Phrasal Vowel Harmony

Laura J. Downing and Martin Krämer

20.1 Introduction

Vowel harmony is usually claimed to be word bound, and the 'word' is usually taken to refer to the phonological word, not the grammatical word, since compounds are often disharmonic. Indeed, vowel harmony is said to rarely cross lexical word boundaries, either within compounds or within phrases. (See, e.g., Archangeli & Pulleyblank 2007; Hyman 2002; Kaisse 2019; Kiparsky, this volume; Krämer 2003; Rose & Walker 2011; van der Hulst & van de Weijer 1995.)

However, it is not difficult to find cases where vowel harmony applies in a domain larger than the prosodic or grammatical word. Aoki (1966) reports that in Nez Perce (Plateau Penutian, USA), in fast speech, regressive vowel harmony extends one syllable/vowel into the preceding word. Kabak & Vogel (2001) have argued that vowel harmony crosses word boundaries in Turkish (Turkic, Turkey), causing clitics to harmonize with the last vowel of the preceding word. Ribeiro (2002) reports harmonization originating in clitics in the ATR-dominant regressive harmony in Karajá (Macro-Jê, Brazil). Cross-word harmony is particularly well-attested in ATR harmony systems of African languages, such as Akan (Casali 2012, this volume; Dolphyne 1988; Kügler 2015), Chumburung (Snider 1989), Degema (Kari 2007), Gua (Obiri-Yeboah & Rose 2022), Gwa Nmle (Obeng 1995), Ebira (Scholz 1976), Kinande (Schlindwein 1987; Mutaka 1990, 1995, 2007; Archangeli & Pulleyblank 2002; Hyman 2002; Kenstowicz 2009; Downing & Krämer 2022), Kɔnni (Cahill 2007), Luo (Swenson 2015), Nawuri (Casali 2002), Nkami (Akanlig-Pare & Asante 2016), Somali (Andrzejewski 1955; Hall et al. 1974; Nilsson & Downing to appear), Tafi (Bobuafor 2013), Tutrugbu (Essegbey 2019; McCollum et al. 2020), Vata (Kaye 1982; Kimper 2011), and Wolof (Ka 1994; Sy 2005).[1, 2]

Kaisse (2017: 19) suggests that cross-word vowel harmony, while attested, phonologizes "local adjustments" that "start life as natural local effects and these effects are not sensitive to grammatical information but rather to temporal adjacency (Kiparsky 1982 et seq.)." Kaisse (2019: 230) elaborates on this, suggesting that such "local effects" almost always are "phonetically natural, optional, dependent on rate or style or both, and generally are not too far from their phonetic precursors." However, as we show in this chapter, cross-word harmony often applies subject to grammatical information, showing that it cannot be considered just a phonetically-motivated "local adjustment." While in many systems, harmony only affects one vowel in the word adjacent to the trigger, in others, several syllables are affected. While the harmonic feature only spreads to function items in some languages, in others, vowels in lexical words are targeted. And in a number of languages, cross-word harmony is sensitive to morphosyntactic or prosodic domain restrictions.

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[1] See Casali (2008); Downing (2018); Kaisse (2019); Obiri-Yeboah & Rose (2022); and van der Hulst (2018: 46) for overviews.

[2] A reviewer notes that we discuss only ATR harmony and wonders if cross-word harmony is restricted to ATR, and if so, why. Kabak & Vogel's claims about some Turkish clitics harmonizing in backness/roundness with the last vowel of their lexical hosts are also found in other work on Turkish clitics (e.g., Erdal 2000). Duncan (2015) briefly discusses harmonizing clitics in the palatal harmony of Finnish. Sande (2019) reports cross-word nasal harmony in Ebrié. The Nez Perce patterns have been analyzed as ATR harmony by Hall & Hall (1980). However, the harmonic sets are /e, u/ and /a, o/, *a* alternating with *e* and *o* with *u*, while /i/ is neutral (Aoki 1966; see also Krämer 2003 on the behavior of /i/). An analysis as ATR harmony does not seem to be the only conceivable account.

The chapter is structured as follows. In section 20.2, we take up how many vowels in the target word are affected by vowel harmony and the issue of iterativity. We discuss data from Gua (Obiri-Yeboah & Rose 2022) to illustrate regressive cross-word ATR harmony which affects a single vowel in a lexical word adjacent to the trigger. Then we discuss data from Vata, in which cross-word harmony also affects only the last vowel of the target word but continues iteratively from every monovocalic word to the next word. Finally, Kinande represents a language where regressive ATR harmony can affect several syllables in a preceding lexical word. Notably, in all three languages, harmony is subject to prosodic and/or syntactic conditions. Section 20.3 illustrates languages where cross-word vowel harmony mainly affects function words, discussing data from Somali (Nilsson & Downing to appear) and Wolof (Ka 1994; Sy 2005), one of the few languages where cross-word vowel harmony is progressive rather than regressive. Section 20.4 presents concluding remarks.

20.2 Harmony beyond words: how many vowels?

20.2.1 A single vowel: Gua

Gua is a Hill Guang language (Tano, Kwa), spoken in Ghana. As Obiri-Yeboah & Rose (2022, ex. (1)) show, it has a 10-vowel inventory, with a symmetrical [+/- ATR] contrast ([ɜ] is the allophonic variant of [a]):

(1) Gua vowel phonemes

+ATR	–ATR
i u	ɪ ʊ
e o [ɜ]	ɛ ɔ
	a

ATR vowel harmony applies regressively within words and also across word boundaries to the final vowel of a preceding word. In fact, regressive cross-word harmony affecting just the final vowel of a preceding word seems to be very common in Kwa languages. (See Kaisse 2019; Obiri-Yeboah & Rose 2022 for overviews.)

Even though cross-word harmony (VH) is narrowly local – it affects a single vowel – Obiri-Yeboah & Rose's (2022) study shows that harmony cannot be considered just a phonetic phenomenon, as it applies only within minimally binary phonological phrases. As a result, it does not always apply to the same words in the same syntactic configuration. This is illustrated by the following data, each consisting of four-word SVO sentences:

(2) Gua ATR VH (Obiri-Yeboah & Rose 2022, exs. (16), (18))

(a) Harmony between words 3 and 4
àŋɛ́ kítɛ̀ ɔ̀kɔ́tó dùúdùbí
man held crab tiny
'A man held a tiny crab.'

(b) No harmony between words 2 and 3
mí ɔ̀kɔ́tɔ́ | dùúdùbí hè
my crab tiny fell
'My tiny crab fell.'

In (2a), the noun 'crab' and the adjective 'tiny' constitute a prosodic unit, and VH applies to the last vowel of 'crab'. However, in (2b) they are separated by a phonological phrase boundary, and the last vowel of 'crab' does not harmonize with the following first vowel of 'tiny'. The noun is phrased with the preceding possessive pronoun and the adjective with the

following verb to form binary phonological phrases which need not match syntactic phrase structure.[3]

20.2.2 More than one monovocalic word: Vata

Vata, a Kru language spoken in the Ivory Coast, has the vowel system given in (3):

(3) Vata vowel phonemes (Kaye 1982; Kimper 2011)

+ATR	-ATR
i u	ɪ ʊ
e o	ɛ ɔ
ʌ	a

As in Gua and other languages of the region, optional cross-word harmony affects the last vowel of a word, as illustrated in (4a).[4] The last vowel of *saka* 'rice' is optionally realized as ATR, harmonizing with the following high ATR vowel of 'cook'. Unlike in Gua, if the word preceding the trigger is monovocalic, ATR harmony continues to the next word (and the next monovocalic word), as shown in (4b).

(4) Vata cross-word harmony and iterativity (Kimper 2011, exs. (5), (6))

a. ɔ nɪ saka pi / ɔ nɪ sakʌ pi * ɔ nɪ sʌkʌ pi
   3SG NEG rice cook 'He didn't cook rice.'

b. ɔ ka za pi / ɔ ka zʌ pi / ɔ kʌ zʌ pi / o kʌ zʌ pi
   3SG FUT food cook 'He will cook food.'

20.2.3 An entire word: Kinande

While regressive cross-word harmony only affects a single vowel in Gua and Vata, in languages like Kinande and Luo, cross-word harmony can affect an entire lexical word. We illustrate this phenomenon with Kinande. See Swenson (2015) for discussion of Luo.

ATR harmony in Kinande (Bantu JD42; DRC[5]) has been the subject of several thorough studies (Schlindwein 1987; Mutaka 1990, 1995, 2007; Archangeli & Pulleyblank 2002; Hyman 2002; Kenstowicz 2009; Downing & Krämer 2017, 2022). Like many other Bantu languages Kinande has a 7-vowel phoneme inventory where only high vowels are contrastive for [ATR] and non-high vowels are [-ATR]:

(5) Kinande vowel phonemes

+ATR	-ATR
i u	ɪ ʊ
	ɛ ɔ
	a

The surface ATR specification of vowels is subject to vowel harmony. Within words, progressive ATR harmony applies only to high vowels, while regressive ATR harmony applies to all vowels. Regressive vowel harmony also applies across word boundaries within DPs: nouns harmonize with the initial vowel in a following adjective. This cross-word

[3] See Obiri-Yeboah & Rose (2022) for detailed discussion of the algorithm defining the parse into vowel harmony domains in Gua.

[4] We skip the peculiarities of height dependence of ATR-dominant harmony in Vata.

[5] The core Bantu languages are classified according to the Guthrie (1948) system, which provides a letter for the geographic location and a two-digit number for the language. The numbers are also intended to reflect a rough genetic classification.

harmony is optional, according to Mutaka (1990, 1995, 2007) and is also phonetically gradient. The example in (6) illustrates also the variability in the extent to which the initial word, here the noun [ɛβɪtsʊngó] 'potatoes', is affected.

(6) Kinande variable regressive harmony in DPs (Mutaka 1995:52)

e-βi-tsungú βí-kù:hì	'short potatoes'
ɛ-βɪ-ts*ungú* βí-kù:hì	
ɛ-βɪ-tsʊng*ú* βí-kù:hì	

This optionality and gradience led Archangeli & Pulleyblank (2002) to conclude that cross-word harmony is phonetic rather than phonological. Downing & Krämer (2017, 2022) argue against this, pointing out that phrasal harmony is restricted to a specific syntactic constituent, the DP, and applies under very specific phonological conditions. The last vowel of the target word can only undergo regressive cross-word harmony if it is [+high]:

(7) Kinande height-dependence (Mutaka 1995:52)

ɛ-mí-twɛrɔ́ mí-kù:hì	'short nails'	*e-mí-tweró mí-kù:hì

The other condition is that regressive harmony within a DP can always apply if hiatus resolution at the noun+modifier juncture is resolved by gliding (of a high vowel) or deletion of the first of the two vowels. The resulting glide or the remaining last consonant is syllabified as the onset of the second word, and harmony extends from this second word to the beginning of the first:[6]

(8) Kinande cross-word harmony and hiatus resolution, noun + adjective phrase

ɛmí-tɪ + emí-kùhì	ɛ/emítjemíkùhì '	'short trees'

Mutaka (1995: 52) suggests that resyllabification leads to prosodifying the DP as one PWord. Whatever one thinks of this suggestion, it is clear that regressive vowel harmony can cross lexical word boundaries in Kinande, and that this cannot be just a phonetic effect since cross-word harmony is subject to syntactic and prosodic conditions.

20.3 Harmony beyond words: the nature of the domain

Cross-word vowel harmony is often restricted to specific syntactic categories. As we saw, in Kinande, this is the DP or NP (Mutaka 1995). In Ebira (Nupoid; Nigeria), what Scholz (1976) calls "secondary vowel harmony" applies within the VP, between a verb and the following noun, object or locative. We infer from Scholz's description that it does not occur between subject nominal and verb. Akan (Kwa; Ghana) cross-word harmony applies within the phonological phrase but does not cross major syntactic boundaries, such as the VP (Kügler 2015). In this section we discuss two cases, Somali and Wolof, where vowel harmony has been claimed to apply in larger syntactically-defined domains.

20.3.1 Somali[7]

Somali (Cushitic; Somalia) is often cited (Hyman 2002; Kaisse 2016; Krämer 2003: 24) as a language where ATR vowel harmony applies within a clause, based on work by

[6] We are not aware of any data with several adjectives, and it is thus not clear if the harmonic domain would extend over more than two words given the conditions are met at each juncture.

[7] The discussion of Somali vowel harmony is based on a phonetic study by Nilsson & Downing (to appear), except where referenced otherwise.

Andrzejewski (1955) and Hall et al. (1974). The harmonic vowel sets for Somali are given in (9); all vowels can contrast for length:

(9) The Somali vowel system (Krämer 2003: 19)[8]

+ATR		-ATR	
i	y	ɪ	ʊ
e	ø	ɛ	ɔ
æ		a	

As previous studies (Andrzejewski 1955; Armstrong 1964) have shown, Somali words agree in ATR. When suffixes are added to nouns, many suffixes alternate in their ATR quality to agree with the noun, while some suffixes are dominant and trigger ATR agreement in their base. As Nilsson & Downing (to appear) demonstrate, the prosodic constituent that defines the domain of harmony is probably not the PWd. Regressive ATR Harmony can extend not only to functional morphemes in the verbal complex – which might be parsed as one PWord – but also to function words outside the verbal complex, such as sentence type markers. Furthermore, cross-word harmony can affect lexical words. Certain adjectives can optionally trigger harmony on a preceding noun. And regressive harmony is systematically found within compounds (e.g., re:r-mægǽ:l 'city folk' cf. rɛ́:r 'family').

Harmony has even been claimed in Andrzejewski (1955), Hall et al. (1974), and Krämer (2003) to potentially affect all the words in a clause, as shown in the frequently cited example in (10):

(10) Somali clause harmony (Hall et al. 1974: 261)

a. bɛ:ra ʔʊsʊb ba: lɔ: bɛ:raɪ
'New gardens were cultivated for them.'

b. be:ræ ʔysyb bæ: lø: sæ me:jei
'New gardens were made for them.'

Andrzejewski (1955), however, mentions speech rate as important in triggering long distance harmony. As Nilsson & Downing's (to appear) phonetic study shows, at a normal speech rate, it is common to get disharmonic stretches, and longer harmonic stretches often have more than one source of [+ATR]. In sum, while it is clear that Somali vowel harmony is not PWord-bound, the domain appears to usually be fairly local, most robustly affecting the members of a compound and a sequence of function words (both within the verbal complex and outside it) preceding a verb.

20.3.2 Wolof

According to Ka (1994: 49) the domain of ATR harmony in Wolof (Atlantic; Senegal) is that of the phonological phrase. The vowel inventory is given in (11); all vowels but the schwa can also be contrastively long. The high vowels, which have no [-ATR] counterparts, do not participate in the vowel harmony system, i.e., they are not triggers and they are transparent.[9]

[8] ATR counterparts of back vowels are all front, retaining the original specification for rounding. The front vowels are often indicated using tremas in the Somali literature. We use IPA symbols.

[9] See Dye (2015) for a fine-grained phonetic analysis of transparency in Wolof vowel harmony.

(11) Wolof vowels (Ka 1994: 7)

+ATR	-ATR
i u	
e o	ɛ ɔ
ə	a

ATR harmony in Wolof is strictly progressive and root controlled. It is to be noted that Wolof, along with Turkish (Kabak & Vogel 2001) and Chumburung (Kwa, Ghana; Snider 1989), is one of the rare languages with progressive cross-word harmony. (As Hyman 2002 notes, vowel harmony is, in general, most commonly regressive.) The first vowel in a root determines the ATR specification of the entire domain unless there is an opaque vowel, like long *a* somewhere to its right, which can initiate a new harmony domain (the ATR counterpart of /a/ is schwa, which is always short, and long /a:/ does not harmonize with preceding ATR vowels).

As Ka (1994) shows, ATR spreads progressively beyond lexical words to function words, which can be several syllables long. Ka argues that these function words cannot be analyzed as suffixes or clitics, because they can be separated from the word they modify by syntactic units, such as relative clauses.[10] Note in (12) that *ga* 'the' harmonizes with the head noun of the DP whether it is adjacent to it or not:

(12) Wolof progressive cross-word ATR harmony (Sy 2005: exs. (12) and (13))

	[-ATR] noun		[+ATR] noun	
(a)	[kɛr ga]	'the shade'	[kər gə]	'the house'
	shade the		house the	
(b)	[kɛr gu weex ga]	'the white shade'	[kər gu weex gə]	'the white house'
	shade REL white the		house REL white the	

In contrast to Kinande and Somali, a lexical item never harmonizes with another lexical item in Wolof. Function words are the most productive target of progressive cross-word vowel harmony, and strikingly, these function words do not have to be in a phonologically local relationship with the ATR harmony trigger. (Though see Kaisse's 2019 proposal that harmony is an agreement feature in Wolof, so that the examples in (12b) would not represent true long distance vowel harmony.)

20.4 Concluding remarks

In this chapter we have briefly surveyed representative cases of cross-word vowel harmony patterns. Even though the cross-word harmony patterns in our survey apply in a fairly local phrasal domain, we are skeptical of Kaisse's (2017: 19) proposal that cross-word processes such as vowel harmony "start life as natural local effects and these effects are not sensitive to grammatical information but rather to temporal adjacency (Kiparsky 1982 et seq.)." As we have shown, most of the cases of ATR harmony presented here are sensitive to grammatical information. They are not simply phonetic effects resulting from temporal adjacency to a triggering vowel in just any cross-word environment. (See Downing & Krämer 2017, 2022; and Obiri-Yeboah & Rose 2022 for further discussion of this point.) However, since cross-word vowel harmony often affects only a single vowel in an adjacent function word or lexical word, a question for future research remains how to define the domains and how to distinguish PWord from other prosodic domains.

Allegedly typical characteristics of cross-word harmony, such as non-iterativity, gradience, and optionality, which have tempted scholars to consider cross-word harmony a

[10] See Sy (2005) for a phonetic study and analysis of domains of ATR harmony in Wolof.

phonetic phenomenon (e.g., Archangeli & Pulleyblank 2002; Kaisse 2019) have also been observed in word-internal harmony patterns. Vowel harmony in Crimean Tatar is non-iterative (Kavitskaya 2010), and McCollum (2019) suggests that word-internal harmony may also be gradient. Vowel harmony is optional with prefixes and suffixes in Yurok but obligatory with infixes (Ultan 1973).

Finally, we would like to highlight that if vowel harmony is typically claimed to be a word-bound process, then that is most likely due to underreporting, a point that is also made by Kaisse (2019). Most studies we know of look only at vowel harmony within words. (See, e,g, Boyd's 2015 otherwise excellent study of vowel harmony in Mbam languages.) Phrases are usually not included in the data set. This is unfortunate, since the study of cross-word harmony has implications for our understanding of the phonology-syntax interface and modularity. (See Bonet et al. 2019 for a recent discussion of modularity.) As we have seen, cross-word harmony is conditioned by both prosodic as well as syntactic factors, at times revealing mismatches between phonological and syntactic phrasal organization (as in Gua).

In sum, to understand how common phrasal harmony might be and what conditions affect its application, we need more phonetic and phonological studies of more harmony systems that include more phrasal data.

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References

Akanlig-Pare, George & Rogers Krobea Asante. 2016. Vowel harmony in Nkami. *Journal of West African Languages* 43(1): 21-44. https://main.journalofwestafricanlanguages.org/index.php/downloads/download/125-volume-43-number-1/633-vowel-harmony-in-nkami

Andrzejewski, B. W. 1955. The problem of vowel representation in the Isaaq dialect of Somali. *Bulletin of the School of Oriental and African Studies* 17 (3): 567-580.

Aoki, Haruo. 1966. Nez Perce vowel harmony and Proto-Sahaptian vowels. *Language* 42: 759-767.

Archangeli, Diana & Douglas Pulleyblank 2002. Kinande vowel harmony: Domains, grounded conditions and one-sided alignment. *Phonology* 19: 139–188.

Archangeli Diana & Douglas Pulleyblank. 2007. Harmony. In Paul de Lacy (ed.), *The Cambridge Handbook of Phonology*, 353-378. Cambridge University Press.

Armstrong, Lilias E. 1964. *The phonetic structure of Somali*. Ridgewood, NJ: Gregg Press. [originally published 1934]

Bobuafor, Mercy. 2013. *A grammar of Tafi*. LOT: Utrecht.

Bonet, Eulàlia, Lisa Lai-Shen Cheng, Laura J. Downing & Joan Mascaró. 2019. (In)direct reference in the phonology-syntax interface under phase theory: A response to "Modular PIC" (D'Alessandro and Scheer 2015). *Linguistic Inquiry* 50: 751-777.

Boyd, Virginia L. 2015. The phonological systems of the Mbam languages of Cameroon with a focus on vowels and vowel harmony. PhD dissertation: Leiden University.

Cahill, Michael. 2007. *Aspects of the morphology and phonology of Kɔnni*. Dallas: SIL International.

302 Casali, Roderic F. 2002. Nawuri ATR harmony in typological perspective. *Journal of West*
303 *African Languages* 29(1): 3–43.
304 Casali, Roderic F. 2008. ATR harmony in African languages. *Language and Linguistics*
305 *Compass* 2/3: 496-549.
306 Casali, Roderic F. 2012. [+ATR] dominance in Akan. *Journal of West African Languages*
307 39(1): 33-59.
308 Dolphyne, Florence A. 1988. *The Akan (Twi-Fante) language: Its sound systems and tonal*
309 *structure*. Accra: Universities of Ghana Press.
310 Downing, Laura J. 2018. Is vowel harmony canonically (P)Word bound? An Africanist
311 perspective on vowel harmony domains. Paper presented at Phonology Workshop on
312 Long Distance Segmental Phenomena, GLOW 41, Budapest, 10 April 2018.
313 Downing, Laura J. & Martin Krämer. 2017. Kinande phrasal harmony: Gradient phonetic
314 anticipation or phonological domino? Paper presented at OCP 14, Düsseldorf, 20-22
315 February 2017.
316 Downing, Laura J. & Martin Krämer. 2022. Domains and directionality in Kinande vowel
317 harmony: A Correspondence approach. *Glossa: a journal of general linguistics* 7(1). doi:
318 https://doi.org/10.16995/glossa.5712
319 Duncan, Liisa Christine. 2015. *Productivity of Finnish vowel harmony: Experimental*
320 *evidence*. PhD dissertation: University of Toronto.
321 Dye, Amanda. 2015. *Vowel harmony and co-articulation in Wolof and Pulaar: An ultrasound*
322 *study*. PhD dissertation: New York University.
323 Essegbey, James. 2019. *Tutrugbu (Nyangbo) language and culture*. Leiden: Brill.
324 Erdal, Marcel. 2000. Clitics in Turkish. In Aslı Göksel & Celia Kerslake (eds.), *Studies on*
325 *Turkish and Turkic languages. Proceedings of the Ninth International Conference on*
326 *Turkish Linguistics*, 41-48. Wiesbaden: Harrassowitz.
327 Guthrie, Malcolm. 1948. *The classification of the Bantu languages*. London: Oxford
328 University Press.
329 Hall, Beatrice L. & Richard M. R. Hall. 1980. Nez Perce vowel harmony: An Africanist
330 explanation and some theoretical questions. In Robert Vago (ed.), *Issues in vowel*
331 *harmony*, 201-236. Amsterdam: John Benjamins.
332 Hall, Beatrice L., Richard M. R. Hall, Martin D. Pam, Stephen A. Antell & Godfrey K.
333 Cherono. 1973/1974. African vowel harmony systems from the vantage point of
334 Kalenjin. *Afrika und Übersee* LVII (4): 241-267.
335 Hulst, Harry van der & Jeroen van de Weijer. 1995. Vowel harmony. In John A. Goldsmith
336 (ed.), *The handbook of phonological theory*, 495-534. Cambridge, MA: Blackwell.
337 Hulst, Harry van der. 2018. *Asymmetries in vowel harmony: A representational account*.
338 Oxford: Oxford University Press.
339 Hyman, Larry M. 2002. Is there a right to left bias in vowel harmony? Paper presented at the
340 9th International Phonology Meeting, Vienna, November 1, 2002.
341 http://linguistics.berkeley.edu/~hyman/Hyman_Vienna_VH_paper_forma.pdf
342 Ka, Omar. 1994. *Wolof phonology and morphology*. Lanham, MD: University Press of
343 America.
344 Kabak, Baris & Irene Vogel. 2001. The phonological word and stress assignment in Turkish.
345 *Phonology* 18: 315–360.

Kaisse, Ellen M. 2017. The domain of stress assignment: word-boundedness and frequent collocation. In Claire Bowern, Laurence Horn & Raffaella Zanuttini (eds.), *On looking into words (and beyond)*, 17–41. Berlin: Language Science Press.

Kaisse, Ellen M. 2019. What kinds of processes are postlexical? And how powerful are they? In Hongming Zhang (ed.), *Prosodic studies: Challenges and prospects*, 227-251. London: Routledge.

Kari, Ethelbert. 2007. Vowel harmony in Degema, Nigeria. *African Study Monographs* 28: 87-97.

Kavitskaya, Darya. 2010. *Crimean Tatar*. Lincom Europa.

Kaye, Jonathan. 1982. Harmony processes in Vata. In Harry van der Hulst & Norval Smith (eds.), *The structure of phonological representations (Part II)*, 385-452. Dordrecht: Foris.

Kenstowicz, Michael. 2009. Two notes on Kinande vowel harmony. *Language Sciences* 31(2-3): 248-270.

Kimper, Wendell. 2011. Domain specificity and Vata ATR spreading. *University of Pennsylvania Working Papers in Linguistics* 17(1): 155-164. [Article 18] https://repository.upenn.edu/pwpl/vol17/iss1/18 [accessed 12 September 2022]

Kiparsky, Paul. 1982. Lexical phonology and morphology. In Linguistic Society of Korea (ed.), *Linguistics in the morning calm,* 3-91. Seoul: Hanshi.

Krämer, Martin. 2003. *Vowel harmony and Correspondence theory*. Studies in Generative Grammar 66. Berlin, New York: Mouton de Gruyter.

Kügler, Frank. 2015. Phonological phrasing and ATR vowel harmony in Akan. *Phonology* 32: 177-204.

McCollum, Adam G. 2019. *Gradience and locality in phonology: Case studies from Turkic vowel harmony*. PhD dissertation: University of California-San Diego.

McCollum, Adam G., Eric Bakovic, Anna Mai, & Eric Meinhardt. 2020. Unbounded circumambient patterns in segmental phonology. *Phonology* 37: 215-255. doi: 10.1017/S095267572000010X

Mutaka, Ngessimo M. 1990. The *lexical tonology of Kinande*. PhD dissertation: University of Southern California. [Published 1994, Munich: LINCOM Europa.]

Mutaka, Ngessimo M. 1995. Vowel harmony in Kinande. *Journal of West African Languages* 25: 41–55.

Mutaka, Ngessimo M. 2007. *Kinande: A grammar sketch (Version 1.0)*. http://www.africananaphora.rutgers.edu/images/stories/downloads/casefiles/KinandeGS.pdf

Nilsson, Morgan & Laura J. Downing. to appear. Somali vowel qualities and vowel harmony domains. *Proceedings of the 47th North Atlantic Conference on Afroasiatic Linguistics (NACAL)*, held at INALCO, Paris, 24-26 June 2019.

Obeng, Samuel. 1995. Vowel harmony in Gwa Nmle. *Afrikanistische Arbeitspapiere* 41: 143-152.

Obiri-Yeboah, Michael & Sharon Rose. 2022. Vowel harmony and phonological phrasing in Gua. *NLLT* 40(1): 159-193. https://doi.org/10.1007/s11049-021-09509-y

Ribeiro, Eduardo Rivail. 2002. Directionality in vowel harmony: The case of Karajá (Macro-Jê). *Berkeley Linguistic Society* 28: 475-485. https://journals.linguisticsociety.org/proceedings/index.php/BLS/article/view/3859

391 Rose, Sharon & Rachel Walker. 2011. Harmony systems. In John Goldsmith, Jason Riggle &
392 Alan C. L. Yu (eds.), *The handbook of phonological theory*, 2nd ed., 240–290. Oxford:
393 Blackwell.
394 Sande, Hannah. 2019. Ebrié cross-word nasal harmony. Paper presented at the Berkeley
395 Phonetics & Phonology Forum (Phorum), 18 November 2019.
396 Schlindwein, Deborah. 1987. P-bearing units: A study of Kinande vowel harmony. *NELS* 17:
397 551–567.
398 Scholz, Hans-Jurgen. 1976. Igbira Phonology. *Language Data Microfiche, African Series* #7.
399 Summer Institute of Linguistics.
400 Snider, Keith L. 1989. Vowel coalescence in Chumburung: An autosegmental analysis.
401 *Lingua* 78: 217-232.
402 Swenson, Janel. 2015. ATR quality in the Luo vowel system. *Canadian Institute of*
403 *Linguistics EWP* 1: 101-145.
404 Sy, Mariame. 2005. Ultra long-distance ATR agreement in Wolof. In Rebecca T. Cover &
405 Yuni Kim (eds.), *Proceedings of BLS 31: Special Session on Languages of West Africa,*
406 95–106.
407 Ultan, Russell. 1973. Some reflections on vowel harmony. *Working Papers on Language*
408 *Universals* 12: 37-67. Stanford University: California Committee on Linguistics.