIGN-L($\acute{\sigma}_{\mu}$, PWd)	ALIGN-R($\acute{\sigma}$, PWd)
a. uːcɔːmɨ́t	**!	
☞ b. uːcɔ́ːmɨt		*
c. úːcɔːmɨt		**!

On the other hand, in the form in (40), where all syllables are light, the highly ranked ALIGN-L constraint renders the word-initial stress optimal (40c). This analysis thus derives the rightmost heavy/leftmost light pattern using the same general constraints that were used to account for Japanese mimetic palatalisation.

(40) ǘŋŋɨntɨ 'wolverine'

	ALIGN-L($\acute{\sigma}_{\mu}$, PWd)	ALIGN-R($\acute{\sigma}$, PWd)
a. üŋŋɨntɨ́	**!	
b. üŋŋɨ́ntɨ	*!	*
☞ c. ǘŋŋɨntɨ		**

5 Typology

The proposed analysis for the first time relates conflicting directionality in the prosodic and melodic domains. In this section I will show that this account surpasses previous analyses further by correctly making more constrained predictions about the variety of patterns expected cross-linguistically. In particular it predicts that we will not find a language where it is the *unmarked* structure that has defective distribution (41). In such a language, for example, palatalisation would target a rightmost velar, but if there were none, an initial coronal would be palatalised.

Likewise, stress would be attracted to the rightmost light syllable, or failing that, the leftmost heavy. No matter how we manipulate the constraints it is impossible to derive this pattern. While one may never have expected to find such a language, standard rules of association predict it to exist.

(41) *Prediction: no language where* unmarked structure *has defective distribution*

	palatalisation	*stress*
target the rightmost marked	ko**k**^{y}	ta.tá
	k^{y}ot	tá.taa
otherwise leftmost unmarked	**š**od	táa.taa

The factorial typology derived from the possible licensing and alignment constraints will fail to generate the pattern in (41). As summarised in (42), the typology comprises only four possible patterns. When a constraint which is not specific to marked structure outranks a licensing constraint (42a, b), the effects of the lower constraint will not be felt. In these patterns licensing plays no active role. Only when the licensing constraint is dominant and specifies the opposite edge from the general constraint will it have an impact on the output. Where licensing favours the left edge (42c), the Japanese mimetic palatalisation pattern will be found. Where it favours the right edge (42d) we expect the mirror image.

(42) a. *leftmost*
Align-L(α) $\gg$ Align-R/L(marked)
b. *rightmost*
Align-R(α) $\gg$ Align-R/L(marked)
c. *leftmost simple else rightmost complex*
Align-R(marked) $\gg$ Align-L(α)
d. *rightmost simple else leftmost complex*
Align-L(marked) $\gg$ Align-R(α)

First, ranking of a general *right*-edge oriented precedence constraint over a phonological licensing constraint for either edge will produce a uniform 'final segment' or 'final syllable' pattern. Such subsegmental suffixes occur in Inor (Rose 1994) and Bini (Akinlabi in press), for example. Likewise, Hayes (1981) notes that Hyman (1977) lists 97 languages with predominant final stress.

In Uzbek (Poppe 1962, Walker 1996), for example, stress is final regardless of syllable quantity:

(43) *Final stress in Uzbek* (Walker 1996: 4)

LH́	[ki.tób]	'book'
LLH́	[ki.to.bím]	'my book'
HĹ	[ait.dí]	'he said'
HLH́	[aŋ.la.móq]	'to understand'
HLLH́	[aŋ.la.di.lár]	'they understood'

As shown by the tableau in (44), ranking the licensing alignment below Align-R(σ́) masks any potential licensing effects. The candidate which best satisfies general alignment (44a) will simply place stress on the final syllable.

(44)

		Align-R(σ́)	Align-L($\acute{\sigma}_\mu$)
☞ a. HĹ	suu.dá		*
b. g̈L	súu.da	*!	

The reversal of the directional parameter of a high-ranking general precedence constraint yields a pattern where the *leftmost* potential element will be the target, regardless of markedness. Subsegmental examples include Zoque palatalisation (Wonderly 1951, Akinlabi in press), voicing in Otomi (Wallis 1956), Japanese Rendaku (Itô & Mester 1986) and H-tone association in Mixteco (Tranel 1995a, b). In addition, at least 144 languages have been shown to exhibit word-final stress (Hyman 1977). The data in (45) from Tinrin (Melanesia) reflect one such case (Osumi 1995, Walker 1996). Stress always falls on the initial syllable, regardless of quantity.

(45) *Initial stress in Tinrin* (Walker 1996: 2–3)

ĹL	[ɳĩ́.ɖi]	'(in the) swamp'
H́H	[ɯ́ɯ.ii]	'to thank'
H́L	[mɔ̃́ɔ̃.wi]	'lung'
ĹLL	[vé.u.a]	'whetstone'
H́LL	[ɔ́ɔ.ju.o]	'chair'
ĹHL	[á.mʷaa.ti]	'chief'

As shown by the tableau in (46), ranking Align-L(σ́) over the licensing constraint again renders licensing irrelevant. In the optimal candidate, *á.mʷaa.ti*, stress falls on the initial syllable since this best satisfies the dominant constraint.

(46)

		Align-L(σ́)	Align-R($\acute{\sigma}_\mu$)
☞ a. ĹHL	á.mʷaa.ti		**
b. Lg̈L	a.mʷáa.ti	*!	
c. LHĹ	a.mʷaa.tí	**!	

Finally, the only possibility remaining in this system is to keep licensing high, but with the *right* edge as the strong edge, in conflict with a more general *left*-edge oriented constraint. If complexity is licensed at the right edge of a word, but the precedence constraint favours the left edge, a conflicting directionality opposite to Japanese mimetic palatalisation and Selkup stress results. The analysis of tone association above provided one common example. Likewise, in Kwakwala, as described in Zec (1994) (drawing on Boas 1947), the *leftmost* heavy syllable is stressed, where heavy syllables include those with long vowels or non-glottalised sonorant codas (47a). In the absence of a heavy syllable it is the *final* syllable which receives the stress (47b).

(47) *Kwakwala stress* (Zec 1994: 44–45)

a. *leftmost heavy*

xʷáː.xʷə.kʷ'ə.na	'canoe (PL)'
t'ə.líː.dᶻu	'large board on which fish are cut'
m'ə́n.sa	'to measure'
tə́l.qʷa	'soft'
dᶻə́m.bə.təls	'to measure'
mə.xə́n.xənd	'to strike'

b. *rightmost light*

c'ə.xə.lá	'to be sick'
gas.xá	'to carry on fingers'
məl'.qá	'to repair canoe'

As in Selkup and Japanese, conflicting directionality results from a hierarchy where a licensing constraint, ALIGN-R($\acute{\sigma}_\mu$), outranks a general constraint on stress placement at the opposite edge (48). As the tableau in (49) shows, this ranking will pick out the leftmost heavy syllable (49b), because it best satisfies ALIGN-L without violating licensing. When confronted with a word containing exclusively light syllables (50), however, stress will be optimised on the final syllable (50c), because only that position licenses the marked light stressed syllable.

(48) ALIGN-R($\acute{\sigma}_\mu$) ≫ ALIGN-L($\acute{\sigma}$)

(49) *Leftmost heavy*

	ALIGN-R($\acute{\sigma}_\mu$)	ALIGN-L($\acute{\sigma}$)
a. mə́.xən.xənd	**!	
☞ b. mə.xə́n.xənd		*
c. mə.xən.xə́nd		**!

(50) *Rightmost light*

	ALIGN-R($\acute{\sigma}_\mu$)	ALIGN-L($\acute{\sigma}$)
a. c'ə́. xə. la	**!	
b. c'ə. xə́. la	*!	*
☞ c. c'ə. xə. lá		**

The resulting typology is shown in the table in (51).[19]

(51)

		stress	melody
a.	*leftmost*		
	ALIGN-L(α) $\gg$ ALIGN-R/L(marked)	Tinrin	Otomi
b.	*rightmost*		
	ALIGN-R($\acute{\sigma}$) $\gg$ ALIGN-R/L(marked)	Uzbek	Inor
c.	*leftmost simple, else rightmost complex*		
	ALIGN-R(marked) $\gg$ ALIGNL($\acute{\sigma}$)	Kwakwala	Mende
d.	*rightmost simple, else leftmost complex*		
	ALIGN-L(marked) $\gg$ ALIGN-R($\acute{\sigma}$)	Selkup	Japanese

6 Conclusion

Optimality Theory has been very successful in accounting for non-local dependencies straightforwardly, obviating the need to build the ill-formed intermediate structures that are sometimes inevitable in serial derivational frameworks (McCarthy & Prince 1993b, Prince & Smolensky 1993). The limits of parallel output evaluation have also forced reassesment of other phenomena traditionally thought to require serial rule application. Directionality effects, for example, are recast in OT by designating one edge of a domain as a magnet for phonological material (McCarthy & Prince 1993b, Prince & Smolensky 1993). The bidirectionality of Japanese mimetic palatalisation and stress assignment in Selkup presents apparent difficulties in the non-derivational framework since it seems to require that both edges be designated simultaneously dominant. This paper has demonstrated, however, that conflicting directionality in such cases arises from the opposition between the licensing of marked structures and the demands of more general alignment. The account reveals the link between the segmental and prosodic cases of conflicting directionality, relates them to well-attested cases of licensing cross-linguistically, and undermines what has been considered to be a strong argument for contrastive underspecification.

NOTES

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[1] Thanks to Larry Hyman for suggesting this term.

[2] Other languages with this pattern include Classical Arabic, Kuuku-Yaʔu, Juasateco and Chuvash (Hayes 1995: 254).

[3] See Hewitt & Crowhurst (1996) for another approach within Optimality Theory.

[4] The consonant traditionally transcribed as *r* is an alveolar flap, [ɾ], although pronunciation may vary depending on context (Tsujimura 1996).

[5] The consonant inventory of Japanese is (Tsujimura 1996):

(i)

p	b	t	d				k	g		
ɸ		s	z	š	ž	ç				h
		t^s	d^z	č	ǰ					
			r			y		w		
m			n		ň	ɲ		ŋ	ɴ	

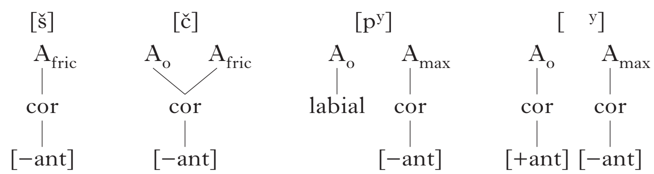
[6] The Mester & Itô (1989) account of the palatalisation pattern is discussed below in §2.2.

[7] Archangeli & Pulleyblank (1994) discuss a number of other cases where automatic 'node generation' facilitates association (cf. Clements 1985).

[8] These representations reflect the C/V separation under the Place node argued for in Clements (1991). Other details of the geometry conform to that of McCarthy (1988). Full representations would include laryngeal features as well.

[9] Segmental representations which utilise aperture nodes in place of a root node (Steriade 1992) capture the same distinction between the two types of segments.

(i)



[10] Licensing alignment is actually the conjunction (Smolensky 1994) of two simple constraints: *Complex & Align-L.

[11] This constraint reflects the original formulation of Align proposed by McCarthy & Prince 1993a (below), where Edge(X,{L, R}) = the element standing at the Edge L, R of X:

(i) *Generalised Alignment* (McCarthy & Prince 1993a: 2)

Align(Cat1, Edge1, Cat2, Edge2) = $_{def}$Cat1 Cat2 such that Edge1 of Cat1 and Edge 2 of Cat 2 coincide

coincidence encompasses three configurations. Two elements (x, y) coincide if (i) y = x, (ii) y dominates x or (iii) x dominates y. Thus the coincidence relation is symmetric ($x\boldsymbol{C}y \rightarrow y\boldsymbol{C}x$). See Zoll (1996) for discussion.

[12] McCarthy & Prince (1995) propose to eliminate Parse(F) in favour of a constraint over the identity of segments, but Orgun (1995), Ringen & Vago (1995), Lombardi (1995) and Zoll (1996) have demonstrated independently the need for some version of the original notion of featural faithfulness.

[13] Mester & Itô (1989) mention a palatal prosody in Guɗe (Chadic; Hoskison 1974) as another potential case, but while the situation is quite complex there appears to be no conflict in directionality. In general, palatalisation will target *all* unmarked targets in a word, otherwise the final syllable.

[14] Some underlying LH words surface as LLH, as in *fàndè-má* (Leben 1978: 197). See Leben (1978) and more recently Archangeli & Pulleyblank (1994) and Zoll (1996) for an account of this pattern.

[15] This is true in the Optimal Domains Theory of Cole & Kisseberth (1994) as well, where alignment sets up edges of domains in which spreading can take place.

[16] I leave aside here contour tone units, e.g. in Chinese, which Yip (1989) argues to be simple tones (see Duanmu 1994 for discussion).

[17] Kenstowicz (1995) discusses two dialects of Mari which exhibit a similar pattern with non-finality, except that marked stress peaks are distinguished by quality (stressed central vowels such as [ə] are marked) rather than quantity. See Walker (1996) for an application of this model to the Literary Mari dialect. Zoll (in preparation) provides an analysis of Northwest Mari, with apparent non-initiality, as a case of the default-to-same pattern not requiring licensing (see note 19).

[18] A high-ranking constraint must require every word to have a stress, thereby forcing violations of alignment.

[19] To account for the other unbounded pattern, the so-called 'default-to-same', Zoll (1996) ranks the well-motivated WEIGHT-TO-STRESS constraint (WSP – Prince 1990; see also Prince & Smolensky 1993 and Kenstowicz 1995) at the top of the hierarchy in (a) and (b) (likewise limiting stress to one per word). As shown schematically in the tableaux below, WSP»ALIGN-L($\acute{\sigma}$) selects the first heavy syllable if there is one, otherwise the first syllable (as in Fore, Khalkha Mongolian, Yana (Hayes 1995)). Conversely, if alignment is to the right edge, stress will be found on the last heavy syllable, else the last (as in Aguacatec (Mayan) and Golin (Hayes 1995)).

(i) WSP: If heavy then stressed (Prince 1990)

(ii)

/$\sigma_L\sigma_H\sigma_H$/	WSP	ALIGN-L($\acute{\sigma}$)	
a. $\acute{\sigma}_{\mathbf{L}}\sigma_H\sigma_H$	**!		*2 heavy σ's are unstressed*
☞ b. $\sigma_L\acute{\sigma}_{\mathbf{H}}\sigma_H$	*	*	
c. $\sigma_L\sigma_H\acute{\sigma}_{\mathbf{H}}$	*	**!	*2 σ's intervene between σ́ and edge*

(iii)

/$\sigma_L\sigma_L\sigma_L$/	WSP	ALIGN-L($\acute{\sigma}$)	
☞ a. $\acute{\sigma}_{\mathbf{L}}\sigma_L\sigma_L$			
b. $\sigma_L\acute{\sigma}_{\mathbf{L}}\sigma_L$		*!	*1 σ intervenes between σ́ and edge*
c. $\sigma_L\sigma_L\acute{\sigma}_{\mathbf{L}}$		**!	*2 σ's intervene between σ́ and edge*

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