

# Retroflex Harmony in Kalasha: Agreement or Spreading?\*

Alexei Kochetov (al.kochetov@utoronto.ca) and Paul Arsenault (paul.arsenault@utoronto.ca)

Department of Linguistics, University of Toronto

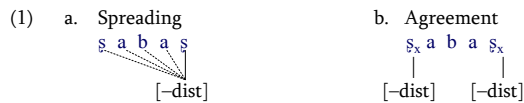
## 1. Introduction

- This paper investigates co-occurrence restrictions on coronals in Kalasha evaluating current theories of consonant harmony.
- We show that Kalasha roots exhibit retroflex consonant harmony that is sensitive to relative similarity of non-adjacent consonants.
- We argue that the data are compatible with the *agreement by correspondence* approach which encodes featural similarity.

## 2. Background

Two theories of consonant harmony

- Local Feature Spreading** (Gafos 1999): The harmonic feature spreads across adjacent segments within some domain. All segments within the domain that are contrastive for the spreading feature are either targets or blockers. Others are permeated by the feature, but not audibly affected (1a).
- Agreement by Correspondence** (Rose & Walker 2004; Hansson 2001): A correspondence relationship is established between segments in an output string if they are highly similar. Agreement for the harmonic feature is enforced between correspondents. Segments that do not enter into the correspondence relationship are transparent (1b).



Previously identified cases of retroflex harmony involve either stops or sibilants (affricates and/or fricatives).

- (2) a. Retroflex harmony in Malto (Hansson 2001)  
 tu:d 'tiger'            dudu 'mother'            d̪anda 'staff'  
 \*t̪...t, \*d̪...d, etc.
- b. Retroflex harmony in Gimira (Rose & Walker 2004)  
 saʃ 'vein'                      ʃatʃ 'stretcher'            tʃ̪ʉtʃ̪ 'louse'  
 \*ʃ̪...ʃ, \*tʃ̪...tʃ̪, \*ʃ̪...tʃ̪, etc.

The two theories make different predictions about harmony in languages that have both types of contrasts – retroflex/nonretroflex stops and retroflex/nonretroflex sibilant affricates or fricatives.

- The spreading approach* does not encode featural similarity, and thus does not predict similarity effects. All segments contrastive for the relevant feature are equally likely to harmonize.
- The agreement approach* relies crucially on similarity of participating segments. It predicts that same-manner consonants (both stops, both fricatives, etc.) are more likely to harmonize than different-manner consonants (a stop and a fricative, etc.).

These predictions have not been tested, largely due to the fact that languages with 2- or 3-way retroflex contrasts are typologically rare (Maddieson 1984) and relatively under-studied.

In this paper we present new data that have an important bearing on the theoretical debate on mechanisms of retroflex harmony.

## 3. Coronal obstruents in Kalasha

Kalasha (Indo-Aryan, Dardic) has a rich inventory of coronal obstruents: dental, retroflex, and palatal fricatives, affricates, and stops (3) (Bashir 2003; Heegård & Mørch 2004; Trail & Cooper 1999).



(3) Coronal contrasts

dental	retroflex	palatal
t t <sup>h</sup>	t̪ t̪ <sup>h</sup>	
d (d <sup>h</sup> )	d̪ (d̪ <sup>h</sup> )	
ts ts <sup>h</sup>	tʃ̪ tʃ̪ <sup>h</sup>	tɕ tɕ <sup>h</sup>
ʈ	dʒ	ɕ (ɕ <sup>h</sup> )
s	ʃ	ç
z	ʒ	ʒ

Morgenstierne (1973) notes some diachronic cases of “assimilation at a distance” involving retroflexes. Retroflex harmony as a synchronic phenomenon, however, has not been investigated.

## 4. Method

- A corpus of 218 word-initial C<sub>1</sub>VC<sub>2</sub> root sequences, where both C<sub>1</sub> and C<sub>2</sub> are coronal obstruents, based on an electronic copy of Trail & Cooper's (1999) dictionary of Kalasha.
- 36 logically possible combinations of 8 C<sub>1</sub>/C<sub>2</sub> place and manner classes (e.g. dental fricatives and retroflex affricates).
- Ratios of Observed/Expected (O/E) values (Frisch et al. 2004): under-representations (O/E < 1.00) and over-representations (O/E > 1.00).

## 5. Results

The results revealed robust co-occurrence restrictions on coronals.

Table 1. O/E ratios (shaded = categorical absence of a combination; bold = significant under-/over-representation, p < 0.05, χ<sup>2</sup> > 3.84).

C <sub>1</sub> /C <sub>2</sub>	s z	ç z	ʃ z	ts ts <sup>h</sup> ʈ	tɕ tɕ <sup>h</sup> ɕ ɕ <sup>h</sup>	tʃ̪ tʃ̪ <sup>h</sup> dʒ	t t <sup>h</sup> d d <sup>h</sup>	t̪ t̪ <sup>h</sup> d̪ d̪ <sup>h</sup>
s z	1.13	0.32	<b>0.00</b>	0.55	<b>1.66</b>	<b>0.00</b>	<b>1.56</b>	1.16
ç z		<b>3.82</b>	<b>0.00</b>	0.00	0.48	0.00	<b>1.81</b>	0.83
ʃ z			<b>4.62</b>	0.00	0.97	0.84	0.92	0.57
ts ts <sup>h</sup> ʈ				<b>12.11</b>	0.73	<b>0.00</b>	<b>1.98</b>	0.53
tɕ tɕ <sup>h</sup> ɕ ɕ <sup>h</sup>					1.12	<b>0.00</b>	0.90	1.11
tʃ̪ tʃ̪ <sup>h</sup> dʒ						<b>8.77</b>	0.93	<b>0.00</b>
t t <sup>h</sup> d d <sup>h</sup>							0.96	<b>0.00</b>
t̪ t̪ <sup>h</sup> d̪ d̪ <sup>h</sup>								<b>3.10</b>

Key observations:

- 2 stops, 2 fricatives, and 2 affricates that agree in retroflexion are statistically over-represented  
 e.g. ʃʃ 'head', tʃ̪adʒa 'pinewood torch', t̪<sup>h</sup>et̪ karik 'to scatter'.
- 2 stops, 2 fricatives, and 2 affricates that disagree in retroflexion are categorically absent  
 e.g. \*s...ʃ, \*tɕ...ʃ, \*t̪...t̪.
- Different-manner combinations (stops & fricatives or affricates or fricatives & affricates) are commonly found, and not under-represented  
 e.g. tʃat 'moment', saʃuk 'apple sauce', tɕaʃ 'lunch'.

## 6. Discussion

- The results show that Kalasha roots exhibit retroflex harmony, which is highly sensitive to relative similarity of non-adjacent consonants. It applies only when both consonants agree in [+cont, ±strid].
- The data are compatible with the *agreement approach* which encodes featural similarity, and are problematic for the *spreading approach* (unless the latter is modified to incorporate the notion of similarity).
- We propose an *agreement analysis* of Kalasha retroflex harmony whose crucial component is a hierarchy of C↔C Correspondence constraints (4), combined with the constraint IDENT-CC([±dist]) enforcing agreement for retroflexion between corresponding consonants in (5, 6) (following Rose & Walker 2004; Hansson 2001).
- Similarity-based correspondence hierarchy, [±dist]  
 Corr-T↔T̪ » Corr-Ç↔ʃ, Corr-T↔t̪ » Corr-T↔ʃ  
 same manner same stridency/continuity same sonorancy

(5) Retroflex harmony applies in same-manner combinations

/ta/	Id-CC [±dist]	Corr-T↔T̪	Id-IO [-dist]	Id-IO [+dist]	Corr-Ç↔ʃ	Corr-T↔t̪	Corr-T↔ʃ
a. t a <sub>l</sub>		*!			*	*	*
b. t̪ a <sub>l</sub>	*!						
c. t̪ a <sub>l</sub>				*			
d. t̪ a <sub>l</sub>			*!				

(6) Retroflex harmony fails to apply in different-manner combinations

/sa/	Id-CC [±dist]	Corr-T↔T̪	Id-IO [-dist]	Id-IO [+dist]	Corr-Ç↔ʃ	Corr-T↔t̪	Corr-T↔ʃ
a. s̪ a <sub>l</sub>							
b. ts a <sub>l</sub>	*!					*	*
c. tʃ̪ a <sub>l</sub>				*			
d. ts a <sub>l</sub>			*!				

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