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Weak triggers and gang effects in Sanskrit retroflex harmony

Sanskrit exhibits a consonant harmony process called *nati* by which retroflexion spreads progressively and at any distance from a retroflex continuant trigger to a coronal nasal target (e.g. 1a–b) unless a consonantal coronal intervenes to block it (1c).

(1)	(a)	√ɻaːgʱaʋ-eːna	→ [ɻaːgʱaʋ-eːɳa]
	(b)	√ɻug-na	→ [ɻug-ɳa]
	(c)	√ɻatʰ-eːna	→ [ɻatʰ-eːna]

The core facts of *nati* have been described and analyzed numerous times since antiquity (OT treatments include Steriade 1995, Ní Chiosáin & Padgett 1997/2001, Gafos 1999, Hansson 2010, Jurgec 2011). The present paper revisits the primary data (a two-million-word corpus of Vedic and Epic Sanskrit) to document and analyze two previously unrecognized (including by the grammars) morpho-prosodic conditions on *nati.* Both reveal prefixes to be weak triggers in the sense that a prefix trigger has access to a proper subset of the targets accessible to a non-prefix trigger. Specifically, a prefix trigger almost never accesses a target immediately following a plosive or immediately preceding a retroflex interval (VC_0), while a post-prefix trigger almost always does.

Consider the first generalization, which concerns post-plosive targets. If the trigger occupies the root-suffix complex, such targets always undergo *nati*, as exemplified in (2).[1] Furthermore, a trigger-containing prefix such as [pɻa-] normally reaches a target in the root-suffix complex, as in (3). As (4) illustrates, however, *nati* fails whenever both the target is post-plosive and the trigger occupies a prefix. This failure cannot be attributed to the particular prefix or suffix involved, nor to phonological distance.

(2)	(a)	[√gɻ̩bʱ-ɳV-]	'grasp (pres. stem)'	(v48 vs. 0)
	(b)	[√ɻug-ɳá-]	'break (pass. part.)'	(v2 e40 vs. 0)
	(c)	[√ʋɻ̩k-ɳá-]	'cut off (pass. part.)'	(v18 e2 vs. 0)
	(d)	[√ɻéːkɳas]	'inheritance'	(v14 vs. 0)
(3)	(a)	[pɻ̩-√aːp-aɳa]	'attaining'	(v1 e5 vs. 0)
	(b)	[pɻ̩-√aːp-aɳiːja]	'to be attained'	(e2 vs. 0)
	(c)	[pɻa-√ɦi-ɳV-]	'incites (pres. stem)'	(v2 e2 vs. 0)
	(d)	[pɻ̩-aː-√ɦi-ɳoː-t]	'incited (3s impf.)'	(e82 vs. 0)
	(e)	[pɻa-√miːɳ-aː-ti]	'frustrates (3s)'	(v5 vs. 0)
(4)	(a)	[pɻ̩-√aːp-nV-]	'attain (pres. stem)'	(v27 e380 vs. 0)
	(b)	[pɻa-√gʱn-an-ti]	'kill (3pl)'	(v4 vs. 0)
	(c)	[pɻa-√bʱag-na]	'break (pass. part.)'	(v1 e72 vs. 0)

Both cases are analyzed in Harmonic Grammar through the 'ganging up' of the relevant independently motivated markedness constraint (*Tɳ or OCP) with CrispEdge (e.g. Ito & Mester 1999, Selkirk 2011), which in this case penalizes spreading across the

[1] For corpus counts, 'v' = Vedic, 'e' = Epic, and 'vs. 0' makes explicit that no counterexample is found in the corpus. The paper includes comprehensive statistics for all relevant forms.

left edge of a root. A simplified illustration follows, using '*nati*' as a placeholder for the harmony-inducing constraint.[2] In (5), harmony spreads from a root to an immediately post-plosive target. In (6), harmony spreads from a prefix to a target in the root-suffix complex. In (7), however, in which both the target is post-plosive and a root boundary must be breached, *Tɳ and CRISPEDGE collectively outweigh *nati*, and harmony fails.

(5)

√ɻug-na		$\mathscr{H}$	*nati* 3	*Tɳ 2	CRISPEDGE 2
a. ☞	√ɻug-ɳa	-2		-1	
b.	√ɻug-na	-3	-1		

(6)

pɻa-√ɦi-noː-ti		$\mathscr{H}$	*nati* 3	*Tɳ 2	CRISPEDGE 2
a. ☞	pɻa-√ɦi-ɳoː-ti	-2			-1
b.	pɻa-√ɦi-noː-ti	-3	-1		

(7)

pɻa-√aːp-noː-ti		$\mathscr{H}$	*nati* 3	*Tɳ 2	CRISPEDGE 2
a.	pɻ-√aːp-ɳoː-ti	-4		-1	-1
b. ☞	pɻ-√aːp-noː-ti	-3	-1		

An Optimality Theory analysis of these facts would require a conjoined (or similarly multi-predicate) constraint, which entails both a loss of generalization and certain empirical problems concerning locality (cf. Pater 2009). For one, such a constraint (necessarily local to the word) erroneously rules out harmony even when the violations of *Tɳ and CRISPEDGE come from different domains of harmony within the same word. An analysis set in Serial OT (McCarthy 2009, 2011) has the same issues.

A classical Serial HG analysis is also untenable. The issue, in brief, is that the critical violations of the two constraints needed for the gang effect come from separate steps in the derivation. The domain of harmony first spreads across the root boundary unaware of the plosive-target cluster lying in its path. In a later step, when the domain reaches the target, all of the candidates available violate CRISPEDGE, so the grammar has no choice but to harmonize, as it would if harmony were root-initiated.

That said, Serial HG augmented by non-local dependency constraints can handle the gang effect properly. Here, a proposal by Mullin (2011) (see also Walker 2014), namely, *DEPENDENT-HEAD(W), is extended to morphological or junctural structure for this purpose. This constraint effectively allows the serial HG grammar to refer back to the origin (head) of harmony at every step to determine whether it is prefix-initiated. Empowering serial HG with such non-myopia, however, introduces certain pathologies. Relevant pathologies of classical HG are also discussed. The purpose of this paper, then, is not to advocate for a particular harmony constraint, but rather to bring to light new locality problems concerning a well-known harmony system and to argue for an analysis of them in terms of the ganging up of independently motivated markedness constraints against harmony, whatever its mechanism.

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[2]In the full analyses, ∀-HARMONY (Walker 2014) is employed in non-serial frameworks and SHARE (McCarthy 2009) in serial ones, though nothing critical here hinges on this choice.