On skipping

(A reply to Steriade's "Non-underlying feature values")

vd. Hulst & Smith, Inc.

1. Introduction

In this note we will evaluate two approaches toward harmony and disharmony processes. Of central importance to any theory of such processes is the question how it can be that in many cases the target and trigger may be separated by other segments whose presence or absence appears te be irrelevant to the process.

In the past such processes have been described in terms of rules which make reference to conditioned variables of the following type:

(1) Structual Description: \A X B

Condition on X: a. X may contain C
b. X may not contain C

If no variable was specified in the SD the rule was assumed to operate strictly local, i.e. only on segments which are adjacent. Only if material could intervene between A and B this had to be stated in the rule. Specification of C was basically arbitrary, although attempts were made to constrain this (e.g. Jenssen).

Variables are powerful devices and much research of the past ten years has aimed at eliminiating reference to variables like X. If we make the strongest claim and say that no variables can be used, hence that no material can ever intervene between A and B, we need a model which meets two requirements:

(2) a. Features are represented on independent tiers
b. Feature specifications need not be present al all level of representation

The framework of autosegmental phonology meets the first requirement. More recently several proposals have been made to incorporate the notion of *underspecification* in this model. In her paper "Non-underlying feature values", presented as the NIAS-workshop on phonological features, Donca Steriade proposes a theory of underspecification which allows one to formulate rules for long-distance processes without making use of variables like X.

A crucial property of this proposal is that features are binary valued and also that distinctive and non-distinctive feature specifications should not be treated on a par.

Van der Hulst & Smith (1986) also claim to explain at least some of the long-distance phenomena, in particular those involved in vowel harmony processes, and within their theory features are single-valued. Here we investigate whether and how this theory can accomodate the wide variety of cases which are covered by Steriade's theory, and thus, whether it is really crucial to abondon single-valued features. We will modify our theory in certain respects, in particular by incorporating Steriade's distinction between distinctive and non-distinctive properties of segments and by making use of proposals concerning the structure of segments as made in Clements (1986, NIAS-workshop) en Steriade (several papers & NIAS workshop).

In section 2 I will show how Steriade's framework handles a wide variety of harmony and disharmony processes. In section 3 I show how the vd Hulst & Smith approach can be made to fit the cases which S. has discussed. As a bonus, I

will give a solution for the skipping-of-i-riddle in Khalkha in section 4.

2. Steriade's model

2.1. General points

S. makes a distinction between two *non-underlying feature specifications*:

(1) a. *Complement value*
A non-underlying value of F within the minimal segmental class where F is distinctive

b. *Default value*
A non-underlying value of F within a segmental class where F is predictable

The value which is specified lexically (for segments belonging to the class where F is distinctive) will be called the *lexical value* here.

Which value is lexical and which complemental depends on language particular factors such as alternations, economy and, if that is not decisive, on universal markedness (cf. Archangeli 1984).

A simple example involving the feature [voice] will illustrate the distinction. (All examples I mention here are taken from Steriade's talk, unless specified otherwise). In (2) one finds the Japanese segment inventory:

(2) a. p,t,k,b,d,g,s,z
b. m,n,r,j,w, vowels

(2a) contains the obstruents, the class whithin which the feature [voice] is distinctive. (2b) contains non-obstruents which are all predictably [+voice]. On the assumption that [+voice] represents the lexical value, we may formulate two feature-filling rules:

(3) a. CR [-son] -> [-voice]
b. DR [+son] -> [+voice]

Complements values are filled in by a *universal complement rule (UCR)*:

(4) Universal Complement Rule
Given some feature F and a level of representations where only underlying values of F, [aF], are present: find all pairs of segments (s1, s2) such that s1 differs from s2 only in that s1 is [aF] and s2 is [OF]. Specify s2 as [-F]

Observe that CR's need not be provided with a context and in fact need not be stated at all, given the UCR.

S. has to stipulate that C-values are always specified before D-values.

Footnote
Within the Dutch system [voice] is non-distinctive for velar non-continuent obstruents (i.e. there is /k/ but no /g/). Hence this segment must acquire its value by a DR. Why? Although there is no way to designate the class of obstruents *minus /k/*, the UCR will assign no value to /k/ which is [OF] underlyingly, because it has no minimally distinct counterpart. If one speaks a dialect of Dutch which has no /G/ (voiced velar fricative) then the minimal class where [voice] is distinctive would be [-son, -back]:

Standard Dutch [-son, -cont, +back] -> [-voice]
/G/-less dialect [-son, +back] -> [-voice]

The prediction is that obstruents which has a predictable value for [voice] potentially behave different with respect to voice assimilation.# ← indicates end of footnote

Specifications for a particular feature then are of three types:

(5) 1. L-values
2. C-values
3. D-values

Phonological rules of assimilation or dissimilation (harmony or disharmony) refer to two elements which either must agree or disagree for a feature F. Given (5) we may expect to find three types of rules if we assume that phonological rules may apply before assignment of C-values, after assignment of C-values but before assignment of D-values or after assignment of D-values. With respect to material intervening between the target and the trigger of a rule this means that if a rule making reference to F ignores segments it must be the case that such segments do not have a value for F when this rule applies:

If a rule applies before assignment of C and D-values it can skip segments which have C or D-values for the features which the rule makes reference too. If a rule applies after assignment of C-values it can only ignore segments which have a D-value for the relevant feature(s). Finally, if a rule applies after assignment of D-values it must operate on strictly adjacent segments *on* the assumption that all segments have values for all features.

Steriade shows that the three cases mentioned actually occur. I will discuss the cases she mentions (reconstructing them from a hand-out).

2.2. Cases

2.2.1. L-rules: rules applying before C-values have been assigned

Japanese
Lyman's Law in Japanese (Ito & Mester 1986) which forbids two voiced obstruents inside a morpheme, even if a voiceless osbtruent intervenes, is an example of L-dissimilation. The fact that voiceless obstruents appear to be irrelevant for the process shows that voiceless obstruent must not be specified for voice.

(6) L-value [+voice]
C-value [-voice]
D-value [+voice]

voicing is distinctive for obstruents

S. formulates the rule as follows:

(7) +vce +vce
X X

diss. across distinctive [-α]

Footnote
It is sufficient to formulate the rule as follows:

[+vce] -> [-vce] / - [+vce]

This is in agreement with ~~the~~ Donca's paper abstract.#

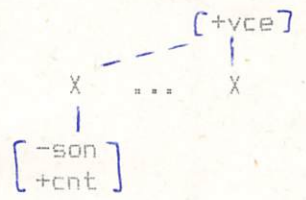
Footnote
Is there anything ruling out the following situation:

fricatives: L-value [+voice]
stops : L-value [-voice]

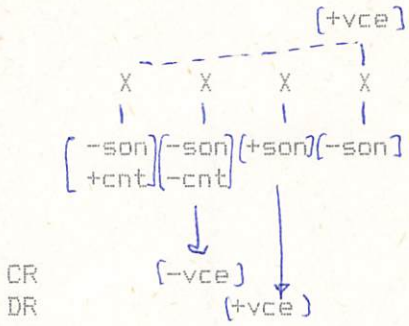
Fricatives assimilate to stops across voiceless fricatives and voiced stops. Of course the *maximal* class within which [vce] is distinctive is the class of obstruents.#

Imaginary example
S. doesn't mention this example. I introduce it here because I will refer to it later. An example of L-assimilation involving voice would be something like this. We have a rule voicing continuant obstruents across voiceless stops (which have a C-value for voice) and across all sonorants (which have a D-value for voice):

(8)



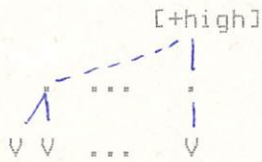
(9)



Footnote
If voicing is distinctive for fricatives, they could not trigger the rule and would be specified as [αvce] by a DR. If voicing is distinctive for fricatives then they could trigger the rule and they would be specified as [-vce] by the CR. Whatever the case may be, it would be technically possibly to have a rule like the one in (8) as a L-rule.#

Menomini
The example of L-assimilation which S. provides is *Menomini Vowel Raising*, a rule which raises a mid vowel (if long) to high before a high vowel. This rule applies across the low vowel and across the mid short vowels (/e/ in any case) and S. formulates it as follows:

(10)



Footnote
Presumably the trigger "V" does not have to occur in the rule's SD.#

The vowel system is:

(11) i e u o a E

The class within which [high] is distinctive is [-low]:

(12)
L-value	[+high]
C-value	[-high]
D-value	[-high]

Because the rule spread [+high] across short /e/ it cannot be the case that

this vowel is specified for the feature [high] and since it gets it value from a complement rule, MVR must apply before the CR for [high]. By the same reasoning MVR must apply before the default rule, since it may spread across the low vowel /a/ which gets its value for [high] by a default rule.

Footnote
/E/ blocks the spreading. It is a [-ATR] vowel. The fact that rules involving height operate on spans of [ATR] vowel is not weird. Cf. Bari.#

2.2.2. C-rules: rules applying after C-values have been assigned

Latin
A dissimilation which applies after C-values have been assigned occurs in Latin and involves the feature [lateral]. This feature is distinctive within the class [+cns, +son, +cnt], i.e. is distinctive for /l/ vs. /r/. Assume that [+lat] is the L-value:

(13) L-value [+lat]
C-value [-lat]
D-value [-lat]

(14) nov-alis, semnin-alis
sol-aris, aliment-aris, line-aris, milit-aris
flor-alis

(14) [+lat] -> [-lat] / [+lat] -

The point is that the value for the feature [lateral] appears to be specified only for /l/ (as the L-value) and for /r/ (as the C-value). Other segments whose value for this feature is non-distinctive will be assigned by a default-rule. If the dissimilation rule would apply before /r/ is specified as [-lateral the third case should be *floraris*.

(14)

Ainu
Ainu provides another example of C-dissimilation: high vowels cannot be preceded by a non-low vowels with the same backness value. However /a/ can precede both /i/ and /u/. Since backness is only distinctive for the non-low vowels, /a/ has a D-value for [back], whatever it is and the rule applies before this value is specified.

(15) L-value [+back]
C-value [-back]
D-value [?back]

Pasiego
C-assimilation minimally different from the Menomini case would involve a situation where mid short vowels are opaque. Another diagnostic for C-assimilation is *symmetry*, i.e. if both values spread then the rule must apply after C-values have been assigned.

Pasiego height-harmony is minimally different from Menomini MVR. However mid vowels are not opaque, because they happen to be targets; since all [-low] vowels undergo raising or lowering following or preceding a stressed [-low] vowel:

(16) L-value [+high]
C-value [-high]
D-value [-high]

The fact that e/o causes i/u to lower indicates that [-high] must be specified and hence that the rule must applies after C-values have been assigned. It must apply before D-values are assigned because /a/ is transparent:

(17) [ahigh]

V // ... V

The target need no be specified as [-low]. /a/ is [+low] which presumably blocks association of [+high] and assigning [-high] doesn't do any harm.

Footnote
Donca's hand out gives [+high] in the rule, but I assume this is a typo.#

Russian
The symmetry argument for C-status of a rule is used to argue that voicing assimilation in Russian is a C-rule. The assimilation is symmetrical and sonorant consonants are transparent. A potential wrinkle is that vowels are not transparent. S. assumes that targets are coda consonants.

Footnote
The symmetry-argument in favor of C-rules is based on the assumption that we don't allow rules like:

[+F] -> [OF] / - [OF]

A rule like this could apply before the CR filling in [-high] in the case of Pasiego.#

Sanskrit, Chumash, Navajo
A rule of coronal harmony operates in Sanskrit, spreading [-ant, -distr] of /r/ and /s./ to the left to /n/. Any intervening coronal blocks. In Sanskrit the features [anterior] and [distributed] are distinctive within the class of coronal consonants. Hence other coronals then /r/ and /s./ have complement# values for these features. The blocking behaviour of these segments is accounted for if we assume that the rule is a C-rule.

S. points to an interesting minimal difference between coronal harmony in Sanskrit and coronal harmony in Chumash (and Navajo) where harmony applies to continuant coronals only (/s/ and /sj/). Harmony here is symmetrical in that the rightmost continuant coronal determines the values for the coronal features. Interestingly intervening non-continuant coronals don't block the harmony. More interestingly within this class the coronal features are not distinctive. Hence although the rule applies after specifying the C-values alveolars non-continuants can't block because they get there coronal values by a DR.

Footnote
Rules applying after C-values have been assigned are not necessarily symmetrical. It is possible that either - or + spreads. Recall our imaginary voicing assimilation rule which skipped voiceless stops. If such stops would block spreading of [+vce] -something which one would expect on intuitive grounds- the rule would have to be C-level. But still this wouldn't mean that fricatives would have to undergo regressive *un*voicing. The Salentino rule discussed below is another case where only + spreads although - has already been filled in.#

2.2.3. D-rules: rules applying after assigning D-values

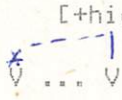
Rules of this type must be *local* since at this level all segments have values

for all features. Also non-distinctive, i.e. default specification may trigger the rule.

Spanish etc.
An example is vocing harmony trigerred by sonorants (and obstruents). A potential problem is that vowels must not trigger voicing harmony, presumably.

Salentino
An example involving [high] is the Salentino case. [+high] spreads leftward onto a stressed vowel:

(18)



The low vowel /a/ may not intervene (mo'nac-u -later mo'nuc-u- and not mu'nuc-u). There appears to be no evidence on intervening mid vowels (?). Still, because /a/ blocks, D-values must be assigned. The prediction is that mid vowels too will be blockers.

Observe that although D-values for vowels have been assigned, those for consonants must not, since the rule can still apply across consonants.

Romanian
A D-rule involving [back] is Romanian, which has the following vowel inventory:

(19)

i	+	u
e	A	o
	a	

The rule of harmony turns the back unrounded vowels into their front counterparts. /u, o, a/ are blockers.

(20)

L-value [+back]
C-value [-back]
D-value [+back]

Since vowels which do not have a distinctive value for backness block the rule, it must apply after D-values have been assigned (for vowels only!).

2.2.4. Other cases of vowel harmony

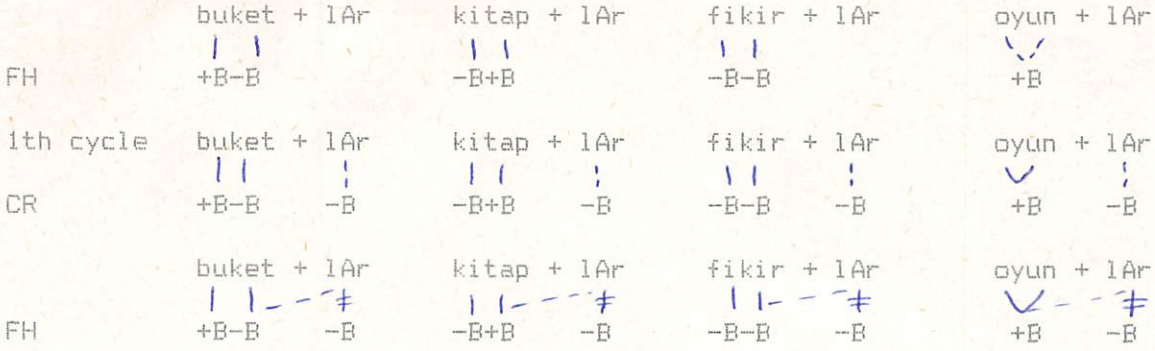
How does all this apply to "ordinary vowel harmony". I am not sure about Donca's treatment of vowel harmony.

Turkish
Consider Turkish and disregard the palatal consonants. The value for [back] is distinctive for the whole class of vowels. Presumably [+back] is again the L-value.

Consider the derivation of disharmonic and harmonic roots:

(21)

	buket + lAr	kitap + lAr	fikir + lAr	oyun + lAr
	+B	+B		+B
0th cycle	buket + lAr	kitap + lAr	fikir + lAr	oyun + lAr
CR	+B-B	-B+B	-B-B	+B

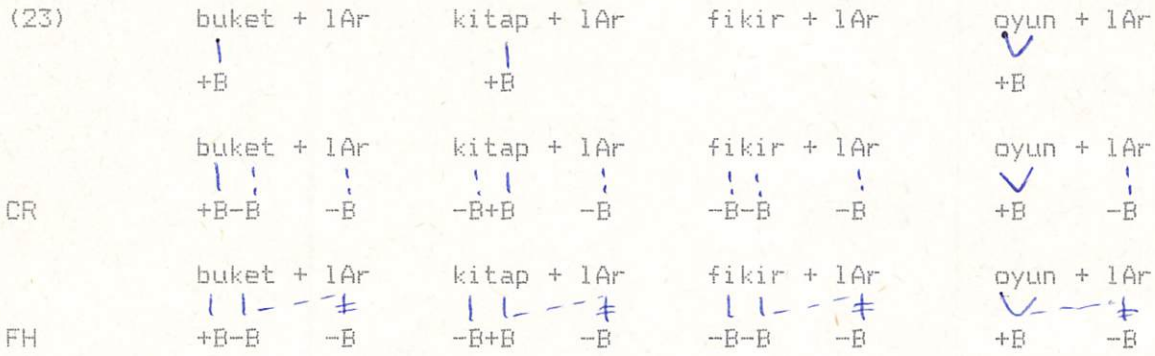


I have assumed that the CR doesn't apply to roots which have a floating instance of [-B]. We could also assume that the vowels are simply linked to [-B]. If CR must precede FH, FH must be feature changing.

(22)

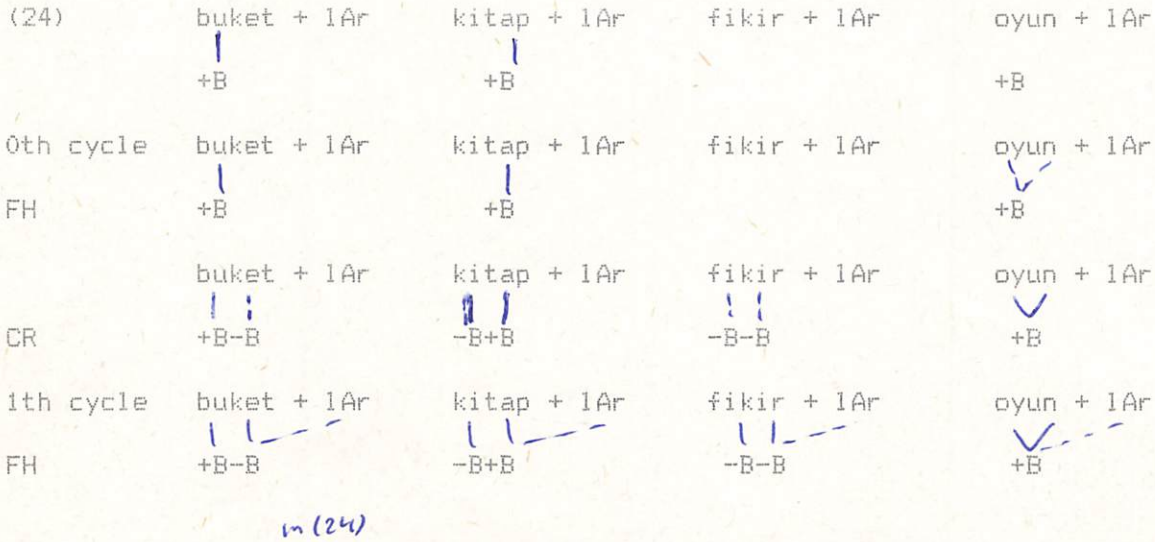
FH could also be applied non-cyclically, as long as CR precedes FH:

(23)



Is it also possible that FH precedes CR?

(24)



In (24)

On the first cycle [+B] cannot spread due to the SSC (which only holds if harmony is cyclic). C-value assignment also operates cyclically. It assigns [-B] to the second vowel. On the second cycle harmony applies spreading [-B] to the suffix vowel.

Finnish

Now consider Finnish. In careful style /i,e,y,ö/ are transparent. In casual style only /i,e/ are transparent. /i,e/ get their [-B] by a DR, /y,ö/ by a CR. Hence in the careful style FH applies before CR and CR, in the casual style it

applies in between CR and DR.

(25) L-value: [+back]
C-value: [-back]
D-value: [-back]

(26) Filter: [-ro, -lo, +back]

FH is also cyclic and therefore subject to the SCC. Condiser two derivations of the disharmonic word *marttyri*:

(27)

0th cycle	marttyri + Us			marttyri + Us	
FH	+B		CR	+B -B	
	marttyri + Us			marttyri + Us	
CR ??	+B		FH ?	+B -B	
	marttyri + Us			[illegible]	
DR ??	+B		DR ?	[illegible]	not applicable
1st cycle	marttyri + Us			marttyri + Us	
FH	+B		CR	+B -B -B	
	marttyri + Us			marttyri + Us	
CR	+B -B +B		FH	+B -B -B	
	marttyri + Us				
DR	+B -B-B +B		DR	not applicable	

It seems to be the case that CR and DR if following FH must not (in the left hand derivation) or need not (in the right hand derivation apply cyclically.

Hungarian

Finally let us look at Steriade's treatment of Hungarian. Here too we are dealing with two systems. In one /e/ is transparent, in the other /e/ is harmonic. S. doesn't make a difference between short and long /e/.

The vowel system is specified as follows:

(28)

	i	y	u	e	ë	o	a
bk			+	.			
rd		+	+		+	+	
hi	+	+	+				
lo						+	

In the "older" system /a/ is specified as [+low]. The redundancy rules are as follows:

(29)

CR a. [bk] -> [-bk]

b. [rd] -> [-rd]

c. [hi] -> [-hi]

d. [lo] -> [-lo]

DR a. [bk] -> [+bk] / [+low, -]

b. [bk] -> [-bk] / [-low, -rd, -]

FH operates after CRa and DRa but before DRb.

The "newer system" differs minimally from the older one. In stead of specifiying the /a/ as [+low] it is specified as [+back]. This eleminates DRa and complictaes slightly CRd:

(30) d' [lo] -> [+lo] / [+bk, -rd, -]
[-lo]

(S. doesn't spell this all out on the hand out, so I may be wrong in certain details.)

In the newer system FH still applies after CRa, which now specifies /e/ as [-back] which explains why it is no longer transparent.

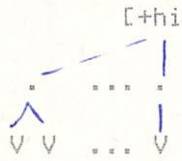
2.3. Summary and discussion

We have come across the following cases:

(31)	Dissimilation	[voice]	[high]	[back]
L-rule	Lyman's Law	(imag. ex)	Menomini	Careful Finnish
C-rule	Latin Lat./Ainu	Russian	Pasiego	Casual Finnish/Old Hun.
D-rule	---	Spanish	Salentino	Romanian/Old Hun.

Looking back at the various rules which we have discussed, one might notice that a certain type of variable is still in use. Take Menomini vowel raising

(32)



The "..." indicate that in between target and trigger there may be any number of intervening slots. On might propose to eliminate these from the rule (in fact the right hand V-slot could be eliminated any way) and adopt the convention that no potential target or trigger may intervene between a selected target and trigger. Steriade assumes this condition of course. The point she wants to make is that in spreading [+high] to the left, we don't encounter any intervening specified feature *on the [high]-tier*.

If we now turn to dissimilation processes, it appears not to be the case that the argument in favor or underspecification is equally forceful. Consider Lyman's Law. Why is it the case that (33) does not meet the SD of (34):

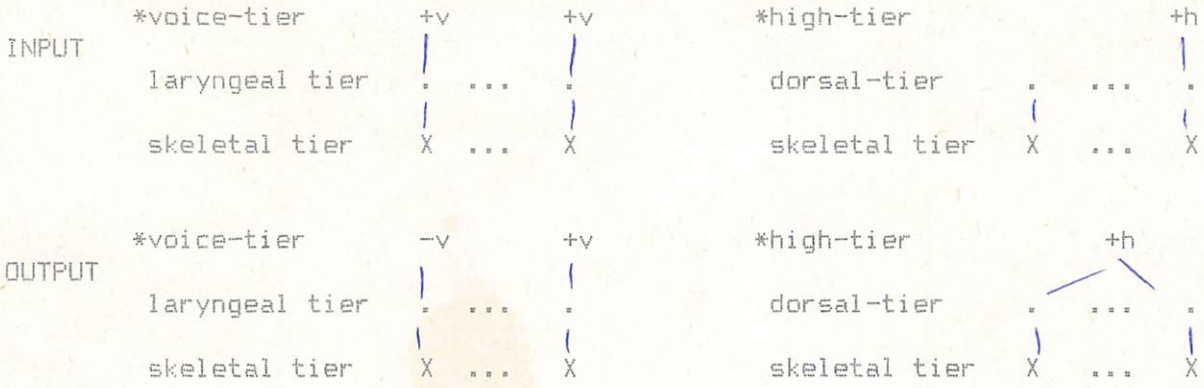
(33)

(34) [+vce] -> [-vce] / - [+vce]

It is apparently not sufficient to say that no target/trigger may be intervening. It must simply be stipulated that dissimilation requires strict adjacency.

We can make the following generalization. In both rules of assimilation and rules of dissimilation part of the SD/SC of the rule refers to the tier or tiers where something changes. Let us call this the *action tier*. In both cases nothing may intervene between target and trigger on that tier (those tiers).

(35)



The *action tiers* are marked with an asterisk. At those tiers we require locality. But notice that although this locality follows from the ban on crossing lines in the case of harmony (i.e. spreading), it does not follow from anything in the case of disharmony.

3. Comparison with vd. Hulst/Smith approach

3.1. Single valued features

A central point of difference between the two approaches involves the fact that we use a feature system in which features are single-valued.

A single valued system makes no difference between something like a complement and a default value. If a segment has a positive value for a particular property (positive from a phonetic point of view) it is literally marked with this property expressed by a feature, particle, element, component (or whatever one might like to call it), but if a segment lacks this property it simply lacks the feature. In our work we refer to the phonetic interpretation of the feature as the lexical value and to the phonetic interpretation of the absence of the feature as the default value. I.e. both Steriade's C-value and D-value are referred to as D-values in this system.

At this point we see the following problems regarding this system:

Practical problems
-What's the precise set of simplex features for vowels and consonants?

Technical problems
-How do we make reference to for example /a/ without making reference to /e/. We must allow to refer to segments which contain [a] *and nothing more*

-Ainu dissimilation is difficult to state. A vowel associated to [i] must become associated to [u] and dissociate from [i] and vice versa.

-Processes involving height often involve reference to the pair i/u (i.e. loss of generalization)

-Some processes which intuitively involve spreading ask for deletion rather than spreading rules, i.e. Menomini /e/ -> /i/ involves deletion of the [a]-particle (cf. below)

Conceptual problems

-The default value (which is not supposed to be an entity) may act as an entity in two ways:

it "spreads"
it "blocks"

Moreover there appear to be cases in which only distinctive default values act this way (i.e. complement values). Hence we must make a difference between default values which appear to interfere and those which do not.

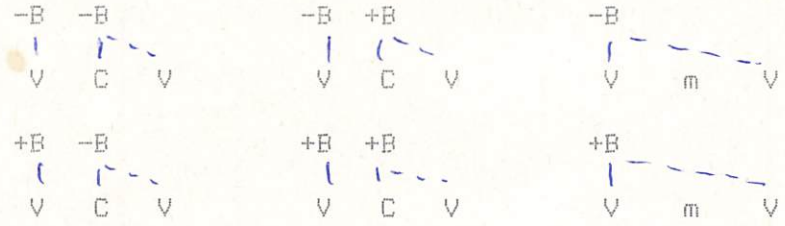
We regard the last mentioned problems as the potentially most damaging ones, as Steriade and Clements also pointed out during the work shop.

We must be able to show that the difference among the processes which Steriade has discussed can be handled in a single valued feature system. We will start the discussion with C-rules which pose the problem in the clearest fashion.

3.1.1. C-rules

Barra dialect of Gaelic
Clements (1986) discusses the following case. In the Barra dialect of Gaelic epenthetic vowels are copies of the preceding vowel in general. Among the nonlabial consonants Barra has a plain/palatal contrast, expressed in terms of [+back]/[-back]. If in between the copee and the copy there is a nonlabial consonant (always a sonorant in epenthesis contexts) the copy takes the backness value of the intevening consonant. This pattern is straightforwardly explained if we assume that nonlabial consonants are specified for backness, whereas labials are not:

(36)



The question is how this pattern can be accounted for with SV-features:

(37)

The underlined case is the problematic one. Non-palatal consonants are opaque iff they ~~intervening consonants~~ have a contrastive value for backness. How do we represents this type of opaqueness and how can we distinguish between the behaviour of a consonant which is distinctively non-palatal and consonants which have no distinctive value for palatality? In Steriade's theory the distinction is clear cut. Distinctive non-palatals acquire [-back] by CR (if [+back] is the lexical value), whereas consonants which do not have a distinctive value for palatality get a value (whatever it is) by DR. The rule referred to above clearly is a C-rule, i.e. applies after C-values have been assigned and before D-values have been assigned.

In our earlier work we indicate opacity by means of brackets. Here I will represent opacity by associating an slot to the nul-feature.

Footnote

So disharmonic roots in Hungarian get the following representation:

except for the bhotha case [u / i] but cf sect. 4.

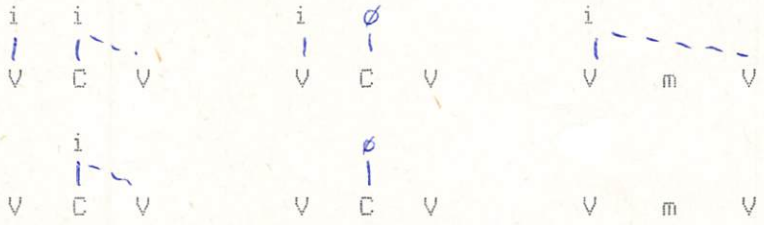
This is really not different from the brackets, but is it more conventient graphically. Below I propose to dispense with this approach toward opacity.#

We must assume that there is a rule (comparable to the CR) which predicts the presence (!) of the zero-feature:

(38) Universal Opacity Rule (UOR)
Given some feature F: find all pairs of segments (s1, s2) such that s1 differs from s2 only in that s1 is associated to F and s2 is not:
Specify s2 as [0]F (i.e. opaque with respect to F)

It is not necessary to assume that non-palatal consonants spread since the default value will surface in that case, being back. In this case then the distinctively non-palatal consonants appear to be blockers rather than spreaders (which in fact they could never be in the SVF-approach):

(39)



liberuws
lets

Pasiego
Something more than blocking must be going on in those cases where simplex features which are distinctively present must be erased. This is what happens in case of symmetrical harmony. We have already referred to cases of symmetrical harmony. A schematic representation is:

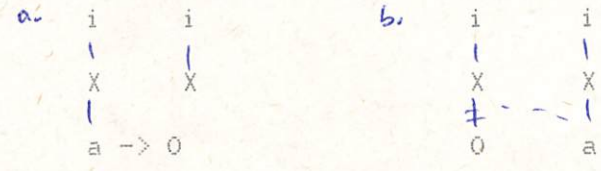
(40)

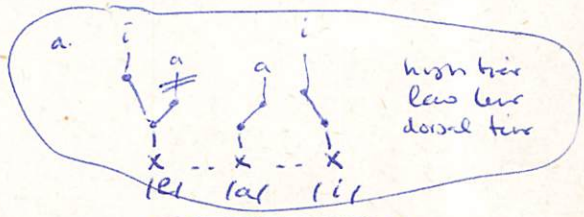
The alternative using particle feature involves two distinct operations: spreading and deletion.

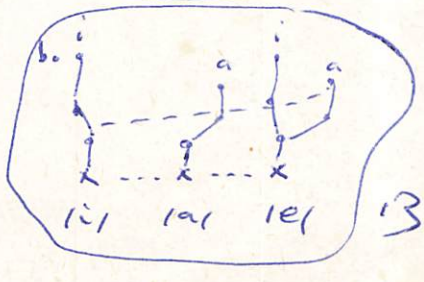
(41)

A specific example is Pasiego height harmony which involves e -> i and i -> e. In our terms this is what we have to state:

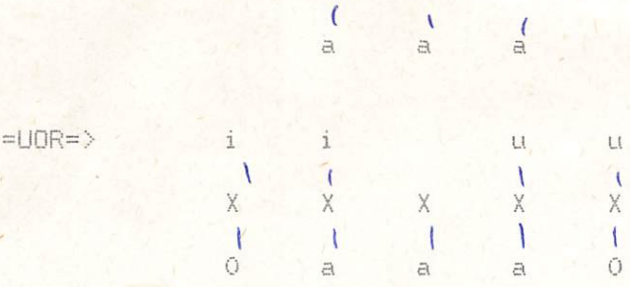
(42)







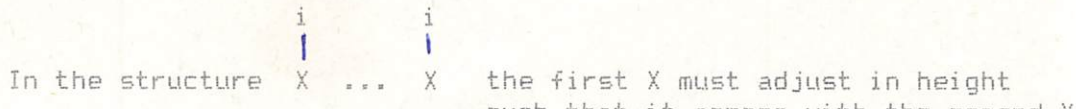
Footnote
The UOR applies to a five vowel system as follows:



For the low vowel there is no *unique* minimally different vowel. I assume that this is why no zero-feature is inserted on the [i] and [u] tier.#

Do we have to state two rules, as in (42)? The answer is No! The rule has to state which configuration meets the SD and what has to happen. Suppose we formulate the rule as follows:

(43)

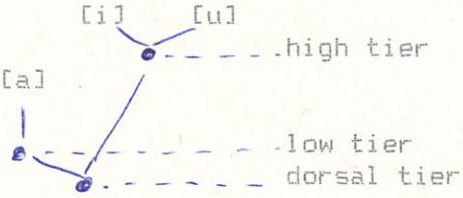


Given this formulation the two operations specified in (42) can be seen as supplied by universal grammar as the two ways in which (43) can be "served". It would be redundant to regard them as part of the rule.

In this case a low vowel x---[a] may intervene between target and trigger. Given our analysis this cannot be considered a problem for two reasons. Firstly, the SD of the rule is locally met even if /a/ intervenes, since /a/ has no value on the [i]-tier. Secondly, spreading of [a] across the [a] which characterizes /a/ is possible in our approach (OCP-effect).

Let us, before turning to L-rules, discuss the Ainu case for completeness. Given that the low vowel has no assoctions to the [i] or [u] tier, Ainu dissimilation is exactly what we expect it to be. The high and mid vowel which have associations to the [i] and [u] tier dissimilate withe respect to each other.

The problem that Ainu presents is that such a dissimilation strongly suggest an intimacy between [i] and [u] which has sofar found no formal expression. Something like:

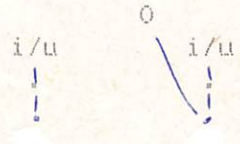


Footnote
The writer of this note is aware of the fact that the ~~SUF~~-system is gradually becoming suspiciously similar to a binary valued system in terms of expressive power. Still he believes that some of the niceties remain present.#

3.1.2. L-rules

We might suggest that L-rules are rules which operate before the UOR has applied. Apart from the question whether this would be a desirable move, it wouldn't help us. Consider Menomini Vowel Raising again, a L-rule in Steriade's system. In our terms the rule states that:

(44)



In the configuration V V ... V VV must agree with V

This rule will cause [a] to dissociate from the long vowel thus turning /e/ into /i/.

Intervening between the two elements of the rule we may find /a/ or /e/ (possible /o/), of which /e/ (or /o/) are specified on the i/u tier. Clearly, it is impossible to have a level of representation at which mid vowels have no specification for [i] and [u]. What conclusion can we draw from this? Apparently that target and trigger CAN see each other because identical elements are transparent. (or: MVR is a suspicious rule)

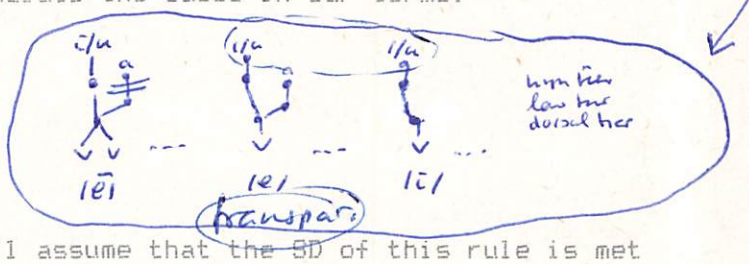
Japanese and Latin

But how do we distinguish Lyman's Law in which voiceless obstruents (although opaque by UOR) do not interfere from Latin lateral dissimilation where both /r/ and /l/ are relevant. Let us formulate the cases in our terms:

(45) Lyman's Law

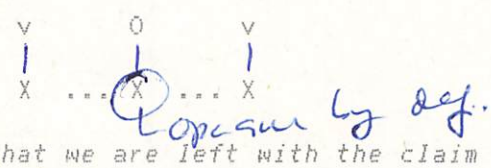
v –> 0 / – v

("v" = "voice-feature")

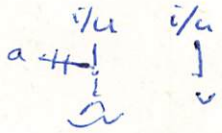


Since no spreading is involved we will assume that the SD of this rule is met even if a voiceless obstruent which is opaque wrt the the voice tier intervenes, i.e. two elements can see each other through a nul-elements. Hence the rule will apply to (46):

(46)



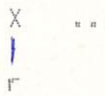
opaque by def.



It seems that we are left with the claim that the only thing which cannot happen is spreading across an opaque segment.

Now consider the latin case:

(46)



the second must disagree wrt [l]

("r" means "liquid", "l" means "lateral")

Two possible violations may occur:

(47)

The therapy should again follow from conventions, analoguous to the case of "bidirectional spreading":

(48)

Turning back to a question mentioned earlier, viz. whether it is desirable to assume that rules must be able to apply before zero-elements are present, we can now conclude that this option appears to be unnecessary. MVR had to apply before C-values are assigned, but it appears to be unnecessary to assume that it applies before 0-elements are inserted. In Menomini mid and low vowels

are transparent with respect to [a]-spreading. Since they have this feature themselves. This is precisely what we expect. On the other hand MVR shows that it is necessary to assume that trigger and target can see each other even if other (identical) elements intervene. Given that conclusion it seems pointless to require that dissimilation rules like Lyman's Law require strict adjacency of the relevant elements. Why could a harmless nul-elements intervene?

We claim then that no rule, dissimilatory or assimilatory, must necessarily apply at a level where no nul-elements are present. This has the advantage that our model is more restrictive. Recall that we mentioned an imaginary L-rule involving voicing assimilation. Such a rule could not exist under our assumptions because spreading had to take place across an opaque segment (i.e. the voiceless stop). Since this is precisely what our model exludes, we predict that no such examples exist.

3.1.3. D-rules

With respect to D-rules we suggest that on the one hand we are dealing with opacity due to *constraints on feature combinations* and on the other hand with *phonetic rules*.

3.1.3.1. Opacity due to constraints on feature combinations

Romanian
Let us sketch the analysis of Romanian, as it would look like in our approach. This system is interesting because it is completely straightforward, filling a gap in the typology we have analyzed sofar (cf. Stewart-paper, Glow-paper & NIAS-paper).

The vowel inventory is as follows:

(49)

i	-	+ u
e	-	A o
	-	a

With respect to the front-back property three oppositions have been neutralized *toward the default value*. On the assumption that [i] is the spreading feature we expect /u, o, a/ to behave opaquely, which is what they do.
How do we formally account for the opacity of these vowels? Observe first of all that the feature [i] is non-distinctive for vowels which are also specified with [u]. Hence the UOR will NOT associate /u/ and /o/ to the nul-~~features~~ on the [i]-tier. Why then can they not be skipped? Moreover why CAN we skip consonants, which also make no distinctive use of [i] and which because of that also fail to undergo the UOR.

Footnote
In Steriade's system both rounded vowels and consonants acquire a D-value for the feature [back] and presumably FH operates after the D-rule for vowels and before the D-rule for consonants.#

An answer to the question why vowels behave differently from consonants lies in the fact that what spreads is a "vocalic", i.e. dorsal feature. Vowels have a dorsal node and they therefore are P-bearing units for the spreading [i]. It is important to realize that they are not P-bearing by stipulation, but simply because they are vowels, have dorsal features and therefore have a dorsal node. To explain why harmony doesn't give rise to /y/ or /ö/ we have to rule out ill formed combinations of dorsal features by means of filters.

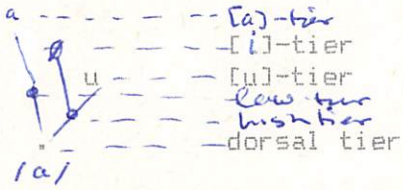
We can now do two things. We can say (following Pulleyblank) that these filters prevent certain associations to take place. It will then follow that /u/, /o/ and /a/ cannot be skipped because they have a dorsal node and because a dorsal feature cannot skip a suitable landing site. We would then claim then that discontinuous association is ruled out.

LC

Footnote
It is not the case that every dorsal node is necessarily a target since we could define the target as a dorsal node which is not associated to [u] and also not exlusively to [a], although admittedly this looks rather clumsy. It doesn't matter what we do, as it will be argued below that even non-targets can block *if they have the relevant class node, i.e. if they are p-bearing with* respect to the spreading feature. #

We could also say that by convention /u/, /o/ and /a/ are represented as opaque on the [i] tier the conditions being that [i] cannot link to them and that they are p-bearing units (cf. Stewart-paper). In that case we don't assume that a spreading feature can never skip a suitable landing site.

(50)



The first option is the most interesting one, because it requires no zero-elements to be present, the claim being that a spreading feature cannot cross any suitable landing site, i.e. any segment which has the required class node.

Let us side-track for a moment and see whether this account of opacity can be extended to the opacity discussed in the previous section. In that section we discussed cases in which a segment lacking F blocked spreading of F simply because F was distinctive for this segment. We could now say that such segments have the required class node, whereas segments for which F is not distinctive lack this class node. Why then are the former blockers? Well, because they do not meet the rule's description of a target the spreading feature cannot associate to them, but because they are P-bearing with respect to F spreading cannot proceed.

Comparing the two cases of opacity we must conclude that what makes a segment opaque is the following:

(51) A segment is Opaque with respect to F iff

a. it has the class node to which F associates
b. it is prevented from associating to F by virtue of
   i. a filter
   ii. the SD of the spreading rule

(52) A segment has the relevant class node iff

a. the presence of F is distinctive
b. the presence of other feature then F which associate to the same class node is distinctive

Let us briefly return to the Barra case. Spreading [i] cannot cross consonants which are distinctively non-palatal because ~~cc~~ meet# (51a) by virtue of (52a) and, because ~~they meet~~ (51bii) holds. (such consonants)

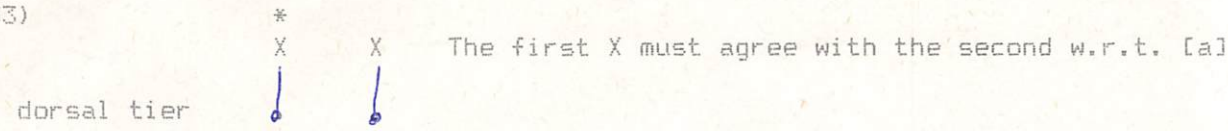
Compare this with the Romanian case. Here no spreading across /u/ etc. because /u/, /ɨ/, /a/ ~~it~~ meet# (51a) by virtue of (52b), and because ~~it meets~~ (51bi) holds

We conclude therefore that we can almost dispense with the O-feature (i.e. the opacity bracket) which we now only need for disharmonic roots. It is probably not too difficult to get around this but we'll deal with that elsewhere.

We still have to mention the Salentino case. Here we take a different perspective on what is going on. Rather than saying that ~~the~~ rule spreads high

from the last vowel, we say that a stressed vowel adjust in height to the immediately following vowel. We formulate the rule as follows:

(53)



As always no target or trigger may intervene. If the following vowel is high the stressed vowel becomes high, but if it is mid or low the stressed vowel remains unchanged.

3.1.3.2. Phonetic rules

We would like to suggest that cases in which for example sonorants impose their voicing on neighbouring obstruents are *phonetic* in nature. Of course such segments are voiced just like voiced obstruent *at the phonetic level*. At this moment we have little to say on such rules. We point to vowel harmony in Turkana where [-ATR] vowels influence neighbouring [+ATR] vowels. We have suggested elsewhere that this is to be interpreted as phonetic spreading.

4. On skipping vowels and not skipping consonants in vowel harmony

Khalkha
It seems to me that we can now begin te understand why it is possible that a vowel can be skipped in rounding harmony. If we pursue the idea that you can skip something which lacks the required node which dominates the spreading feature skipping some vowel makes sense if two conditions are met.

(51) a. F is not a dorsal feature, but associates to some other class node C
b. F is not distinctive for the skipped vowel, nor is any other feature which associates to C

In other words you can skip a vowel if it is not opaque. The second condition implies that the skipped vowel does not have the class node C to which F must associate.

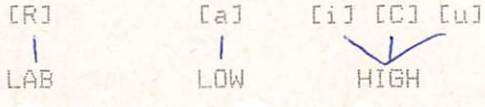
In the proposals of Clements and Steriade it is the case that rounding is not characterized by means of a feature which associates to the same class node as features for frontness and height. Hence being a vowel does not necessarily mean being P-bearing with respect to rounding harmony.

In Khalkha /i/ has no rounded counterpart. In fact, according to Svantesson, there are no front rounded vowels. We can say then that the presence of [i] excludes a labial node and vice versa.

By virtue of this filter the vowel /i/ lacks a labial node and it therefore cannot function as a P-bearing unit. A consequence of this is that /e/ which functions as the front counterpart to rounded back /ɵ/ must not be specified as [i], implying that it can have a labial node.

We arrive at the conclusion that only a subset of the vowels has a labial node. It now remains to be explained why rounded high vowels block.

This relates to the status of rounding. We have to assume a feature [R], which is distinct from [u], which now means "high & back" (phonetically rounded; for the central unrounded vowels we'll use a feature [C] meaning central & unrounded):



(N.B. the features on the HIGH-tier are incompatible.) Suppose we say that high rounded vowels have a LAB node but no [R] associated to it. It then follows that they are opaque given that they are not specified as targets in the harmony rule, which refers to low vowels.

If all consonants are skippable we'll have to assume that no labial feature is distinctive for consonants (?).

Turkish
We would have to assume that a subset of the consonants, and no necessary all consonants, have a dorsal node. Those which have a dorsal node cannot be skipped, those we have not can.