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CONDITIONS ON ITERATIVE ROUNDING HARMONY IN OROQEN[1]

By B. Elan Dresher[a] and Andrew Nevins[b]
[a]*University of Toronto and* [b]*University College London*

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Abstract

In this paper, we re-examine the claim that Baiyinna Oroqen, a language of the Tungusic family with a largely predictable distribution of non-high round vowels, requires a non-iterative type of rounding harmony, by demonstrating instead the need for a clear distinction between stem-internal morpheme structure constraints and suffixal vowel harmony. We also propose to revise what was thought to be a requirement that harmony donors must be anchored in two successive syllables; it is instead a restriction that copying of the harmonic feature must be from the closest non-initial vowel.

1. Introduction

A number of distinct models have been developed to understand the possible space of the phenomenon known as vowel harmony. Nevins (2010) proposes that vowel harmony observes the property of relativized locality, whereby a vowel that lacks a required feature seeks it from the nearest source. The 'nearest' is parametrically defined: for example, it could be the nearest vowel to the left, or the nearest vowel on the left bearing a contrastive value of the required feature, or a variety of other most local elements in a given direction that bear certain feature-values. On this approach, harmony is a derivational process; it propagates iteratively across a harmony domain, and each harmony seeker, once it has found a local source, can then in turn provide a harmonic value for a harmony seeker more local to it.

Walker (2014) argues that Baiyinna Oroqen (also spelled Baiyina Orochen) round harmony does not operate in this way. Rather, she proposes that a single trigger may be related non-iteratively to multiple targets; it follows that all but one of these are necessarily non-local in the sense of Nevins (2010). While trigger-target relations need not be local, Walker (2014: 510) nevertheless requires that round harmony 'is local with respect to propagation; that is, harmony proceeds only among adjacent syllables'. That is, a trigger can 'see over' an intervening vowel that undergoes harmony, but *not* over a vowel that does not require the harmonic feature. This is a decidedly non-local model of harmony, whose properties have not been fully explored with respect to the typology of iterative harmony systems found in Tungusic, Turkic, Finno-Ugric, or Mongolic languages. Before considering the adoption of a wholly new model, we must first consider whether this kind of analysis is warranted for the facts under discussion.

[1] We would like to thank Zhang Xi for many insightful comments and for generously sharing his data and knowledge of Oroqen. We are grateful to two anonymous reviewers for detailed and helpful comments on a previous draft. The article has also benefited from comments and suggestions by Peter Jurgec, Joan Mascaró, Beata Moskal, Matthew Pankhurst, Shanti Ulfsbjornnin, Bert Vaux, and members of the audience at OCP 12 (2015) in Barcelona.

In the present article, we argue that Baiyinna Oroqen does not require an analysis with non-iterative harmony that skips over undergoers, as Walker (2014) proposes. We will show that it has the same stem-to-suffix harmony rule as has been proposed for Xunke Oroqen and for Classical Manchu, other languages in the Manchu-Tungusic family. We will propose an analysis that observes iterative harmony and well-established principles of locality, and which takes account of the similarity between Baiyinna and these other Manchu-Tungusic dialects.

Before proceeding, we wish to familiarize the reader with the locations in which these varieties of Oroqen are spoken (or were, as more recent reports have documented endangerment across the last two decades) to have a sense of their geographic proximity, as this is not always explicitly indicated in previous literature on the topic. Baiyinna, in the topmost circle in the map in Figure 1, is spoken in Huma County in the north of Heilongjiang Province, China. The Xunke variety is spoken south of it in a number of villages in Xunke County, indicated by the lower circled area on the right. Whaley & Li (2000), who provide an overview of Oroqen varieties, classify Baiyinna as Northeastern and Xunke as Southeastern Oroqen. The circle to the left indicates Alihe and its region, in the Oroqen Autonomous Region of Inner Mongolia, the home of Central Oroqen, according to Whaley & Li (2000).

Our analysis of Oroqen vowel harmony is intended to reflect the stage of the language as studied by a number of Chinese researchers in the late 1980s and early 1990s. A major source

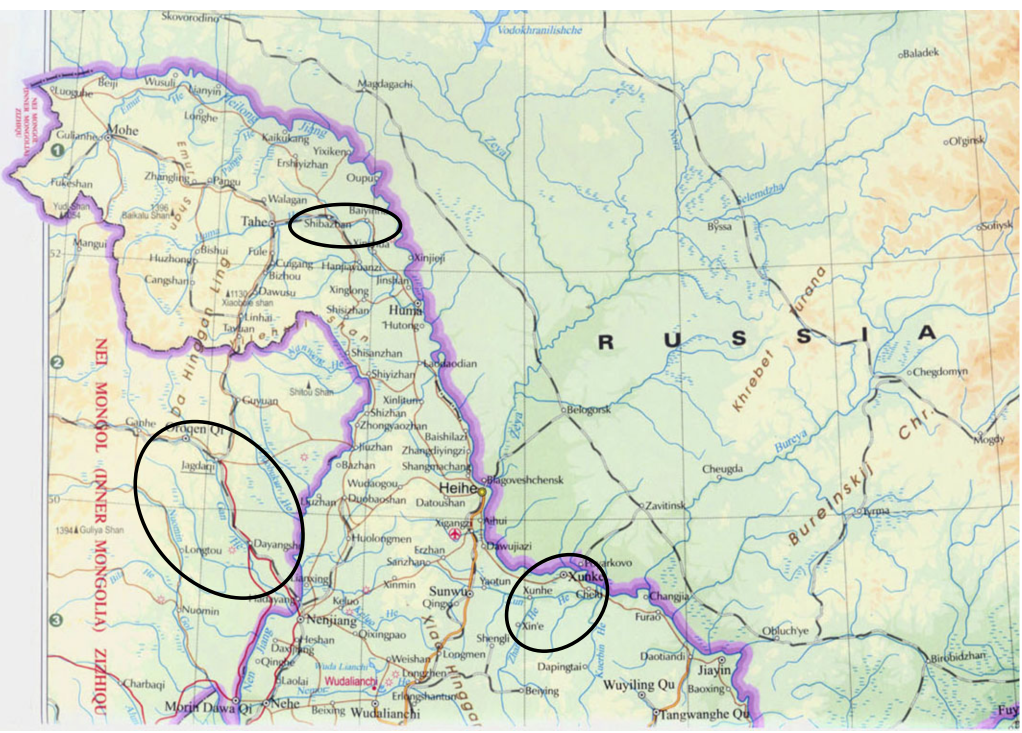


Figure 1. Map of Oroqen dialect areas. The map shows three areas with Oroqen speakers in Heilongjiang Province, China, and in the Oroqen Autonomous Region of Inner Mongolia. The circle at the top indicates Baiyinna and Shibazhan in Huma county (China). Whaley & Li (2000) classify the dialect spoken here as Northeastern Oroqen. Xunke county, in the lower circle on the right, is the home of what they call Southeastern Oroqen. The circle to the left indicates Alihe and its region, in Inner Mongolia (Central Oroqen).

for the phonology of Oroqen is *The Oroqen language* by Zhang et al. (henceforth ZLZ) (1989). This book was the result of a research project and extensive fieldwork organized by Professor Zhang Yan-Chang of Jiling University. Subsequently, his co-authors, Li Bing and Zhang Xi, made separate field trips and developed descriptions and analyses of Oroqen vowel harmony that extended and surpassed the account presented in ZLZ (1989).

Our main sources on Oroqen rounding harmony are Zhang (1995, 1996) and Li (1996). Like ZLZ (1989), Zhang focuses mostly on Xunke Oroqen, though his analysis is meant to apply to Oroqen generally. Our analysis of Oroqen vowel harmony builds on his work, including also Zhang & Dresher (1996) and Dresher & Zhang (2005). Li (1996) discusses a wide number of Tungusic languages and dialects of Oroqen, but our focus here is the new data he contributes from the Baiyinna dialect and his analysis thereof.[2]

In section 2 we present an analysis of the basic facts of stem-to-suffix round harmony in Oroqen. In section 3 we present Walker's (2014) analysis of Baiyinna Oroqen harmony, and argue that it is based on an incorrect conflation of stem-to-suffix harmony with stem-internal constraints on vowel co-occurrence. In section 4 we propose that the facts of Baiyinna shed new light on a seemingly odd restriction on round harmony in all of these dialects. In sum, we argue that our analysis provides a better account of the facts across dialects of Oroqen in terms of specific conditions on round harmony, and maintains the iterative nature of this process.

2. Stem-to-suffix rounding harmony in Oroqen

The vowel system of Oroqen is shown in (1):[3]

(1) Vowel system of Oroqen

/i/	/ii/	/y/		/u/	/uu/
/ɪ/	/ɪɪ/			/ʊ/	/ʊʊ/
/ee/		/ə/	/əə/	/o/	/oo/
/ɛɛ/		/a/	/aa/	/ɔ/	/ɔɔ/

There are two types of vowel harmony in Oroqen. All vowels must harmonize with respect to Retracted Tongue Root ([±RTR]). The vowels in the first and third rows in (1) are [−RTR], and the vowels in the second and fourth rows are [+RTR].[4] RTR harmony is very regular and pervasive, and we will not be concerned with it here.

2.1. Description of stem-to-suffix rounding harmony

The subject of this article is a type of rounding harmony found from low vowels to low vowels, sometimes called 'labial attraction' in the literature on Turkic, Tungusic, and Mongolian (Vaux 1993). The basic facts of stem-to-suffix rounding harmony to be discussed here are common to all Oroqen dialects. Only two sets of non-high vowels /ə, əɔ, o, oo/ and /a, aa, ə, əə/ participate in round harmony in Oroqen (Hu 1986; Zhang 1995, 1996; Li 1996); that is, only the latter set can become [+round], and rounding occurs only in the presence of vowels from the former set. The high round vowels /ʊ, ʊʊ, u, uu/ neither

[2] For more recent accounts of the current state of the Oroqen language and the locations where it is spoken, see Whaley et al. (1999), Whaley & Li (2000), Li & Whaley (2009), and Lulich & Whaley (2012).

[3] The system in (1) is as given by Hu (1986) (cited in Zhang 1996: 153). The vowel [y] occurs very rarely; Li (1996: 210 n. 5) argues that it is a positional allophone of /u/. The non-high front vowels are transcribed as in (1) by Zhang (1996); ZLZ (1989: 4) transcribe them as /e/ and /ɛ/; Li (1996: 121) transcribes them as /ie/ and /iɛ/. In Xunke, /ɪ, ɪɪ/ have merged with /i, ii/ (Li 1996: 141; Zhang 1996: 157). None of these variations affects the issues taken up in this article.

[4] As mentioned above, in Xunke, /ɪ, ɪɪ/ have merged with /i, ii/; the latter are thus considered to be neutral with respect to RTR harmony (ZLZ 1989; Li 1996; Zhang 1996).

trigger nor participate in round harmony, and may occur freely in any position in a word. The front non-high vowels /ɛɛ, ee/ seldom occur in suffixes; when they do, they do not harmonize.

These patterns are illustrated in (2) and (3). In (2a, b) the present tense suffix *–ra* and the definite object suffix *–wa* (or *-ma* after a nasal consonant) occur with the vowel *a* following stems with *a* and *ʊ*; following stems with *ɔ* or *ɔɔ*, these suffixes appear as *–rɔ* and *–wɔ*, respectively, as in (2c, d). The non-RTR counterparts of these forms are shown in (3), where the suffixes appear as *–rə* and *–wə* (3a, b), except when following stems with *o* and *oo*, in which case they appear as *–ro* and *–wo*, respectively:

(2) Rounding harmony in Oroqen: RTR stems
   a. baka-ra 'get PRES.TNS'
   b. ʊrʊʊn-ma 'hoof DEF.OBJ'.
   c. ɔlgɔɔ-rɔ 'dry PRES.TNS' *ɔlgɔɔ-ra
   d. ɔlɔ-wɔ 'fish DEF.OBJ' *ɔlɔ-wa

(3) Rounding harmony in Oroqen: non-RTR stems
   a. nəkə-rə 'weave PRES.TNS'
   b. ulgulu-wə 'language DEF.OBJ'
   c. mooro-ro 'moan PRES.TNS' *mooro-rə
   d. tʃoŋko-wo 'window DEF.OBJ' *tʃoŋko-wə

Notice that the forms that display stem-to-suffix harmony in (2c, d) and (3c, d) all have more than one non-high round (henceforth NHR) vowel in the stem. A suffix with a non-high vowel harmonizes when it follows a stem that contains two or more short NHR vowels, like 'the fish' in (2d) and 'the window' in (3d). Harmony also occurs when the stem has a short NHR vowel followed by a long NHR vowel, as in 'dry' (2c), or when the stem has a long NHR vowel followed by a short NHR vowel, as in 'moan' (3c). But there is no harmony when the stem has a single long NHR vowel, as in the examples in (4):

(4) Two-syllable requirement to initiate rounding harmony in Oroqen
   a. doo-rə 'mince PRES.TNS' *doo-ro
   b. mɔɔ-wa 'tree DEF.OBJ' *mɔɔ-wɔ

It was proposed by Zhang (1996) and Zhang & Dresher (1996) that for harmony to occur in Oroqen as well as in Classical Manchu, [+round] must be anchored in (at least) two successive syllables (see also Walker 2001). For some reason, vowel harmony fails when [+round] occurs only in the initial syllable of the stem.

The NHR vowels are also subject to restrictions on where they may occur in a word. NHR vowels in Oroqen must ordinarily occur in a sequence that starts at the leftmost syllable of a word. That is, for a NHR vowel to occur in the second syllable of a word or further, a NHR vowel must occur in the first or preceding syllable, as shown in (5):

(5) Oroqen NHR vowels at the left edge of a word
   a. kɔrɔ 'terrible' *kirɔ *karɔ
   b. oŋkoo- 'rain heavily' *uŋkoo- *əŋkoo-

A long NHR vowel may occur alone in a monosyllabic stem, as in (6). However, a short NHR vowel may not occur by itself in a stem: it must be followed by another vowel in the next syllable:[5]

[5] Three cases of monosyllables with /ɔ/ are listed in the Appendix; we have found none with /o/.

(6) Oroqen long initial NHR vowels
a. mɔɔ 'tree, wood' *mɔ, *mɔt
b. dʒoog 'chin' *dʒog, *dʒo

Rounding harmony does not apply to high vowels, as shown by the forms in (7). Nor can harmony skip a syllable, as shown by the forms in (8):

(7) High vowels do not undergo harmony
a. dʒɔlɔ-ŋi 'stone POSS' *dʒɔlɔ-ŋʊ
b. boodo-dʒi 'knife INSTRUMENTAL' *boodo-dʒu

(8) Harmony may not skip a syllable
a. tɔrɔki-wa 'wild boar DEF.OBJ' *tɔrɔki-wɔ
b. toŋgori-ma 'round DEF.OBJ' *toŋgori-mo

2.2. Analysis of stem-to-suffix rounding harmony

From the perspective of iterative rounding harmony systems found across Tungusic, Finno-Ugric, Turkic, and Mongolic languages, the harmony patterns described above can be understood as follows. Suffixal NHR vowels are lexically underspecified for the feature [±round]; following Nevins (2010), we will say that such vowels are 'needy' for the missing feature.[6] In the model of Nevins (2010), vowel harmony involves two steps: a search process that looks for a source (a 'donor') from which to copy values for needy features, and conditions on copying from such sources. In iterative vowel harmony, copying proceeds cyclically, as each suffix is added to the stem. In a word with two suffixes, as in the Oroqen word 'cook CAUS.PRES' (9a), the vowel in suffix_1 copies the harmonic feature from the root (9b), and the vowel in suffix_2 copies the harmonic feature from suffix_1 (9c). In (9), 'A' represents a non-high suffix vowel unspecified for [±round]:

(9) Iterative round harmony (Nevins 2010)

a. Needy suffix vowels unspecified for [±round]

o	loo	-wkAAn	-nA	'cook CAUS.PRES'
[–high]	[–high]	[–high]	[–high]	
[+rnd]	[+rnd]	[ ]	[ ]	

b. Suffix_1 vowel finds and copies [+round] from syllable to its left

o	loo	-wkoon	-nA
[–high]	[–high]	[–high]	[–high]
[+rnd]	[+rnd]	[+rnd]	[ ]

c. Suffix_2 vowel finds and copies [+round] from syllable to its left

o	loo	-wkoon	-no	=	o loo -wkoon -no
[–high]	[–high]	[–high]	[–high]		*o loo -wkoon –nə
[+rnd]	[+rnd]	[+rnd]	[+rnd]		

[6] There are exceptions, such as the locative suffix *–ləə/-laa* that does not undergo rounding, as in *mɔɔ-laa* 'tree LOC' (ZLZ 1989: 34). We assume that in such non-needy suffixes the low vowels are exceptionally specified as [–round].

Following work by Calabrese (1995), Nevins (2010) proposes that harmonic searches may be set to look for only *contrastive* values of a feature, or for *marked* values, or for *all* values of the feature (the latter may be notationally abbreviated as parametrically set to *all-values*). One of the key properties of the model in Nevins (2010) is that the transparency or blocking of vowels in harmony systems can be understood in terms of the role their value of the harmonic feature plays within the phonological system as a whole. An example is Classical Mongolian, where the vowel /i/ is transparent to backness harmony across it, as shown in (10), where *-ača* and *–eče* are back and front variants of the ablative suffix:

(10) Classical Mongolian suffix harmony (Nevins 2010: 72)

a.	ulus	'nation'	ulus-ača	'nation ABL'
b.	aman	'mouth'	aman-ača	'mouth ABL'
c.	üker	'ox'	üker-eče	'ox ABL'
d.	mören	'river'	mören-eče	'river ABL'
e.	morin	'horse'	morin-ača	'horse ABL'

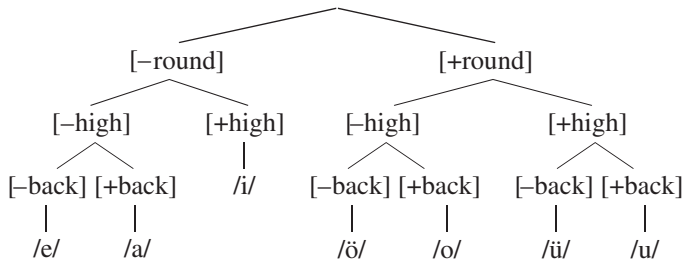
In (10), the [−high, −round] vowels in the ablative suffix are back (*-ača*) when following the back vowels /u/ and /a/ (10a, b), and front (*-eče*) when following the front vowels /ü/ and /ö/ (10c, d). In (10e), the suffixes are back following the back vowel /o/, despite the fact that /i/, a front vowel, intervenes. Nevins (2010: 72) proposes that /i/ is skipped because it does not bear a contrastive value of the harmonic feature [±back]. To see why this is, consider the vowel system of Classical Mongolian (11) as given by Nevins (2010), following Svantesson (1985):

(11) Vowel system of Classical Mongolian (Nevins 2010: 72)

/i/	/ü/	/u/
/e/	/ö/	/o/
	/a/	

In work on how contrastive feature values are determined by ordering features into language-particular hierarchies, Dresher (2009) argues that the ordering of the features is informed by the phonological patterns of the language. In Classical Mongolian, the alternation pattern in (10) shows us that /a/ and /e/ are counterparts with respect to [±back], just like /ü/ ~ /u/ and /ö/ ~ /o/. This result follows from ordering the Mongolian vowel features [round] > [high] > [back], as shown in (12):

(12) Contrastive hierarchy for Mongolian vowels



As is evident in (12), vowels that are [–high] and vowels that are [+round] must receive a contrastive value for [±back]. However, [−round, +high] /i/ has no contrastive value of [±back], so it is not even included in the search domain to begin with, as illustrated in (13):

(13) Mongolian iterative back harmony (contrastive values only)

a. Needy suffix vowels unspecified for [±back]

mo	rin	-A	čA	'horse ABL'
[–high]	[+high]	[–high]	[–high]	
[+back]		[ ]	[ ]	

b. Suffix vowel$_1$ finds and copies [+back] from relevant syllable to its left

mo	rin	-a	čA	
[–high]	[+high]	[–high]	[–high]	*morin-eče
[+back]		[+back]	[ ]	

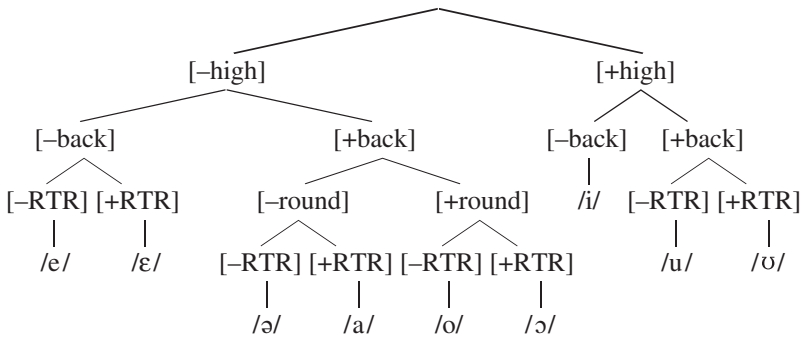
c. Suffix vowel$_2$ finds and copies [+back] from syllable to its left

mo	rin	-a	ča	=	morin-ača
[–high]	[+high]	[–high]	[–high]		*morin-ače
[+back]		[+back]	[+back]		

In Classical Mongolian, all the facts of back harmony are in accord with the hypothesis that only contrastive values of [±back] are in play: every donor has a contrastive [+back] feature, every recipient needs a contrastive value of [±back], and vowels lacking a contrastive [±back] feature are invisible to the search. In Oroqen, however, the facts of round harmony do not all line up so unequivocally. We have observed that only non-front non-high vowels are needy for the feature [±round], and only NHR vowels can be donors of [+round]. These facts might suggest that Oroqen round harmony, like Classical Mongolian back harmony, is sensitive only to contrastive values of [±round], as was argued by Zhang (1996) and Dresher & Zhang (2005).

Zhang (1996: 161) proposes that Oroqen, like other Manchu-Tungusic languages, has the feature hierarchy [high] > [back] > [round] > [RTR], as in (14).[7] Given this feature hierarchy, only the vowels that are [–high, +back] have contrastive values of [±round]:

(14) Contrastive hierarchy for Oroqen vowels (Zhang 1996: 161)



[7] For consistency with the rest of our article, we substitute Zhang's privative features with the binary ones in the text. We omit length from the tree in (14). Baiyinna has an additional [RTR] contrast under [+high, –back].

While donors and recipients of [+round] have contrastive values of this feature, vowels that do not bear this contrastive feature nevertheless block its transmission, unlike what we saw in Mongolian.[8] Assuming that only contrastive values of [±round] are visible to round harmony produces an incorrect result for forms like (8), as shown in (15); the problem is that harmony may not skip the syllable occupied by /i/. The correct form is *tɔrɔki-wa*, not **tɔrɔki-wɔ*:

(15) Oroqen round harmony (contrastive values of [±round] only)

a. Needy suffix vowels unspecified for [±round]

tɔ	rɔk	i	-wA	'wild boar DEF.OBJ'
[–high]	[–high]	[+high]	[–high]	
[+back]	[+back]	[–back]	[+back]	
[+rnd]	[+rnd]		[ ]	

b. Suffix vowel finds and copies [+round] from closest 'relevant' syllable to its left [incorrect result for Oroqen]:

tɔ	rɔk	i	-wɔ	*tɔrɔki-wɔ
[–high]	[–high]	[+high]	[–high]	
[+back]	[+back]	[–back]	[+back]	
[+rnd]	[+rnd]		[+rnd]	

Given that the skipping of [i] as shown in (15b) is not the actual result of vowel harmony, there are a few ways to encode this. One way of keeping the search local with respect to the feature [±round] is to suppose – contrary to what is shown above in (15) yielding the incorrect result – that instead, in Oroqen, *all* values of round are visible, even [−round] that is non-contrastive. Hence, the search will end right away at an /i/. But is it copied from?

Not necessarily, as Nevins (2010) distinguishes between conditions on search and conditions on copying. In systems with labial attraction (e.g. round harmony only among NHR vowels), while the search is relativized to all values (and hence search halts with the first vowel encountered), only [−high] vowels can be copied from. This is a kind of parasitic harmony (on height). Formally, a vowel encountered in the search that fails to meet this [−high] condition on licit donors will not be copied from, and as a result, the default value of [−round] will be inserted. This latter process is shown in (16b):

(16) Oroqen round harmony (all values of [±round])

a. Needy suffix vowels unspecified for [±round]

tɔ	rɔk	i	-wA	'wild boar DEF.OBJ'
[–high]	[–high]	[+high]	[–high]	
[+back]	[+back]	[–back]	[+back]	
[+rnd]	[+rnd]	[–rnd]	[ ]	

[8] There is a rich literature starting with van der Hulst & Smith (1988) in search of a principled account of the difference between /i/ and /u/ in Tungusic and Mongolian rounding harmony. In addition to Nevins (2010), see Ko (2011, 2012, 2013), Godfrey (2012), van der Hulst & Moskal (2013), and Moskal (2013).

b. Suffix vowel cannot copy [–round] from closest vowel; default inserted

tɔ	rɔk	i	-wa	tɔrɔki-wa
[–high]	[–high]	[+high]	[–high]	
[+back]	[+back]	[–back]	[+back]	
[+rnd]	[+rnd]	[–rnd]	[*–rnd*]	

This is the approach taken by Nevins 2010 to similar cases: rather than explicitly stating that rounding harmony is limited to one-syllable away, it is actually not defined by absolute distance at all – only by the closest (however far that may be) relevant source that is a licit donor. Put differently, the overarching goal of this model is to derive as many locality properties as possible from the feature content of the vowels along the search path themselves. And while conditions such as 'adjacent syllable' or 'two-syllables away' are possible additional requirements imposed on the search, they are ones which go beyond the definitional properties of locality in harmony, which involve stating the nature of the search domain in terms of feature-values.

As such, the difference between Tungusic (in which /i/ is not transparent to harmony across it) and Mongolian (in which /i/ is transparent to harmony across it) is in terms of whether the search itself stops at all-values of [±round] (as in Tungusic) or only the contrastive ones (as in Mongolian).

The microvariation in non-locality of harmony across non-contrastive /i/ in Mongolian vs Tungusic is thus parametrically defined in terms of all vs contrastive values in Nevins's (2010) model. A difference arises thus with the approach of Dresher & Zhang (2005), for whom the option of assuming that *all* values of [±round] are in play does not exist. This is because they assume that only contrastive features are active in the phonology; Hall (2007) calls this view *the Contrastivist Hypothesis*, which states that only the features necessary to distinguish phonemic oppositions in a given language can be referred to by phonological processes. Under the Contrastivist Hypothesis, one would be compelled to add an additional requirement of syllable adjacency to Oroqen round harmony. On this view, the vowel /i/ blocks harmony not because it has a [–round] feature, but because it has other vowel features that interfere with locality. We have thus considered two slightly different models of the locality of Oroqen harmony: one, following Nevins (2010), holds that all values of [±round] are *visible* for search, but only contrastive values of [+round] can be donors. The other, following Dresher & Zhang (2005), is that only contrastive values of [±round] are visible, but there is an additional syllable-adjacency requirement above and beyond reference to the values of [±round].[9]

Whichever of these two analytic – or many possible other – routes one takes, there is nonetheless, as discussed above, an important complication in Oroqen, which partly motivated Walker's (2015) development of a non-iterative model of harmony. This is the fact that a [+round] vowel encountered within the search can only *be copied from* if it has another [+round] vowel to its left. This aspect of the harmony pattern, within the Nevins (2010) model, would have to be a condition on *copying*, rather than the search domain. Specifically, whether the search domain is defined as all-values or contrastive-values of [+round], the fact remains that even if a [+round] value is found, it can only be copied from under the condition that another [+round] vowel is found to *its* left. Stated in this way, this is indeed an unusual condition to impose on copying. However, as we develop throughout this article, once suffixal harmony and stem-internal harmony are dissociated, this condition can be stated differently:

[9] See Dresher (2009, 2012) for analyses in which vowel harmony may be sensitive only to contrastive features, and Nevins (2015) for a different view. See Godfrey (2012) and Ko (2012, 2013) for attempts to reconcile the Contrastivist Hypothesis with the locality theory of Nevins (2010).

instead, suffixal harmony has a condition that limits copying to vowels that are *non-initial within the stem*.

We sum up the operation of round harmony in (17) (where c and c′ represent the two potential analytic routes mentioned above):

(17) Stem-to-suffix round harmony in Oroqen
  a. Non-high suffix vowels that are needy for the feature [±round] seek it from vowels on their left.
  b. [+round] must be supplied by a non-high vowel that follows another NHR vowel (alternatively, by a non-initial NHR vowel).
  c. Locality, based on all-values of [±round], in effect becomes the adjacent leftward syllable (as all vowels have a value for [±round]) (Nevins 2010); *or*
  c′. Locality is based on contrastive-values of [±round] supplemented by a condition of syllable adjacency (Dresher & Zhang 2005).
  d. When a [−high] donor is found in an adjacent syllable, the non-high suffix vowel surfaces as [+round]; otherwise, it receives [–round] by default.

In (18) we illustrate how round harmony operates in the word *ɔlgɔɔ-rɔ* 'dry PRES.TNS' (2c). The present tense suffix *–rA* is needy for the feature [±round], and seeks it from a vowel on the left (17a). The vowel immediately to its left, *ɔɔ*, is a non-high [+round] vowel that follows another NHR vowel, and is thus a licit donor of [+round] (17b). This donor observes locality by either (17c) or (17c′); the result is that the suffix vowel surfaces as [+round] (17d):

(18) Example of stem-to-suffix round harmony in Oroqen

ɔl	gɔɔ	-rA	⟶	ɔlgɔɔ-rɔ 'dry PRES.TNS'
[–high]	[–high]	[–high]		*ɔlgɔɔ–ra
[+rnd]	[+rnd]	[ ]		

2.3. *NHR vowels in Classical Manchu*

In order to make the case that stem-internal vowel harmony is a distinct process from suffixal round harmony, we must examine the nature of the former across a range of parallel cases. In fact, the behaviour of NHR vowels in Classical Manchu (a related language, not the parent of Oroqen) clearly displays the same 'two-syllable condition' on donors as Oroqen. As in Oroqen, a NHR vowel in Manchu must occur in a sequence that starts at the leftmost syllable of a word (19a, b). A NHR vowel may occur by itself in a stem, whether short (19c) or long (19d); stems of the former type do not occur in Oroqen. A NHR vowel may also be followed by non-NHR vowels; we provide examples involving a short NHR vowel in (19e, f); such stems are rare in Oroqen:

(19) Classical Manchu NHR vowels at the left edge of a word (Zhang 1996)

a.	pətʂ'ə	'colour'	*pitʂ'ə
b.	fəχələn	'short'	*fʊχələn
c.	tə-	'alight' (of birds)	
d.	təə	'cross' (a river)	
e.	mərin	'horse'	
f.	tʂ'əpan	'lever'	

In Classical Manchu, as in Oroqen, for [+round] to serve as a donor it must be preceded by another NHR vowel, as in (20a, b) (Zhang 1996; Zhang & Dresher 1996; Walker 2001). When a

stem has a single NHR vowel, short /ɔ/ or long /ɔɔ/, a needy suffix does not harmonize, as shown by the examples in (20c–f):

(20) Two-syllable requirement to initiate harmony in Classical Manchu

a.	pɔtʂ'ɔ-ŋgɔ	'coloured'	*pɔtʂ'ɔ-ŋga
b.	fɔχɔlɔ-qɔn	'somewhat short'	*fɔχɔlɔ-qan
c.	tɔ-na	'alight in swarm'	*tɔ-nɔ
d.	tɔɔ-na	'go to cross river'	*tɔɔ-nɔ
e.	mɔri-ŋga	'of a horse'	* mɔri-ŋgɔ
f.	tʂ'ɔpan-la-	'lift with a lever'	*tʂ'ɔpan-lɔ-

We offer an elaboration of the nature of the two-syllable requirement across Manchu-Tungusic languages in terms of copying from a non-initial stem vowel in section 5 below. What we wish to call attention to here is that Classical Manchu clearly shows that a single /ɔ/ or /ɔɔ/ do not trigger stem-to-suffix [round] harmony. Therefore, the existence of stem-internal harmony, as in (19a, b), must be due to a distinct process.

3. Rounding harmony in Baiyinna Oroqen: Li (1996) and Walker (2014)

We turn now to a different analysis of round harmony, proposed by Walker (2014), building on Li's (1996) account of harmony in Baiyinna Oroqen. Li (1996) considers that round harmony applies within stems as well as from stems to suffixes. He thus interprets the stems in (21) as involving stem-internal harmony triggered by a single initial short NHR vowel. In (21), an initial short /o/ or /ɔ/ is followed by another /o/ or /ɔ/ within the stem; it may not be followed by /ə/ or /a/:[10]

(21) Stem-internal harmony in Oroqen following a short NHR vowel

a.	tʃolpon	'morning star'	*tʃolpən
b.	gɔlɔɔ	'log'	*gɔlaa

In contrast to such cases, Li (1996) proposes that round harmony in Baiyinna is not triggered by a long NHR vowel; compare the examples in (21) with (22a). The long /ɔɔ/ in (22a) is followed by /a/, not /ɔ/. According to Li (1996), a long NHR vowel may not be followed by /ɔ/ or /o/ *except in loanwords*, such as (22b):[11]

(22) No stem-internal harmony in Oroqen following a long NHR vowel

a.	kɔɔŋakta-	'handbell'	* kɔɔŋɔktɔ-
b.	boodo-	'kitchen knife'	(*Chinese loanword*)

Walker (2014) proposes a formal account of Baiyinna Oroqen round harmony that builds on Li's (1996) analysis. She thus assumes that the same harmony mechanism applies both within stems and in stem-suffix sequences. Following Li (1996), she assumes that a single short NHR vowel can trigger harmony, but that a long one cannot. However, a long vowel can nevertheless transmit a [+round] feature if it is part of a continuous span that originates with a trigger, as shown schematically in (23). She concludes that trigger-target relations may be non-local, as in the last two suffixes in (23):

[10] Li (1996: 126) reports that sequences of *ɔ – a, ɔ – aa, o – ə,* and *o – əə* were not found in Baiyinna Oroqen. However, other sources report exceptions to this rule. ZLZ (1989) list six examples with *ɔ – a*, and Lulich & Whaley (2012) list one case of *ɔ – a* and one of *o – ə*. We discuss these exceptions below in section 4.

[11] Other such examples of Chinese loanwords are *woogoo* 'pumpkin', *moogo* 'mushroom', and *oopon* 'clay hut' (Hu 1986).

(23) Non-local transmission of round harmony in Oroqen (Walker 2014)

o	lAA	-wkAAn	-nA-	=	o loo -wkoon -no
[–high]	[–high]	[–high]	[–high]		*o loo -wkoon –nə
[+rnd]	[+rnd]	[+rnd]	[+rnd]		‘cook CAUS.PRES’

The idea that long vowels can pass on – but not initiate – harmony is found in Jurgec (2011) as well. Jurgec's model of vowel harmony involves nested binary domains with heads. For Baiyinna Oroqen, Jurgec (2011: 260–8) posits a constraint against a long vowel being the head of the outermost head of such domains (i.e., the main head, which in Oroqen is the initial syllable of the stem), but allows it to be the head of the outermost dependent. As such, it can pass along harmony, but not initiate it. Jurgec's model is inspired by the same interpretation of the data as Walker's analysis; we will look more closely at the relevant facts in section 4.

While trigger-target relations need not be local, Walker (2014: 510) nevertheless requires that round harmony ‘is local with respect to propagation; that is, harmony proceeds only among adjacent syllables’. In other words, a trigger can ‘see over’ intervening vowels that undergo harmony, as in (23), but not over a vowel that does not require the harmonic feature, as in (24). In (24), harmony cannot get past the suffix *–xi*, so the final suffix is realized as *–wə*, not *-*wo*:

(24) Non-local transmission of [+round] is blocked

bol	bA	xi	-wA	=	bol bo xi -wə
[–high]	[–high]	[+high]	[–high]		*bol bo xi -wo
[+rnd]	[+rnd]	[–rnd]	[–rnd]		‘wild duck DEF.ACC’

This kind of ‘non-local locality’ is a new approach to what otherwise looks like iterative harmony, and as it has not been explored with respect to a broad range of typological data within iterative harmony systems of the Tungusic, Turkic, Finno-Ugric, or Mongolic language families, it is necessary to consider whether indeed a wholly new model should be adopted. Specifically, the proposal that vowels that *undergo* harmony cannot themselves pass it onwards runs counter to the intuition developed in iterative harmony systems quite generally.

Consider, for example, nasal harmony, as broadly found in languages such as Maxakalí, where its productivity is confirmed by its application to loanwords (Wetzels 2009; Silva & Nevins 2015). Let us take as an example the loanword [pãnãmæ̃j] (from Brazilian Portuguese [flamẽgʊ] ‘a soccer team’). Given the hypothesis that nasality is a property of only the final, stressed nucleus, this comes from the underlying form /padabæ̃j/. In this language, as in many languages of the same type, iterative nasal harmony involves vowels and consonants, with all segments except voiceless stops undergoing a search-and-copy procedure for the feature [nasal]. The iterative harmony process for /padabæ̃j/ is thus as illustrated in (25), where segments unspecified for [±nasal] are indicated by capitals:

(25) Maxakalí iterative nasal harmony

a. Needy vowels and consonants unspecified for [±nasal]

p	A	D	A	B	æ̃	j̃
[–nasal]	[ ]	[ ]	[ ]	[ ]	[+nasal]	[+nasal]

b. /b/ (= B) finds and copies [+nasal] from vowel to its right

p	A	D	A	m	æ̃	j̃
[–nasal]	[ ]	[ ]	[ ]	[+nasal]	[+nasal]	[+nasal]

c. Copy of [+nasal] continues iteratively from right to left

p	ã	n	ã	m	æ̃	j̃
[–nasal]	[+nasal]	[+nasal]	[+nasal]	[+nasal]	[+nasal]	[+nasal]

First, the /b/ searches for [+nasal] from its right, finding /æ̃/ and copying from it, thereby turning into [m] (25b). Next, the /a/ searches for [+nasal] from its right, finding [m] and copying from it, thereby turning into [ã]; next, the /d/ searches for [+nasal] from its right, finding [ã] and copying from it, thereby turning into [n]; and finally, the leftmost /a/ searches for [+nasal] from its right, finding [n] and copying from it, thereby turning into [ã] (25c). This is the spirit of iterative nasal harmony: items which are not the underlying source of the harmonic feature nonetheless, by virtue of harmony, in turn *become* subsequent sources of the harmonic feature for other items that are further away from the underlying source.

Analyses of this sort have been applied to nasal harmony systems of South America as well as the [round] and [back] systems found across Eurasia, and given their broad typologically applicability and the fact that their properties are well-understood, should not be so easily discarded in favour of wholly new models that have not been tested on such a range of data.[12]

Importantly, the conflation of stem-internal and stem-to-suffix harmony that motivates the non-iterative analyses of Oroqen, on closer scrutiny is not so well-supported by the data. While one can see how the facts of Baiyinna Oroqen as set out by Li (1996) could lead Jurgec (2011) and Walker (2014) to this kind of analysis, a detailed review of the stem-internal data, as conducted below, leads us to different conclusions.

4. An alternative analysis of stem-internal harmony

Recall that Li (1996), Jurgec (2011), and Walker (2014) propose that a single short NHR vowel causes rounding in a following NHR vowel within a stem, but a single long NHR vowel does not. Therefore, words like *boodo-* in (22b) must be treated as exceptions to the regular pattern.

Let us adopt some terminology for these types of words for ease of reference. We will refer to types of stem-internal vowel patterns as set out in (26):

[12] Walker (2014) discusses Mọ̀bà Yoruba nasal harmony as another case in support of the non-local and non-iterative model. For this language, however, it can be shown that two distinct processes are at work: syllable-internal agreement and trans-syllabic nasal harmony between nuclei (see Ajíbóyè & Pulleyblank 2008 and Piggott & van der Hulst 1997 more generally for this distinction); in fact, Standard Yoruba has the former but lacks the latter. See Mascaró (2015) for further discussion of how the Mọ̀bà Yoruba pattern fails to exclusively support the non-local model of Walker (2014).

(26) Types of stem-internal vowel patterns with initial NHR vowel

a. Type O · O(O) are words with an initial short /ɔ/ or /o/ followed by a short or long /ɔ(:)/ or /o(:)/ in the second syllable; e.g., *gɔlɔɔ, tʃolpon*.
b. Type OO · A(A) are words with an initial long /ɔ:/ or /o:/ followed by a short or long /a(:)/ or /ə(:)/ in the second syllable; e.g., *kɔɔŋakta-*.
c. Type OO · O are words with an initial long /ɔ:/ or /o:/ followed by a short /ɔ/ or /o/ in the second syllable; e.g., *boodo-*.
d. Type O · I/U/E are words with an initial short /ɔ/ or /o/ followed by a high vowel or by /ɛɛ/ or /ee/; e.g., *ɔrki* 'to prick', *solgee* 'weasel'.
e. Type O · A are words with an initial short /ɔ/ or /o/ followed by a short /ə/ or /a/ in the second syllable (such words violate harmony); e.g., *tɔsa* 'peach'.
f. Type #(C)OC_0 are monosyllabic stems or words with a short /ɔ/ or /o/; e.g., *nɔŋ* 'corner'.

Li (1996) writes that words of Type OO · O (26c) are exceptional. There are several problems with this analysis, beginning with the fact that some account still needs to be given of such words: how does the second short round vowel get there? Moreover, to our knowledge there are no such exceptions in stem-to-suffix harmony: that is, there are no cases where an initial long vowel exceptionally causes a suffix vowel to harmonize. In fact, within a broader typology of exceptions in vowel harmony, Mahanta (2012) argues that while stem-internal harmony may show exceptional triggers and exceptional undergoers, two things are never found (Mahanta 2012: 1129): 'The two unattested patterns are exceptional non-triggers of harmony and exceptionally transparent vowels'. Nonetheless, in Walker's model, long round vowels would be exceptionally non-triggering and at the same time exceptionally transparent.

In sum, there are empirical differences in patterning within stems and in stem-suffix combinations that need to be accounted for. Moreover, patterns predicted by Walker's non-iterative theory with intervening long round vowels are otherwise unattested in typological overviews of harmony. We conclude that stems of the OO · O versus OO · A type are not consistent enough to be handled by the same mechanism as that of stem-to-suffix harmony. It is difficult to sustain the claim that OO · O patterns are exceptional simply because they are loanwords; moreover, although they may be less common than OO · A patterns, they are also found alongside other minor stem-internal patterns such as OO · I, whose presence cannot be explained either in terms of loanwords or vowel harmony.

Li (1996) does not provide evidence that loanwords like *boodo-* remain outside the native system. We do not know if speakers are aware that such words are special. Of course, there may be considerable variation in this respect (see Ito & Mester 1995 for discussion of the extent to which the lexicon may be stratified according to whether a set of loanwords patterns as an independent phonological group).[13] However, we do observe clear cases where Oroqen speakers adapt Chinese loanwords to fit a native phonological pattern. For example, all Oroqen words must meet a requirement that they have at least two moras: a long vowel in a monosyllable may or may not be followed by a consonant (27a), but a short vowel in a monosyllable must be followed by a consonant (27b):

[13] Li & Whaley (2009: 533) write, 'Chinese loans are found in all four dialects although only a small number of them are used in the northeastern dialect. This is expected since the northeastern dialect was impacted by the Chinese the latest in terms of intensity and time depth'. Thus, there may be differences in the extent of assimilation of such loanwords in Baiyinna (northeastern dialect) as compared with Xunke (southeastern).

(27) Oroqen bimoraic requirement

a. Monosyllables with long vowels		b. Closed monosyllables	
bii	'I'	bər	'bow'
muu	'water'	kat-	'reap'
əəm	'medicine'	tur	'soil'
dʒuur	'two'	ʊg-	'ride' (a horse)'

Zhang (1996: 176) remarks: 'The bimoraic requirement is not only observed in Oroqen native words, but also in the loanwords from Chinese'. According to Zhang (1996), when a Chinese word is an open syllable, it is borrowed in Oroqen as an open syllable with a long vowel (28a). If the Chinese word ends in a consonant, it is borrowed with a short vowel in Oroqen (28b). This shows that vowel length can be adjusted to make a word fit the native pattern:[14]

(28) Oroqen bimoraic requirement imposed on Chinese loanwords

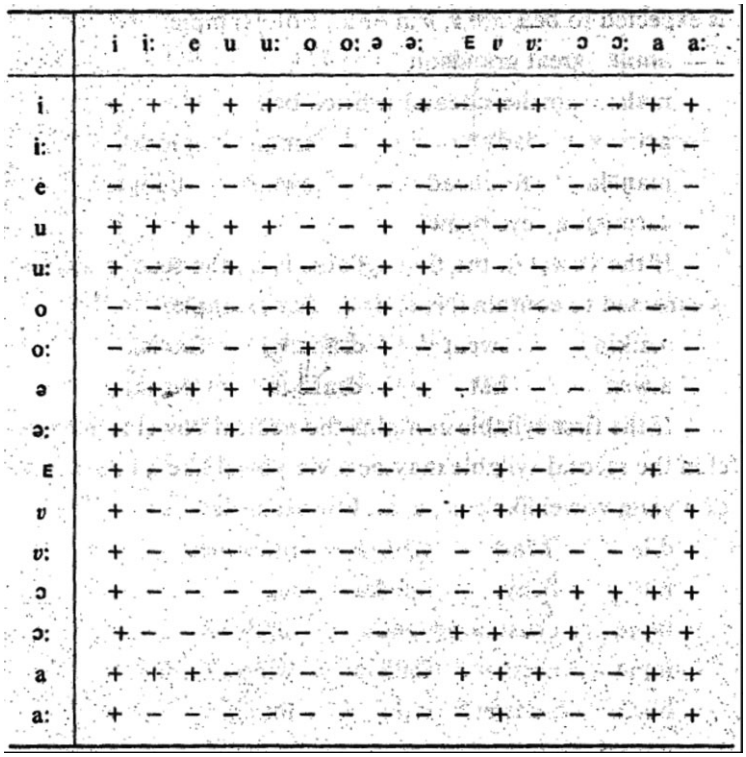
a. Monosyllables with long vowels			b. Closed monosyllables		
Chinese	Oroqen	Gloss	Chinese	Oroqen	Gloss
la	laa	'candle'	gang	gaŋ	'steel'
mu	muu	a Chinese unit	cun	tʃun	a Chinese unit
wa	waa	'tile'	sheng	səŋ	'province'

These patterns of loanword incorporation for other phenomena in Oroqen suggest that there is no obvious reason to take Oroqen stems with a loan source as necessarily excluded from consideration in determining whether harmony applies. Thus, the fact that *boodo-* 'kitchen knife' (22b) shows stem-internal harmony is not so easily chalked up to the fact that it is a loanword. Walker's (2014) proposal, of course, depends on the claim that Type OO · A(A) words like *kɔɔŋakta-* 'handbell' (22a) are regular (where long vowels cannot transmit round harmony). In tandem, therefore, it must assert that Type OO · O stems, as in *mooro-ro* 'moan PRES.TNS' (3c), which contravene the claim about OO as a non-source of round harmony, are exceptional. There is no evidence, however, that the mechanism of stem-to-suffix harmony in OO · O stems is any different from that in O · OO stems.

Consider now Figure 2, a table that appears in ZLZ (1989: 20). It lists 'the possible vowel sequences that may occur in the first and second syllable of the root of a word'. Vowels in the first column are in first position, and vowels across the top are in second position (for example, the sequence *i – i:* occurs, but **i: - i* does not). ZLZ (1989) take a more permissive approach to possible stem-initial vowel sequences than do Li Bing and Zhang Xi in their subsequent work (Zhang 1995, 1996; Li 1996). It shows that long /o:/ may be followed by an /o/ as well as by /ə/, not marking these words as having special status. Similarly, it shows long /ɔ:/ able to be followed by /ɔ/, as well as by /a/ and /a:/.

This table indicates the sequences observed in the data, however rare; it does not provide numbers or relative frequency. Fortunately, ZLZ (1989) includes a vocabulary list of 1,034 items (1,016 words after removing some duplicates), which gives us more information about these sequences. This list includes twenty eight words whose first syllable has OO (/o:/ or /ɔ:/). Of these, seven are Type OO · A(A) (29a) and five are Type OO · O (29b). The other words with first syllable OO include seven monosyllables, and nine words with OO followed by a high vowel or by /e:/ or /ɛ:/. These figures are summarized in the table in (30):

[14] Additional examples illustrating the bimoraic requirement can be found in the Appendix, where there are eight examples of monosyllabic stems ending in *ɔɔ* or *oo*, but none that end in *ɔ* or *o*.



	i	i:	e	u	u:	o	o:	ə	ə:	ɛ	ʊ	ʊ:	ɔ	ɔ:	a	a:
i	+	+	+	+	+	−	−	+	+	−	+	+	−	−	+	+
i:	−	−	−	−	−	−	−	+	−	−	−	−	−	−	+	−
e	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−
u	+	+	+	+	+	−	−	+	+	−	−	−	−	−	−	−
u:	+	−	−	+	−	−	−	+	+	−	−	−	−	−	−	−
o	−	−	−	−	−	+	+	+	−	−	−	−	−	−	−	−
o:	−	−	−	−	−	+	−	+	−	−	−	−	−	−	−	−
ə	+	+	+	+	+	−	−	+	+	−	−	−	−	−	−	−
ə:	+	−	−	+	−	−	−	+	−	−	−	−	−	−	−	−
ɛ	+	−	−	−	−	−	−	−	−	−	+	−	−	−	+	−
ʊ	+	−	−	−	−	−	−	−	−	+	+	+	−	−	+	+
ʊ:	+	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+
ɔ	+	−	−	−	−	−	−	−	−	−	+	−	+	+	+	+
ɔ:	+	−	−	−	−	−	−	−	−	+	+	−	+	−	+	+
a	+	+	+	−	−	−	−	−	−	+	+	+	−	−	+	+
a:	+	−	−	−	−	−	−	−	−	−	+	−	−	−	+	+

Figure 2. Distribution of NHR vowels in stems (ZLZ 1989: 20). The table shows the possible vowel sequences that may occur in the first and second syllable of the root of a word. Vowels in the first column are in first position, and vowels across the top are in second position. Note that 'ɛ' = ɛ, and 'ʊ' = ʊ.

(29) Comparison of Type OO · A(A) and Type OO · O

a. Type OO · A(A)

kɔ:kan	'child'
tɔ:lga	'pillar'
dɔ:la:	'inside'
nɔ:da:	'to give up, let go'
ɔ:ŋkar	'certainly'
ko:rgə	'bridge'
o:ŋkəki	'horizontal'

b. Type OO · O

mɔ:tçɔn	'difficulty'
mɔ:rɔ	'to bleat' (an ox or cow)
ko:to	'knife, sword'
mo:go	'mushroom, fungus'
mo:ro	'to moan'

(30) Numbers of words in ZLZ (1989) with initial long NHR vowel

Type	Number
OO · A	7
OO · O	5
OO (monosyllable)	7
OO · I/E	9

Type OO · O is the smallest group, but not by much. We conclude that the numbers do not support the notion that Type OO · O is anomalous while Type OO · A(A) is regular.[15]

Given a total of twelve relevant cases with OO in the first syllable, the fact that seven of twelve are disharmonic does not statistically constitute evidence that this is the default pattern and that harmonic forms are exceptional.[16] On the other hand, no sources we have found provide evidence for (or discussion of) suffixes that exceptionally fail to undergo rounding harmony under idiosyncratic conditions, or of stems that exceptionally fail to trigger harmony in suffixes. This is a clear indication that suffixal harmony is to be held separately from stem-internal harmony (where the latter may not be the result of harmony as such, but rather are governed by a set of morpheme structure constraints, to which we return below).

Another problem for stem-internal round harmony initiated by a single short NHR vowel is that, within stems, we sporadically find short /ɔ/ followed by /a/, which is not consistent with any harmony approach to stem-internal patterns. (Recall that Walker (2014), in constructing the argument that long /oo/ cannot transmit harmony, juxtaposes it with short /o/, which is said to transmit harmony). The numbers in ZLZ's vocabulary list for all words starting with short O (/o/ or /ɔ/) are shown in (31):

(31) Stem-Internal vowels following short O

	Type	# of words
a.	O · O	60
b.	O · OO	10
c.	O · I/U/E	9
d.	O · A	6
e.	#(C)OC_0	1

Types O · O (31a) and O · OO (31b) are the expected types, but the other types are still found.[17] Zhang (1995, 1996), following Hu (1986), who worked in Alihe (Central Oroqen), proposes a constraint that a short initial /o/ or /ɔ/ must be followed by another NHR vowel. This constraint is a morpheme structure condition (MSC), and rules out the remaining three types: O followed by a high vowel or E (31c), O followed by A (31d), and O in a monosyllabic stem (31e). In the low vowels, it has the same effect as a rule of stem-internal round harmony triggered by initial O. But round harmony alone, which only applies to non-front non-high vowels, would not account for the rarity of Type O · I/ U/E or of Type #(C)OC_0 (O in a monosyllabic stem or word).

Zhang (1995) points out, as is evident in (31c–e), that some exceptions to this MSC can be found in ZLZ (1989) (such exceptions occur only with /ɔ/, not /o/). The point is that we need MSCs (alternatively called licensing conditions) to account for a variety of tendencies and restrictions that govern vowel distribution within stems. We need an MSC to account for why NHR vowels must normally occur in initial position if they occur anywhere in a stem, and we

[15] The comparison in the text involves the patterns reported in a single source, ZLZ (1989), rather than summing the number of patterns found in the Appendix, which would potentially conflate across distinct sources, dialects, and time-periods of data collection; see also footnote 13 for discussion of dialect differences with respect to Chinese loanwords. For example, an additional set of OO · A forms are found in Lulich & Whaley (2012), but they include the stem+suffix combinations *o:tʃə* 'he descended' and *ɔ:tʃa* 'he did/made'. As our focus is on comparing the relative numbers of harmonizing forms in stem-internal sequences within a single list, we do not include them here. They can be found, however, in our synoptic comparison of lists in the Appendix.

[16] In a Fisher's exact test, a distribution of 7 non-undergoers and 5 exceptional undergoers is not different from the chance distribution ($p > 0.05$).

[17] The low number of forms with long OO is consistent with the overall rarity of long vowels in general. Of the 1,016 words in the ZLZ word list, 149 (14.7%) begin with a long vowel, and 867 (85.3%) begin with a short vowel. Of 937 words that have a vowel in second position, 111 (11.8%) have a long vowel, and 826 (88.2%) have a short vowel.

need an MSC to account for why Types O · I/U/E and #(C)OC$_0$ are relatively rare. The very similar rarity of Type O · A should be handled in the same way. A few of these MSCs are summarized in (32), which in fact could be formalized for all of the '-' cells in Figure 2:

(32) Stem-internal MSCs in Oroqen
  a. A non-initial NHR vowel must be preceded by another NHR vowel.
  b. A short initial NHR vowel must be followed by another NHR vowel.
  c. A long initial NHR vowel may not be followed by another NHR vowel.

Statements like (32) are based on the co-occurrence restrictions observed in stems, as summarized in Figure 2. Naturally some of these allow exceptions, as seen in (31). The nature of these exceptions can be handled in a variety of approaches to lexical exceptions (e.g. Zuraw 2010), but whatever their implementation, they stand in stark contrast to the pattern of suffixal harmony, which is exceptionless, and thereby governed by the single iterative search-and-copy mechanism proposed in (17).[18]

To summarize, we have argued that one should distinguish between stem-to-suffix round harmony, which is the same in the languages we have looked at (Xunke and Baiyinna Oroqen and Classical Manchu) – and indeed typologically parallel to iterative harmony systems overall – versus stem-internal co-occurrence restrictions, which may differ in their details across these languages, or even from speaker to speaker. In fact, MSCs like these are arguably the most likely to vary across dialects, given that they must be encoded as a set of statistically-supported distributions over static stems, whereas, based on the available evidence, we contend that the stem-to-suffix harmony is invariable across dialects. Mascaró (2015) reaches a similar conclusion within Optimality Theory, arguing that stem-to-suffix harmony and the distribution of stem-internal round vowels arise from two distinct constraints.

Mascaró's conclusion, as well as our own, support an analysis that does not suffer from what is commonly referred to as the 'Duplication Problem' (Kenstowicz & Kisseberth 1977). The term refers to cases where static MSCs and dynamic rule-governed alternations state the same, or similar restrictions, thereby apparently missing a significant generalization. An example is the fact that English monomorphemes such as **apd* are not found (compare *apt*); a MSC that rules out a cluster consisting of a voiceless obstruent followed by a voiced obstruent appears to duplicate the work done by the rule that devoices the past tense suffix in *wrapped* (/ræp + d/→ [ræpt]). The Duplication Problem is in fact not a problem, once evidence can be found that the two may decay or show exceptions along different lines, as is clear in many harmony systems (see also Anderson 1974: ch. 16). Indeed, discussions of vowel harmony within frameworks such as Lexical Phonology (Kiparsky 1982) explicitly distinguish stem-level from word-level restrictions on otherwise similar processes.

In sum, if we treat the stem-internal distributional facts with MSCs – arguably necessary given their tapestry-like distribution, in stark opposition to that of suffixal behaviour – we can preserve a straightforward local harmony mechanism in which harmony undergoers (e.g. long NHRs) are not distinct from sources, and indeed iteratively pass along [+round] to the next eligible vowel.

5. A NEW INTERPRETATION OF THE 'BISYLLABIC TRIGGER CONDITION'

There is one respect in which our round harmony rule is not entirely simple. Recall the forms in (20) from Classical Manchu, which clearly illustrate the odd restriction that harmony only

[18] Many similar cases of partially overlapping but distinct treatments of heteromorphemic versus stem-internal vowel co-occurrence restrictions can be found in the literature; for example, Mahanta (2012: sec. 4.2) notes that while the distribution of [+ATR] and [–ATR] *across* morphemes is quite regular in Assamese according to rules of regressive harmony, stems themselves are not to be handled this way, though 'there is tacit avoidance of words with sequences of [e … o] in the root'.

occurs when [+round] is anchored in two successive syllables. For example, there is no harmony in (20c) *tɔ-na* 'alight in swarm' (**tɔ-nɔ*) or in (20d) *tɔɔ-na* 'go to cross river' (**tɔɔ-nɔ*), but harmony is obligatory in (20a) *pɔtʂ'ɔ-ŋgɔ* 'coloured' (**pɔtʂ'ɔ-ŋga*). This 'bisyllabic restriction' affects both long and short vowels in Classical Manchu. The same restriction is observed in Oroqen, though only long vowels can appear in the relevant contexts.

Walker (2014) calls attention to the behaviour of some exceptional NHR vowels in Baiyinna Oroqen discussed by Li (1996). There are two types of cases in which NHR vowels *can* occur in the middle of a word without being preceded by another NHR vowel, in violation of the otherwise regular generalization stated in (32a).

First, certain exceptional suffixes, such as *-nɔr* in (33), have a NHR vowel no matter what other vowels precede them:[19]

(33) Exceptional NHR suffix (Li 1996: 139)
ətʃəxə-nɔr 'paternal uncles'

This is an exceptionally non-needy suffix; see also footnote 6 for the locative suffix. As noted above in section 4, we claim that what crucially does not exist are exceptional non-triggers. An example would be if a word like *ɔlɔ* 'fish' (2d) would exceptionally not cause rounding in suffixes. In the framework of Nevins (2010) this asymmetry between exceptionally non-needy suffixes and exceptional non-triggers is easy to capture, for the following reason. Neediness is lexically marked, and thus the suffix *-nɔr* is simply already specified as [+round], with no need to search-and-copy. On the other hand, there *is* no way to lexically specify 'the ability to be copied from'. Conditions may certainly be imposed on whether a [+round]-bearing vowel may be copied from (e.g. its height, its positioning within the stem, etc.), but none of these may be lexically specified for individual lexical items; there is no way to do so on the target-centered approach to harmony.

Second, among the disharmonic loanwords that have entered the language are some that have a word-internal NHR vowel that is preceded by a non-NHR vowel (34). These words violate the MSC in (32a):

(34) Disharmonic loanword with exceptional NHR vowel (Li 1996: 133)
kinɔ- 'film' (Russian)

As if these NHR vowels were not exceptional enough, they show another, even more unexpected, property that we contend is fundamental to understanding their status. An exceptional NHR vowel that is not preceded by another NHR vowel *does* act as a round harmony donor to a needy vowel in a following syllable. Li's discussion suggests that harmony occurs regularly in such cases (35):

(35) Round harmony following an exceptional NHR vowel
ətʃəxə-nɔr-wɔ-t 'paternal uncles DEF.ACC'
kinɔ-wɔ 'film DEF.ACC'

This fact leads us to ask: Why do exceptional NHR vowels pattern with bisyllabic sequences and not with single stem-initial NHR vowels? The generalization is stated in (36):

[19] Li (1996: 140) specifies that this suffix is non-alternating in Baiyinna Oroqen. He notes that the suffix is alternating in Xunke Oroqen, according to ZLZ (1989). According to Hu (1986), in Gankui (what we have been calling Central Oroqen) it is non-alternating in the speech of older speakers, but alternating in that of younger speakers. For more on this suffix see Li & Whaley (2009: 539–40); they propose that it is a borrowing from Dagur, a Mongolic language, with which Oroqen was long in contact.

(36) Generalization about NHR harmony donors
In all cases, a needy suffix vowel obtains [+round] from the closest NHR vowel that is *not stem-initial*.

A constraint that initial vowels may not be harmony donors appears to be particularly odd in a language family where bearers of the harmonic feature are normally restricted to stem-initial and adjacent positions. But perhaps these facts are connected; it could be that the non-initiality condition has its origins in the particular historical distribution of NHR vowels in the Manchu-Tungusic languages. Whatever the explanation turns out to be, it remains to revise our condition on stem-to-suffix harmony in these languages; we thus replace the formulation in (17b) with (37):

(37) Stem-to-suffix round harmony: condition on harmony donors
[+round] must be supplied by a non-high vowel that is not stem initial.

This condition unifies the bisyllabic requirement with the otherwise surprising facts in (35) that 'exceptional' non-initial round vowels indeed pass along harmony. It can be added to the set of conditions on donors developed in Nevins (2010: ch. 5), where morphologically-based requirements are added as additional conditions above and beyond the relativization of search to specific feature-value types.

6. Conclusions

We have proposed that stem-to-suffix rounding harmony should be distinguished from stem-internal co-occurrence restrictions. The former operates in the same manner in Baiyinna Oroqen, Xunke Oroqen, and Classical Manchu, whereas the latter vary in their details from one dialect to another. Moreover, the former is regular and the latter has exceptions. We have argued that these patterns suggest that stem-to-suffix rounding harmony is a phonological rule, whereas stem-internal co-occurrence restrictions are governed by morpheme structure constraints (MSCs). Once we make this basic distinction, the motivation for a non-iterative and non-local mechanism for the propagation of harmony disappears. More generally, we need not distinguish between harmony donors and undergoers in these languages; suffixal vowels that acquire harmony in words such as *oloo-wkoon-no* in (23) are in turn the ones that iteratively pass it along.

A closer look at the stem-internal co-occurrence patterns in Oroqen reveals that what may at first appear to be dialect differences between Bayinna and Xunke Oroqen are actually differences in interpretation between Li (1996) and Zhang (1995, 1996) as to whether particular co-occurrence patterns are exceptions to a MSC that rules them out, or simply happen to be relatively rare patterns. Like the integration of loanwords, we might expect considerable variation in these details from dialect to dialect and even from speaker to speaker. Thus, there may well be genuine dialect-level differences between Baiyinna and Xunke with respect to some of these MSCs, but not to the extent of requiring different types of theoretical mechanisms or representations.

With respect to the condition on harmony donors, we have shifted the focus of explanation from 'Why does Oroqen suffixal harmony have a two-syllable requirement?' to 'Why does it have a requirement on copying from non-initial vowels?', which no doubt leads to further questions and research. This revision amounts to an improvement on previous models: it is a condition on individual [+round]-bearing vowels as possible donors, rather than being some kind of constraint on whole stems. Indeed, the bisyllabic requirement was unique among all other requirements found in vowel harmony systems in referring to a global property of the whole stem, which (37) does away with.

We have also shifted the focus from 'Why must [+round] be docked within two moras in the stem?' to 'How much systematicity is there to the MSCs (or their licensing equivalents) in the stem?' This is a question that can be formulated in terms of specific matrices of comparison, in a manner similar to what has been pursued for more well-studied cases of partial systematicity, like the constraints on root-internal consonantal MSCs in Semitic studied from Greenberg (1950) to Pierrehumbert (1993) to Berent & Shimron (2003). In the Appendix, we provide exactly such a panoptic matrix of the existing state of knowledge on such root-internal combinatorics, comparing the vowel co-occurrence patterns as extracted from six different existing sources on Oroqen.

In providing a new focus on the extent to which stem-internal vowel-cooccurrence MSCs hold (as distinct from the regularly governed stem-to-suffix harmony), we thus pave a connection between the Oroqen patterns and much broader research on whether speakers of Turkic, Tungusic, and Mongolic languages are sensitive to static patterns in the lexicon, as examined in a range of prior work such as Zimmer (1969)[20] and Harrison & Kaun (2000, 2001). In turn, these are related to the more general question of the extent to which learners generalize from stem-level static patterns of harmony towards word-level, alternation-generating processes of morpheme-to-morpheme harmony – or vice-versa.

B. Elan Dresher
Department of Linguistics
University of Toronto
Toronto, Ontario M5S 3G3
Canada
Email: dresher@chass.utoronto.ca

Andrew Nevins
Department of Linguistics
University College London
London WC1N 1PF
United Kingdom
Email: a.nevins@ucl.ac.uk

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[20] Zimmer (1969) studied Turkish speakers' knowledge of MSCs within roots, including the 'harmony'-like pattern among consonant-vowel sequences including labial [m]. He found that violations to this particular MSC pattern were much more highly rated than comparable violations to harmony, which speakers strongly disliked.

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APPENDIX: STEMS WITH /ɔ/, /ɔ:/ = /ɔɔ/, /o/, /o:/ = /oo/

ZLZ = Zhang, Li & Zhang (1989) vocabulary list; *Li* = the Baiyinna forms in Li (1996); *Hu* = Hu (1986);[21] *WGL* = Whaley, Grenoble & Li (1999) Appendix B; *L&W09* = Li & Whaley (2009) loanwords list; *L&W12* = words in Lulich & Whaley (2012).

Type categories:

1 = *ɔ - ɔ* 2 = *ɔ - ɔɔ* 3 = *ɔ - i/ʊ/ɛ* 4 = *ɔ - a* 5 = *ɔ* solo.
6 = *ɔɔ - ɔ* 7 = *ɔɔ - a(a)* 8 = *ɔɔ - i/ʊ/ɛ* 9 = *ɔɔ* solo
10 = *o - o* 11 = *o - oo* 12 = *o - i/u/e* 13 = *o - ə* 14 = *o* solo.
15 = *oo - o* 16 = *oo - ə(ə)* 17 = *oo - i/u/e* 18 = *oo* solo
19 = *ɔ(ɔ)* non-initial 20 = *o(o)* non-initial

Type	*Gloss*	*ZLZ*	*Li*	*Hu*	*WGL*	*L&W09*	*L&W12*	*Source*
1	animal's spring hair	ɔmɔri						
1	armpit	ɔŋɔni						
1	Autumn	bɔlɔ	bɔlɔ	bɔlɔ				
1	beans	bɔrtɐɔ		bɔrtʃɔ				
1	bed	ɔrɔ		ɔrɔ				
1	black	kɔŋɔrin	kɔŋnɔrın	kɔŋnɔrin	kɔŋɔrın			
1	blind in one eye	tɐɔkɔr						
1	boat	mɔŋgɔ	mɔŋkɔ					
1	by the side of	ɔldɔndʊn						
1	cripple	dɔkɔlɔn						
1	cup[22]	tɐɔmɔ		tʃɔmɔ				
1	deaf	kɔŋgɔ						
1	December	ɔrɔn						
1	far	gɔrɔ	gɔrɔ-	gɔrɔ	gɔrɔ			
1	fierce[23]	kɔrɔtɐi						
1	fire	tɔgɔ, tɔ:	tɔɣɔ	tɔgɔ	tɔ:			
1	fish	ɔlɔ	ɔlɔ	ɔlɔ	ɔlɔ			
1	fish skin		sɔbgɔ					

[21] Forms in Hu (1986) are as cited in Zhang (1995, 1996), or were kindly provided to us by Zhang Xi.
[22] Zhang (1995) has *tɐomo* 'wine cup'.
[23] Zhang (1995, 1996) have *kɔrɔ* 'terrible'.

Type	*Gloss*	*ZLZ*	*Li*	*Hu*	*WGL*	*L&W09*	*L&W12*	*Source*
1	gloves	kɔkkɔrɔ						
1	grandson	ɔmɔlɛ	ɔmɔliɛ	ɔmɔlɛɛ				
1	grass; hay	ɔrɔktɔ	ɔrɔktɔ	ɔrɔktɔ	ɔrɔktɔ			
1	halfway up the mountain	kɔldɔkɔ						
1	kidney[24]	bɔɛɔgdɔ		bɔʃɔktɔ				
1	knot in wood; hunchback	bɔkɔgdɔ		bɔkɔktɔ				
1	night	dɔlbɔ	dɔlbɔ	dɔlbɔ	dɔlbɔ			
1	nose	ɔŋɔktɔ		ɔŋɔktɔ	ɔŋɔktɔ			
1	official	nɔjɔn						
1	one-year-old bear	ɔjɔkɔr						
1	one-year-old deer	lɔrbɔdɔ						
1	one-year-old horse	ɳɔkɔn						
1	Oroqen	ɔrɔtɛɛn						
1	peanut	lɔkɔtɛɔn		lɔkɔʃɔn				
1	pheasant[25]	kɔrgɔl		kɔrgɔl				
1	ramie	ɔnɔgdɔ						
1	reindeer		ɔrɔn					
1	road	ɔktɔ		ɔktɔ	ɔktɔ		ɔktɔ	
1	ship					pɔrɔkɔʃ		*Russian*
1	stone	dzɔlɔ	dʒɔlɔ	dʒɔlɔ	dʒɔlɔ			
1	swamp		ɔrmɔk					
1	the Big Dipper	dɔrɔn						
1	to catch up		bɔsɔn					
1	to fill[26]	ɛɔkɔ		ʃɔkɔ				
1	to forget	ɔmŋɔ						
1	to graze		gɔrɔr					
1	to hang	lɔkɔ	lɔxɔ	lɔkɔ				
1	to limp		tɔxɔlɔk					
1	to make use of	tɔkɔra						

[24] Zhang (1995) has *botɛɔgdɔ*.
[25] Zhang (1995) gives the suffixed form *kɔrɔgɔ-*.
[26] Zhang (1995) transcribes *sɔkɔ-*.

Type	*Gloss*	*ZLZ*	*Li*	*Hu*	*WGL*	*L&W09*	*L&W12*	*Source*
1	to pound		tʃɔmə-					
1	to rub with hands	tɔmkɔ		tɔŋkɔ				
1	to scent; smell	ŋɔkɔr			ŋɔxɔ-			
1	to think; consider	bɔdɔ	bɔdɔ					
1	to unfold; spread	ɐɔgdɔ						
1	to watch; guard	ɔtɔ						
1	to weep; cry	ɐɔŋɔ	sɔŋɔ	ʃɔgɔ				
1	to wither away	ɔlgɔl		ɔlgɔ				
1	upper part of a mountain	ɔlɔŋida						
1	upper reaches (of a stream)	ɐɔlɔ		ʃɔlɔ				
1	when	kɔdɔ						
1	wild boar	tɔrɔki	tɔrɔxɪ	tɔrɔki				
1	window[27]	tɐɔŋkɔ		tʃɔŋkɔ		tʃɔŋkɔ		*Chinese*
1	wound[28]	kɔrɔ						
2	dull				mɔmɔː			
2	fatty meat (of deer)		ɔmɔɔŋ					
2	ice[29]				ɔmɔːksɔ			
2	log		gɔlɔɔ					
2	monkey	mɔŋɔː		mɔɳɔɔ				
2	rocky hillock		ɔpɔɔ					
2	span	tɔŋɔːr						
2	top; surface		ɔrɔɔn					
2	walk across a river			ɔlɔɔ				
2	young	dʑɔlɔː		dʒalaw				
3	animal's winter hair	lɔgdi						
3	breast[30]				ɔxun			
3	cloud-shaped design		tʃɔlɪk					
3	door-bar/bolt	jɔkʊŋ						

[27] Zhang (1996) transcribes this as *tɐoŋko*.
[28] To this type (*ɔ* - *ɔ*) Zhang (1996) adds *ɔlɔ-* 'surprise' and *ɔrɔdɔkin* 'hill top'.
[29] *ZLZ* list *umukɐu*.
[30] *ZLZ* list 'breast, mama' as *ukun*. *WGL* have several cases of *u* in RTR contexts.

Type	*Gloss*	*ZLZ*	*Li*	*Hu*	*WGL*	*L&W09*	*L&W12*	*Source*
3	flame		ɔxɪxan					
3	manure	ɔrikta						
3	middle finger	dəlgʊ						
3	rib	ɔwʊtila						
3	star[31]	ɔɐikta		ɔɔʃikta	ɔ:ʃɪkta		ɔʃɪkta	
3	to begin	ɔkiŋal						
3	to prick	ɔrki						
3	valley/pit[32]						kəŋdɪ	
4	five-year-old horse	tɔŋlan						
4	forest						məʃa	
4	fox	ɐəlaki						
4	gem; precious (stone)	bəbaj						
4	grey	ɔlan						
4	old (thing)				gɔrapti			
4	peach	tɔɐa						
4	wives of brothers[33]	ɔjalɛ						
5	corner	nɔŋ						
5	how				wɔn			
5	think				dʒɔn-			
6	difficulty	mɔ:tɐɔn						
6	gold					dʒɔ:lətʊ		*Russian*
6	to bleat (of an ox or cow)	mɔ:rɔ						
7	certainly	ɔ:ŋkar						
7	child	kɔ:kan	kɔɔxan	kɔɔkan	kɔ:xan			
7	container for sewing stuff		ɔɔxa/ɔɔsa					
7	dust					tɔ:rag		*Mongolian*
7	hail		bɔɔna					
7	hand-bell		kɔɔŋakta					
7	he did/made						ɔ:tʃa	

[31] Li (1996) gives Xunke *ɔɔʃikta*.

[32] Zhang (1995) has *kooŋde* 'pit' (transcribed as *kooŋdee* in Zhang 1996); on the length of the non-high front vowels, see footnote 3.

[33] Zhang (1995: 170 n. 13) reports that *ZLZ* have *ɔlaa* 'loose'; in their word list, however, they list 'loose' as *ɐɔla:*.

Type	*Gloss*	*ZLZ*	*Li*	*Hu*	*WGL*	*L&W09*	*L&W12*	*Source*
7	inside	dɔ:la:			dɔ:lɪn			
7	mountain pass		ɔɔŋan					
7	owl		ɔɔŋmakta					
7	pillar; pole supporting a coffin	tɔ:lga	tɔɔlga					
7	skin (on a deer's legs)		ɔɔxa					
7	to give up; let go; throw[34]	nɔ:da:		nɔɔdaa				
8	bullet	mɔ:lɛn		mɔɔlɛɛn				
8	cartridge		mɔɔlɪɛ					
8	convention; custom		kɔɔlɪ					
8	he; she	nɔ:nin	nɔɔnɪn		nɔ:nin			
8	how many[35]	ɔ:ki		ɔɔkɪɪ				
8	in the past; ago[36]	ŋɔ:wʊdʊ						
8	key	jɔ:kʊ						
8	large intestines		ɔɔmɪ					
8	often	ɐɔ:ti						
8	radish	lɔ:bʊ						
8	they	nɔ:rtin						
8	to hear; listen[37]	dɔ:ldi			dɔldɪ-			
9	firewood; wood	mɔ:	mɔɔ					
9	policy		gɔɔl					
9	thigh/ham						ɔ:	
9	to bark	gɔ:		gɔgɔ				
9	to crouch; to huddle (of dogs)	tɔ:d	tɔɔd					
9	to do; make; write	ɔ:	ɔɔ	ɔɔ				
9	to sharpen with a knife		kɔɔ					
9	tree	mɔ:	mɔɔ	mɔɔ	mɔ:			
9	wine pot[38]		kɔɔ					

[34] Zhang (1996) lists another example in the category of *ɔ:* followed by a nonhigh nonround vowel, *ɔɔjalɛɛ* 'sisters-in-law'. *WGL* list *dɔ:ntə-* 'freeze', with otherwise unattested *ɔ: - ə*. The Tungusic cognates are *doŋoto*.

[35] Zhang (1996) transcribes *ɔɔkii*.

[36] Compare Zhang (1995, 1996) *nɔɔdʊ* 'before'.

[37] The first vowel in the Tungusic cognates in *WGL* have a long vowel. Another example of this type is *kɔɔsʊn* 'empty' (Zhang 1996).

[38] Zhang (1996) adds to this type *pɔɔ* 'cannon', from Chinese *pau*.

Type	*Gloss*	*ZLZ*	*Li*	*Hu*	*WGL*	*L&W09*	*L&W12*	*Source*
10	April	dojon		dojon				
10	bear		ɲoŋoxo					
10	carp; sardine			morgo				
10	green[39]				koho			
10	hazel		olkok					
10	lean (of meat); thin	joldo		joldo				
10	mattress		sokton					
10	morning star		tʃolpon					
10	other (person)	oŋto		oŋto	ɔŋtɔ			
10	pancake		owon					
10	pasture		somsok					
10	pasture		soŋkok					
10	round	toŋgorin		toŋgorin	tɔŋgulyɛ			
10	Shaman's hat		bomboŋkie					
10	silver	mowon	moɣon	mowon		moŋwon		*Dagur*
10	spherical[40]	bonborin						
10	strange		oŋtot					
10	to harness		dokto					
10	to swim; bathe	olbot	olbos	olbot				
10	wild duck[41]		bolboxi					
11	butterfly[42]	bolbo:te		bolbokon				
11	cupboard; wardrobe	koŋgo:						
11	false	olo:k		olook				
11	frail			oktoo				
11	muddy		sokkoo					
11	pumpkin; squash	wogo:		woogoo		wɔgwɔ		*Chinese*
11	to cook; boil	olo:l	oloo	oloo				
11	to lie; cheat[43]	olo:kit	olook	olookit				

[39] For 'green' *WGL* list also *tfuturm*; compare *ZLZ*'s *tɛuturin*.
[40] Zhang (1996) has *bomborin*.
[41] Also of this type: *ponto* 'deer' (Zhang 1995); *dombotʃi* 'to murmur' (Li 1996); and *bokoto* 'knob' (Zhang 1996).
[42] Zhang (1995) gives *bolbokon*.
[43] Li (1996) transcribes *olooxit*.

Type	*Gloss*	*ZLZ*	*Li*	*Hu*	*WGL*	*L&W09*	*L&W12*	*Source*
11	to rain heavily	oŋko:		oŋkoo				
12	kind of wild fruit		moliktə					
12	long[44]				gonum			
12	suck[45]				nopku-			
12	weasel[46]	ɕolge						
13	coin					toŋzər		*Chinese*
13	he is gathering[47]						koptərən	
15	chopping/kitchen knife		boodo	boodo				*Chinese*
15	knife; sword	ko:to		kɔtɔ				
15	motorbike		mooto					*Chinese*
15	mushroom; fungus	mo:go	moogo			mo:go		*Chinese*
15	to moan; groan	mo:ro		mooroo				
16	bridge	ko:rgə	koorgə	koorgə			ko:rgə	
16	chop[48]			doolɔə				
16	he descended						o:tʃə	
16	horizontal	o:ŋkəki						
16	thigh		ooməxi					
16	throat						ko:məkə	
16	velvet		oodən					
16	windpipe[49]		kooməxə					
17	cloth		boosu					
17	pond[50]			kooʃun				
17	to lose one's way[51]		toori-					
18	chin	dʑo:g						
18	February[52]	dʑo:		dʑoo				

[44] *ZLZ* list *ŋunum*.
[45] *WGL* list next to this another form *uxun-*; cf. *ZLZ ukun* 'milk'.
[46] Zhang (1995) has *solge* 'yellow weasel'.
[47] Zhang (1995: 170 n. 13) cites *ZLZ* as having *goŋnə* 'to manage'. We cannot find this form in their wordlist, it may appear elsewhere in the text.
[48] Zhang (1996) lists *doo-* 'mince (meat)'.
[49] Of this type Zhang (1996) also has *poosə* 'winnowing fan'.
[50] Zhang (1996) has *koosun*.
[51] To this type Zhang (1996) adds *oorin* 'all'.
[52] Zhang (1996: 174) cites Han & Meng (1993) as giving *dʑɔɔ*.

Type	*Gloss*	*ZLZ*	*Li*	*Hu*	*WGL*	*L&W09*	*L&W12*	*Source*
18	October	dʑɔ:n		dʑoon				
18	slave		bool					
19	dry[53]				algɔxın			
19	film		kınɔ					*Russian*
19	to broadcast		guaŋbɔ-					*Chinese*
19	to report		xuibɔɔ-					*Chinese*
20	grape					puto		*Chinese*
20	I am tired						ə:rtʃow	
20	to attack		dʒiŋgoŋ-					*Chinese*
20	to discount		xujko-					*Chinese*

[53] Compare *ZLZ* and *Hu ɔlgɔ-* 'to wither away', and Zhang (1996) *ɔlgɔɔ-* 'to dry'. *WGL* list the Northwest Tungusic (Solon, Literary Evenki and Negidal) cognates of this form as all being *olgo-*, which suggest that we would expect *ɔlgɔ-* here.