

More on Hungarian Vowel Harmony*

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0. INTRODUCTION

An interesting paper by Zonneveld [23] presents yet another view of the nature and implications of Hungarian vowel harmony, adding to the debate among Vago [18], [19], [20], Jensen [8], Phelps [14], and Ringen [15]. The purpose of the present paper is to motivate a further analysis of the exceptional classes of roots in Hungarian which differs from the ones proposed by all of the above. In Section 1 the exception classes to Hungarian vowel harmony are reviewed. In Section 2 the rudiments of the abstract analysis are elaborated; special attention is given to Zonneveld's treatment of *vacillating roots*, and a problem that arises on his treatment of the diminutives of such roots is pointed out. In this section I also survey some of the special problems that arise in determining the underlying distribution of vowels; it is argued that the optimal mechanism is to allow the rule of Vowel Harmony to apply within roots to yield underlying forms. It is also suggested that this mechanism is related to the rules that assign exception features, yielding the so-called *mixed vowel roots* and *disharmonic roots*. And it is shown that the *vacillating roots* can be treated most effectively in terms of a simple set of exception features, and that a "two rule analysis" like Vago's, or a "exception subrule analysis" like Zonneveld's is not required. Two potential "single rule" analyses are given. An initial proposal stipulates that vacillating roots can violate a "crossover" constraint on rule application. A further refinement suggests that "crossover" violations be treated as a reflex of an exception feature which designates a segment is both a contextual and a focal exception to a rule. The single rule analysis is argued to be superior to the others on the bases of simplicity and restrictiveness.

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1. EXCEPTIONALITY IN HUNGARIAN VOWEL HARMONY

Hungarian has the surface vowels shown in (1), which I will represent using Hungarian orthography. The acute mark indicates length, and the umlaut indicates rounding. Double acutes indicate long, rounded, front vowels.

(1)	front	back	front	back	
	i	ü	í	ű	high
	ö	o	é	ó	mid
	[ɛ]	e	á	á	low

In the regular cases, all of the vowels in a root are either front vowels or are back vowels. In addition, all of the suffix vowels, with the exception of *i*, *í*, and *é*, agree in backness with the value of the root vowel(s). There are a number of irregular paradigms with respect to this generalization, and these are reviewed below. (The terminology follows Vago [19].) The exceptions manifest themselves in roots which contain both front and back vowels. The examples in (2)–(5) illustrate roots that consist of back vowels combined with unrounded front vowels. These are called *mixed vowel roots*, and each set in (2)–(5) has slightly different properties. The examples in (6) show roots having back vowels plus rounded front vowels; these are called *disharmonic roots*. A closed class of exceptional roots that have front vowels but only take back vowel suffixes is illustrated in (7). These are the *abstract vowel roots*.

Mixed vowel roots

(2) unrounded, front vowel + back vowel; takes back vowel suffixes.¹

bika + nál	'at the bull'
béka + nak	'to the frog'
szivar + tól	'from the cigar'
Éva + nál	'at Éva'
Tibor + nál	'at Tibor'

the diminutives of these roots take only front vowel suffixes.

Évinél	'at little Éva'
Tibinél	'at little Tibor'

¹ Morpheme boundaries are illustrated in the first set of examples only. The underlying forms of the suffixes are generally agreed upon; the ones we shall consider are /nál/ 'at', /nek/ 'to', and /tól/ 'from'. Cf. Vago [21].

(3) back vowel + /e/ (the short, low, unrounded front V); takes front vowel suffixes.

Józsefnél	'at Joseph'
októbernél	'at October'
fortenél	'at the fort'
novembertől	'from November'

the diminutives of these roots take only back vowel suffixes.

Józsitól	'from little Joseph'
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(4) back vowel + /e²;
takes front or back vowel suffixes (*vacillating roots*)

Ágnesnél or Ágnesnél	'at Agnes'
szalamandernél or szalamandernél	'at the salamander'
havertől or havertől	'from the friend'
fotelnek or fotelnek	'to the armchair'

the diminutives of *vacillating roots* take only back vowel suffixes.

Ágítól	'from little Agnes'
--------	---------------------

(5) back vowel + /i, í, é/ (the nonlow, unrounded front vowels); takes back vowel suffixes.

taxinál	'at the taxi'
radírnál	'at the eraser'
tányérnak	'to the plate'
kávétól	'from the coffee'

Disharmonic roots

(6) back vowel + rounded front vowels; takes front vowel suffixes.

sofőrnél	'at the chauffeur'
kosztümnek	'to the costume'

rounded front vowel + back vowel; takes back vowel suffixes.

amőbának	'to the amoeba'
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Abstract vowel roots

(7) About fifty roots having putative unrounded front vowels take only back vowel suffixes.

hídnak	*'hídnek	'to the bridge'
céltól	*'célthől	'from the goal'

For a complete list of the *abstract vowel roots*, see Vago [18], [21].

² There are some exceptions to this generalization, which I believe Ringen [15] was the first to attempt to exploit. There are some *vacillating roots* that end in *i*, *í*, or *é*, rather than *e*, e.g., *pozítív* 'positive', *analízis* 'analysis', *aszpirín* 'aspirin', *rókanié* 'sofa bed', *föderatív* 'federal', *Tihamer* (a proper name). I turn to these cases in section 3; until then, I will adopt the idealization that all *vacillating roots* have the above mentioned shape.

2. THE ANALYSIS OF EXCEPTIONS TO VOWEL HARMONY

One of the central problems in the analysis of Hungarian is why back vowel suffixes sometimes show up after roots that end in surface front vowels, as in the examples in (4), (5), and (7). Some investigators have favored what is known as the "abstract solution" to this problem.³ On such an analysis, the examples in (5) and (7) have underlying back vowels in root final position which condition backness harmony in the suffixes. A rule of *Vowel Harmony* (VH) like (8) is assumed. The underlying vowel inventory is as in (9).

- (8) Vowel Harmony
 $[+syll] \rightarrow [\alpha\text{back}] / \left[\begin{array}{c} +\text{syll} \\ \alpha\text{back} \end{array} \right] C_0 \text{---}$
- (9)
- | | | | | |
|---------|---------|------|-------|------|
| | front | back | front | back |
| i | ü | i | ú | í |
| ö | o | é | ő | á |
| [ε] = e | a = [ɔ] | á | á | ú |
| | | | | high |
| | | | | mid |
| | | | | low |

The basic idea is that the abstract back vowels *i*, *í*, and *á* appear in the underlying forms of the roots in (7) and in (5). The surface vowel system is obtained by means of a rule of Absolute Neutralization (AN) which applies after Vowel Harmony to front all nonlow, unrounded vowels.

One immediate advantage of this analysis is that no special stipulations are required to account for the opaque suffixes that always contain surface *i*, *í*, or *é*. These suffixes may be assumed to undergo Vowel Harmony; however if the vowels *i*, *í*, or *á* result, they will be fronted by the Absolute Neutralization rule.

Notice also that the *radír* type of *mixed vowel roots* are *mixed vowel roots* only superficially. At the level of underlying structure they are regular harmonic roots. The application of vowel harmony will be such that the final vowel of an underlying form like */radír/* triggers backness harmony in the suffix, as suggested by the rule in (8).

- (10) */radír/* + */től/* → */radírtól/* → *radírtól*

³ Jensen, Phelps, Vago, and Zonneveld all advocate varieties of the abstract analysis. Ringen [15] advocates a concrete analysis, but, as Vago [20] suggests, it is unclear that Ringen's position is based on anything more than a manifesto about how exceptionally should be treated. In particular the question of abstractness cannot be decided a priori, but rather must be based on overall considerations dealing with simplicity (e.g., of rules and distributional statements).

Notice that if *radír* were underlyingly */radír/*, the derivation in (11) would be predicted.

- (11) */radír/* + */től/* → **radírtól*

Now consider the mixed vowel roots in class (3). Here we might account for the fact that the mixed vowel roots always take front vowel suffixes by claiming that underlying forms end in a front vowel. Since the usual situation is that root vowels agree, some special stipulation is needed. Assuming that root vowels agree in backness because they undergo the rule of Vowel Harmony at some level, we can account for underlying *mixed vowel roots* by using the familiar type of exception feature, [-Rule x]. *Disharmonic roots* and underlying *mixed vowel roots* will be assigned the feature; when suffixes are attached, they will harmonize to the final root vowel. We will have underlying forms and derivations like the following.

- (12) a. */tíbor/* + */től/* → *tíbertől*
_[-VH]
- b. */kosztüm/* + */nál/* → *kosztümnél*
_[-VH]
- c. */józsef/* + */nál/* → *józsefnél*
_[-VH]

Notice that it is necessary to analyze such forms as *tíbor* and *józsef* as underlying *mixed vowel roots* in order to explain their harmonic behavior in the diminutive paradigm, where the final syllable is truncated. In such cases only the initial vowel will be relevant for harmony (it is irrelevant whether the truncated root is marked [-VH] or not).

- (13) a. */józsi/* + */l/* + */től/* → *józsitól* → *jozsitól*
 b. */tíbi/* + */l/* + */nál/* → *tíbinél*

Observe that if forms like *tíbor* were analyzed as underlyingly having an abstract back vowel in the initial syllable, the wrong result (**tíbinél*) would be derived.⁴

To summarize, the description given so far assumes that the exceptional roots fall into two classes. The roots in (7) (*híd*, *cél*) and in (5) (*taxi*, *radír*) are assumed to be underlying back vowel suffixes, since they always take back vowels; the roots in the examples in (2) (*tíbor*), (3) (*józsef*), and (6) (*sofőr*, *amóba*) are assumed to be marked [-VH], since suffixes harmonize to the root final vowel in these cases. This

⁴ This observation and its implications are due to Vago [18].

is the basis of the abstract analysis adopted by Jensen and by Zonneveld, and I will also adopt in as the basis for the description of exceptions to be presented below. Before turning to the analysis I will offer, I wish to consider the treatment of *vacillating roots* suggested by Zonneveld. If we assume that the vacillating roots like *Ágnes* are essentially parallel to roots like *József*, i.e., that they are underlyingly mixed vowel roots marked as [-VH], then the technical problem is how to derive the forms with back vowel suffixes. The regular rule of Vowel Harmony will be sufficient to derive the forms with front vowels. Zonneveld posits an "exception branch" to the Vowel Harmony rule. This subrule is shown in (14).

(14) Zonneveld's exception subrule

$$[+syll] \rightarrow [\text{back}] / \left[\begin{array}{c} +\text{syll} \\ -\text{back} \\ +\text{D} \end{array} \right] C_0 \text{---}$$

The diacritic feature [+D] is assigned to roots like /ágnés/. All rules that are conditioned by diacritic features are, by hypothesis, optional in Zonneveld's theory. This tactic allows the effects of either branch of the combined Vowel Harmony schema to be realized. A derivation where the branch of Vowel Harmony in (14) applies is shown in (15a); a derivation where the branch of Vowel Harmony given in (8) applies is shown in (15b).

- (15) a. /ágnés/ + /től/ → ágnestól
 (-VH)
 (+D)
 b. /ágnés/ + /nál/ → ágnésnél
 (-VH)
 (+D)

Zonneveld's primary objective is to constrain the class of exception rules and mechanisms in phonology. He concludes that the analysis of Hungarian that he adopts allows, among others, the following restriction to be placed on exceptions in phonology.

- (16) The presence of a diacritic feature (e.g., [+D]) is obligatory in all cases of a lexical representation.

Zonneveld intends this constraint to eliminate optional exceptions. While this is an interesting attempt, further evidence suggests that (16)

is untenable and will have to be dropped or weakened if the *vacillating roots* are to be correctly accounted for in Zonneveld's framework. This is actually quite a serious problem for Zonneveld's analysis, in view of the fact that he argues for the superiority of his approach over Jensen's on the basis that his permits a more restrictive view of exceptionality [i.e., because it permits condition (16)]. Jensen's theory, which does not have an exception subrule like (14), accounts for doubts by stipulating that *vacillating roots* undergo an optional readjustment rule which marks them [-VH].⁵ However, it can be shown that Zonneveld's analysis requires ad hoc readjustment rules also. We have observed that the only grammatical diminutive form of the *vacillating roots* is the one in which back vowel suffixes occur. We find the doublet *Ágnes*tól ~ *Ágnes*től with the full forms, but in the diminutive we find *Ágít*ól ~ **Ágít*ól.

Now, for Zonneveld the underlying form of the diminutive will be /ág/ + /í/ + /től/. But if the optional branch of the Vowel Harmony rule applies, we will have the derivation in (17a). [If the usual branch of Vowel Harmony applies, we will have the correct derivation in (17b).]

- (17) a. /ág/ + /í/ + /től/ → *ágítól
 (+D)
 b. /ág/ + /í/ + /től/ → /ágítól/ → ágítól
 (+D)

In (17a), /í/ will (vacuously) dissimilate from the /á/ of /ág/, and then /ő/ will (vacuously) assimilate to /í/. To avoid derivations like (17a) it will apparently be necessary to stipulate that some readjustment rule removes the feature [+D] in the diminutive (or to assume some similar complication). However, any such move will weaken the constraints on exception mechanisms and is thus counter to Zonneveld's aims.

The best hope for preserving the spirit of Zonneveld's analysis would

⁵ Jensen's analysis of *vacillating roots* ultimately fails for an independent reason. As Vago [20] notes, Jensen's analysis cannot account for *vacillating roots* by making the [-VH] feature optional or by deleting it, because this will yield the wrong result in a case like vacillating /rókanié/. If the [-VH] feature is not present, /rókanié/ yields *rókanié on Jensen's analysis.

It should be noted that Jensen's analysis has the interesting feature that it posits a vowel system with both low and nonlow unrounded front vowels. This seems to be an option worth further investigation, especially in that some dialects of Hungarian retain a contrast between these vowels. It might be possible to analyse, for example, the underlying form of /ózeŋ/ as having a low, unrounded front vowel, and the underlying representation of *Ágnes* as having a mid one.

seem to be to allow the diminutive morpheme to be specified as an exception to the [+D] branch of the vowel harmony rule (by means of the feature [-VH, +D branch]). Such features would be specified as "costly" by the evaluation metric, to reflect the stipulative nature of this solution.⁶

There is also one further problem for Zonneveld's analysis which should be noted. The apparent phonological generalization about Hungarian seems to be that back vowels may follow roots that end in surface front vowels. This means that the exception subrule of Vowel Harmony will only apply in cases where [-VH] roots end in front vowels. But given a theory where there is an exception subrule like (14), one would expect to find both of the logically possible types of exceptions. Yet the facts do not reflect this.⁷ And in fact, this is precisely what is causing the problem in the case of forms like **Agítól*. At this point we put aside discussion of Zonneveld's approach to the exceptions to Vowel Harmony and turn to the task of formulating a different, hopefully more explanatory account.

I wish to now formulate a *single rule analysis* of Hungarian vowel harmony, in contrast to the analysis proposed by Zonneveld (with an exception subrule) or the two rule approach proposed by Vago (see below). In the approach to be proposed the various exception classes will follow from the interaction of a single rule of Vowel Harmony [similar to (8)], the underlying distribution of vowels and exception features, and the theory of exception features. Thus to begin we will wish to focus on the question of the underlying distribution of vowels and the assignment of exception features.

Consider the relation between vowel harmony in roots and vowel harmony between roots and suffixes. There is an overarching generalization about the vowel system to be represented.⁸ The process of

⁶ This was suggested to me by Wim Zonneveld (p.c.).

⁷ Zonneveld actually does suggest that there are instances of dissimilation from a back vowel. The noun *férfi* 'man' takes back vowel derivational suffixes but takes either front or back vowel inflectional suffixes. Zonneveld suggests that *férfi* is underlyingly /férfi/ and is "in addition [+D] before inflectional suffixes." However, his solution appears to run counter to his claim that "a diacritic feature such as [+D] will be obligatory in all cases" (of a lexical item?). We shall return to the analysis of *férfi* within the analysis of the present paper below.

⁸ Implicit in any analysis of vowel harmony is the question of what the basic generalization is concerning exceptionality. A reviewer has suggested that the set of exceptions to vowel harmony might all be characterized by the notion of nonadjacent assimilation by distinguishing two types of vowel harmony: one type where the suffix vowels agree with the root final vowel and another type where the suffix vowels agree with the root initial vowel. These types would be as illustrated in (i), where the circled vowels do not participate in the harmony, which is indicated by the connecting lines.

vowel harmony generally (i.e., exceptions aside) determines the quality of vowels in both roots and words. A quite reasonable way to view this generalization is to have a rule of Vowel Harmony that applies in both roots and in words. However, certain phonological shapes (the ones that are characteristic of the underlyingly *mixed vowel roots*) will have to be exceptions to root applications of Vowel Harmony. The patterns that we will desire to be exceptional are summarized in (18).

- (18) a. . . . back vowel . . . e . . .
 b. . . . front vowel . . . back vowel . . .
 c. . . . back vowel . . . front rounded vowel . . .

The first shape will be forms like *József*, the second for forms like *bika* or *Tibor* or *amiőbá*, the third for forms like *sofőr*. Again we reiterate that we do not desire underlying forms like (19), since such forms always take (19)

- (19) back vowel

$$\left. \begin{array}{c} i \\ f \\ é \end{array} \right\}$$

back vowel suffixes.

(i)	Type I	Type II
	b@k@á@j@f	to@j@z@se@f
	j@z@se@f@é@l	ib@t@ör@é@l
	k@sz@t@un@ek	ag@t@ól
	@g@ne@snél	je@z@snél
		agn@snál

Such an analysis would have underlying forms like those posited by Vago. It would differ from the underlying forms of the present analysis in that the underlying forms of the mixed vowel roots taking only back vowel suffixes would be underlyingly mixed, as in (ii), rather than underlyingly back, as in the partially abstract forms in (iii).

- (ii) /taxi/
 (iii) /axi/

The reviewer suggests that the advantage of this system is that it localizes all of the exceptions to vowel harmony into a single type of root—roots that permit nonadjacent assimilation.

The single rule analysis formulated below in the text does not depend on the analysis of roots like *taxi* being /taxi/, and the reader's suggestion has merit. The implementation of this suggestion within the final framework is discussed further in fn. 20. One apparent disadvantage of the analysis positing underlying forms like /taxi/ is that there is no simple explanation for why such forms *must* take back vowel suffixes. It might just as well be the case that *taxi* vacillated and forms like *Agyes* only took back vowel suffixes. On the partially abstract analysis of *taxi*-type roots, however, it follows that these forms will not vacillate.

What we therefore require is a mechanism by which the exception feature [- VH], which will block root applications of Vowel Harmony, will be associated with the phonological shapes in (18). I now turn to a proposal for a technical mechanism for effecting this assignment.

Let us consider what it means for a phonological rule like Vowel Harmony to apply to a root. In the early days of generative phonology (e.g., in Halle [5]), phonological rules doubled as morpheme structure rules by applying to strings that were unspecified for (predictable) features. However, if we adopt the "standard theory" assumption of Chomsky and Halle [1], that underlying representations are fully specified for all features, then it is a rather senseless redundancy to try to express a generalization about roots and words by *vacuously* applying the phonological rule of Vowel Harmony to roots in which the fully specified vowels already agree in backness. The question now becomes this: if Vowel Harmony applies to roots, then what is the nature of the objects that it applies to?

Returning in spirit to the earlier assumptions, suppose we adopt the idea that the underlying forms of a language are generated by a phonological base component which incorporates standard theory morpheme structure conditions as base rules.⁹ This option will allow some content to be given to the notion of phonotactic parallels between morpheme structure conditions and phonological rules.¹⁰ We merely state that the rule of Vowel Harmony applies freely. It applies to roots before the level of underlying representation and to suffixes after they are adjoined. (Formally, what this does is distinguish between subderivations which have as their result the fully specified underlying representations of roots and other subderivations which have as their result phonetic representations of words. We capture the generalization that vowel harmony ranges over both roots and words by allowing the rule to apply in both sets of subderivations.)

To be somewhat more concrete regarding the phonological base, we could view it as generating a phrase marker of consonant and vowel nodes, and then as inserting particular consonants or vowels (by a

⁹ The lexicon will contain the information regarding which subset of the underlying representations are occurring forms of the language. One might object that it is redundant to generate underlying forms and to also list them in the lexicon. However, this redundancy can be avoided by making the phonological base input to the lexicon and defining lexical entries as rules that associate phonological and nonphonological information (cf. Langendoen [11], [12]). The lexical rules involved might then be thought of as rules that associate a redundancy free sequence of segments (together with the appropriate non-phonological information) with some output of the phonological base.

¹⁰ The idea of a phonological base is not a new one. See Halle [6] and Langendoen [10] for some discussion.

"lexical insertion" type of operation) to yield the possible morpheme structures of a language.¹¹ In the case of a vowel harmony language like Hungarian, it will not be necessary to stipulate that only back vowels can be inserted in the environment of a preceding back vowel and that only front vowels can be inserted in the environment of a preceding front vowel. Rather, we can permit vowels to be inserted freely into phrase markers the application of vowel harmony to roots will ensure that the desired configurations will result. As a consequence, the base rules for inserting vowels into phrase markers will be very simple, and as a result, very highly valued.

The rules for the "lexical insertion" of vowels may be given as (20) and (21):

(20) Vowel Insertion I

$V \rightarrow \{i, e, a, o, u, \bar{o}, \bar{i}, \acute{e}, \acute{a}, \acute{o}, \acute{u}, \bar{o}, \bar{u}\}$

(21) Vowel Insertion II

$V \rightarrow \{i, \lambda\}$ in the env. "abstract vowel roots"

We stipulate that abstract vowels are only inserted in the roots that are specifically marked as abstract vowel roots. This will prevent them from occurring productively. It will also prevent abstract vowels from occurring in initial syllables. Consequently, aside from the abstract vowel roots, all of the underlying abstract vowels will be due to the application of root vowel harmony to forms like . . . back vowel . . .

$\left\{ \begin{matrix} i \\ e \\ \acute{e} \end{matrix} \right\} \dots$; these will yield underlying form having the shape . . . back

vowel . . . $\left\{ \begin{matrix} i \\ \lambda \end{matrix} \right\} \dots$ and conditioning backness harmony. The ad-

vantage of deriving such forms by root harmony and restricting Vowel Insertion I to the surface vowel system is that we can explain why there are no productive forms with abstract vowels as the leftmost vowel. Since abstract vowels are derived by Vowel Harmony, they will only occur after back vowels in mixed vowel roots. The insertion of abstract vowels by rule (21) will be conditioned by a special diacritic associated with the roots in this class.

Now let us consider the forms which are exceptions to Vowel Harmony, the *mixed vowel roots* and *disharmonic roots* whose forms are

¹¹ Cf. Langendoen [10], [12].

given in (18). These forms can be derived if we adopt the following rules for assigning exception features.

(22) Exceptionality I

$$e \rightarrow [-\text{VH}] / \left[\begin{array}{l} +\text{syll} \\ +\text{back} \end{array} \right] C_o \text{---}$$

(23) Exceptionality II

$$\left\{ \begin{array}{l} \ddot{o}, \ddot{u} \\ \ddot{ö}, \ddot{ü} \end{array} \right\} \rightarrow \left[\begin{array}{l} -\text{VH} \\ +\text{FOREIGN} \end{array} \right] / \left[\begin{array}{l} +\text{syll} \\ +\text{back} \end{array} \right] C_o \text{---}$$

(24) Exceptionality III¹²

$$\left\{ \begin{array}{l} e, i \\ é, í \end{array} \right\} \rightarrow [-\text{VH}] / \text{---} C_o \left[\begin{array}{l} +\text{syll} \\ +\text{back} \end{array} \right]$$

(25) Exceptionality IV

$$\left\{ \begin{array}{l} \ddot{o}, \ddot{u} \\ \ddot{ö}, \ddot{ü} \end{array} \right\} \rightarrow \left[\begin{array}{l} -\text{VH} \\ +\text{FOREIGN} \end{array} \right] / \text{---} C_o \left[\begin{array}{l} +\text{syll} \\ +\text{back} \end{array} \right]$$

If these rules operate in the phonological base that specifies the underlying forms, they will permit us to derive the canonical shapes listed in (18), which is repeated below.¹³

- (18) a. . . . back vowel . . . e . . .
 b. . . . front vowel . . . back vowel . . .
 c. . . . back vowel . . . front rounded vowel . . .

The forms in (19) will not be available as underlying forms, since root applications of Vowel Harmony will convert the vowels i, í, and é to their abstract counterparts.

- (19) . . . back vowel . . . $\left\{ \begin{array}{l} i \\ í \\ é \end{array} \right\}$. . .

The rules that I have suggested so far appear to be the minimal apparatus needed to provide an account of the underlying distribution of vowels in Hungarian. One point deserves further mention. The pres-

¹² Rule (24) must include /e/ in order to account for forms like *hegyvár* 'scamp'.

¹³ Since the Exceptionality rules are formulated in terms of pairs of vowels, it is important to note what will happen in cases where there are three or more vowels in a root. No problem will be engendered accounting for such roots if we assume that the exception features are assigned to segments, not spread to the entire morpheme.

ent analysis makes explicit the mechanism by which roots are permitted to be exceptions to the rule of Vowel Harmony. The rules in (22)–(25) confirm the notion of Chomsky and Halle [1:175] that the phonological shape of a string will be relevant to the assignment of exception features. The present analysis differs, however, in that the exception features are assigned prior to the level of underlying representation.

Now we are ready to turn our attention to the analysis of the *vacillating roots*. We begin by observing that the analysis I have developed so far will not alone account for the fact that a root like *Ágnes* can take either front or back vowels suffixes. The interaction of the underlying representation /ánes/ and the rule of Vowel Harmony in (8) predicts only front vowel suffixes will occur.

It is of interest to observe that the other cases where surface front vowels take back vowel endings will be roots of the form . . . back

vowel . . . $\left\{ \begin{array}{l} i \\ í \\ á \end{array} \right\}$. . . ; these forms will not vacillate, however. We

cannot, of course, analyse roots like *Ágnes* as having an abstract back vowel in the second syllable. There are two types of surface *mixed vowel roots* that take back vowels suffixes. We may distinguish these and their properties by analysing *radír* type roots (which always take back vowels) as underlying back vowel roots, and analysing *Ágnes* type roots (which vacillate) as *mixed vowel roots*.¹⁴ What this then entails is that we find some mechanism that allows roots of the shape . . . back vowel . . . e . . . to take back vowel endings. For Zonneveld, the underlying generalization about vowel harmony is that it is adjacent assimilation—suffix vowels are conditioned by the final vowel of the root. Thus for Zonneveld, the analysis is that vacillating roots undergo *dissimilation* from /e/. The analysis proposed by Vago offers a contrast. For Vago, the generalization involved is that vowel harmony may be nonadjacent, and that front vowels may be skipped to permit assimilation to a more distant back vowel. Vago attempts to formalize the notion that vacillating roots involve assimilation over (a series of) front vowels by means of a rule of Marked Vowel Harmony (MVH) like (26).

(26) Marked Vowel Harmony

$$\left\{ +\text{syll} \right\} \rightarrow \left[+\text{back} \right] / \left[\begin{array}{l} +\text{syll} \\ +\text{back} \end{array} \right] C_p \left(\begin{array}{l} +\text{syll} \\ -\text{back} \\ -\text{round} \end{array} \right) C_o$$

¹⁴ Cf. fn. 8.

While the solution I propose agrees with Vago's assessment of the relevant generalization,¹⁵ it rejects a two rule approach such as the one Vago adopts. Rather, I wish to propose that the appropriate solution is to be found by actually *simplifying* the usual rule of Vowel Harmony [in (8)]. I reject both Vago's two rule approach and Zonneveld's two branch approach. I will show that a simplification in the rule of Vowel Harmony results in an ambiguity of rule application. This ambiguity may then be disambiguated by means of an (independently motivated) Minimal Distance Constraint on rule application which ensures adjacent assimilation. The logic of this proposal is that nonadjacent assimilation will be possible in instances where the generalized rule of Vowel Harmony does not, for some reason, obey the Minimal Distance Constraint. If we provide a mechanism whereby the generalized Vowel Harmony rule has the option of obeying the Minimal Distance Constraint or not in certain cases, then the problem of vacillating roots will be solved.

Now let us consider specifically how such a proposal can be formulated. Traditional formulations of vowel harmony posit a rule as in (8), using an abbreviatory variable which specifies that only consonants may intervene between the focus of the rule and the determinant. But suppose instead that the rule were formulated using a general variable, X, as in (27).

$$(8) \text{ Vowel Harmony (VH)} \\ [+syll] \rightarrow [\alpha\text{back}] / \left[\begin{array}{c} +syll \\ \alpha\text{back} \end{array} \right] C_0 \text{ ---}$$

¹⁵ Vago assumes that the distribution of abstract vowels is restricted to the *abstract vowel roots* [of (7)]. He also assumes that the rules of Vowel Harmony and Marked Vowel Harmony do not apply to roots (due to Kiparsky's Alternation Condition). Consequently, the underlying forms of mixed vowel roots will be as in (i), with no [-VH] specification. Note that Vago assumes that class (5) roots are underlyingly mixed, not underlyingly back.

(i) /tibor/, /józsef/, /agnes/, /taxi/

Vago [19] assumes that Marked Vowel Harmony must apply where it can. It will apply in forms like *taxi*. Forms like *agnes* are marked as optional contextual exceptions to the rule of Marked Vowel Harmony, meaning that they may optionally not condition the rule. When such roots avail themselves of this option, the rule of Vowel Harmony [in (8)] applies, deriving front vowel roots. Forms like *József* are contextual exceptions to Marked Vowel Harmony period. They have no option but to condition (unmarked) Vowel Harmony.

In Vago [20] this analysis is slightly revised. It is suggested that Marked Vowel Harmony is becoming an optional rule. On this account, roots like *József* must be marked as not undergoing this optional rule obligatorily and roots like *taxi* must be marked as obligatorily undergoing this optional rule.

$$(27) \text{ Generalized Vowel Harmony (GVH)} \\ [+syll] \rightarrow [\alpha\text{back}] / \left[\begin{array}{c} +syll \\ \alpha\text{back} \end{array} \right] X \text{ ---}$$

If all else is equal, the structural description of (27) could be satisfied by any of the factorizations shown in (28)–(31), given an underlying forms like /haver + o + tok + hoz/. The determinant of each factorization is circled and the focal vowel is italicized.

$$(28) \text{ a. } /h\textcircled{a}\text{ver} + o + tok + hoz/$$

$$\text{X}$$

$$\text{b. } /h\textcircled{a}\text{ver} + o + tok + hoz/$$

$$\text{X}$$

$$\text{c. } /h\textcircled{a}\text{ver} + o + tok + hoz/$$

$$\text{X}$$

$$(29) \text{ a. } /hav\textcircled{a}r + o + tok + hoz/$$

$$\text{X}$$

$$\text{b. } /hav\textcircled{a}r + o + tok + hoz/$$

$$\text{X}$$

$$\text{c. } /hav\textcircled{a}r + \textcircled{o} + tok + hoz/$$

$$\text{X}$$

$$(30) \text{ a. } /haver + \textcircled{a} + tok + hoz/$$

$$\text{X}$$

$$\text{b. } /haver + \textcircled{o} + tok + hoz/$$

$$\text{X}$$

$$(31) \text{ a. } /haver + o + t\textcircled{a}k + hoz/$$

$$\text{X}$$

The ambiguity of rule application can be eliminated by general principles. One of the principles that interests us is a condition on the

content of the variable X. Jensen [7] has proposed that the length of variables can be predicted by a constraint which (roughly speaking) prohibits any segment S from being contained in the substrings matched to X if S itself is a possible focus of the rule. Departing slightly from Jensen's specific technical proposal,¹⁶ we formulate the relevant principle as (32).

(32) Minimal Distant Constraint (MDC)

No segment S may intervene in a variable X of some rule R, if S can itself condition the application of the rule.

The Minimal Distance Constraint will rule out all of the factorizations in (28)–(31) except the (a) ones in (29)–(31). To account for the choice among the allowable factorizations, we simply state that the rule of Generalized Vowel Harmony applies from left to right across a string (i.e., first the determinant is matched to the leftmost vowel and the rule is applied, then the determinant is matched to the next leftmost vowel and the rule is applied, and so on).¹⁷ The output of the rule of Generalized Vowel Harmony to the underlying form /haver + o + tok_[-VH] + hoz/ will thus be /haverötökhoz/ (haveretekhez, following a further rule of Unrounding).

As in a theory with a rule like (8), suffix harmony is to the final root vowel. However, given a rule like Generalized Vowel Harmony, it is the Minimal Distance Constraint which actually entails this fact, not the formulation of the rule. We could therefore account for *vacillating roots* by stating that they are exceptions to the Minimal Distance Constraint, permitting a factorization like (28a). (Notice that only the roots will be exceptional; the suffixes will harmonize adjacently from left to right, as usual. This will prevent the derivation of forms like *haveretekhez, *haveretokhoz, or *haveretokhez.)

One question of interest is of course how the *vacillating roots* would come to be exceptions to the Minimal Distance Constraint. The most obvious approach is to revise the theory of exceptionality to allow

¹⁶ There are a number of ways that the principle of minimal distance can be worked out. See Jensen [7], Odden [13], and Jensen and Stong-Jensen [9]. See also Friengo and Gitterman [4], where an "A-Before-A Condition" is adopted, and Friengo [3], where a "Priority Filter" is formulated.

¹⁷ Stipulating the direction of the rule's application simplifies matters, but it may not be necessary if the convention that some rules apply whenever their structural description is met is adopted. GVH would then iterate until all of the vowels in a form agree in backness with the leftmost vowel. This nondirectional alternative is not without problems, however.

markings like [-MDC] to appear on roots. Such features would be assigned by rules similar to the Exceptionality rules that assign the feature [-VH] to roots. Since the *vacillating roots* generally have the shape ... back vowel ... e ... , a first approximation would be a rule like (33).

(33) Exceptionality V (preliminary version)

$$e \rightarrow [-MDC] / \left[\begin{array}{l} + \text{syll} \\ + \text{back} \end{array} \right] C_o \text{---}$$

However, this rule is too general. We obviously do not want this rule to apply to all of the roots having the shape ... back vowel ... e ... , since this would predict that roots like *József* (which only take front vowels) vacillate. We must apparently add a stipulation to rule (33) specifying the identity of the roots in which it applies (or those in which it doesn't).¹⁸ Thus, the conditions under which roots of the shape ... back vowel ... e ... will yield doublets will be partly phonological [due to the general rule (33)], but partly idiosyncratic (due to the stipulation on its application). (33) will be replaced by (34).

(34) Exceptionality V

$$e \rightarrow [-MDC] / \left[\begin{array}{l} + \text{syll} \\ + \text{back} \end{array} \right] C_o \text{---} \text{ in certain roots}$$

A rule like (33) or (34) is also too specific. Until now we have been assuming that only roots of the form ... back vowel ... e ... vacillate, and that roots having the form ... back vowel ... $\left. \begin{array}{l} i \\ i \\ é \end{array} \right\}$... always take back vowel suffixes. But as noted in fn. 2, there are a few roots having the later shape that *do* vacillate, e.g., *analízis*, *pozítív*, *affér*, *aszpirín*. In order to account for this class of forms we must do two things. First we must posit a mechanism that will enable these forms to have the underlying shape ... back vowel ... $\left. \begin{array}{l} i \\ i \\ é \end{array} \right\}$...

rather than the shape ... back vowel ... $\left. \begin{array}{l} i \\ i \\ \lambda \end{array} \right\}$ Second we must

¹⁸ Alternatively, we could state the *e* is generally [-MDC], but that roots like *József* are exceptions to this subgeneralization.

exception is also a focal exception. If this were so, it would suffice to mark the vowels of *vacillating roots* as being (optionally) contextual exceptions to vowel harmony. The principle involved is a natural one, and in fact Phelps [14] reports that a *Linguistic Inquiry* reader suggested that "it may not be desirable to allow exceptions that are contextual but not focal."

If we adopt the position suggested here, then the analysis of Hungarian only needs to stipulate two things to account for the relevant underlying mixed vowel roots: that certain forms (like *József*) are marked as [-VH]_r, while other forms (like *Ágnes*) are marked as either [-VH]_r or as [-VH]_c.²⁰ This analysis seems to be the best that can be done and we now turn to a contrast between the revised single rule analysis and the other analyses that have been discussed.

3. SUMMARY

The purpose of elaborating the single rule analysis has not merely been to show another way in which Hungarian vowel harmony can be analyzed. I obviously wish to show that, of the many analyses that have been advanced, this is the optimal one. In this concluding section

²⁰ Vago [22] notes that there is a mixed vowel root ending in /e/ that only takes back vowel suffixes: *maszék* 'self-employed'. If this root is analyzed as /maszék/, it is problematic for Zonneveld's analysis, as the optional subrule of disharmony *must* apply.

On the revised single rule analysis, *maszék* can be analyzed as having an /e/ which is always a contextual exception to the rule of GVH.

The analysis of the form /érfi/ is also straightforward. Recall that this form takes back vowel derivational suffixes but either front or back vowel inflectional suffixes. This form would be analyzed as having the underlying representation /érfi-_r i-_r / before derivational suffixes and either that form or the form /érf-_r i-_r / before inflectional suffixes.

A comment is also required concerning the formulation of the analysis of *taxi* type mixed vowel roots as having the underlying forms /taxi/ rather than /taxi/ that was mentioned in fn. 8. Consider the forms *József*, *Ágnes*, and *taxi*. The first would have the final vowel marked as [-VH]_r; the third would have the final vowel marked as [-VH]_c; the second would take either marking. We could account for the distribution of exception features by means of one rule assigning the feature [-VH]_c to all roots having the shape . . . back vowel . . . front vowel . . . and by means of a second rule changing [-VH]_c to [-VH]_r in certain stipulated roots.

(i)
$$\begin{bmatrix} +\text{syll} \\ -\text{back} \end{bmatrix} \rightarrow \begin{bmatrix} -\text{VH}_c / \\ +\text{back} \end{bmatrix} \begin{bmatrix} +\text{syll} \\ +\text{back} \end{bmatrix} C_0$$
 in certain roots

(ii) [-VH]_c → [-VH]_r / in certain roots

While this solution requires less features than the one where *taxi* type roots are underlyingly back vowel roots, other factors are involved [such as the status of rules like (ii)]. I leave the choice between these two versions of the revised single rule analysis for another occasion.

I now summarize the axioms of the revised single rule analysis and counterpose them to the systems that have been advanced by Vago and by Zonneveld. (I do not, however, discuss the systems proposed by Jensen [7], Phelps [14], or Ringen [15]. This decision is partly due to a desire to avoid prolixity and partly due to the fact that the discussion of these analyses in Vago [20] and Zonneveld [23] present convincing counterarguments.²¹)

We turn first to the revised version of the single rule analysis, the analysis proposed in this paper. I seek to account for vowel harmony by means of a minimal rule of harmony in conjunction with a limited theory of exception features. The axioms of this analysis are summarized in (40).

(40) the revised single rule analysis

- a single rule of Generalized Vowel Harmony, which is formally simpler than other rules of vowel harmony,
- the exception features [-VH]_r and [-VH]_c, and the rules that assign these features; the exceptionality rules also function to give the distribution of underlying vowels,
- a rule of Absolute Neutralization which fronts the abstract back vowels.

We contrast this with Zonneveld's "exception subrule" analysis, which has the axioms in (41).

(41) Zonneveld's "exception subrule" analysis

- a subrule of Vowel Harmony
- a subrule of disharmony
- the diacritic feature [+D], which triggers the disharmony rule, and rules to assign this feature,
- rules which assign the feature [-VH] to underlying forms (for the purposes of comparison we may assume that the relevant rules, not given by Zonneveld, are as in the single rule analysis),
- a special rule eliminating the feature [+D] from roots like /ág/ (i.e., in the diminutive form of *Ágnes*),
- a rule of Absolute Neutralization.

²¹ The main points of the criticisms are the following. Jensen's analysis fails in the case of *vacillating roots* like *rokamie* (cf. fn. 5). Phelps' analysis relies on complex phonological rules, partly conditioned by diacritic features. Ringen's analysis (the version of it made explicit by Zonneveld) both uses rules of unnecessary complexity and fails in the case of forms like *rokamie* and *affér*, which vacillate.

morpheme structure conditions.) A rough formal balance may be assumed between Vago's treatment and the single rule analysis as regards the underlying forms.²⁴ Vago's analysis will not require rules for assigning the feature [-VH] to mixed vowel roots, but it will require that his morpheme structure conditions duplicate the content of the vowel harmony rules. The single rule analysis must, of course, be favored over the two rule analysis on the basis of simplicity. The single rule analysis requires no rule of Marked Vowel Harmony; it permits both a simpler set of rules to be adopted in this case and a more restrictive theory of phonological rules to be defended in general.

To conclude, we observe that the analysis of Hungarian vowel harmony is controversial in that it has implications for the confirmation or disconfirmation of a number of theoretical devices and claims, including those relating to abstractness and the proper formulation of exception mechanisms. It should be stressed in particular that these are empirical questions that may be resolved by comparing the relative prolixity of the class of grammars proposed, and by choosing what is jointly the optimal solution and the best theory. The "theoretical" questions involved are not *per se* questions of abstractness versus concreteness, or of diacritic features versus exception features, but rather of which type of analysis—what devices and what division of labor—permits the simplest, most general and most revealing account.

In the present paper I have laid out a complete analysis of Hungarian Vowel Harmony, adopting certain analytic options. The central points that I assume are that a single rule of Generalized Vowel Harmony and a small set of exception features and redundancy rules will suffice to account for vowel harmony. On the basis of simplicity and restrictiveness, I have argued that the proposed analysis should be evaluated as optimal. As always, this evaluation is tentative. It remains to be seen now whether further attempts can improve on the suggestions made here, and whether analyses of other languages confirm or disconfirm the devices and division of labor which have been suggested here.

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- ²⁴ See Vago [18], [21] for the relevant morpheme structure condition. While Vago does not explicitly assign the feature [-VH₁] to roots, he does state that *dis-harmonic roots* will be exceptions to the morpheme structure conditions.

We observe the Zonneveld's analysis requires a special mechanism to deal with the diminutive of *Ágnes*; such forms are straightforward on the single rule analysis. Zonneveld also requires the additional sub-rule of disharmony and the diacritic feature [+D]; these are not needed on the single rule analysis. We also observe that the "exception sub-rule" analysis will provide no connection between the assignment of [-VH] to mixed vowel roots and the assignment of the feature [+D]. It might just as well be underlying back vowel roots that receive [+D], given the lack of any connection.

Now consider Vago's "two-rule" analysis. This analysis will require the devices in (42).

- (42) Vago's "two-rule" analysis
- a. a rule of Vowel Harmony
 - b. a rule of Marked Vowel Harmony
 - c. morpheme structure conditions that yield the distributions of the vowels in the roots
 - d. an exception feature that marks roots as not conditioning Marked Vowel Harmony, and rules that obligatorily assign this feature to *József*-type roots and that optionally assign this feature to *Ágnes*-type roots
 - e. a rule of Absolute Neutralization

This analysis contrasts with the revised single rule analysis in that it requires the additional rule of Marked Vowel Harmony.²² It also requires that diacritic features be assigned to designate (for any mixed vowel root) which rule of vowel harmony will apply to it²³; but again, there is no connection between the mechanisms that stipulate that certain roots do not obey the usual (unmarked) vowel harmony conditions and the further fact that nonadjacent assimilation is permitted.

Another difference between the single rule analysis and Vago's analysis concerns the specifics of the morpheme structure mechanisms. Vago disallows *i*, *é*, and *á* in any roots except the *abstract vowel roots*; his morpheme structure conditions permit unrounded front vowels and back vowels to cooccur. (*Dis-harmonic roots*, which have rounded front vowels together with back vowels, are marked as exceptions to the

²² Vago proposes that phonological rules should duplicate the effects of morpheme structure conditions, but this proposal has not met with much favorable reaction. In particular, it is difficult to see how the fact that root harmony and word level harmony have the same effects is better explained by duplicate rules (conditions) than by a single rule (condition).

²³ As noted, this is Vago's original approach. A later revision is suggested in Vago [20].

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Remarks on Thematically Governed Predication

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0. INTRODUCTION

Williams [4] (hereafter W) suggests that all sentences have a level of representation (predicate structure) in which modifier-head¹ relations are indicated by indexing. W believes that there are two basic types of predication relations—grammatically governed cases in which syntactic structure signals the relevant relationships [cf. (1)] and thematically governed cases in which a VP-internal predicate modifies the theme [cf. (2)]

- (1) a. NP_i VP_i John died.
 - b. NP_i VP X_i John left nude/singing.
 - c. NP_i be X_i John is sick/near Larry.
- (2) NP V Y $\left[\begin{array}{l} NP_i \\ + \text{theme} \end{array} \right]$ X_i John sold the meat raw.

In all cases of predication, an NP must c-command and be c-subjacent to its modifier.

Within the framework just outlined, there is a curious asymmetry involving the grammaticality of verbal constructions and nominalizations that fall into cases (1b) and (2).

- (3) a. That John departed nude shocked me.
 - b. *John's departure nude shocked me.
- (4) a. John destroyed the paintings drunk.
 - b. *John's destruction of the paintings drunk was a crime.

¹ W uses the term "antecedent" rather than "head" to refer to the nominal of which a modifier is predicated.