Epiphenomenal and true non-iterative harmony

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4i.1 Introduction

In the majority of cases, vowel harmony operates iteratively throughout a given domain. Typically, this is the word, although both larger and smaller domains are attested (Ch. 7b). Harmony that does not extend its influence throughout the word is the focus of this subchapter. Before exploring the typology of iterativity in harmony, a few definitions are necessary. Within a given domain, I define iterative, non-iterative, and bounded iterative harmony thusly:

(1) Iterative harmony: a harmony pattern in which every potential featurally-defined target may assimilate to [F].

(2) Non-iterative harmony: a harmony pattern in which only a single featurally-defined target may assimilate to [F].

(3) Bounded iterative harmony: a harmony pattern in which *n* featurally-defined targets may assimilate to [F].

When we think of harmony, (1) is typically what we consider (van der Hulst and van der Weijer 1995: 501-503). This is evident from the lack of discussion concerning types (2) and (3) in the various handbook chapters and overviews of vowel harmony (e.g. van der Hulst and van der Weijer 1995; Archangeli and Pulleyblank 2007; Rose and Walker 2011).

Even if empirical and typological work on types (2) and (3) have been lacking, formal work within both SPE (Chomsky and Halle 1968) and OT (Prince and Smolensky 2004) is far more abundant. Early work in SPE explored how to encode non-iterative assimilation, proposing a variety of mechanisms to differentiate iterative from non-iterative patterns (Johnson 1972; Howard 1973; Jensen and Stong-Jensen 1973; Anderson 1974; Kenstowicz and Kisseberth 1977). While the structure of derivational formalisms allowed for the direct representation of iterativity and non-iterativity as a parameter on rules, encoding non-iterativity is more challenging for OT, as noted by Kisseberth (2007). Since markedness constraints have access only to surface structures, there is no straightforward way to distinguish whether a particular [+F][-F] sequence derives from /[+F][-F]/ or from /…[-F][-F]/ where the underlying trigger occurs elsewhere in the word. This feature of OT in part drives Kaplan's (2008b) claim that all non-iterativity is epiphenomenal. He contends that OT cannot reasonably model non-iterativity because non-iterativity is always derivable from other forces in a language. I evaluate this claim below, discussing five types of non-iterativity in the world's languages.

4i.2 Types of non-iterative harmony

When the typology of patterns is examined, five basic types of non-iterativity emerge: domain-bounded, prominence-targeting, featural non-intersection, exceptional harmony, and true non-iterativity. These are discussed in turn.

4i.2.1 Domain-bounded harmony

Phonological patterns exhibit sensitivity to a range of word-internal domains, including both morphological and prosodic domains. Among these, the foot offers a sub-word domain to delimit the operation of a number of harmonies. Consider the data from Veps (Uralic) in (4). In Southern Veps, the frontness of the initial syllable spreads to the second syllable, whereas no such spreading occurs in the Central and Northern dialects. The fact that harmony only targets the second syllable is derivable from the fact that stress is initial, making the domain of harmony a trochaic foot, e.g. (ký.zy).ma.ha in (4a).

(1) Foot-bounded palatal harmony in Veps (Zaiceva 1981)

	Southern	Central/Northern	Gloss
a.	kýzy-ma-ha	kýzu-ma-ha	ask-INF.3-ILL
b.	nǽlktyda	nǽlktuda	be.hungry
c.	lǽmptæʃkandob	lǽmptaʃkandob	fills.up

A similar pattern is attested in Kera (Pearce 2006; 2007), with the head of the foot controlling the realization of the non-head. Among the word-internal forces that interact with harmony, foot and metrical structure have played a significant role in a number of theoretical approaches (Halle and Vergnaud 1981; Abu-Salim 1987; Hualde 1989).

4i.2.2 Prominence-targeting harmony

In a manner quite distinct from domain-bounded harmony, the trigger for harmony may also occur in a weak position, triggering assimilation of a stronger position. This is precisely the analysis of a metaphony patterns developed in Walker (2005; 2011; see chs. 4e, 10). Consider the pattern from Grado (Romance) in (5). In the left-hand column, stressed mid vowels are followed by non-high vowels. However, in the right-hand column, when these same mid vowels are followed by a high vowel, they raise to high. Observe that in (5a-c), the [+high] affects the penult only, but in (5d), since stress is antepenultimate, [+high] assimilates both the penult and the antepenult. The pattern in these examples only appears to be non-iterative because the trigger and target are often in adjacent syllables (5a-c). Walker analyzes this as licensing, with the height feature of the post-tonic vowel being licensed only by affiliation with a prominent position, i.e. the stressed syllable in Grado.

(5) Stress-targeting metaphony in Grado (Walker 2005: 924-925)

	Post-tonic vowel is [-high]		Post-tonic vowel is [+high]	
a.	mét-o	put-1.SG	mít-i	put-2.SG
b.	rénd-e	return-3.SG	rínd-i	return-2.SG
c.	amór	love.M.SG	amúr-i	love-M.PL
d.	ʃóven-e	young.man-M.SG	ʃúvin-i	young.man-M.PL

Kaplan (2008a; 2015) discusses a number of examples of similar patterns, including umlaut in German, Chamorro, and Lango. He argues that in all of these, the target of harmony is a prominent position, e.g. primary stressed syllable, root. To the extent that this analysis accounts for the facts in each language, harmony is not truly non-iterative.

4i.2.3 Featural non-intersection

A third type of apparent non-iterativity may emerge when the triggers and targets of harmony do not intersect. Consider the example from regressive ATR harmony in Bengali (Mahanta 2008) in (6). In each case, a [-hi, -ATR] vowel surfaces as [+ATR] before a [+hi, +ATR] trigger, but with no further spreading since the harmonized mid vowel is not a possible trigger in the language.

(6) Trigger-target non-intersection in Bengali (Mahanta 2008: 152-153)

	Unsuffixed	Gloss	Suffixed	Gloss
a.	pɔt^h	way	pot^{h}ik	traveler
b.	pɔd	position	pɔdobi	position.holder
c.	ɔʃɔt	dishonest	ɔʃoti	dishonest.F

A similar pattern is found in Mayak (Andersen 1999), where [u] triggers rounding of the low vowels /a ʌ/ to [o]. In harmonies like these, iterativity is simply precluded by the conditions on triggers and targets, and is thus analyzable without crucial reference to non-iterativity.

4i.2.4 Exceptional harmony

In some cases, harmony may occur only within a given lexical item (e.g. Finley 2010). The type of exceptional morpheme that yields surface non-iterativity is what Finley calls an *exceptional undergoer*. In this type of pattern, only a certain set of morphemes undergo harmony while the more generally vowels in the language are immune to harmony. For an example, consider the realization of the intransitive subjunctive and transitive imperfective suffixes in Yucatec Maya (Mayan; Krämer 2001). The intransitive subjunctive suffix (7a-h) copies the vowel of the preceding syllable while the transitive imperfective, like most suffixes in the languages, is invariant (7f-h).

(7) Exceptional harmony in Yucatec Maya

	Word	Gloss
a.	ʔah-ak	wake.up-INTR.SUBJ
b.	ʔok-ok	enter-INTR.SUBJ
c.	lub’-uk	fall-INTR.SUBJ
d.	wen-ek	sleep-INTR.SUBJ
e.	kíim-ik	die-INTR.SUBJ
f.	jil-ik	see-TR.IMPF
g.	tsol-ik	explain-TR.IMPF
h.	putʃ-ik	hit-TR.IMPF

In a language where only a select set of morphemes undergo harmony, the result may appear to be non-iterative. That being said, if a language were to possess a set of *exceptional undergoers* that could co-occur, then one would expect to find harmony extending throughout those morphemes, unlike a truly non-iterative pattern. Like featural non-intersection, in the type of exceptional harmony illustrated in (12) the set of morphemes that may trigger harmony does not intersect the set of morphemes that may undergo harmony. For a list of more exceptional patterns, see Finley (2010: 1563-1564).

4i.2.5 True non-iterativity

The four previous patterns are all amenable to Kaplan’s analysis. Crucially though, Kaplan (2008b) predicts that no pattern should exist where the extent of harmony is not definable in the terms of the previous categories. However, such a pattern is robustly attested in the rounding harmony pattern found in the Central dialect of Crimean Tatar (Turkic; Kavitskaya 2010; 2013; McCollum and Kavitskaya 2018). Observe first that non-high vowels do not undergo rounding harmony (8a,b; see also ch. 4b). In (8c,d), the nominalizer and third-person singular possessive suffixes undergo harmony after monosyllabic roots in both the Southern and Central dialects. In (8e-j) though, these two dialects diverge. Whereas the Southern dialect spreads lip rounding to all non-initial high vowels, the Central dialect only rounds the second-syllable high vowel. Note that this holds true of words derived from monosyllabic (8e-h) and as well as disyllabic roots (8i,j). In both dialects, backness harmony holds regardless of vowel height.

(8) Non-iterative rounding harmony in Central Crimean Tatar

	Southern	Central	Gloss
a.	tuz-lar	tuz-lar	salt-PL
b.	kyz-ler	kyz-ler	autumn-PL
c.	tuz-u	tuz-u	salt-POSS.3S
d.	tuz-luq	tuz-luq	salt-NMLZR
e.	tuz-luɣ-u	tuz-luɣ-ɯ	salt-NMLZR-POSS.3S
f.	kyz-lyg-y	kyz-lyg-i	autumn-NMLZR-POSS.3S
g.	toz-luɣ-ɯ	toz-luɣ-ɯ	dust-NMLZR-POSS.3S
h.	køz-lyg-y	køz-lyg-i	eye-NMLZR-POSS.3S
i.	burun-u	burun-ɯ	nose-POSS.3S
j.	bojun-u	bojun-ɯ	neck-POSS.3S

In order to demonstrate that the pattern in Central Crimean Tatar is truly non-iterative, it must be shown that the domain of harmony is not derivable from other factors. First, as noted in (Sevortjan 1966; Kavitskaya 2010), stress regularly falls on the final syllable. However, some descriptions of the language as well as the larger Turkic family suggest that stress may also fall on the initial syllable (Sevortjan 1966; Baski 1986; Johanson 1998). Two pieces of evidence support that stress is word-final, vowel syncope and pre-stressing suffixes. High vowels may be elided in all non-final syllables, but are never elided in final syllables (Kavitskaya 2010, 28-31). Moreover, the position in which high vowel deletion is most common is actually the initial syllable, suggesting that the initial syllable exhibits no special prosodic or metrical privilege. Second, as in many Turkic languages, some suffixes (or alternatively, enclitics) are unstressable, and in these instances, stress shifts to the preceding syllable (Johanson 1998). The existence of such suffixes indicates that the locus of stress is at the right edge of the word. If stress were defined by the left edge of the word, then we would expect to find native words with exceptional stress referencing the left edge of the word. Since the evidence gathered to-date supports a single stress falling on the ultima, we propose the foot structure in (9). It is obvious in (9) that the extent of rounding harmony does not coincide with the right-aligned iamb necessary to account for stress.

(9) Foot structure in Central Crimean Tatar

a.	(tuz.lúq)	salt-NMLZR
b.	tuz.(lu.ɣɯ́)	salt-NMLZR-POSS.3S
c.	tuz.lu.(ɣɯ.mɯ́z)	salt-NMLZR-POSS.1P
d.	tuz.lu.ɣɯ.(mɯz.dán)	salt-NMLZR-POSS.1P-ABL

Since prefixes are absent from the language, the left edge of the word is the morphological root. As a result, the source of harmony is also the most morphologically prominent position in the word. This fact precludes any appeal to the prominence-targeting analyses developed in Walker (2005) and Kaplan (2008b).

There is one additional fact about the language that deserves mention. The gerundial suffix is invariantly [+round], surfacing as [-uv] or [-yv] depending on the backness of the verb root. However, GER does not trigger harmony on a following high vowel (10).

(10) No rounding harmony after GER

a.	al-uv-ɯ	take-GER-POSS.3S
b.	bil-dir-yv-i	know-CAUS-GER-POSS.3S

If harmony were non-iterative without any reference to prominent positions within the word, e.g. the morphological root or the left edge, then we would expect harmony to obtain following GER, e.g. *al-u-v-u or *bil-dir-yv-y in (10). The absence of harmony in these cases suggests that in addition to be truly non-iterative, harmony exhibits a subsidiary dependency on prominence. More concretely, the fact that the initial syllable is the only trigger of harmony suggests that both prominence and true non-iterativity factor into the pattern in Crimean Tatar.

Another instance of non-iterative harmony has been reported in van Oostendorp and Revithiadou (2005; see also ch. 57). In the Megisti dialect of Greek, word-final vowels trigger backness harmony on the preceding vowel. In (11), note that the word-final vowel triggers backness harmony completely independent of stress. In (11a,b), stress is antepenultimate, in (11c,d) stress is penultimate, and in (11e,f) stress is final. In all six forms, though, the final vowel controls the backness of the immediately preceding vowel.

(11) Regressive backness harmony in Megisti Greek

a.	/ágir-a/	[agura]	anchor-NOM.F
b.	/kalójer-os/	[kalójoros]	monk-NOM.M
c.	/zílj-a/	[zúlja]	jealousy-NOM.F
d.	/anófli/	[anéfli]	lintel
e.	/zervjá/	[zarvjá]	left
f.	/sits-á/	[sutsá]	fig.tree-NOM.F

The Megisti Greek data is similar to Central Crimean Tatar in that the only position that may trigger harmony occurs at a word edge. In these cases, non-iterativity could be construed as positional non-intersection of triggers and targets. If word-initial or word-final vowels trigger harmony but other positions may not, this entails that all undergoers will be necessity fail to propagate the feature further within the word. However, this dependence on prominence does not appear to be the only type of non-iterativity attested among the world's languages. In Kazakh (Turkic; Balakayev 1962; McCollum 2018; 2019), rounding harmony is non-iterative, as in

Central Crimean Tatar. In general, rounding harmony optionally targets second-syllable high vowels, as seen in (11).

(12) Rounding harmony in Kazakh (see McCollum 2018; McCollum and Chen to appear for more details)

a.	ɑl-dɯ-ŋ	take-PST-2S
b.	bɪl-dɪ-ŋ	know-PST-2S
c.	qʊl-dʊ-ŋ ~ qʊl-dɯ-ŋ	do-PST-2S
d.	kʏl-dʏ-ŋ ~ kʏl-dɪ-ŋ	laugh-PST-2S

Unlike Central Crimean Tatar, the gerundial suffix in Kazakh may trigger harmony on a following high vowel (13; Balakayev 1962).

(13) Rounding after GER in Kazakh

a.	ɑl-ʊw-ʊ-ŋ ~ ɑl-ʊw-ɯ-ŋ	take-GER-POSS-2S
b.	bɪl-ʏw-ʏ-ŋ ~ bɪl-ʏw-ɪ-ŋ	know-GER-POSS-2S

In addition to the Crimean Tatar and Megisti Greek data above, the Kazakh data supports the conclusion that non-iterativity does not always interact with positional prominence. A number of other languages with similar patterns are listed in (14). Almost all of these patterns come from Turkic rounding harmony. This is almost certainly a byproduct of my own biases, but the existence of these patterns in Turkic, as well as the presumably contact-induced pattern in Megisti Greek provides reasonable evidence that non-iterative vowel harmony may exist elsewhere among the world's languages.

(14) Languages with non-iterative harmony

a. Central Crimean Tatar rounding harmony (Kavitskaya 2010)
b. Megisti Greek backness harmony (van Oostendorp and Revithiadou 2005)
c. Kazakh rounding harmony (Balakayev 1962; McCollum 2018)
d. Uyghur rounding harmony (McCollum 2019; cf. Hahn 1991)
e. Qaraqalpaq rounding harmony (Menges 1947)

If non-iterative harmony is not always derivable from independent forces in a language, there appears to be no obvious way to sidestep encoding this fact in the grammar. In derivational formalisms, this is unproblematic. For discussion of modeling non-iterativity in OT, see McCollum and Kavitskaya (2018).

4i.3 Bounded iterativity

If vowel harmony may trigger alternations on a single vowel within a given domain or iterate throughout that domain, an ancillary question arises – can vowel harmony trigger alternations on *n* vowels within a given domain? Although there is some evidence that tonal patterns may be able to count beyond two (Marlo, Mwita, and Paster 2015), there is very little evidence that harmony may operate with *n*-ary domains. Perhaps the most suggestive evidence comes from one of the languages already discussed, Veps (see also Noonan 1992, 32, 79 for evidence from Lango). In (4), Veps is presented as foot-bounded harmony, which is consistent with the transcriptions used in Zaiceva (1981). However, Zaiceva (1981, 306) states, “Vowel harmony in the Veps language is only partial. It is most widely represented in the Southern dialect. However, there it does not spread beyond the second or third syllable [my translation].” If harmony may optionally target a third-syllable in Veps, then we might expect harmony within a three- or four- or even five-syllable domain. In the absence of conclusive evidence supporting bounded iterativity in harmony, I will assume that this type of pattern is unattested in natural language harmony patterns.

4i.4 Conclusion

When the typology of iterativity in vowel harmony is considered, it is clear that in many cases apparent non-iterativity can be derived from other forces in the grammar. However, in other cases it is clear that non-iterativity does not fall out from word-internal domain bounding, prominence-targeting harmony, featural non-intersection, or exceptionality. Instead, these cases, as in Central Crimean Tatar, indicate the need for a relatively direct encoding of non-iterativity in the phonological grammar.

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