Dark secrets of Hungarian vowel harmony

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This is a descriptive paper: we discuss some lesser-known or hitherto unnoticed subregularities of an extremely well-known phenomenon (Hungarian backness harmony) which, in our view, defy insightful analysis based on the standard assumptions and (representational or computational) devices of derivational phonology and Optimality Theory. The paper is negative in the sense that while we can identify the problems, we will not be offering a solution. Nevertheless the paper is positive at the same time in that it is intended to celebrate the indomitable spirit, curiosity and intellectual restlessness of a great linguist who loved problems of this kind.

1. Introduction

Hungarian shows many symptoms of an agglutinating-type language, with a large number of affixes. A few of these affixes are prefixes, which do not exhibit allomorphy, most of them are suffixes, most of which do. The most common cause of suffix allomorphy is vowel harmony, typically front–back, less extensively unrounded–rounded harmony, the latter always occurring in tandem with the former (that is, rounding harmony is parasitic, cf. e.g., Polgárdi and Rebrus 1998) and restricted to mid vowels only, see (3c) below.

This paper limits itself to examining the front–back harmony in suffixes that follow front unrounded vowels (accordingly – unless specifically indicated otherwise – when we say "harmony" we mean front–back harmony). One would expect the front version of alternating suffixes to turn up following a stem that contains a front vowel, however, we will see that this is not always the case. It is well known that some monosyllabic stems containing a front vowel select a back-vowelled suffix. Morphologically complex stems, however, exhibit even more surprising patterns in their harmonic behaviour.

We will first introduce the vowel inventory of standard Hungarian (Section 2). In the following section the vowel harmony patterns are listed, the possible vowel alternations are given in 3.1, the regularities in the selection of the suffix vowel are reviewed in 3.2. The next section (4) discusses the relationship of vowel length and harmony. In Section 5 we address two cases that exhibit the divergent transparency effects of suffixes containing a front unrounded vowel in morphologically complex stems: the front alternant of an alternating suffix is always opaque, but the same vowel in a nonalternating suffix may behave as transparent (5.1) and we find the same two patterns in stems whose back vowel

is truncated before suffixation. The theoretical issues raised by these phenomena are discussed in Section 6, and Section 7 concludes the paper.

2. Vowel inventory

Standard Hungarian distinguishes seven vowels, the fairly common five-vowel set extended by two front rounded vowels, as shown in (1).[1]

(1)
    a i u e o + ü ö

Each of these vowels has a long version, indicated by an acute or double acute accent mark in the standard orthography, as shown in (2).

(2)
    á í ú é ó + ű ő

The short–long pairs are phonetically not only distinct in quantity but also in quality: there is a significant quality difference for *a~á* (low-mid back vs. low central) and *e~é* (low-mid vs. high-mid) pairs, a less noticeable one for the mid *o~ó* and *ö~ő*. The short–long contrast is waning in the case of the high pairs, variation is more common here, minimal pairs are much fewer than for non-high short–long pairs, and spelling is less consistent, indicating the uncertainty of speakers.

    Alternations are found for each short–long pair, but as most of these alternations are lexical, they occur in lexically and/or morphologically defined environments. We will briefly return to length alternations in Section 4.

3. Vowel harmony

As already mentioned, vowel harmony in Hungarian is primarily front–back harmony, that is, a front and a back vowel alternate in most suffixes. (Conso-

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[1] Hungarian spelling is quite reliable in representing vowel quality. It is less reliable in the case of the quantity of high vowels, but this has no relevance in vowel harmony. Therefore we will use standard orthographical symbols. Note that *y* does not normally stand for a vowel, it occurs in digraphs marking the palatality of the consonant that precedes it. In some family names it stands for *i,* especially word finally.

nants do not block or initiate the spreading of harmonic features, neither their quality, nor their quantity matters.[2])

3.1.   The alternations

The vowel pairs that alternate are listed in (3).

(3)

a.	a~e	24 suffixes	e.g., -ban/-ben 'iness.', -nak/-nek 'dat.'
b.	á~é	10 suffixes	e.g., -nál/-nél, 'adess.', -vá/-vé 'translat.'
c.	o~ö~e	9 suffixes	e.g., -hoz/-höz/-hez 'allat.', -szor/-ször/-szer 'times'
d.	(o~ö)	1 suffix	-nok/-nök 'agentive'
e.	(o~e)	1 suffix	-omány/-emény 'result of X$_{verb}$'
f.	ó~ő	5 suffixes	e.g., -ból/-ből 'elat.', -tól/-től 'ablat.', -ó/-ő 'partic.'
g.	u~ü	7 suffixes	e.g., -ul/-ül 'essive-modal'
h.	ú~ű	1 suffix	-(j)ú/-(j)ű 'equipped with'

The phonetically high-mid *é* does not alternate with the high-mid vowels *ó* or *ő,* but with the low *á*. It is also notable that *e* participates in alternations both with the low *a,* (3a), and the mid *o~ö,* (3c) (and (3e)). In fact, in several Western accents there are two phonetically distinct vowels corresponding to the standard accent's *e,* a low one (which alternates with *a*) and a mid one (which alternates with *o~ö*). The three-way alternation of short mid vowels is governed by both the frontness and the roundedness of the last stem vowel: *hat-szor* 'six times', *öt-ször* 'five times', *négy-szer* 'four times' (throughout this paper we use hyphens to indicate morpheme boundaries).[3]

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[2] This claim is true in the sense that secondary articulation of consonants does not affect harmony, unlike in Turkish (Clements and Hume 1995), or long consonant clusters do not lessen the harmonizing power of vowels. However, recent experiments have shown that in the case of variation the decision may be based on erratic or "unnatural" last resort strategies that involve consonantal patterns too (Hayes *et al.* 2010).

[3] Some vowel-initial suffixes (e.g., the plural) exhibit a four-way alternation (*ez-ek* 'these', *sül-ök* 'porcupines', *dal-ok* 'songs', *hal-ak* 'fishes'). In fact, this is a five-way alternation in accents that distinguish the mid and low *e*'s, where the second vowel of *ez-ek* is mid, but that of *fül-ek* 'ears' is low (also note the absence of rounding in the suffix as compared to *sül-ök*). This pattern is a result of the combination of alternations (3c) and (3a), the latter applied in the case of so-called lowering stems, which require that the suffix-initial vowel should be low. Also note that this initial vowel is often not analysed as part of the suffix, since it does not always appear (*zokni-k* 'socks', *cipő-k* 'shoes'). If we do analyse such vowels as part of the suffix they precede, the number of suffixes in types (3a) and (3c) is much higher.

The high front unrounded vowels *i* and *í* do not alternate with other vowels in any regular vowel harmony process (including roundness harmony) in Hungarian. The alternations in (3d) and (3e) are marginal (they only occur in two non-productive derivational suffixes) and both can be taken to be subcases of (3c): in (3d) we do not find the front unrounded suffix vowel even if the stem-final vowel is such – as if the vowel were long:[4] *hír-nök* 'messenger', *mér-nök* 'engineer', contrary to the expected **hír-nek, *mér-nek*. In (3e) we do not find the front rounded suffix vowel: *költ-emény* 'poem', *őrl-emény* 'grist', *süt-emény* 'cookie', contrary to the expected **költ-ömény, *őrl-ömény, *süt-ömény*. We have no explanation for these discrepancies (and none has been offered in the literature), but they do not concern backness harmony anyway.

3.2. The selection of the suffix vowel

The choice of the front or back alternant of suffixes usually depends on the last vowel of the stem.[5] When the last vowel is neutral, a preceding nonneutral vowel governs harmony – this behaviour is usually referred to as the *transparency* of neutral vowels. The set of neutral vowels includes *i, í, é,* and, *e,*[6] that is, the front unrounded vowels. In (4a) we exemplify all the occurring combinations with monosyllabic stems, and in (4b) those with polysyllabic stems (only the non-trivial cases are shown – stems ending in BB and FF are omitted since they behave just like those ending in FB and BF, respectively). F stands for a front vowel (*ü, ű, ö, ő*), B for a back vowel (*u, ú, o, ó, a, á*), N for a neutral vowel (*i, í, e, é*).

(4)

a.	B+B	hat-nak 'six+dat.'
	F+F	tök-nek 'pumpkin+dat.'
	N+B	híd-nak 'bridge+dat.', cél-nak 'goal+dat.'
	N+F	hír-nek 'news+dat.', fél-nek 'half+dat.'
b.	BF+F	kajüt-nek 'cabin+dat.'
	FB+B	amőbá-nak 'amoeba+dat.'
	BN+B	tapír-nak 'tapir+dat.'
	FN+F	römi-nek 'rummy+dat.'
	NN+B	derék-nak 'waist+dat.'
	NN+F	szirén-nek 'mermaid+dat.'

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[4] Which is the regular pattern for the long mid vowels *ó* and *ő,* cf. (3f).

[5] The "stem" is not necessarily monomorphemic, it is the string excluding the last suffix. In compounds, only the last stem influences the harmony of the suffix.

[6] The neutrality of *e* is debated by some authors (who think that neutrality is a categorical property), see Törkenczy (2011) for references.

When a stem contains one or more nonneutral vowels, the last of them will govern harmony (but see (5) and (6) for exceptions). If a monomorphemic stem only contains neutral vowels and is longer than two syllables, the following suffix is always front: *Rimini-ben* 'in Rimini', *szintézis-nek* 'synthesis+dat.'. If there are only neutral vowels in a maximally bisyllabic stem, the following suffix is usually front, but for a lexically specified, closed set of words it is back. This latter behaviour is usually referred to as *antiharmony*.

There are only two[7] monomorphemic NN stems that take back suffixes. Both of them show some variation for consonant-initial suffixes: *derék-nak‰nek, derék-ban‰ben* 'iness.', *férfi-nak‰nek* 'man+dat.', *férfi-ba‰be* 'illat.' vs. *derek-ak* (*-ek) 'pl.', *derek-as* (*-es) thoroughgoing', *férfi-ak* (*-ek) 'pl.', *férfi-as* (*-es) 'manly'. The latter item, *férfi*, may be considered a compound – although neither part is a free form, *fér-* can be associated with *férj* 'husband', *-fi* with *fiú* 'boy', and *fia* 'son'[8] – hence harmony takes into consideration only a monosyllabic N stem, as in (4a). The other item, *derék*, is more peculiar in that it governs back harmony when its second vowel is shortened: *derek-ak* 'waists', that is, if the stem contains two *e*'s. We are going to return to the strange behaviour of this stem in Section 4.1.

Neutral vowels show *gradient* behaviour on at least four counts.

(i) The ability to alternate in suffixes: we have already noted that the high neutral vowels, *i* and *í,* do not alternate at all with their back counterparts, *u* and *ú* (*i* does participate in a suppletive suffix alternation, cf. (8a)), the nonhigh vowels *é* and *e* do alternate with back vowels, cf. (3a–e). Furthermore, in addition to alternating with *á* in alternating suffixes, *é* occurs in some nonalternating suffixes as well (e.g., *hat-ért* 'six+caus.', *pap-é* 'that of the priest'), while *e* does not occur in nonalternating suffixes at all.

(ii) Occurrence in antiharmonic roots: in monosyllabic stems high *i* and *í* govern back harmony in dozens of cases, with mid *é* we find only two such words (*héj* 'peel', *cél* 'goal'), as well as two bound stems (*bén-, ném-*), which will be discussed in Section 5.2. The low *e* of a monosyllabic stem is always followed by the front alternant of a suffix. Both of these facts indicate that the lower a front unrounded vowel, the more consistent its frontness inducing effect in harmony.

(iii) Transparency and vowel height: the transparency of neutral vowels depends on their height. Some data are given in (5).

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[7] The stem *izé* 'thingy, whatsit' is sometimes jocularly used with the back alternant of suffixes.

[8] One may identify an archaic suffix *-fi* 'son of': e.g., *pap-fi* 'son of the priest', and in many family names: *Aba-fi* 'son of A.', though the vowel of this suffix is transparent: *Abafi-nak* vs. *Petőfi-nek* both are names with the dative suffix. Note, nevertheless, the final back vowels in *fiú* and *fia.*

(5)
 a. tapír-nak 'tapir+dat.'
   latin-nak 'Latin+dat.'
 b. kastély-nak 'castle+dat.'
   kastély-ok 'castle+pl.'
   tányér-nak[9] 'plate+dat.'
   tányér-ok 'plate+pl.'
   azték-nak%nek 'Aztec+dat.'
   azték-ok%ek 'Aztec+pl.'
   szatén-nak%nek 'satin+dat.'
   szatén-ok%ek 'satin+pl.'
 c. haver-nak%nek 'pal+dat.'
   mágnes-nak%nek 'magnet+dat.'
   József-nak%nek 'Joseph+dat.'
   kódex-nek 'codex+dat.'

A stem containing a back vowel followed by the high neutral vowels *i* and *í* always governs back harmony, i.e., these vowels are never opaque. The vowel *é,* which at least phonetically is mid, is also often transparent, but it may be opaque, too, while the low *e* may never be transparent only, its opacity is always an option, and in some stems it is obligatorily opaque (cf. Siptár and Törkenczy 2000). Recent literature on Hungarian vowel harmony shows that gradience is not accidental since it also manifests itself in native speaker performance in wug-tests and native speaker judgements of nonsense forms (Hayes and Londe 2006).

 (iv) Transparency and vowel count: what is most embarrassing for a standard autosegmental analysis of Hungarian vowel harmony is that the number of neutral vowels at the end of a stem also influences the variation of the suffix vowel. As has been noted, a Bi stem always governs back harmony, cf. (5a). If after a back vowel the two last syllables contain *i* (or *í*), the suffix vowel is variable, cf. (6a). We also find variation in Béé, Bié, and Béi stems, cf. (6b).

(6)
 a. harakiri-nak%nek 'harakiri+dat.'
   analízis-ba%be 'analysis+illat.'

 b. Athéné-nak%nek 'Athena+dat.'
   klarinét-nak%nek 'clarinet+dat.'
   hipotézis-nak%nek 'hypothesis+dat.'
   oxigén-nak%nek 'oxygen+dat.'

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[9] For some suffixes, Google does give front-vowelled versions too: *tányér-től, tányér-től, tányér-ről,* beside the more usual *tányér-tól* 'ablat.', *tányér-ból* 'elat.', *tányér-ról* 'delat.'.

   c. bakelit-nak%nek 'bakelite+dat.'
      agresszív-nak%nek 'aggressive+dat.'
      szuterén-ban%ben 'basement+iness.'

   d. kabinet-nek 'cabinet+dat.'
      parizer-nek 'mortadella+dat.'
      barométer-nek 'barometer+dat.'
      Honegger-nek 'H.+dat.'

In the case of two stem-final neutral vowels following a back vowel an alternation is only possible if the last one is not *e*, cf. (6a–c), there is no variation, only the front variant of the suffix is possible if the last stem vowel is *e,* cf. (6d) (Beňuš *et al.* 2004)

    To summarize, vowels fall into three groups, front, back, and neutral. If the stem-final vowel is one of the first two types, or is neutral and preceded by a front vowel, suffixes show no harmonic variation. If the stem-final vowel is neutral, but preceded by a back vowel, the degree of variation depends on both the height of the neutral vowel and the number of neutral vowels: generally the lower and the more neutral vowels found at the end of a stem, the less likely the occurrence of the back version of a suffix. That is, higher and fewer neutral vowels are more transparent than lower and more. It is also notable that while "phonologically" *é* is a low-only vowel (it alternates with *á*) and *e* is both low and mid (alternating with *a*, as well as *o* and *ö*), gradience seems to consider the "phonetic" properties of these vowels: *é* is more often transparent than *e*.

4. Vowel length and harmony

Most short–long vowel alternations take place in lexically defined stems in morphologically defined environments. Stem-internal vowel length alternations are found for most vowel pairs. These alternations only take place in a closed set of items, before a given set of suffixes, e.g., *nyár~nyar-ak* 'summer~pl.', *kéz~kez-et* 'hand~acc.', *tűz~tüz-es* 'fire~fiery', etc.

    There is, however, a further short–long alternation (traditionally called Low Vowel Lengthening (LVL)), which regularly occurs in any stem that ends in *a* or *e.* The triggering environment includes most[10] suffixes: *anya~anyá-k~anyá-nak* 'mother~pl.~dat.', *hülye~hülyé-k~hülyé-nek* 'stupid~pl.~dat.'.

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[10] Not all suffixes, though: e.g., *anya-ság* 'motherhood', *hülye-ség* 'stupidity'. The fact that the suffix vowel harmonizes precludes the analysis that such words are compounds, which would explain the lack of vowel lengthening. Accordingly, word-final low vowel

Standard analyses of Hungarian vowel harmony (e.g., Vago 1980; Ringen and Vago 1998; Siptár and Törkenczy 2000) assume and (explicitly or implicitly) claim that backness harmony is independent of length and length alternations. This is based on the observation that short vowels and their long counterparts (a) alternate in the same way in suffixes (compare short *-nak/-nek* 'dative' with long *-nál/-nél* 'adessive': *hat-nak* 'six dat.' *hat-nál* 'six adess.', *tök-nek* 'pumpkin+dat.', *tök-nél* 'pumpkin+adess.') and (b) induce harmony in the same way when they occur in stems (compare the unshortened and shortened alternants of the same stems in, e.g., *nyár-nak* 'summer+dat.', *nyar-ak* 'summer+pl.', *kéz-nek* 'hand+dat.', *kez-ek* 'hand+pl.').

Although this is true by and large, there *are* a few cases when vowel length seems to interact with harmony.

4.1.   "Upgrading" by length and transparency

As we have already noted, *é* is more transparent than *e,* that is, a Bé stem more readily governs back harmony than a Be stem. It is clear that this is not caused by the length but by the height difference between the two vowels.[11] The height difference, however, is parasitical on length for these two vowels. This leads to an interesting situation in the case of LVL. When suffixed with the harmonic, but nonlengthening suffix *-ság/ség,* a Be stem typically selects the front variant: *dózse-ség* 'dogehood'. With suffixes that trigger lengthening, however, the back version is more common, but in any case there is variation: *dózsé-nak‰nek* 'doge+dat.'. Although examples do not abound, the difference is consistent: *Hallé-ban‰ben* 'in H.' vs. *Halle-ség* 'H-ness', *dafké-ból‰ből* 'for the hell of it' vs. *dafke-ség* 'stubbornness'.[12] Thus, LVL is a process that upgrades stem-final *e* on the transparency scale by turning it into an *é.*

4.2.   Length and antiharmony

We have already mentioned that *derék* is the only monomorphemic NN stem – if *férfi* is considered a compound – which governs back harmony. It is even more intriguing that the suffix vowel again depends on vowel length, but in just the opposite way one would expect. The second stem vowel is long, and higher (i.e.,

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lengthening is less "lexical" than any other type of length alternation, but is still not an exceptionless process.

[11] We do not find any such difference between short *i* and long *í,* for example.

[12] We also find a front suffix vowel in *halle-i-ek* 'people from H.', but besides the absence of lengthening, this may also be caused by an increase in the number of neutral vowels.

it is *é*), before consonant initial suffixes. For many suffixes a following back harmonic suffix is typical here, but the front version is also found: *derék-ba‰be* 'waist+illat.', for others a front suffix is more common: *derék-ség‰ság* 'worthiness'. Before the plural (*-Vk*), the accusative (*-Vt*), the adjective-forming suffix (*-Vs*), and the possessor-marking suffixes (*-Vm, -Vd, -unk/ünk,* etc.), which are all vowel initial, the stem vowel shortens (i.e., it becomes lower, *e*), but now only back vowels are possible in the following harmonic suffix, there is no variation: *derek-ak* 'pl.', *derek-at* 'acc.', *derek-as* 'thoroughgoing', *derek-am* 'my waist', *derek-unk* 'our waist'.[13]

This is a truly vexing difference: stem-final *e* lengthened by LVL (=*é*) is more neutral than unlengthened *e* – this is in agreement with the transparency hierarchy based on height: *é* > *e* – but shortened stem-internal *é* (=*e*) seems to be more neutral than unshortened *é* (i.e., more likely to co-occur with antiharmony) — which is in contradiction with the general neutrality hierarchy (based on all four factors: ability to alternate in suffixes, height, count and antiharmony (see 3.2). However, it is unclear if this strange behaviour in antiharmony is really related to the length (and height) difference: (i) the "generalization" is based on one lexical item only: *derék* is the only antiharmonic stem that also has a non-high vowel alternating in length[14] and the behaviour displayed by *derék* is impossible to wug-test since stem-internal length alternations are limited to a closed set of stems (as opposed to stem-final ones, which are productive); (ii) the behaviour of *férfi* parallels that of *derék* in that it shows variation vs. consistent antiharmony with the same suffixes: férfi-*nak‰nek* 'man+dat.', *férfi-ba‰be* 'illat.' vs., *férfi-ak* (*-ek*) 'pl.', *férfi-as* (*-es*) 'manly', etc., although *férfi* displays no length alternation. The contrast between variation vs. consistent antiharmony may be due to some property of the *suffixes* (e.g., their frequency or whether they begin with a vowel or not) and not the stems, and the higher probability cooccurrence of *e* (i.e., shortened stem-internal *é*) with antiharmony in *derék* is just a by-product. If this is the case, then this is not a real counterexample to the neutrality hierarchy.

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[13] The stem vowel does not shorten before the terminative suffix *-ig,* which behaves as if consonant-initial anyway. The suppressive *-on/-en/-ön* also leaves the stem vowel long, but only the back alternant of the suffix is possible: *derék-on.* Of the adverb-forming *-on/an/en* the front alternant is also possible: *derék-an‰en,* but this is a less common form instead of the usual *derek-as-an* 'thoroughly'.

[14] There are antiharmonic stems in which a high vowel alternates in length, but they are all consistently antiharmonic regardless of the length of the vowel, e.g., *híd-ról/*ről* 'bridge+delat.', *hid-at/*hid-et* 'bridge+acc.'

5. Morphological complexity

What has been said so far about harmonic alternations following stem final neutral vowel(s) is true for monomorphemic words. Morphologically complex words exhibit various discrepancies from the already rather complicated patterns discussed so far.

5.1. Transparency: once decided, always decided

Neutral vowels occur both in the front allomorph of alternating (i.e., harmonic) suffixes, cf. (8a), and in the only allomorph of nonalternating suffixes, cf. (8b). (In (8) we only list suffixes that may be followed by a further suffix.) Note that the neutral vowel *e* only occurs in alternating suffixes.

(8)
    a. -ja/-i '3sg.Subj.-def.Obj.'[15]
         -ság/-ség '-ness'
         -ja/-je '3sg.poss.' (the *e* is lengthened to *é* by LVL before a further suffix)
    b. -i 'coming from'
         -ít 'turn into'
         -é 'possessor'
         -ék 'group of'

Words suffixed with a nonalternating suffix containing a neutral vowel, that is, a suffix of (8b), behave similarly to monomorphemic words containing the same vowels, inasmuch as the neutral vowel in them is transparent to harmony, see (9a), but a string of several neutral vowels may (or may not!) behave opaquely, as shown in (9b).

(9)
    a. kuba-i-nak 'Cuban+dat.'
         szám-ít-ok 'I calculate'
         ház-é-nak 'for that of the house'
         Nagy-ék-nak 'for N. and his/her group'

    b. karib-i-nak%nek 'Caribbean+dat.'
         hamis-ít-ok 'I forge'
         Sári-é-nak%?nek 'for that of S.'
         Tomi-ék-nak%?nek 'for T. and his/her group'
         martini-s-ít-ok%ek 'I turn something indefinite into something similar to Martini'

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[15] This is a completely regular, productive, but phonologically suppletive alternation.

The same neutral vowels in words suffixed with the front version of an alternating suffix, that is, a suffix of (8a), however, are exceptionlessly opaque in that they cannot "pass on" backness (cf. Törkenczy 2011). This is shown in (10).

(10)
    a.   martini-z-ok%ek 'I drink Martini'
         alibi-nak%nek 'alibi+dat.'
         agilis-nak%nek 'agile+dat.'
         haver-nak%nek 'pal+dat.'

    b.   martini-z-i%za 's/he spills Martini on something definite'
         alibi-ja%je 'his/her alibi'
         agilis-ság%ség 'agility'
         haver-ja%je 'his/her pal'

    c.   martini-z-i-tek (*tok) 'you-pl. spill Martini on something definite'
         martini-z-zá-tok (*tek) id.
         alibi-jé-nek (*nak) 'for his/her alibi'
         alibi-já-nak (*nek) id.
         agilis-ség-nek (*nak) 'agility+dat.'
         agilis-ság-nak (*nek) id.
         haver-jé-nek (*nak) 'for his/her pal'
         haver-já-nak (*nek) id.

(10a) lists stems that begin with a back vowel and contain one or two neutral vowels. As expected, harmonizing suffixes show variation after such stems. (10b) shows the same stems with harmonizing suffixes, the front version of which contains a neutral vowel of the set (8a). What we see in (10c) is that the front version of a harmonizing suffix is opaque – one might say a *front* vowel in its effect – since the suffixes following them do not vary, they are front only, as dictated by the decision made about the harmonic property of the stem in the previous step. This is in sharp contrast with the case of nonalternating suffixes containing a neutral vowel, after which the variability of further suffixes remains, as shown in (9). The generalization is that neutral vowels are (variably) transparent in nonalternating suffixes, but are consistently opaque in alternating ones.

5.2.   Antiharmony: backness lingers on

In a set of stems certain vowel-initial suffixes trigger the loss of the stem's last vowel. This vowel may be stem internal, as in (11a) or stem final, as in (11b). Since the difference is irrelevant for our purposes, we will uniformly call the

process truncation for ease of reference. In (11) the vowel which is missing from the suffixed form is enclosed in angled brackets in the base form.[16] (11c) contains bound stems that can be identified by splitting off their suffixes.

(11)

    a. pisz⟨o⟩k 'dirt', piszk-ít 'make dirty'
          tit⟨o⟩k 'secret', titk-ár 'secretary'
          ter⟨e⟩m 'hall', term-et 'hall+acc.'
          bok⟨o⟩r 'bush', bokr-ot 'bush+acc.'

    b. tiszt⟨a⟩ 'clean$_{adj}$', tiszt-ít 'clean$_{verb}$'
          sim⟨a⟩ 'smooth$_{adj}$', sim-ít 'smooth$_{verb}$'
          bén⟨a⟩ 'lame', bén-ít 'paralyse'
          bék⟨e⟩ 'peace', bék-ít 'reconcile'
          ifj⟨ú⟩ 'young', ifj-ít 'regenerate'

    c. ind-ul 'start (medial)', ind-ít 'start (active)'
          sik-olt 'scream', sik-ít 'scream'
          csikl-andoz 'tickle', csikl-ó 'clitoris'

Truncation is also typical of diminutive forms, but in their case it is usually more than a vowel that gets deleted.[17] Examples are given in (12), the deleted string is again marked with angled brackets. Glosses are not given, all the examples are names and their diminutives.

(12)

      Év⟨a⟩, Év-i
      Sim⟨on⟩, Sim-i
      Nánd⟨or⟩, Nánd-i
      Mik⟨lós⟩, Mik-i
      Ren⟨áta⟩, Ren-i
      Fer⟨enc⟩, Fer-i
      Il⟨ona⟩, Il-i

As can be seen in (11) and (12), some of the stems contain the NB vocalic pattern, the back vowel of which gets deleted by truncation. These are of special

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[16] The missing vowel is typically *o, e* or *ö* in (11a) and can be any vowel in (11b), cf. Siptár and Törkenczy (2000).

[17] In fact, here it is the portion that remains rather than the portion that gets deleted that can be captured in a phonological/prosodic generalization (cf. van de Weijer 1989).

interest to us, since here the process leaves us with stems that contain only a neutral vowel. Without truncation such stems govern back harmony, as expected, after truncation the harmony the remaining neutral vowel governs is not obvious.

There is a marked difference in the harmonic properties of the words in (11) and the diminutives in (12). Neither group allows any variation, but while the stems in (11) govern harmony as if truncation did not take place at all, those in (12) ignore the truncated vowel, and make their selection according to the remainder of the stem. The relevant stems in (11) are repeated with a harmonizing suffix in (13a), those in (12) in (13b).

(13)

    a. piszk-ít-ok 'I make sg dirty'
        tiszt-ít-ok 'I clean sg'
        sim-ít-ok 'I smooth sg'
        bén-ít-ok 'I paralyse sg'
        bék-ít-ek 'I reconcile sg'
        ind-ít-ok 'I start sg'
        sik-ít-ok 'I scream'
        ifj-ít-ok 'I regenerate sg'

    b. Év-i-nek
        Sim-i-nek
        Nánd-i-nak
        Mik-i-nek
        Ren-i-nek
        Fer-i-nek
        Il-i-nek

At a first glance this looks like a difference between the verb roots of (13a) and the noun roots of (13b). However, the diminutive *-i* can also be found in verbs: e.g., *sim-ogat* 'caress' > *sim-i* 'caressing+dim.' > *sim-i-z* 'caress' > *sim-i-z-ek* (**-ok*) 'caress-1sg.Subj-indef.Obj'; *tap-ogat* 'palpate' > *tap-i* 'feeling up+dim.' > *tap-i-z* 'feel up' > *tap-i-z-ok* 'feel up-1sg.Subj-indef.Obj'. These data suggest that the two suffixes *-ít* and *-i* are responsible for the difference. We return to this issue in 6.4.

6.   Theoretical difficulties

In this section we discuss some of the theoretical difficulties that the analyst faces when observing the data discussed so far.

6.1.   Gradience

Neutrality/transparency is gradient in Hungarian. Until recently, this gradience, even if it was noted, was not built into the analyses of Hungarian vowel harmony since the frameworks of the analyses (derivational, classical OT, etc.) were categorical by nature and thus predicted gradience to be accidental or something that belonged to performance rather than grammar proper. This stance is problematic if it can be shown that gradience is systematic and psychologically real. In a recent paper Hayes and Londe (2006) argue for this latter view and present an analysis in a model in which gradience is directly represented by constraints referring to the various neutral vowels that can be independently and stochastically ordered in the hierarchy of constraints (Stochastic OT).

6.2.   Paradigm-internal variation, lexical determinacy

We have seen that the transparency of neutral vowels is gradient in Hungarian and depends on the height (the more open, the less transparent) and the number (the more numerous the less transparent) of neutral vowels and that this gradience manifests itself in variation in addition to categorical opacity. There is a further complication here beyond the mere fact of gradience: variation is influenced by the rank of the vowel in the hierarchy of transparency (i.e., its height), but it is also *lexically* determined in the case of *é* and *e*. A vowel of a given rank may be (semi)transparent in one stem, but opaque in another (compare *kastély* vs. *szatén,* see (5b)). Antiharmony is also clearly lexically determined since stems containing the same neutral vowel may harmonize in different ways, e.g., *szív-nak* 'suck+3pl.pres.indef.' vs. *szív-nek* 'heart+dat.'. The harmonic properties of suffixes are also (partially) lexically determined since one and the same stem may induce different harmonic behaviour in different alternating suffixes, or – to look at the same thing from another angle – different alternating suffixes may harmonize differently with the same stem, e.g., *mágnes-es, *mágnes-os* 'magnetic' *mágnes-nak‰nek* 'magnet+dat.' *férfi-ak, *férfi-ek* 'man+pl.', but *férfi-nak‰ne*k 'man+dat.'. Nonalternating suffixes may also have morpheme-specific harmonic properties. Consider the lexical differences between the fol-

lowing nonalternating suffixes which contain the same vowel.[18] The suffix *-i* 'coming from' seems to participate in the count effect, cf. *karib-nak* (*-nek) 'Carib+dat.', but *karib-i-nak‰nek* 'Caribbean+dat.', while the verb-forming suffix *-ít* never changes the harmony – inducing properties of the stem it is added to, cf. *hamis-nak* (*-nek) 'fake+dat', consequently *hamis-ít-ok* (*-ek) 'I forge'.

The lexical determinacy of harmony in stems is usually addressed in standard treatments of Hungarian vowel harmony (e.g., Vago 1980; Siptár and Törkenczy 2000). Typically, a different (and often abstract) underlying representation is set up for antiharmonic stems, and more than one underlying representation is assumed for the same stem to handle variation. By contrast, the lexical determinacy of harmony in suffixes is rarely noted, and has not been analysed in any standard analysis.

6.3.   Transparency

The central analytic issues here (if we abstract away for the time being from the problem of whether transparency is considered to be gradual or categorical) are (a) conceptual/typological: do we make a prediction about which vowels can be neutral/transparent in a harmony system? and (b) formal/technical: how do we encode transparency?[19] Some of the facts we have reviewed in 3 and 5.1 pose a serious and interesting problem both conceptually and formally. In some analyses the set of transparent/neutral vowels is only stipulated in some way, which implies that any vowel can in principle be neutral/transparent in any given harmony system. By contrast, it has been observed typologically and made a central ingredient of the analysis of vowel harmony that transparency is closely connected to the inability to alternate (e.g., Kiparsky and Pajusalu 2003): those vowels are or can be neutral/transparent in a given language that do not have a harmonic partner in the inventory or that are contextually prevented from changing into their harmonic partners in a particular domain (usually, in the root, the first syllable or the first foot of the root). Thus, the inability to alternate derives from "loneliness" in the inventory (markedness: no harmonic pair) and/or the suspension of neutralization by harmony in a domain (positional faithfulness outranking vowel harmony). Hungarian is doubly problematic in this respect: although transparency *is* related to participation in alternation, the (in)ability to alternate cannot be derived from markedness or positional faithfulness. On the

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[18] Here we disregard the length difference between *i* and *í* since they always behave in the same way in backness harmony.

[19] Naturally, (a) and (b) are not unrelated since in a formalized analysis predictions are encoded in the devices and mechanisms employed by the analysis.

one hand, some neutral/transparent vowels (*e* and *é*) do have a harmonic pair in the inventory and participate in regular harmonic suffix alternations (cf. (3a–c, e)); and on the other, one and the same neutral vowel may be opaque or transparent depending on whether it alternates or not in a suffix (cf. 5.1). Formally this is also a problem. Derivational or OT analyses of vowel harmony encode transparency/neutrality in the representation of neutral vowels (e.g., Ringen 1988), in the way neutral vowels are "calculated" by the rules/constraints (e.g., Ringen and Vago 1998), or in a combination of both (e.g., Siptár and Törkenczy 2000). The generalization to be expressed in Hungarian is quite clear: if the frontness of a suffixal "neutral" vowel is required by backness harmony, then it behaves in an opaque way (it only passes on frontness), if however the frontness of a suffixal "neutral" vowel is independent of backness harmony (i.e., the suffix has no back alternant), then it can behave in a transparent way (it can pass on the preceding vowel's backness). It is not clear how this could be represented unless one resorts to arbitrary or "phonologized" diacritics (abstract vowels, floating features, etc.), especially since alternating neutral vowels behave in the same way independently of whether the alternation is clearly "phonological" or suppletive, compare *-ság/-ség* and *-ja/-i* in (10) above. The procedural approach to the problem fares no better. It is not unusual to find that one and the same vowel may be neutral/transparent and harmonic/opaque in the same harmony system, but such ambiguities are resolved with reference to domains, typically the root or the first syllable/foot of the root: a given vowel may be neutral/transparent in the (first syllable/foot of the) root, but harmonic/transparent in an affix (cf. Kiparsky and Pajusalu 2003), i.e., vowel harmony can be stricter in affixes than within roots. This can be handled with positional faithfulness constraints in OT (Kiparsky and Pajusalu 2003) or may be analysed as a derived environment effect in derivational phonology. This is how *e* behaves in Hungarian: it may be transparent in roots, but is always harmonic/opaque in suffixes. The rest of the neutral vowels, however, behave differently: *i* and *í* are always transparent in roots, *é* is variably transparent in roots, but they all are (variably) transparent in non-alternating suffixes, but categorically opaque in alternating ones. It is not clear how this distinction between alternating and non-alternating affixes can be formulated in these frameworks since the distinction is not one between domains.

6.4.   Antiharmony

To explain the unpredictable harmony after neutral vowels, which are phonetically front (cf. (4)), previous analyses (e.g., Szépe 1969; Vago 1980) have proposed that neutral vowels are underlyingly of two types, there exists the default case, which is front, conforming to its surface specification, and there is also an underlyingly back type, which is fronted after the vowel harmony rule has ap-

plied, and the back alternant of the suffix has been chosen. The fronting of underlyingly back unrounded vowels results in absolute neutralization. Such an analysis is not only theoretically undesirable (and circular), but also empirically untenable. One reason is that stems containing a front vowel before neutral vowel(s) always select the front version of a suffix, that is, (at least in such stems) a neutral vowel cannot act like a back vowel triggering back harmony (formulaically: FB+B is a possible configuration, FN+B is not). We now have to explain why an "underlyingly back" neutral vowel (the one posited in *híd*, cf. (4a)) never occurs in an FN stem.

There is another, more coercive reason for rejecting the back-unrounded analysis. In fact, this is what Vago (1980) assumes. He argues (in an *SPE* type of framework) that the "diminutive evidence" reveals that roots like the ones in (13b) have an underlyingly front vowel in their first syllable (as opposed to those in (13a) which have an abstract back vowel in their first syllable). We have seen, however, that the same stem can exhibit both types of behaviour: *sim-ít-ok* 'I smooth something', *csikl-and-oz* 'tickle' vs. *sim-i-z-ek* 'I caress something', *csik-i-z-ek* 'I tickle-dim. something'.

Apparently the difference is not in the properties of the stem vowel (underlyingly back vs. underlyingly front), but in the suffixes *-ít* and *-i*. Positing different representations for them should account for the different harmonic properties of *simít* and *simiz*. Traditional categories like opacity, transparency, or antiharmonicity cannot be applied here. The vowel of *-ít* cannot be taken to be antiharmonic (yielding *sim-ít-ok, bén-ít-ok*), since we find a front suffix in other instances: e.g., *dísz-ít-ek* 'I decorate', *bék-ít-ek* 'I pacify'. Therefore the vowel of *-ít* cannot be but transparent. Neither can we treat the vowel of the diminutive *-i* as opaque (yielding *sim-i-z-ek*), since it lets backness harmony through in other instances: e.g., *tap-i-z-ok* 'I feel somebody up'. Thus this suffix must also contain a transparent vowel. We have arrived at an impasse situation.

7.   Conclusion

In this paper we have discussed some well known, as well as some less known or until now undiscussed peculiarities of Hungarian backness harmony. Our aim was to show that the usual representational or computational tools that are typically applied in the analysis of vowel harmony prove inadequate when challenged by these phenomena.

References

Beňuš, Štefan, Adamantios Gafos, and Louis Goldstein
   2004   Phonetics and phonology of transparent vowels in Hungarian. In *Proceedings of the 29th Annual Meeting of the Berkeley Linguistic Society*, 485–497.
Clements, George N., and Elizabeth Hume
   1995   The internal organization of speech sounds. In *Handbook of Phonological Theory*, J. Goldsmith, (ed.), 245–306. Oxford: Basil Blackwell.
Gafos, Adamantios I., and Amanda Dye
   2011   Vowel harmony: opaque and transparent vowels. In *The Blackwell Companion to Phonology. 5 vols.*, M. van Oostendorp, C. J. Ewen, E. Hume, and K. Rice (eds.), 2164–2190. Malden, MA and Oxford: Wiley-Blackwell.
Hayes, Bruce, and Zsuzsa Cziráky Londe
   2006   Stochastic phonological knowledge: the case of Hungarian vowel harmony. *Phonology* 23: 59–104.
Hayes, Bruce, Kie Zuraw, Péter Siptár, and Zsuzsa Londe
   2010   Natural and unnatural constraints in Hungarian vowel harmony. *Language* 86: 822–863.
Kiparsky, Paul, and Karl Pajusalu
   2003   Towards a typology of disharmony. *The Linguistic Review* 20: 217–241.
Polgárdi, Krisztina, and Péter Rebrus
   1998   There is no labial harmony in Hungarian: A Government Phonology analysis. In *Approaches to Hungarian.* Vol. 6, C. de Groot, and I. Kenesei (eds.), 3–20. Szeged: JATE Press.
Ringen, Catherine
   1988   Transparency in Hungarian vowel harmony. *Phonology* 5: 327–342.
Ringen, Catherine, and Robert M. Vago
   1998   Hungarian vowel harmony in Optimality Theory. *Phonology* 15: 393–416.
Siptár, Péter, and Miklós Törkenczy
   2000   *The Phonology of Hungarian*. Oxford: Oxford University Press.
Szépe, György
   1969   Az alsóbb nyelvi szintek leírása [A description of lower linguistic levels]. *Általános Nyelvészeti Tanulmányok* 6: 359–466.
Törkenczy, Miklós
   2011   Hungarian vowel harmony. In *The Blackwell Companion to Phonology. 5 vols.*, M. van Oostendorp, C. J. Ewen, E. Hume, and K. Rice (eds.), 2963–2990. Malden, MA and Oxford: Wiley-Blackwell.
Vago, Robert M.
   1980   *The Sound Pattern of Hungarian*. Washington: Georgetown University Press.
van de Weijer, Jeroen
   1989   The formation of diminutive names in Hungarian. *Acta Linguistica Hungarica* 39: 353–371.