

Vowel Harmony in the Armenian Dialect of Karchevan

Bert Vaux

Harvard University

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1. Introduction

Though vowel harmony has been one of the central concerns of theoretical phonologists for several decades now (cf. Ringen 1975, Clements and Sezer 1982, Li 1996), debate has centered around data from a relatively limited number of Altaic, Uralic, and African languages. The goal of this paper is to bring to bear on our understanding of harmony systems some of the more interesting facts from the Armenic family of languages, many members of which possess problematic vowel harmony systems (cf. Vaux 1997). I focus here on the variety of Armenian spoken in the village of Karchevan, located in the southern finger of Armenia near the Iranian border.

Karchevan vowel harmony is interesting in that it actually consists of three separate processes: inert word-level [back] harmony and active epenthetic [back] and [round] harmony. Inert harmony systems, such as we also find in Hungarian and Khalkha Mongolian, are characterized by neutral vowels which not only block propagation of harmonic features, but also do not spread their own specifications to following vowels. Epenthetic harmony systems spread harmonic features to epenthetic vowels, but not to underlying vowels.

I account for the harmony processes in Karchevan in terms of the theory of vowel harmony developed in Calabrese 1995 and Vaux 1997, wherein inert harmony systems result not from underspecification (cf. Steriade 1979, Ringen 1988), but rather result from the fact that the harmony rules in these languages spread only contrastive feature values. Epenthetic harmony, on the other hand, is characterized as a feature-filling process that spreads marked harmonic features.

2. The Karchevan Vowel System

Karchevan has the inventory of surface vowels in (1) (Muradjan 1960):

(1)	<i>i</i>	<i>y</i>	<i>ə</i>	<i>u</i>
	<i>e</i>	<i>ø</i>		<i>o</i>
	<i>ɛ</i>			
	<i>æ</i>		<i>a</i>	

ɛ is described as ‘a simple vowel pronounced in a position between *ə* and *e*’ (Muradjan 1960:15). Muradjan represents this vowel as <*æe*>, and in the dialects of the area that I am familiar with it indeed sounds at first like the sequence [*æɛ*]. However, closer inspection reveals that this sound sequence is in fact [*ɛ*] preceded by a consonant with a [+back] secondary articulation. I therefore represent this phoneme as /*ɛ*/, which is underlyingly [-high, -low, -ATR] (the phonetic [+back] specification of the preceding consonant is not relevant for the purposes of this paper). According to Muradjan 1960:73, the ten surface vowels fall into the harmonic classes in (2).

(2)	[+back]	<i>a</i>	<i>o</i>	<i>u</i>	<i>ɛ</i>	<i>ə</i>
	[-back]	<i>æ</i>	<i>ø</i>	<i>y</i>	<i>e</i>	<i>i</i>

I argue below that the system in (2), based on generalizations concerning the surface distribution of vowels, is better viewed as a product of the phonemic system in (3).

(3)	[+back]	<i>a</i>	<i>o</i>	<i>u</i>		
	[-back]	<i>æ</i> ¹	<i>ø</i>	<i>y</i>	{ <i>ɛ</i>	<i>e</i> <i>i</i> }

The system in (3) differs from (2) in stating that Karchevan has only three pairs of vowels that contrast in terms of backness: *a* : *æ*, *o* : *ø*, and *u* : *y*. Of the four remaining vowels, *ə* has been eliminated from the harmonic system in (3) because it does not participate in harmonic alternations (with the exception of epenthetic harmony, which I treat separately in section 4). This follows from the fact that *ə* is not part of the underlying phonemic inventory in Karchevan, but appears solely as the product of a rule of epenthesis which applies after word harmony in the derivation.

The remaining three vowels {*ɛ e i*} are placed in brackets to represent the fact that they are not contrastive for the harmonic feature [back] in Karchevan. Muradjan was perhaps misled into assuming that *ɛ* and *e* formed a harmonic pair because of the alternations found in the past participle /-ats/ and the monosyllabic plural /-ar-/, which become [-ɛts-] and [-er-] respectively when stressed (4).²

(4)	underlying form	surface form	gloss
a.	<i>as-ats</i>	<i>ásats</i>	say-ppl.
	<i>hærb-ats</i>	<i>hæ'rbæts</i>	drink-ppl.
	<i>χm-ats</i>	<i>χəme'ts</i>	drink-ppl.
b.	<i>tsaɾ-ar</i>	<i>tsáɾar</i>	trees
	<i>æts-ar</i>	<i>æ'tsær</i>	goats
	<i>tsæts-ar</i>	<i>tsətse'r</i>	breasts

The first problem with Muradjan's analysis lies in the fact that the alternations are not between *e* and *ɛ*, but rather between *a* and *ɛ*. Since we know from independent evidence that *a* forms a harmonic pair with *æ*, it does not make sense that it should also enter into a harmonic relationship with *ɛ*. Furthermore, it should be clear from the forms in (4) that the alternations in the past participle and the plural result from an unrelated morphophonemic rule that is sensitive solely to stress, and not to neighboring segments.

¹ Actually, I assume that {*æ ø y*} are not part of the underlying inventory, but rather are allophones produced by the attachment of a [-back] morpheme to underlying {*a o u*} respectively (see Vaux 1997 for arguments supporting this analysis). The traditional notation in (3) is simply for convenience.

² Karchevan generally stresses the penultimate syllable of a word; words may exceptionally receive final stress, and words containing only schwas receive initial stress.

The alternations in (4) should therefore not be viewed as harmonic alternations; for this reason I have represented ε in (3) as a neutral [+back] vowel.

The remaining two vowels that are not contrastive for [back], the front vowels e and i , interestingly sometimes appear to behave as if they were [+back], and at other times they do not; I discuss the relevant facts below.

3. Word Harmony

Before considering the problems involving $\{e\ e\ i\}$, let us quickly survey the basic working of Karchevan harmony. Harmony applies to all word elements, so that roots and suffixes share a single value for [back], with the exception of neutral vowels. The one productive prefix containing a full vowel, *an-* ‘un-’, does not undergo harmonic alternations. This could be because harmony applies from left to right, or because the prefix is non-harmonic (cf. (6b)). The workings of harmony on roots can only be seen by comparison with non-harmonic varieties of Armenian (5a). Note that i and e freely occur in both [+back] and [-back] roots (5b).

(5)	standard Armenian	Karchevan	gloss
a.	<i>lezu</i>	<i>ly'zy</i>	tongue
	<i>amaɪn</i>	<i>ámaɪnə</i>	summer
	<i>tʰfoban</i>	<i>tʰfobán</i>	shepherd
	<i>tʰfamitʰf</i>	<i>tʰfímitʰf</i>	raisin
	<i>aveluk</i>	<i>yvy'lyk</i>	dock
b.	<i>alevor</i>	<i>hilévur</i>	old
	<i>ʃalak</i>	<i>ʃélak</i>	back
	<i>ʃabat^h</i>	<i>ʃébæt^h</i>	sabbath
	<i>akves</i>	<i>ákvest</i>	fox
	----- ³	<i>fira' tʰfep^h</i>	measure of wine
	<i>agah</i>	<i>akahí</i>	greedy
	<i>akavni</i>	<i>kúni</i>	pigeon
	<i>gerezman</i>	<i>girízman</i>	tomb
	<i>gih(uk)</i>	<i>gihók</i>	herd of sheep
	<i>parikam</i>	<i>paríkam</i>	friend
	<i>apriřum</i>	<i>apriřum</i>	silk
	<i>dabbet^hka</i>	<i>dabbét^hka</i>	type of chair

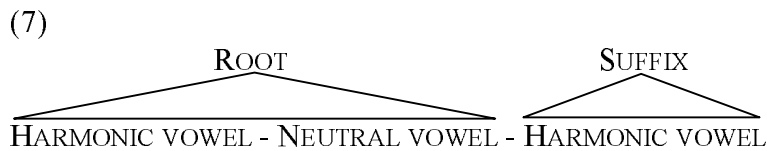
Harmony applies to some suffixes (6a), but not others (6b); i , e , and ε take [+back] suffixes (6c).

(6)	suffix	underlying form	surface form	gloss
a.	<i>-ar-</i>	<i>tsaɪ-ar</i>	<i>tsáɪar</i>	trees

³ This word derives from Persian *fira* ‘sweet wine’ + Armenian *tʰfap^h* ‘measure’. I have found no examples of e preceded by a front vowel other than i and e within a root.

		<i>muts-ar</i>	<i>mútsar</i>	big ones
		<i>onk^h-ar</i>	<i>ónk^har</i>	eyebrows
		<i>ton-ar</i>	<i>tánár</i>	houses
		<i>æts-ar</i>	<i>æ' tsær</i>	goats
		<i>g^lyl-ar</i>	<i>g^ly' lær</i>	wolves
		<i>g^lørn-ar</i>	<i>g^lø' rncær</i>	sheep-pl.
	-u-	<i>anguz-u</i>	<i>angúzu</i>	walnut-dat.
		<i>byn-u</i>	<i>by' ny</i>	nest-dat.
		<i>angutf-u</i>	<i>əngətfú</i>	ear-dat.
		<i>sar-u</i>	<i>sáru</i>	mountain-dat.
		<i>tset-u</i>	<i>tsətú</i>	sparrow-dat.
		<i>k^læ' t^hsin</i>	<i>k^læ' t^hsný</i>	axe-dat.
	-(n)or-	<i>anguz-nor-u</i>	<i>anguznóru</i>	walnut-pl.-dat.
		<i>aɾdz-or-u</i>	<i>aɾdzóru</i>	bear-pl.-dat.
		<i>byn-or-u</i>	<i>bynø' ry</i>	nest-pl.-dat.
b.	-ná-	<i>kloχ-ná</i>	<i>kəloχná</i>	head-pl.
		<i>byzyz-ná</i>	<i>byzyzná</i>	little bell-pl.
		<i>febæ^h-ná</i>	<i>febæ^hná</i>	sabbath-pl.
c.		<i>izn-ar</i>	<i>íznar</i>	oxen
		<i>bein-ar</i>	<i>béinar</i>	burdens
		<i>dəzn-ar</i>	<i>dé' znar</i>	wild mints
		<i>t^hfimit^hf-nor-u</i>	<i>t^hfimit^hfnóru</i>	raisin-pl.-dat.

In order to determine whether *i*, *e*, and *ɛ* are transparent or opaque, the optimal test case would be of the type in (7):



In this case, transparent neutral vowels should allow the harmonic feature of the preceding harmonic vowel to spread to the following harmonic vowel, whereas opaque neutral vowels should not. Forms such as */birgædir-u-n/* ‘together-dat.-def.’ → *[birgædírun]* demonstrate that harmonic values do not spread through neutral vowels in Karchevan. If the neutral vowel *i* were transparent, we would expect the *æ* in *birgædírun* to be able to spread its [-back] specification through the neutral vowel *i* to the following *u*, producing **[birgædíryn]*. Consequently, we can conclude that Karchevan neutral vowels are opaque.

Furthermore, the [+back] value of the suffixal *u* clearly cannot have spread from the [-back] value of the root *æ* preceding the neutral *i*. I suggest that the best way to account for the fact that the *u* surfaces as [+back] is to assume that Karchevan neutral

vowels are not only opaque, but also are inert; in other words, they block the propagation of harmonic [back] specifications. Consequently, any vowel following a neutral vowel in Karchevan will surface with its underlying [+back] specification. Given that the phonemic inventory of vowels in Karchevan is $\{a\ o\ u\ \varepsilon\ e\ i\}$ (see below for further discussion), the underlying form of the genitive/dative suffix must be $/u/$, which is underlyingly specified as [+back] and surfaces as such in $[birgædírun]$.

Let us now consider the behavior of the neutral vowels i and e in more detail (leaving out ε , whose distribution is severely restricted in the language). The behavior of these vowels falls into three patterns:

(8) neutral vowels:

- a. can be preceded or followed by front or back vowels within roots
- b. are followed by back or neutral suffixes
- c. spread [-back] to epenthetic vowels

The facts in (8a) follow naturally if we assume that Karchevan harmony spreads contrastive [back] values iteratively from left to right within a word, and that all vowels are fully specified underlyingly. Given the system in (3), the only [back] contrasts are $a : \text{æ}$, $o : \emptyset$, and $u : y$. The vowels e and ε contrast for [ATR] but are both [-back], and i has no [+back] counterpart. Following Calabrese 1995, I assume that the marking statement $*[+back, -round]/_[-low]$ is active in Karchevan, and blocks spreading of [+back] from $\{a\ o\ u\}$ to neutral vowels.

I further assume that roots draw from the vocalic inventory in (3) (i.e. $\{a\ o\ u\ \varepsilon\ e\ i\}$), whereas suffixes contain only the cardinal vowels $\{a\ e\ i\ o\ u\}$ in their underlying representations (for further discussion of this restriction see Vaux 1997, chapter 5). This being the case, we can account for the fact that both [+back] and [-back] harmonic vowels can follow neutral vowels root-internally, whereas only cardinal vowels can occur in suffixes after roots ending in one or more neutral vowels. The insight here is that i and e do not spread [+back] to suffixes such as the plural (as Grigorjan 1957 claimed for Meghri, the mother dialect of Karchevan) but rather do not spread any back value, enabling suffixes to surface in their underlying form. Inertness of this type is also found in Hungarian vowel harmony (cf. Ringen 1988, van der Hulst and van de Weijer 1995), but differs from the harmonic systems in languages such as Turkish (Clements and Sezer 1982) and Agulis (Vaux 1997), where neutral vowels are active, and therefore spread their own specifications for the harmonic feature to following vowels.

We thus far have seen that Karchevan neutral vowels need not be [+back] in order to produce the [+back] specification that surfaces in following vowels. However, we have not yet provided evidence that these neutral vowels themselves need to be specified as [-back] during the phonological derivation. In the next section I demonstrate that we in fact have to make this assumption in order to account for the behavior of epenthetic harmony.

4. Epenthetic Harmony

Karchevan possesses a process of epenthetic harmony, according to which the [back] and [round] specifications of epenthetic vowels are determined by neighboring segments under certain conditions. Consider first the noun + definite article alternations in (9).

(9)	underlying form	surface form	gloss
a.	<i>hak^h-n</i>	<i>hákhə</i>	foot-def.
b.	<i>værd-n</i>	<i>væʻrdi</i>	rose-def.
	<i>beh-n</i>	<i>béhi</i>	spade-def.
	<i>knag^l-n</i>	<i>kənág^li</i>	woman-def.
c.	<i>myrdžym-n</i>	<i>myrdžyʻmy</i>	ant-def.

Muradjan 1960:103 states that the definite article has the allomorphs {ə i y}, each of which may be followed by *n* when preceding a vowel-initial clitic. I assume that as in standard Armenian these alternations result from the addition of a clitic definite article /-n/, which triggers epenthesis and then deletes when not followed by a vowel. Karchevan differs from standard Armenian and resembles Turkish in applying two harmonic processes to this vowel, one that spreads [back] and another that spreads [round]. According to Muradjan 1960:103, the definite article surfaces as [ə] after back vowels, [i] after non-round front vowels and roots ending in palatalized consonants or {ʒ f tʃ dʒ tʃ} (i.e. [-anterior] coronals), and [y] after roots having *y* as their last vowel. Though Muradjan does not give examples of the definite article with roots ending in \emptyset , we can tell from forms such as /bødʒr/ ‘high’ → [bøʻdʒyr] that \emptyset also spreads [+round] to the epenthetic vowel.

The appearance of ə after back vowels (9a, 10a) is not surprising. The appearance of *i* after neutral vowels (9b, 10b) is somewhat unexpected, however, since if the harmony process affecting the epenthetic vowel were the same as that affecting full vowels, we would not expect neutral vowels to spread [-back]. The harmonic process in (9) therefore must be different from the one in (6). This assumption is further justified by the fact that the harmony rule in (6) applies before epenthesis, whereas the one in (9) applies after epenthesis. This being the case, it is a simple matter to state that the post-epenthesis harmony rule spreads all [back] values⁴, and the vowels *i* and *e* therefore freely spread [-back].

The rounding rule, on the other hand, requires further refinement in order to account for the fact that the epenthetic vowel surfaces as [+round] after *y* and \emptyset , but not after *u* and *o*. The alternations in the ordinal suffix *-mndʒi* in (10c) confirm that *o* and *u* do not spread rounding.

(10)	underlying form	surface form	gloss
a.	<i>tʃok^h-mndʒi</i>	<i>tʃək^hməndʒi</i>	fourth
	<i>hang^l-mndʒi</i>	<i>hang^lməndʒi</i>	fifth
	<i>tasn-mndʒi</i>	<i>təsəməndʒi</i>	tenth
b.	<i>irik^h-mndʒi</i>	<i>irik^hmindʒi</i>	third
	<i>viʃ^h-mndʒi</i>	<i>viʃ^hmindʒi</i>	sixth

⁴ One must stipulate a correlation between {coronal, [-anterior]} and {dorsal, [-back]} in order to account for the behavior of palatals (for further discussion see Vaux 1997).

c.	<i>jorku-mndzi</i>	<i>jorkuməndzi</i>	second
	<i>joχtn-mndzi</i>	<i>joχtəməndzi</i>	seventh
	<i>ot^h:n-mndzi</i>	<i>ot^h:əməndzi</i>	eighth

In order to account for the behavior of the feature [round] in epenthetic harmony, illustrated in (9c) and (10c), I postulate a feature-filling rule that spreads marked [round] specifications from left to right within a Clitic Group. Since [round] is marked only in [-back] vowels, *y* and *ø* are correctly predicted to be triggers, and *o* and *u* are not.

The reason that we must stipulate that the rounding harmony rule just postulated applies from left to right rather than being bidirectional involves the forms ‘fourth’ and ‘tenth’. If [back] spreading did apply from right to left, we would expect the final *-i* of the ordinal suffix to spread its [-back] vowel to the preceding schwas, which is not the case.

To summarize the above discussion, I propose that Karchevan harmony involves the rules in (11).

- (11)
- | | | |
|----|------------|---|
| a. | deletion | |
| b. | harmony 1 | spread contrastive [back] iteratively L → R |
| c. | epenthesis | |
| d. | harmony 2 | spread all [back] L → R |
| e. | harmony 3 | spread marked [round] L → R |

In my analysis the harmony rules that affect the epenthetic vowel (11d, e) are not crucially ordered relative to one another. (There is also no evidence for the ordering of epenthesis (11c) relative to harmony (11b)). I assume that both rules (11d) and (11e) are feature-filling and therefore apply to the epenthetic vowel, which is only prespecified for the feature [+high] (as in Turkish); they do not affect full vowels which are underlyingly specified for all vocalic features.

In order to account for the deletion rule in (11a), I assume that certain vowels are lexically specified as unable to project brackets, and subsequently undergo unstressed vowel deletion (for further discussion see Vaux 1997). Deletion must occur before harmony in order to account for alternations of the type found in (12).

(12)	underlying form	surface form	gloss
a.	<i>kæʔ^hsin-u</i>	<i>kʰæʔ^hsnɨ</i>	axe-dat.
b.	<i>sært</i>	<i>sərtú</i>	heart-dat.

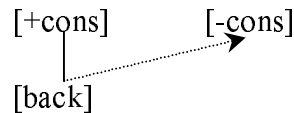
In (12a), [-back] spreads from the *æ* of the root to the dative suffix *-u-*. If the root *i* were still present at the time harmony applied, we would expect it to block this spreading, and the suffix to surface as *-u*. Similarly in (12b), if harmony applied before deletion we should expect **sərtɨ*. Given the scheme in (11), harmony should apply to the intermediate form **srt-u*; since the root at this point contains no contrastive [back] specifications, the suffix surfaces in its underlying form, [*u*].

Now, at first blush the instrumental suffix *-av* might appear to be a problem for the analysis we have developed so far, because it sometimes shows alternations (13a) but at other times does not (13b).

(13)	underlying form	surface form	gloss
a.	<i>aʔink^{hʲ}-av</i>	<i>aʔink^{hʲ}æv</i>	bowel
	<i>knag^ʲ-av</i>	<i>kənag^ʲæv</i>	woman, wife
b.	<i>byʒyʒ-av</i>	<i>byʒ:av</i>	bell
	<i>byn-av</i>	<i>bynav</i>	nest
	<i>byn-or-av</i>	<i>bynørav</i>	nest-pl.
	<i>g^ʲørynk^h-av</i>	<i>g^ʲirønk^hav</i>	spring (season)
	<i>hyrbyr-av</i>	<i>hyrbyrav</i>	father's brother
	<i>k^ʲætʂin-av</i>	<i>k^ʲætʂnav</i>	axe
	<i>p^hlænk^hæs-av</i>	<i>p^hlænk^hæsav</i>	someone
	<i>Sæg^ʲin-av</i>	<i>Sæg^ʲinav</i>	Sargis (personal name)

However, the forms in (13) turn out not to be a problem. The suffix *-av* is in fact disharmonic; it never undergoes alternations as a result of vowel harmony. The exceptional forms in (13a) result from an independent rule of Karchevan phonology, formalized in (14), that fronts vowels when they immediately follow a palatalized consonant.

(14) Vowel fronting



Some other forms showing the effects of this rule can be seen in (15a). Forms of the type in (15b) demonstrate that spreading does not occur when a consonant intervenes between the palatalized consonant and the vowel.

(15)	underlying form	surface form	gloss
a.	<i>mat^hk^{hʲ}-ar</i>	<i>mat^hk^{hʲ}ær</i>	mind-pl.
b.	<i>aʔink^{hʲ}-nor-u</i>	<i>aʔink^{hʲ}noru</i>	bowel-pl.-dat.
	<i>hang^ʲ-mndʒi</i>	<i>hang^ʲməndʒi</i>	fifth

The rule in (14) appears to be the same one that fronts the epenthetic vowel after palatalized consonants, as we saw earlier in forms such as *kənág^ʲi* ‘the woman’ in (9).

Note that the rule in (14) does not appear to feed epenthetic harmony; in other words, epenthetic vowels do not become [-back] after vowels that themselves have been fronted by a preceding palatal consonant. For example, underlying */aʔink^{hʲ}-av-n/* surfaces as *[aʔink^{hʲ}ævə]* rather than **[aʔink^{hʲ}-æv-i]* (Muradjan 1960:91). I account for the fact that

the fronting rule in (14) does not feed epenthetic harmony by postulating that (14) is ordered after epenthetic harmony in the derivation, as schematized in (16).

- (16) a. deletion
b. harmony 1
c. epenthesis
d. harmony 2
e. harmony 3
f. vowel fronting by palatalized consonants

Note that this rule ordering also implies that vowels fronted by palatals do not spread their [-back] specification to subsequent vowels as a result of word-level [back] harmony. I have not been able to locate any forms that confirm or disconfirm this prediction, however.

5. Conclusion

I hope to have shown that the Armenic family of languages presents a fertile field for future research on vowel harmony systems. Furthermore, I have argued that the Karchevan facts reveal that a single language can possess many types of vowel harmony simultaneously, and that these individual harmonic systems do not necessarily employ the same parameters. Complex harmonic systems of this type therefore present difficulties for non-derivational models of phonology such as Optimality Theory, which rely on a single set of parameter settings and constraint rankings.

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