

1 Introduction

Phonologists have known for some time that the so-called 'standard' theory of generative phonology is not adequate for the analysis of vowel harmony. Ringen (1975, 1977, 1980) suggests that some of the problems can be solved by abandoning the assumption that phonological representations are fully specified. Clements (1977b, 1980) suggests that vowel harmony should be analysed autosegmentally. 1 Underspecification theory, developed in the recent work of Kiparsky, Archangeli and Pulleyblank, incorporates both of these proposals. This paper considers how Hungarian can be analysed within this theory. 2 It is shown that by adopting Goldsmith's (1985) proposal that vowel harmony in Hungarian involves the spreading of the feature [-back], the transparent (neutral) vowels in Hungarian are derived because the redundancy rule assigning [-back] to these vowels, although available, does not apply early in the derivation because its structural description is not met. Other accounts of transparent vowels involve stipulation (that is removing neutral vowels from the domain of harmony as in e.g. Kiparsky 1981), neutralisation (as in e.g. McCarthy 1984), or feature geometry (as proposed in Archangeli & Pulleyblank 1987, forthcoming a). If the account presented here is correct, it raises the following questions: Are there several sources for transparent vowels? Can other cases of transparent vowels be shown to have a similar source?

2 Background data

The vowels of the standard (Budapest) dialect of Hungarian are given in (1):

1  
Front

<table>
<thead>
<tr>
<th>Short</th>
<th>Long</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>i [i]</td>
</tr>
<tr>
<td>Mid</td>
<td>é [e]</td>
</tr>
<tr>
<td>Low</td>
<td>e [e]</td>
</tr>
</tbody>
</table>

2  
Back

<table>
<thead>
<tr>
<th>Long</th>
<th>Short</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back</td>
<td></td>
</tr>
<tr>
<td>u [u]</td>
<td>ü [u:]</td>
</tr>
<tr>
<td>o [o]</td>
<td>ő [o:]</td>
</tr>
<tr>
<td>á [a:]</td>
<td>a [a]</td>
</tr>
</tbody>
</table>

Unrounded | Round

327
Front vowels do not generally occur in words with back vowels. The transparent or neutral vowels (i, e, and o) are not subject to this restriction. Non-neutral (harmonic) suffix vowels alternate depending on the harmonic quality of root vowels:

(2) ház 'house' ház-nak dat.
    város 'city' város-nak dat.
    úr 'gap' úr-nak dat.
    óröm 'joy' óröm-nak dat.

When a root contains a back vowel followed by one transparent vowel (mixed vowel root), harmonic suffix vowels are back:

(3) radúr-nak 'eraser' dat.
    kavics-nak 'pebble' dat.
    tányér-nak 'plate' dat.

Following roots with only neutral vowels, harmonic suffix vowels are generally front, as illustrated in (4):

(4) víz 'water' víz-nak dat.
    fillér 'penny' fillér-nak dat.

There are, however, about fifty roots with only transparent vowels that require back suffixes:

(5) híd 'bridge' híd-nak dat.
    célt 'goal' célt-nak dat.

Loanwords often violate harmony restrictions. For example, sofőr 'chauffeur' and bűrő 'bureau' have both front and back harmonic vowels. Harmonic suffix vowels following such disharmonic roots agree in backness with the last harmonic root vowel:

(6) bűrő-nak 'bureau' dat.
    sofőr-nak 'chauffeur' dat.

3 Analysis

Archangeli (1984) assumes that only one value (+ or −) of every feature is specified in underlying representation. Consider first the possibility that only [+back] is specified in underlying representations and that [−back] is supplied by a redundant vowel. Non-neutral vowels have the following.

(7) i e a  

    high

    low

    back

    round

Finally, let us assume with Hungarian which states:

(8) [+back] may only be

Following Pulleyblank (1984) are linked by Universal A.

(9) Vowel Harmony

[+ back]

/ \ 
V V 

Because of the constraint in those vowels which are either ház 'house' will have a form specified as [+back]:

(10) [± back]

h V V z

[± low]

After the UAC applies, the re

(11) [± back]

h V V z+n V

[± low] [± low]
Transparency in Hungarian vowel harmony

is supplied by a redundancy rule. Assume further that the Hungarian vowels have the following underlying specifications:

\[
\begin{array}{cccc}
\text{high} & \text{low} & \text{back} & \text{round} \\
\text{ie} & + & + & + \\
\text{eu} & + & + & + \\
\text{o} & - & - & - \\
\text{a} & + & + & + \\
\text{u} & + & + & + \\
\text{A} & + & + & + \\
\end{array}
\]

Finally, let us assume with Kiparsky (1981) that there is a constraint in Hungarian which states:

\[(8) \ [+\text{back}] \text{ may only link with vowels that are [+low] or [+round].}\]

Following Pulleyblank (1986), we can assume that floating autosegments are linked by Universal Association Convention (UAC) to unassociated vowels from left to right, one-to-one. Vowel Harmony (VH) can be stated as a rule that spreads [+back] rightward:

\[(9) \ Vowel \ Harmony\]

\[\begin{array}{c}
\text{[+back]} \\
\text{V} \\
\text{V}
\end{array}\]

Because of the constraint in (8), VH will spread [+back] to all and only those vowels which are either [+low] or [+round]. The lexical entry for ház 'house' will have a floating autosegment and the vowel will be specified as [+low]:

\[(10) \ [+\text{back}] \]

\[
\begin{array}{cccc}
\text{h} & V & V & z \\
\text{(ház)} & & & \\
\text{[+low]} & & & \\
\end{array}
\]

After the UAC applies, the representation of the dative of ház would be as shown by the solid lines in (11):

\[(11) \ [+\text{back}] \]

\[
\begin{array}{cccc}
\text{h} & V & V & z + n & V & k \\
\text{(háznak)} & & & & & \\
\text{[+low]} & & & \text{[+low]} & & \\
\end{array}
\]

\(+ \text{ or } -\) of every feature der first the possibility that inations and that \([-\text{back}]\)
The application of VH, indicated by the dashed lines, would link the second and third vowels to the autosegment [+back]. Compare (11) to the dative of ār ‘gap’, which would have the underlying representation in (12):

\[ \begin{array}{c}
V \ V \ r+n \ V \ k \\
\ \ \ [\text{+round}] \ [\text{+low}]
\end{array} \]  

(úrnek)

By the redundancy rules listed in (13), the root vowel would surface as ā and the suffix vowel as e [e].

\begin{align*}
(13) & \ a. [\text{ }] \rightarrow [-\text{back}] \\
& b. [\text{ }] \rightarrow [-\text{low}] \\
& c. [\text{ }] \rightarrow [-\text{round}] \\
& d. [\text{ }] \rightarrow [+\text{high}] \\
& e. [+\text{low}] \rightarrow [-\text{high}]
\end{align*}

On this analysis, the representation of the dative of radir ‘eraser’ would be as in (14) after the UAC and Vowel Harmony apply (application of VH is indicated by the dashed line):

\[ \begin{array}{c}
r \ V \ d \ V \ V \ r+n \ V \ k \\
\ \ \ [+\text{low}] \ [\text{+low}]
\end{array} \]  

(radirnak)

The autosegment [+back] would not link with the final root vowels because these vowels are not [+low] or [+round], as required by the constraint in (8). By application of the redundancy rules in (13), the representation of radirnak is derived:

\[ \begin{array}{c}
r \ V \ d \ V \ V \ r+n \ V \ k \\
\ \ \ [+\text{low}] \ [-\text{low}] \\
\ \ \ [+\text{round}] \ [-\text{round}] \\
\ \ \ [+\text{high}] \ [-\text{high}]
\end{array} \]  

(radirnak)

Roots with only neutral vowels specified autosegment; by the surface as front vowels:

\[ \begin{array}{c}
v \ V \ V \ z+n \ V \ k \\
\ \ [+\text{low}]
\end{array} \]  

(16) Exceptional forms such as *hi would spread to suffix vowels root vowels because of the constraint. Disharmonic roots such as lexically bound to the second:

\[ \begin{array}{c}
[-\text{back}] \\
\ b \ V \ r \ V \ V+r \\
\ \ [+\text{round}] \ [+\text{round}] \\
\ \ [-\text{high}]
\end{array} \]  

(17) The [+back] autosegment is defined as operating only rigidly linked to the [+b] however, it must be assumed bound to the first vowel, as in:

\[ \begin{array}{c}
s \ V \ f \ V \ V \ r \\
\ \ [+\text{round}] \ [+\text{round}] \\
\ \ [-\text{high}] \ [-\text{high}]
\end{array} \]  

(18) It can be assumed that some v blocks the spreading of [+back] to the autosegment of the second root vowel must be
Roots with only neutral vowels, such as víz, would have no lexically specified autosegment; by the redundancy rules in (13) all vowels would surface as front vowels:

\[
\begin{array}{c}
\text{(16)} \\
v \ V \ V \ z+n \ V \ k \rightarrow v \ V \ V \ z+n \ V \ k \quad (\text{víznek})
\end{array}
\]

Exceptional forms such as híd would have a [+back] autosegment which would spread to suffix vowels by VH, but which would not associate with root vowels because of the constraint in (8).

Disharmonic roots such as büro would have a [+back] autosegment lexically bound to the second vowel:

\[
\begin{array}{c}
\text{(17)} \\
b \ V \ r \ V \ V+n \ V \ k \quad (\text{búrónak})
\end{array}
\]

The [+back] autosegment could not spread leftward because VH is defined as operating only rightward. Harmonic suffix vowels would be correctly linked to the [+back] autosegment by VH (g). For sofőr, however, it must be assumed that the [+back] autosegment is lexically bound to the first vowel, as in (18):

\[
\begin{array}{c}
\text{(18)} \\
s \ V \ f \ V \ V \ r+n \ V \ k \quad (\text{sofőrnek})
\end{array}
\]

It can be assumed that some version of the Strict Cycle Condition (SCC) blocks the spreading of [+back] within the root. But what blocks the spreading of [+back] to the suffix vowels? (Compare (18) with (14) where the second root vowel must be skipped in the derivation of radírnak.)
earlier autosegmental treatments of vowel harmony, both vowels in disharmonic loans such as sofőr were lexically bound to (different) autosegments as in (19). Hence, spreading of [+back] was blocked by the prohibition against crossing of association lines (Goldsmith 1976):

(19) [+back] [-back] 

This option is not available if we assume that only one value of a given feature, + or -, may occur in lexical representations. Unless we abandon the claim that root and suffix harmony are both accounted for by the VH rule (as does Goldsmith 1987), it appears that it is not possible to describe Hungarian vowel harmony in underspecification theory as outlined in Archangeli (1984) and Pulleyblank (1986) if it is assumed that the feature [+back] is lexically specified in Hungarian.

Consider next the possibility that [-back] is lexically specified rather than [+back] and that underlying vowels in Hungarian are as in (20):

<table>
<thead>
<tr>
<th></th>
<th>i</th>
<th>e</th>
<th>u</th>
<th>o</th>
<th>a</th>
<th>ü</th>
<th>ö</th>
</tr>
</thead>
<tbody>
<tr>
<td>high</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>low</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>back</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>round</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

The following redundancy rules will correctly fill in the blanks:

21.

a. [+low] → [-high^-]
   [-round^-]

b. [ ] → [+round^-]

c. [ ] → [-low^-]

d. [-round^-] → [-back^-]

e. [ ] → [+back^-]

On this analysis, Vowel Harmony (VH) spreads [-back]:

22. Vowel Harmony

[-back^-] 

V V

Roots such as ūr, with fi a free [-back] autosegment:

23. [-back^-]

V V r+n

Application of the UAC:

24. [-back^-]

V V r+n

[+]

Back vowel roots such as h: [+back^-] specification of supplied by the redundancy rule:

25.

h V V z+n V k

[+low^-] [+low^-]

Mixed vowel roots such as n: the redundancy rules in (21)

26.

V V d V V r+n V

[+low^-][-round^-] [+low^-]
Roots such as űr, with front harmonic vowels, are lexically specified with a free [-back] autosegment:

(23) [-back]

\[
\begin{array}{c}
\text{V V r+n V k} \\
\phantom{\text{V V}} \text{[+low]} \\
\end{array}
\] (űrnek)

Application of the UAC and VH gives:

(24) [-back]

\[
\begin{array}{c}
\text{V V r+n V k} \\
\phantom{\text{V V}} \text{[+low]} \\
\end{array}
\] (űrnek)

Back vowel roots such as hűz have no lexically specified autosegment. The [+back] specification of the root vowels and harmonic suffix vowels is supplied by the redundancy rules:

(25)

\[
\begin{array}{c}
\text{h V z+n V k} \\
\phantom{\text{h V}} \text{[+low]} \\
\end{array}
\] (hűznak)

Mixed vowel roots such as radír have no [-back] autosegments either. By the redundancy rules in (21), harmonic suffix vowels become back, but the second root vowel surfaces as the front vowel i:

(26)

\[
\begin{array}{c}
\text{r V d V r+n V k} \\
\phantom{\text{r V d V}} \text{[+low]} \phantom{\text{[+low]}} \\
\end{array}
\] (radírnak)
Notice that because VH refers to [-back], the Redundancy Rule Ordering Constraint (Archangeli 1984) will require that the redundancy rule (21d), which fills in the [-back] specification of transparent vowels, be assigned to the same component as VH:

(27) **Redundancy Rule Ordering Constraint**

A redundancy rule assigning \([\alpha F]\), where \(\alpha\) is '+' or '−', is automatically assigned to the first component in which there is a rule which refers to \([\alpha F]\).

The redundancy rule (21d) does not actually apply, however, because the vowels \(i\), \(i\) and \(é\) are not yet specified as [-low] and hence the structural description of the rule is not met.\(^{13}\) Were the redundancy rule (21d) to apply to the vowels of *radir*, the analysis being developed here would not be tenable because subsequent application of VH would, incorrectly, result in front harmonic suffix vowels following mixed vowel roots such as *radir*.

Roots with only neutral vowels can be assumed to have a floating [-back] autosegment which is associated with the first vowel by the UAC and with other vowels by VH:

\[ \begin{array}{c}
\text{v} \quad \text{V} \quad \text{V} \quad z+n \quad \text{V} \quad \text{k} \\
\text{[-round]} \quad \text{[-low]} \\
\end{array} \]  

(viznek)

(28)  

Roots such as those in (5), which require back harmonic suffix vowels, yet contain only transparent vowels, have no autosegment. By the redundancy rules in (21), the root vowels become front unrounded vowels, but harmonic suffix vowels following these roots become [+back]. A disharmonic loanword such as *sofar*, which was problematic if [+back] was lexically specified, is not problematic if [-back] is the lexically specified feature:

\[ \begin{array}{c}
\text{V} \quad \text{f} \quad \text{V} \quad \text{V} \quad \text{r} \\
\text{[-high]} \quad \text{[-high]} \\
\end{array} \]  

(sofar)

(29)  

It can be assumed that *sofar* has a [-back] autosegment that is lexically bound to the second root vowel. Suffix vowels following this root will be [-back] (by VH), but the first root vowel will become [+back] by the redundancy rules, since VH cannot apply to spread [-back] to it. The

form *bür*, however, appear under consideration as sof lexically bound to the first second vowel, but how can

4 Locality Condition

Archangeli & Pulleyblank local:

(30) **Locality Condition**

A rule can apply only trigger.

They note that if features a Clements (1985), and if a rule highest level of syllabic struct then, in general, consonants but vowels will block rules at whose targets and triggers a heads, a level which provides rules affecting consonants will access to both consonants and.

If the Locality Condition is of the [-back] autosegment:

\[ \begin{array}{c}
\text{b} \quad \text{V} \quad \text{r} \quad \text{V} \quad \text{V+n} \\
\text{[-high]} \quad \text{[+]} \\
\end{array} \]  

(sofar)

Assuming that the SCC blocks last vowel in *bitr*, then the Lo of VH to the suffix vowel bec autosegment would require ski of the Locality Condition.\(^{16}\)

5 Spreading of [+back]

It might appear that a similar is available if VH spreads [+back]
Redundancy Rule Ordering at the redundancy rule (21d), insparant vowels, be assigned

where 'α' is '+' or '-' is an element in which there is a

apply, however, because the low and hence the structural
the redundancy rule (21d) to

Vzhnek

ok harmonic suffix vowels, yet

ont unrounded vowels, but

tons become [+back]. A dis-

problematic if [+back] was

ack] is the lexically specified

autosegment that is lexically

eals following this root will be

will become [+back] by the
to spread [+back] to it. The

form būró, however, appears to present the same difficulty for the analysis
under consideration as sofőr did for the previous one. If [-back] is

lexically bound to the first vowel, the SCC can prevent spreading to the
second vowel, but how can the spreading to suffix vowels be blocked?

4 Locality Condition

Archangeli & Pulleyblank (1987) suggest that all spreading must be local:

(30) **Locality Condition**

A rule can apply only if a specified target is adjacent to a specified

trigger.

They note that if features are organised hierarchically, as suggested by
Clements (1985), and if a rule whose target is node or feature α scans the
highest level of syllabic structure providing access to α (maximal scansion),
then, in general, consonants will be transparent to rules affecting vowels,

but vowels will block rules applying to consonants. This is because rules

whose targets and triggers are vowels will scan at the level of syllable
heads, a level which provides access to vowels but not consonants, whereas

rules affecting consonants will scan the skeletal tier, a level which provides

access to both consonants and vowels.

If the Locality Condition is adopted, it is possible to block the spreading

of the [-back] autosegment of būró:

(31) [-back]

\[ b \overset{V}{\underset{\text{[-high]}}{V \overset{V+n}{\underset{[+low]}{V}}} \overset{k}{\text{būrónap}}} \]

Assuming that the SCC blocks the application of VH root internally to the

last vowel in būró, then the Locality Condition will block the application

of VH to the suffix vowel because linking the suffix vowel to the [-back]

autosegment would require skipping over the root final vowel, a violation

of the Locality Condition.

5 Spreading of [+back] reconsidered

It might appear that a similar solution invoking the Locality Condition is

available if VH spreads [+back]. It will be recalled that a disharmonic
root such as sofør was problematic because, although root-internal spreading of the [+back] autosegment could be blocked by the SCC, nothing would prevent it from spreading to suffix vowels. However, if VH is assumed to apply to a projection of [+round] and/or [+low] vowels, then the Locality Condition could be invoked to prevent VH from skipping the harmonic vowel in a disharmonic root such as sofør. Specifically, since transparent vowels would not appear on such a projection, they would be skipped, but harmonic vowels—even in the disharmonic roots—would appear on the projection and hence could not be skipped. The difficulty with such an analysis is that although a single non-low unrounded vowel can be skipped, two or more cannot. If transparent vowels are excluded from the harmonic projection, they should not be able to block spreading.

6 Mixed vowel roots with sequences of neutral vowels

It is usually claimed that harmonic suffix vowels following mixed vowel roots ending in two neutral vowels vacillate, i.e. they allow both front and back harmonic vowels. However, the empirical investigations of Kontra & Ringen (1986, 1987) show that, in fact, very little vacillation occurs. Most of Kontra & Ringen's subjects used exclusively front suffix vowels with most mixed vowel roots ending in multiple transparent vowels. For example, the overwhelming majority of subjects use front harmonic suffix vowels with a word such as bronchitis 'bronchitis': bronchitis-neh.

The fact that a sequence of transparent vowels apparently can influence suffix vowel choice shows an analysis such as the one just sketched, involving the projection of only the harmonic vowels, to be inadequate.

On the other hand, if [-back] is the spreading feature, the behaviour of suffix vowels following mixed vowel roots ending with more than one transparent vowel can be described by a rule that inserts a [-back] autosegment whenever a morpheme ends with a sequence of transparent vowels:

(32) [-back] Insertion

\[
\begin{array}{c}
\text{V} \rightarrow \text{V} / \quad - \quad \text{V} + \\
\text{[-round] [-round]}
\end{array}
\]

This rule feeds VH, so that neutral vowels become fron

\[
\begin{array}{c}
\text{V n V} \\
\text{[+low][+low]}
\end{array}
\]

b. by rule (32): [+back] -

\[
\begin{array}{c}
\text{V n V} \\
\text{[+low][+low] [+]}
\end{array}
\]

c. by Vowel Harmony

\[
\begin{array}{c}
\text{V n V} \\
\text{[+low][+low] [-]}
\end{array}
\]

d. by the redundancy

\[
\begin{array}{c}
\text{[+back] [+back] [+]}
\end{array}
\]
cause, although root-internal vowels could be blocked by the SCC, suffix vowels. However, if VH were applied and/or [+low] vowels, evoked to prevent VH from allowing root such as sőfő, could not appear on such a harmonic root such as sőfő, even in the projection and hence could not be excluded, two or more cannot. If the harmonic projection, they

ces of neutral vowels

vowels following mixed vowel i.e. they allow both front and back suffix vowels. For example, Kontra very little vacillation occurs. exclusively front suffix vowels tippe transparent vowels. For subjects use front harmonic vowels such as 'bronchitis': bronchitisz-neh. Vowels apparently can influence such as the one just sketched, i.e. vowels, to be inadequate. sking feature, the behaviour of a suffix ending with more than one rule that inserts a [−back] with a sequence of transparent

This rule feeds VH, so that suffix vowels following roots ending with two neutral vowels become front:

(33) a. underlying representation

```
V n V l V z V s + n V k
[+low] [+low] [−round] [−round] [+low]
```

b. by rule (32): [−back] Insertion

```
[−back]
V n V l V z V s + n V k
[+low] [+low] [−round] [−round] [+low]
```

c. by Vowel Harmony

```
[−back]
V n V l V z V s + n V k
[+low] [+low] [−round] [−round] [+low]
```

d. by the redundancy rules in (21)

```
[+back] [+back] [−back] [−back]
V n V l V z V s + n V k
[+low] [+low] [−low] [−low]
[−round] [−round] [−round] [−round]
[−high] [−high] [−high] [−high]
```

(analizisnek)
7 Conclusion

We have seen that it is possible to describe Hungarian vowel harmony in underspecification theory as outlined by Archangeli (1984) and Pulleyblank (1986) if, as proposed by Goldsmith (1984), the feature that spreads in Hungarian is [−back]. The analysis outlined here describes disharmonic loanwords and other complications of vowel harmony without abandoning the claim that root and suffix harmony is a single process or the claim that the feature [−back] occurs only on one tier. More interesting, perhaps, are the questions raised by the analysis sketched here. Must multiple sources for transparent vowels be admitted? Can transparent vowels in Khalkha Mongolian, which derive from the feature geometry in Archangeli and Pulleyblank’s work, be analysed in a similar fashion?

NOTES

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[1] Autosegmental analyses of various vowel harmony systems involving different (and often incompatible) assumptions have appeared in recent years. These include quite a few that deal with Hungarian: Clements (1977), Kiparsky (1981), Booij (1984), Goldsmith (1985), Even & van der Hulst (1985), van der Hulst (1985), Steriade (1987), Kornai (1987), and Farkas & Beddor (1987), to name a few.

[2] Even & van der Hulst (1985) suggest that the assumption of single-valued features is similar to, but simpler than, the underspecification assumption of Archangeli (1984). They analyse Hungarian in this framework, but are forced to index autosegments as either word level or syllable level. Archangeli & Pulleyblank (1987) adopt a set of assumptions which, they suggest, predicts that a language like Hungarian, with neutral vowels of two heights, cannot exist.

[3] Although Hungarian vowel harmony has received considerable attention in recent years, even statements about which vowels are transparent are not uncontroversial. I base the claim that [e] is front harmonic, and not transparent, on the arguments in Ringen (1975, 1978, 1980) and on the empirical investigations summarised in Kontra & Ringen (1986, 1987) and Ringen & Kontra (1988).

[4] Hungarian also has roundness harmony, which is ignored here. For a recent discussion see Kornai (1987).

[5] Archangeli assumes two types of redundancy rules, Default Rules and Complement Rules. For our purposes it is not necessary to distinguish between these two types of rules.


[7] I assume that the interaction of these rules is determined by universal constraints on rule application. Although both (13d) and (13e) are applicable to the suffix vowel, the ’elsewhere’ condition (Kiparsky 1972) or Proper Inclusion Precedence (Sanders 1974) predict that (13d) applies. That the interaction of rules filling in unspecified features is predictable by universal constraints is assumed by Ringen (1975) and Archangeli (1984), among others.

[8] In addition to the redundancies

\[ \text{[+ba]} \]
\[ \text{[+back]} \]
\[ \text{V} \]
\[ \text{[+round]} \]
\[ \text{[+lo]} \]

so that short low back vocals satisfy the rules.

[9] Even if VH operated left projection, VH...

[10] Recent discussions (e.g. /good/ 1984) for dis-u-caseions in the case of disharmony in the version of the SCC as a... in non-derived forms (1983) blocks the root-in...

[11] As in the previous analysis redundancy rules will have to be applied to the inputs and ignored. We cannot ignore the fact that... to the vowel specified as [−front].

[12] The Redundancy Rule Or... of the original construction.

[13] This was pointed out to me that the analysis sketched... in the sense of the SCC and the SCC as applied to the structural description of (a) good vowel harmony.

[14] Van der Hulst & Smith (1979) on... for reasons that are not considered here. Indeed, redundants are built into the paradigms of good vowel harmony. An alternative analysis would assign the redundant segment for roots containing...

[15] I continue to represent the present analysis depends on features.

[16] Following Farkas & Beddor the suffixes following disharmonic [−back] must spread. As in... and [−back] (1979), that harmony must be...

...others with back vowels.

...
Hungarian vowel harmony in rchangeli (1984) and Pulley
ith (1985), the feature that analysis outlined here describes
ions of vowel harmony with-
harmony is a single process curs only on one tier. More
ed by the analysis sketched
nt vowels be admitted? Can
which derive from the feature
work, be analysed in a similar

and an anonymous reviewer for
this paper. Discussions with D.
sterson, V. Urkewich and R. Vago
some of the issues raised in this

many systems involving different
reappearing in recent years. These in-
els (1977a), Kiparsky (1981),
Hulst (1985), van der Hulst
ark & Beddor (1987), to name a

assumption of single-valued fea-
tension in this framework, but are forced to
be syllable level. Archangeli &
which, they suggest, predicts that a
of two heights, cannot exist.
received considerable attention in
vowels are transparent are not un-
harmonic, and not transparent, on
and on the empirical investigations
and Ringer & Kontra (1988),
which is ignored here. For a recent

y rules, Default Rules and Com-
necessary to distinguish between

is determined by universal con-
and (13) are applicable to the
parsky 1973) or Proper Inclusion
ponses that the interaction of
izable by universal constraints is

9] In addition to the redundancy rules in, (13) we must assume a rule:

\[ [+\text{back}] \]

\[ V \rightarrow [+\text{round}] / - \]

\[ [-\text{low}] \]

so that short low back vowels will be specified as [+ round]. By the 'elsewhere'
condition this rule will take precedence over (13c).

[5] Even if VH operated leftward, the SCC would block the root-internal application of VH.

[10] Recent discussions (e.g. Archangeli & Pulleyblank forthcoming b) cite Lever-
good (1984) for discussion of how root-internal spreading is blocked by the
SCC in the case of disharmonic loanwords. It should be noted, however, that
the version of the SCC assumed by Levergood (1984) blocks most rule applica-
tions in non-derived forms. The version of the SCC assumed in Kiparsky
(1985) blocks the root-internal spreading in disharmonic loanwords only if
distinctiveness is defined as in Pulleyblank (1986).

[11] As in the previous analysis, I am ignoring the implication that the actual redundancy rules will have to specify the short low back vowel as [+ round]. Both
analyses also ignore the fact that it is necessary to formulate a rule stating that a
long non-high front unrounded vowel is [-low]. The application of harmony
to the vowel specified as [+ low] will yield [ε], which doesn't occur on the surface.

[12] The Redundancy Rule Ordering Constraint (RROC) cited here is a recent
version of the original constraint (see Archangeli & Pulleyblank forthcoming a).

[13] This was pointed out to me by D. Archangeli (personal communication). Note
that the analysis sketched here can be maintained only if there is no rule that
refers to [-low] in the same lexical component as the harmony rule. If there is
such a rule, then the RROC requires that redundancy rule (21c), which
introduces [-low], apply in that component. This, in turn, would mean that the
structural description of (21d) would be met and this rule would apply and
(incorrectly) feed vowel harmony.

[14] Van der Hulst & Smith (1989) reject an analysis similar to the one just sketched
for reasons that are not completely clear to me. They suggest that forms like
are show that redundancy rule (21d) must apply at the lexical stratum, but that
forms like rodz show that it cannot. As pointed out in the text, however, al-
though the RROC puts the Redundancy Rule (21d) in the lexical stratum, it
cannot apply there. Hence, this rule cannot be responsible for the [+ back]
specification of [ε]. I see nothing, however, that precludes assuming that roots like
are specified lexically with a floating [+ back] autosegment as I have done.
An alternative analysis would be to formulate a rule to insert the [+ back] auto-
segment for roots containing only unrounded non-low vowels (see note 16).

[15] I continue to represent the features non-hierarchically because nothing in the
present analysis depends on (or is inconsistent with) hierarchically organised
features.

[16] Following Farkas & Beddor (1987), Steriade (1987) cites the behaviour of
suffices following disharmonic loanwords as evidence that both [+back] and
[+back] must spread. As we have seen, however, the behaviour of suffixes
following disharmonic loanwords can be accounted for without assuming that
both [+back] and [+back] spread. Steriade also assumes, following Vago
(1978), that harmony must be feature changing in Hungarian. Vago's argument,
which he now rejects (personal communication), is that certain (alternating)
suffices occur as independent stems, some with front harmonic vowels and
others with back vowels. He takes the quality of the vowel in the independent
stem to indicate the (underlying) quality of the suffix vowel. But as van der Hulst (1985) has shown, Vago’s argument does not show that suffix vowels must be specified for backness in Hungarian. Moreover, I do not see how Steriade’s analysis will work if some suffix vowels have underlying [+back] vowels. Specifically, she introduces the [+back] feature of i, i and e by a (late) redundancy rule which applies after the VH rule applies. If, following Vago (1976), we assume that a suffix nd/nd (additive) has an underlying back vowel, a root with only transparent vowels (e.g., ZEN field ‘water’) will be predicted to have the additive *vNEN, which is not correct; only *vNEN is possible.

[17] If [+back] is assumed to be the lexically specified feature, then the transparent i, i, and e must be skipped by vowel harmony. Archangeli & Pulleyblank suggest that if hierarchically organised features are assumed, it is possible to skip one transparent vowel—the one that is totally unspecified—if it is assumed that in addition to rules involving maximal scansion, some rules involve minimal scansion. In the case of minimal scansion, a rule whose target is node or feature x scans the tier containing z. A vowel harmony rule which scans the secondary place tier (the tier containing [+back]) will skip a vowel that is totally unspecified on the secondary place tier without violating the Locality Condition. As Archangeli & Pulleyblank note, this allows for one neutral vowel (e.g., i in Khalkha Mongolian), but not for neutral vowels of different qualities as found in Hungarian and Finnish.

[18] front back both
paralízis 943 47 09 ‘paralysis’
alibi 953 28 19 ‘alibi’

Compare the results obtained with roots ending in a single neutral vowel:
profit 00 1000 00 ‘profit’
kurziv 41 939 20 ‘italic’
anket 38 905 57 ‘meeting’

(Between 50 and 100 subjects participated in all experiments.) Although roots ending in two neutral vowels did not show vacillation, other types of roots which have been claimed to induce vacillation did show vacillation in Kontra & Ringen’s studies. For example, ne ‘wife of’ is a suffix which Vago (1980) claims induces vacillation of suffix vowels: Farkas-nah but Farkaszsene/nah. Subjects in Kontra & Ringen’s (1987) studies did exhibit much less agreement about suffix vowel choice in such cases than with mixed vowel roots ending with two neutral vowels:

front back both
tamir-né 289 64:4 6:7 ‘teacher’s wife’
Farkas-né 160 71:7 12:3 ‘Mrs Farkas’

[19] I assume that no suffix vacillation occurs with roots ending with two neutral vowels. If, however, vacillation does occur, then the rule can be assumed to be optional. This rule must be prevented from applying to the exceptional roots with only neutral vowels (e.g. hid) when followed by a suffix with transparent vowels. This can be done by restricting the insertion rule to apply only on the first lexical stratum. Note that this rule would also insert a [-back] autosegment in all roots containing only transparent vowels except monosyllabic ones. Thus, if another rule inserting a [-back] autosegment to monosyllabic roots with a transparent vowel were adopted, it would be unnecessary to specify [-back] for any roots containing only transparent vowels. Exceptional roots such as hid, which require back vowel suffixes, would have to be marked with a rule feature to prevent such a rule from applying to them. This is actually a welcome complication because otherwise the exceptional roots like hid are formally less complex than the regular roots like viz, since the former would have no autosegment specified lexically whereas the latter would have a [-back] autosegment.
the suffix vowel. But as van der
does not show that suffix vowels
are. Moreover, I do not see how
vowels have underlying [+back]
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rule applies. If, following Vago
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example: 'water') will be predicted
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rule which scans the secondary
vowel that is totally un-
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Underspecific harmony systems

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1 Introduction

The recent phonological literature presents a significant body of research under the heading of underspecific harmony. This model of inquiry was first formulated more deeply in Archangeli (1988) and Archangeli & Pulleyblank (forthcoming), where it is advanced in these works under the name of underspecific harmony. The value of underspecific harmony is specified underlyingly by changing harmony, which is characterized by its particular interest in the generative system and its restrictiveness. Indeed, it fits as Steriade (1987b), to give an example, suppose that the feature values at the underspecific harmony are rare (cf. Lieber 1987). Height in Spanish, as analysed by McCarthy and others, is a solid piece of evidence for the underspecific harmony. The underspecific harmony is in fact not limited to underspecific feature values. Additional support for the underspecific harmony is that it recognizes only one feature.

In §2 I outline the basic facts. In §3 I account for the underspecific feature interaction of feature architecture. In §4 I motivate the underspecific interaction of feature architecture. The underspecific feature changing property of height feature [high] is floating in formalisms that first link and then I summarise the major findings of the underspecific feature changing property of height feature [high].