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Part Two: Parassession on Autosegmental and Metrical Phonology

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Redundant Values

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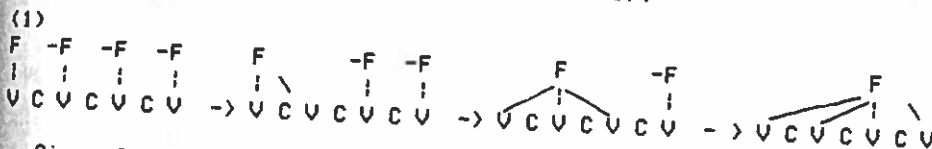
1. Introduction

1.1. The issue

I would like to address in this paper what I believe to be the central issue for the theory of underspecification: are predictable feature values ever missing from phonological representations? I will suggest that only one type of predictable value is systematically absent from underlying representations: those predictable from feature cooccurrence restrictions.

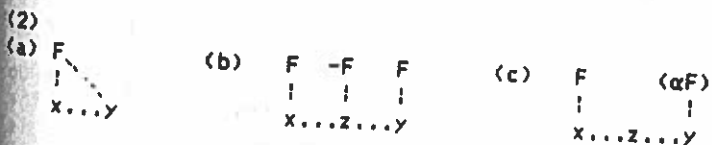
1.2. Assumptions

Let me begin by listing the considerations that I will not use as criterial in looking for the evidence of underspecified values. I will not assume that we must eliminate predictable information from lexical entries. I will not assume that phonological rules apply always simultaneously to multiple targets: in other words, I will not rule out the sequential iterative mode of rule application. This means that nothing, in my view, prevents a rule of vowel harmony from operating sequentially, by successive spreading and delinking steps, as shown in (1):



Since I do not rule out the type of operation shown in (1), I am excluding an abundant but ultimately misleading source of arguments for underspecification.

The considerations I will appeal to in determining when a redundant value is missing will involve primarily the terms in which locality conditions on phonological rules must be stated. I will assume that if a rule propagating F has applied to a string, then any segment intervening between target and trigger was unspecified for F when the rule applied. This is represented schematically in (2), where (a) is the rule, (b) is a surface string resulting from the rule and (c) is the underlying representation of the string in (b).



Similarly I assume that dissimilation rules apply under strict adjacency between the target and the trigger autosegment. Therefore if any segment z intervenes on the surface between the

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target and the trigger of a dissimilation rule, it will count here as underlyingly unspecified for the dissimilating feature.

I will use other phenomena as sources of evidence for underspecification, but only when they confirm conclusions drawn from the study of locality conditions on assimilation and dissimilation.

Evidence that a segment such as /z/ in (2) is transparent to harmony or disharmony is then sufficient to determine that /z/ is underspecified for F; but the converse doesn't hold. We cannot conclude from the sole fact that some segment /z/ is not transparent with respect to a process involving F that /z/ is specified for F. For instance, the fact that low vowels block the Turkish Rounding Harmony (cf. Clements and Sezer (1982)) need not be interpreted as evidence that they are specified at any stage in the derivation as [-round]. The Turkish Rounding Harmony rule may involve a prosodic locality requirement which restricts spreading to adjacent syllables; and since low vowels do not undergo Rounding Harmony, they will act as blockers every time they intervene between a potential trigger and a potential target in sequences of the form /CoCaCi.../.

1.3. Types of underspecification

1.3.1. Trivial and non-trivial underspecification

Two distinctions will play a role here. The first is that between trivial and non-trivial underspecification. A segment may lack specifications for a feature value at all stages in the derivation: for instance one can argue that labials never acquire specifications for the feature [anterior], because anteriority is a feature characterizing exclusively the position of the tongue blade, an articulator that is not active in the production of a labial. In this sense, labials are trivially underspecified for [anterior]: they lack this feature underlyingly and never acquire it on the surface. A further potential source of trivial underspecification are single-valued features. I shall suggest below that [round] is one such feature, in the sense that it either takes the positive value [+round] or it is absent altogether. I will further argue that a number of documented instances of underspecification can be analyzed by assuming that the relevant feature is single-valued, perhaps on a language specific basis.

Non-trivial underspecification involves segments which lack underlying values for a feature, even though they acquire such values in the course of the derivation. It is, by and large, the only type of underspecification discussed in the current literature.

My choice of terms is not meant to suggest that trivial underspecification is a trivial aspect of the theory. On the contrary, while it seems clear that this is a useful concept, we do not know at present which sounds and which features stand in the relation of trivial underspecification, whether the relation is universal or language specific, or what if anything the difference between trivial and non-trivial underspecification follows from. While I cannot offer a systematic answer to these questions, I will

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As sources of evidence for them they confirm conclusions drawn under conditions on assimilation and

as /z/ in (2) is transparent to sufficient to determine that /z/ is the converse doesn't hold. We cannot say that some segment /z/ is not a process involving F that /z/ is the fact that low vowels block the elements and Sezer (1982)) need not they are specified at any stage in Turkish Rounding Harmony rule may a process which restricts spreading of low vowels do not undergo Rounding blockers every time they intervene a potential target in sequences of

ion underspecification role here. The first is that underspecification. A segment may have one value at all stages in the process. I argue that labials never acquire the feature [-anterior], because anteriority is a feature of the position of the tongue which is not active in the production of labials. Labials are trivially underspecified for the feature [-anterior] and never acquire it as a potential source of trivial underspecified features. I shall suggest that the feature, in the sense that it either is present or it is absent altogether. I shall cite a number of documented instances of underspecification by assuming that the relevant feature is on a language specific basis. Underspecification involves segments which lack a feature, even though they acquire such a feature by underspecification. It is, by and large, the underspecification discussed in the current

meant to suggest that trivial underspecification is an aspect of the theory. On the assumption that this is a useful concept, we do not know what features stand in the relation of underspecification, whether the relation is one-to-one or what if anything the difference between underspecification follows from the answer to these questions, I will

suggest that the view of underspecification theory changes significantly when we take into account the possibility of trivial underspecification.

1.3.2. Distinctive and Redundant values

The second distinction drawn here is that between two types of predictable values. To make this distinction clear I will use the distribution of voicing in a segmental inventory similar to that of English:

(3)

p	t	k	s
b	d	g	z
m	n		
	l		
	r		

Voicing is partly predictable in this system. It is predictable for every sonorant, since all sonorants are voiced. Further, if we assume that only one value of [voice] is present underlyingly, then voicing is also predictable for half of the obstruents, as indicated by the analysis in (4):

(4)

	p	t	k	s	b	d	g	z	m	n	l	r
son	-	-	-	-	-	-	-	-	+	+	+	+
cont	-	-	-	+	-	-	-	+	-	-	-	+
voic					+	+	+	+				

- a. [+sonorant] -> [+voice]
- b. [-obstruent] -> [-voice]

Rule (4)a introduces a non-underlying specification [+voice] within a segmental class, that of sonorants, where the feature is predictable: this rule is equivalent to the statement that only one value of [voice], [+voice], is present within the class of sonorant segments. Rule (4)b introduces the non-underlying feature value within a segmental class, that of obstruents, where the both of its values occur freely. I will call the values introduced by rules like (4)a Redundant values (R-values) and those introduced by rules like (4)b Distinctive values (D-values). A more precise definition of these notions is attempted below:

- (5)
- R-class of segments with respect to F: the class of segments where a feature co-occurrence constraint blocks one value of F.
 - D-class of segments with respect to F: a class of segments where both values of F are allowed.
 - R-value for F: the value of F present within its

R-class.

- D-value for F: a value of F present within its D-class.
- R-rule for F: a redundancy rule introducing an R-value.
- D-rule for F: a redundancy rule introducing a D-value.

A different classification of redundancy rules has been proposed by Archangeli (1984) and Archangeli and Pulleyblank (1986). These authors distinguish Default rules and Complement rules: the former class expresses universal restrictions on feature-cooccurrence such as [+low] → [-high]. In addition, Default rules introduce what are considered to be universally unmarked feature values such as [+high] for [high]. In contrast, Complement rules are language specific rules which introduce the opposite value of an underlying specification for F, in case no appropriate Default rule is available for the task. Roughly then, the proposed distinction is that between universal and language specific redundancy rules. In contrast, the terms defined in (5) characterize distinctive and non-distinctive assignments of feature specifications, regardless of their universality: according to (5), a feature-cooccurrence constraint need not be universal in order to define the R-class of a feature and therefore its R-value and corresponding R-rule.

1.4. Overview

I begin by showing that we have rather abundant evidence for the claim that R-values are underlyingly absent. I will then discuss the more limited evidence that D-values may also be absent. Finally, I will indicate an alternative interpretation of some of the attested patterns of underspecification, which allows us to further reduce the cases of non-trivially missing values.

2. Missing R-values

In this section I present the evidence establishing that redundant specifications are absent underlyingly.

2.1. The height of low vowels

The impossibility of simultaneous [+high, +low] specifications establishes that the height of low vowels is a R-value. The height of low vowels is also, frequently, a missing value in height harmony systems, both in the sense that low vowels do not spread their [-high] specifications and in the sense that low vowels are transparent to the spreading of height values from other segments. Before reviewing the evidence that low vowels are neutral in height harmony, we must however determine that low vowels do have surface specifications for [high]. This can be easily seen in cases where both mid and low vowels spread [-high]. For instance, Latin /i/ lowers to /e/ when tautosyllabic with a non-high vowel. For independent reasons, the class of tautosyllabic /Vi/ sequences reduces in Latin to /ai/ and /oi/: these assimilate in height and become /ae/ and /oe/. Phenomena of this type indicate that low vowels are as [-high] on the surface as the mid vowels. It then becomes quite significant that low vowels may lack [-high] specifications at a stage where the mid vowels are already [-high]: we observe this next.

2.1.1. Pasiego

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In the Pasiego dialect of Montañas Spanish a harmony rule assimilates non-low vowels to the height of a non-low stressed vowel. Low vowels do not undergo, trigger or block the rule. This is, in essence, the analysis of the Pasiego height harmony rule presented in McCarthy (1984). The examples below illustrate some of the relevant aspects of this process. Lax vowels, whose distribution is also discussed by McCarthy, are written in capitals.

(6)

- | | |
|-------------------------------|---------------------------------|
| a. /beb/ 'drink' | /sint/ 'feel' |
| bib-i's | sint-i's |
| beb-e'mus | sent-e'mus |
| beb-a'mus | sint-a'is |
| b. el ma'l 'the evil' | Il mAdI'rU 'the log' |
| en kwe'nta 'because of' | in il kali'xu 'in the lane' |
| po la ka'le 'down the street' | pU l ArrU'yU 'along the arroyo' |

The forms in (6)a show that both mid and high vowels trigger, when stressed, the height harmony rule. The underlying quality of the stem vowel surfaces intact only when the stressed vowel is low, as in /beb-a'mus/ and /sint-a'is/. The forms in (6)b show that the low vowel fails not only as a trigger but also as a blocker: thus the preposition /po/ undergoes height harmony in /pU l ArrU'yU/ across the intervening low vowel.

The lack of trigger or blocker behavior of low vowels in the height harmony of Pasiego indicates that these vowels lack height values at the stage when harmony applies. That low vowels cannot be underlyingly associated with any value for [high] follows from the fact that they represent the R-class of segments for [high]: the distribution of height values is defective in this class (1).

2.1.2. Menomini

The vowel system of Menomini (Bloomfield 1939, Cole 1986) includes a low vowel, /a/, three mid vowels, the lax /E/, and the tense /e/ and /o/, and two high vowels /i/ and /u/. Each vowel may be short or long. The mid tense long vowels /e:/ and /o:/ raise to high when followed in the word by a high vowel or by a postconsonantal glide.

(7)

- a. ko:n 'snow'; ku:nyak 'lumps of snow'
ne:mow 'he dances'; ni:mit 'when he dances'
- b. mo:skamow 'he comes up from under water'; mu:skamit 'if he emerges'

The forms in (7)a illustrate alternations resulting from height harmony; (7)b shows that a low vowel intervening between the triggers of height harmony and its targets will not block the rule. Given that the trigger of Menomini height assimilation is a [+high] feature, low vowels will understandably have no effect on the height of other vowels. However, their transparency to height harmony must be explained. The explanation is the same as for

Pasiego: R-values for height are absent when harmony applies <2>.

2.1.4. Ngbaka

A height disharmony operates in Ngbaka, a Central African language analyzed by Thomas (1963) and Ito (1984). The Ngbaka vowels are: /e(:)/, /E(:)/, /o(:)/, /O(:)/, /a(:)/, /i(:)/, /u(:)/. Within a single morpheme, vowels of the same height may occur only if they are entirely identical: thus the two high vowels /i/ and /u/ are incompatible with each other, although each may co-occur with itself in morphemes of the form CiCi, CuCu. Similarly, distinct mid vowels may not co-occur morpheme-internally. The only pair of non-high vowels exempted from this restriction is formed by the low vowel /a/ and any one of the mid set (e,o,E,O): /kaŋ/ 'chain', /mona/ 'navel', /kaŋpe/ 'slave'. Following Ito (1985), one can assume that the tautomorphic V(C)V sequences with identical vowels involve multiply linked vocalic autosegments rather than distinct but identical ones. Given this, the height disharmony system of Ngbaka could be formulated as the prohibition against [αhigh][αhigh] sequences in underlying representations. But in order to explain the neutrality of /a/, the fact that /a/ may co-occur with a mid vowel even though both are [-high], we must assume that /a/ lacks underlying specifications for [high].

The Ngbaka data is also interesting in that it suggests that both values of [high] occur underlyingly within the D-class for [high], that of non-low vowels. In order to exclude underlying sequences of [+high] [+high], or [-high] [-high], both D-values for this feature must be present at the stage where the disharmony constraint is active: the stage of underlying representations.

2.2. The backness of /a/ in triangular systems

Many vowel systems have a single low vowel, both in the sense that no other vowel is phonetically low and in the sense that this low vowel does not have any direct counterpart for features such as [back], [round] or [ATR]. Trubetzkoy (1939) refers to such systems as triangular vowel systems.

In a triangular system, the backness of the low vowel will be predictable from its [+low] specification and thus will qualify as a R-value. The present section will show that this R-value is absent underlyingly.

The low vowels discussed next are those of Ainu and Tamil, both of which have triangular five-vowel systems. It is not entirely clear whether these low vowels display trivial or non-trivial underspecification for [back]: I have no information as to whether these low vowels are front, back, central or of contextually varying backness. For present purposes, however, this distinction is of secondary importance: I will concentrate only on the underlying absence of redundant [back] specifications. It will matter little how this absence is resolved on the surface.

2.2.1. Ainu

Ito (1984) discusses the following pattern of vocalic dissimilation in Ainu: transitive verbal stems take the form CV_1C-V_j , where V_j is either a copy of the preceding vowel (as in

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in Ngbaka, a Central African (63) and Ito (1984). The Ngbaka /o(:)/, /O(:)/, /a(:)/, /i(:)/, e, vowels of the same height may be identical: thus the two high vowels [h] each other, although each may be different: thus the two high vowels of the form CiCi, CuCu. Vowels may not co-occur in a pair of non-high vowels exempted by the low vowel /a/ and any one of 'chain', /mona/ 'navel', /kakpe/ (i), one can assume that the vowels with identical vowels involve differences rather than distinct but height disharmony system of Ngbaka. A prohibition against [αhigh][αhigh] combinations. But in order to explain that /a/ may co-occur with a mid [h], we must assume that /a/ lacks [gh].

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triangular systems

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following pattern of vocalic features in verbal stems take the form [copy] of the preceding vowel (as in

/tem-e/ 'to measure', /yok-o/ 'to aim') or else a high vowel whose value for backness is distinct from that of a preceding non-low vowel. This second category includes stems like /sir-u/ 'to rub', /pok-i/ 'to lower'. Ito analyzes the cases like /yok-o/ as involving a single, multiply linked vowel. In the second class of cases (e.g. /pok-i/) the suffixal vowel is high and undergoes dissimilation: it is [-αback] in the context of a stem [αback] specification. Significantly, /a/ is neutral in this process in that it cooccurs with both /u/ and /i/: /kar-i/ 'to rotate' and /ram-u/ 'to think'.

We need, as Ito notes, one assumption in order to simplify the analysis of the Aino melodic dissimilation: the assumption is that /a/ lacks backness specifications. Beyond this, we must explain why, of the five vowels of Aino, it is precisely /a/ which lacks backness values. The reason is that backness is non-distinctive, i.e. a R-value, only in the low range.

2.2.2. Tamil glide-vowel sequences

According to Christdas (1986), the Tamil front vowels (e,i) do not occur underlyingly (i.e. morpheme-internally, before phonological rules apply) after the front glide /y/. Nor do the back vowels (o,u) occur in underlying representations after the back glide /w/. In contrast, the unique low vowel of Tamil can occur underlyingly after both /y/ and /w/. The behavior of /a/ in the disharmony constraint discussed by Christdas is again attributable to the absence of its redundant [back] specifications.

The interest of the Tamil data extends further: as in the case of the Ngbaka height disharmony, the Tamil constraint holds of the underlying representations. It is not a phonological rule, which could be ordered relative to a redundancy rule, but rather a constraint on underlying segment sequences: as such it must precede all redundancy rules. Christdas points out that both the front vocoids (e,i,y) and the back ones (o,u,w) must be specified for backness at the underlying stage when this disharmony applies. In our terms, this shows that both D-values for [back] must be present underlyingly. The extent of underspecification for [back] in Tamil appears then to be limited to the absence of the R-value: that of /a/.

2.3. Redundant [back] values in Hungarian

Hungarian has a much discussed rule of harmony involving the feature [back]. Within native roots vowels may belong to either of the two sets (o(:),u(:),a(:)), (ö(:),ü(:)) but not to both. The vowels of a third set (e(:),i(:)) may co-occur within native roots with any vowel: /pelda/ 'example', /tömeg/ 'crowd', /bika/ 'bull', /rövid/ 'short'. This third set is generally referred to as neutral. Non-native roots have no restrictions on vowel co-occurrence: /büro/ 'bureau', /parfüm/ 'perfume'.

Suffixal vowels agree with the backness of the last stem vowel, when this vowel is non-neutral: /büro-nak/ 'bureau-DAT', /parfüm-nek/ 'perfume-DAT'. Matters are more complex when the last stem vowel belongs to the set of (e(:),i(:)). Kontra and Ringen

(1986) have shown that stems ending in /e:/ or /i(:)/ preceded by a back vowel take suffixal back vowels: /papir-nak/ 'paper-DAT', /produkti:v-nak/ 'productive-DAT', /anke:t-nak/ 'meeting-DAT'. This rule appears to hold for the majority of lexical items and for most speakers, although it does not hold absolutely. On the other hand, stems like /magnes/ 'magnet', which contain back vowels followed by short /e/, take primarily front suffixes. Kontra and Ringen conclude, in line with Ringen's earlier findings (1978, 1980), that short /e/, i.e. [ɛ], is not transparent to [back] harmony in contemporary Hungarian; but that /i(:)/, /e:/ are.

What must be explained is why there should be a disparity between the inventories of long and short neutral segments of Hungarian: why short /e/ is not neutral while long /e:/ is. The explanation will invoke the distinction between D-values and R-values for [back].

If we were to group the Hungarian vowels according to their surface specifications for height, backness and rounding, the following picture would emerge:

(8)

	Short vowels		back	Long vowels		back
	front			front		
	-R	+R		-R	+R	
high	i	ü	u	i:	ü:	u:
mid		ö	o	e:	ö:	o:
low	ɛ		ɔ			a:

The tables in (8) reveal an important disparity between the long and the short vowel systems of Hungarian: the low and mid short vowels are paired as to backness, with [ɛ] (= /e/) opposed to [ɔ] (= /a/) and [ö] opposed to [o], while the long vowel system has no backness contrast in the low range and no direct back counterpart for the mid vowel [e:]. On the other hand, in both the long and the short vowel systems, backness is non-distinctive among unrounded high vowels: neither /i/ nor /i:/ have direct back counterparts.

We may explain now why /e/ (i.e. [ɛ]) is not neutral: /e/ is paired for backness with /a/ and it thus belongs to the D-class of [back]. In contrast, /e:/ has no back counterpart and it therefore belongs to the R-class. As in the other systems studied so far, the neutral vowels turn out to systematically belong to the R-class. Both the long and the short /i/ are neutral, because they both lack a minimally different [+back] vowel. In this case too, membership in the R-class translates into neutral behavior.

Our analysis does however classify long /a:/ as belonging to the R-class for [back] as well, despite the fact that /a:/ does not behave as a neutral vowel. In light of this fact one may have to acknowledge that no two-way correlation can be established between R-status and neutral behavior: the neutral vowels of Hungarian all belong to the R-class for [back] but not all vowels of this class are neutral. This would suggest an analysis of Hungarian harmony

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Long vowels		
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e:	ö:	o:
		a:

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along the following lines:

(9)

Stage a: Underlying representations: all D-values for [back] are present. Vowels specified at this stage: (a, e, o, ö, u, ü, o:, ö:, u:, ü:).

Stage b: R-rule 1: [+low] -> [+back]

Vowels specified at this stage: all of the above plus /a:/.

Stage c: Harmony (iterative, feature-changing):

[αback] [βback]



Stage d: R-rule 2: [-low,-round] -> [-back]

(affects /i/, /i:/, /e:/)

Aside from the relative order between harmony and the redundancy rules of Hungarian, the analysis above relies on a number of assumptions that need spelling out. First, I adopt Farkas and Beddor's (1987) conclusion that both [+back] and [-back] must be spread by harmony: Farkas and Beddor show that harmony must take place both in forms like /büro:-tol/ and in forms like /parfüm-tol/. In each of these cases, the last stem vowel - one belonging to the D-class for [back] - is the one determining the backness of suffixal vowels. If both [+back] and [-back] values belonging to the D-class are present when harmony operates, harmony must be feature-changing. This conclusion had already been reached earlier by Vago (1976). Second, I follow Ringen (1980) and Kiparsky (1981) in assuming that neutralizing applications of harmony are prohibited morpheme internally by the Alternation/Strict Cycle Condition: this is why /büro:-töl/ becomes /büro:-tol/, rather than /*büro:-tol/. Third, I assume that structure preservation prohibits harmony from affecting the vowels of the R-class (cf. footnote 1). Finally, in order to account for the fact that stems consisting exclusively of neutral vowels take in general front suffixes (cf. Kontra and Ringen's (1986) experimental results), I assume that Hungarian suffixes are in the unmarked case specified as [-back].

2.4. The rounding of back vowels

In some of the most common vowel systems, the non-low vowels must be specified for either rounding or backness underlyingly but not necessarily for both. If the system is a standard triangular one (a,e,o,i,u), the rounding of (o,u) can be predicted from their backness by a rule such as [+back] -> [+round] (3); alternatively, backness can be predicted from rounding by the inverse statement [+round] -> [+back]. It appears however that, when there is a choice, one must count [round] values as redundant and [back] values as underlying rather than vice versa. I sketch next a demonstration of the fact that [round] is missing in such systems from derivationally early representations.

2.4.1. Maori

Like other Malayo-Polynesian languages, Maori (Krupa 1968) prohibits the morpheme-internal co-occurrence of labial segments; morphemes of the shape /mVpV/, /mVwV/, /wVpV/, /whVwV/, /wVwhV/, /pVwV/ do not occur.

Within the triangular vowel system of Maori, the roundness and backness of (o,u) stand in the mutually predictable relation mentioned above: they can be analyzed as being either basically round or as basically back, with derived rounding, or, denying underspecification, as underlyingly both round and back. The ban against co-occurring labial segments provides us with grounds for choosing between analyses. A first relevant fact is that the rounded vowels (o,u) are not incompatible with tautomorphic labials and not incompatible with each other. A second observation is that a sequence of labial consonants separated by a rounded vowel is as ill-formed as one in which the labials are separated by unrounded vowels: neither /*mawa/ nor /*mowa/ occur. Both observations suggest strongly that the labiality of (o,u) is simply absent at the stage when the constraint against morpheme-internal labial sequences is active. Given the possibility to analyze the vocalic labiality as an R-value, its underlying absence is not surprising.

Evidence confirming this suggestion comes from Cantonese, a language in which redundant rounding coexists with distinctive rounding.

2.4.2. Cantonese

The following is a summary of Yip's (1987) account of Cantonese Labial disharmony, with a few added comments of my own concerning the status of various [round] specifications.

Cantonese has a set of labial segments (p,f,m,w), a set of front rounded vowels (y, ö, Ö) and a set of back rounded vowels (u, U, o, O). (Capitals, as before, designate lax vowels.) The vowel inventory of Cantonese includes, in addition, the front unrounded (i, I, e, E), and the low tense and lax vowels (a, A). Note that all non-low back vowels are rounded but not all rounded vowels are back in this language. So the statement [+back] → [+round] is still appropriate, while the statement [+round] → [+back] is not, or at least not as a statement about directly observable distributional restrictions. Cantonese is then a language in which the rounding of back vowels is transparently and unambiguously an R-value. It is also, as Yip shows, a language in which redundant rounding is absent underlyingly.

There are three apparently distinct Labial disharmony constraints operating within a Cantonese syllable: an onset Labial may not be followed by a front rounded vowel (Ö, ö, y); a rounded vowel, front or back, may not be followed by a Labial consonant; an onset Labial may not be followed by a coda Labial. The first constraint rules out syllables like /pö/ but allows /pö/. The second rules out /öp/ as well as /op/. The third eliminates sequences like /pam/. Yip argues that a single constraint underlies all three prohibitions:

languages, Maori (Krupa 1968)
co-occurrence of labial segments:
/mVwV/, /wVpV/, /whVmV/, /wVwhV/,

system of Maori, the roundness and the mutually predictable relation analyzed as being either basically the derived rounding, or, denying the both round and back. The ban provides us with grounds for the first relevant fact is that the is incompatible with tautomorphic each other. A second observation consonants separated by a rounded which the labials are separated by /awa/ not /mowa/ occur. Both at the labiality of (o,u) is simply in constraint against morpheme-internal when the possibility to analyze the e, its underlying absence is not

suggestion comes from Cantonese, a rounding coexists with distinctive

Yip's (1987) account of Cantonese added comments of my own concerning specifications.

segments (p,f,m,w), a set of front and back rounded vowels (u, U, o, signate lax vowels.) The vowel in addition, the front unrounded and lax vowels (a, A). Note that rounded but not all rounded vowels are statement [+back] → [+round] is statement [+round] → [+back] is not, comment about directly observable Cantonese is then a language in which transparently and unambiguously an ows, a language in which redundant

ly distinct Labial disharmony Cantonese syllable: an onset Labial rounded vowel (ö, ö, y); a rounded followed by a Labial consonant; an wed by a coda Labial. The first like /pö/ but allows /po/. The as /op/. The third eliminates argues that a single constraint

(10)
*[...Lab Lab...]₀

This constraint is activated in different ways depending on when the relevant segments are syllabified and when their Labial specifications are introduced. Thus, the underlying Labials are the front rounded vowels (the vowels whose rounding cannot be deduced from their backness) and the labial consonants. When CV syllables are formed, the first stage in syllabification, the only labial values present are the underlying ones: this is why /pö/ is ill-formed while /po/ (a /p/ followed by a mid back vowel) is still acceptable. Next, the R-rule specifies back vowels as round: after this stage both /o/ and /ö/ will count as Labials. The syllabic incorporation of codas takes place after this stage: a labial consonant cannot be incorporated into a /Cö/ or /Co/ syllable, because this would now violate (10). Nor can a labial coda be incorporated into a /pV/ syllable, for the same reason.

The important point here is the fact that at the earliest stage of syllabification, when CV units are formed, only the rounding of the front vowels (ö, ö, y) is incompatible with consonantal labiality. The redundant [round] value of the back vowels is absent at that stage.

2.5. R-values for ATR

If a vowel system utilizes ATR distinctions and has a single low vowel, the low vowel will be [-ATR]. If a vowel system has only two high vowels, a front and a back one, both will invariably be [+ATR]. We have then two potential limitations on the distribution of ATR: one is expressed by the statement [+low] → [-ATR], the other by [+high] → [+ATR]. If the first statement is appropriate, the ATR value of low vowels is redundant; if the second one applies, the ATR value of high vowels is redundant. Obviously, both statements may apply to any given language. Cole and Trigo (1986) discuss the case of Bari suffixal high vowels, whose neutrality in ATR harmony can be related to their predictable [+ATR] specifications. I will examine here the facts of Kinande, a language in which the redundant [-ATR] value of low vowels is absent.

2.5.1. Kinande

Recently, Schindwein (1987) has shown that Kinande, a Bantu language spoken in Zaire, has an ATR harmony rule with respect to which low vowels are transparent. The Kinande vowel system is triangular, with ATR distinctions among the non-low vowels:

(11)

i	u
I	U
e	o
E	O
	a

There are two ATR harmonies, but only one displays the effect of

interest here. This rule spreads [+ATR] leftward onto mid and high vowels. It does not affect a low vowel, nor is it blocked by it.

(12)

a. s010m - irE --> solom - ire 'harvest-past'
 | |
 +ATR +ATR

b. s010m - an - irE -> solom - an - ire 'harvest-reciprocal-past'
 | | |
 +ATR +ATR

For lack of space, I cannot discuss here Schindwein's analysis of this process. My own suggestion is that the neutral status of Kinande /a/ follows from the distinction between D-values and R-values proposed here: in Kinande, the ATR specification of the low vowel is redundant because no ATR contrast exists within the relevant height range. Moreover, Kinande /a/ is the only vowel with a redundant specification for ATR: all other vowels are "paired" in their ATR values and thus belong to the D-class. Confirming this is the observation that /a/ is never transparent in systems where it has a [+ATR] counterpart, such as Igbo (Ringen 1979) and Bari (Hall and Yokwe 1978).

2.6. R-values for [anterior]

A clear instance of missing R-values is found in the sibilant harmony rule of Ineseño Chumash. My source on this language is Poser (1982), whose data comes from the unpublished dissertation of R.B.Applegate.

Chumash has a lexical contrast between /š/ and /s/: the differentiating feature is, according to Poser, [anterior]. There is no corresponding contrast between the Chumash coronal stops: /t/, /l/ and /n/ come in only one variety, all three being alveolar.

Within a word, the rightmost sibilant, /š/ or /s/, triggers [anterior] harmony onto preceding sibilants:

(13)

- a. k-sunon-us 'I obey him' : k-šunon-š 'I am obedient'
 b. ušla 'with the hand: usla-siq 'to press firmly by hand'
 c. uqsti 'of throwing': š-uxšti-meš 'throw over to'

Intervening segments are transparent to the sibilant harmony. In particular, the coronals /t/, /n/, and /l/ fail to block or trigger the rule:

(14)

- a. š-api-tšo-it 'I have good luck'; s-api-tso-us 'he has good luck'
 b. k-šunon-š 'I am obedient'; k-sunon-us 'I obey him'
 c. ha-s-xintila 'his Indian name'; ha-š-hintila-waš 'his former Indian name'

Note that underlying /š/ is turned to /s/ (as in (13)b) and

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turned to /s/ (as in (13)b) and

underlying /s/ is turned to /s̥/ (as in (13)c, (14)c). This
indicates that both values of [anterior] exist at the stage when
harmony operates. It is then significant that one of these values,
the [+anterior] feature of /t/, /n/ and /l/ is inert and
transparent at the same stage. We can attribute this to the fact
that in the Chumash coronal system these segments belong to the
R-class for [anterior]: their anteriority is predictable by the
formula [+coronal, -continuant] → [+anterior]. The R-value
emerges again as a missing value.

2.7. R-values for [lateral]

The distribution of [lateral] is frequently limited to the class
of sonorants in segment inventories like that of English, which
lack obstruents with lateral release. Within the class of
sonorants, the vocoids are always redundantly [-lateral]: in order
that lateral airflow occur one may need a constriction narrower
than that defining a [-consonantal] segment. The nasals lack,
universally perhaps, a lateral/non-lateral contrast. This leaves
one class of segments with which the feature [lateral] can freely
associate: the consonantal non-nasal sonorants, also known as
liquids. This is the D-class for [lateral]. The restrictions on
feature co-occurrence mentioned above define vocoids, nasals and
obstruents as R-classes for this feature.

Consider now the well-known rule of Latin liquid dissimilation:
the adjectival suffix /-alis/ (as in /nav-alis/ 'naval') becomes
/-aris/ when preceded by a stem containing /l/: /sol-aris/ 'solar',
/milit-aris/ 'military', /Lati-aris/ 'of Latium'. Dissimilation
fails only when the stem /l/ is separated from the suffix by an
intervening /r/: /flor-alis/ 'floral', /sepulchr-alis/ 'funereal',
/litor-alis/ 'of the shore'. Needless to add, when the sequence of
liquids inside the stem is reversed, with /r/ preceding stem /l/ as
in /reticul-aris/ 'of the net', dissimilation does take place.

I assume, as elsewhere, that dissimilation operates under strict
adjacency between elements of the relevant tier, in this case that
of [lateral] specifications. It appears then that only one of the
non-lateral segments of Latin is present on this tier when
dissimilation applies: this is the liquid /r/, whose [-lateral]
value blocks dissimilation by interrupting the adjacency between
stem and suffixal /l/ in forms like /litor-alis/:

(15)
[+lat] [-lat] [+lat]
| | |
l i t o r - a l i s

Since no other non-laterals, not even the coronals /t/, /n/,
block dissimilation, one is led to assume that they are unspecified
for [lateral]. This can again be related to the fact that the
non-liquids are redundant non-laterals; in contrast, /r/'s
[-lateral] specification is a D-value. I am not aware of any
reason why the non-liquids of segment inventories like that of
Latin should ever be as specified [-lateral]: it may well be then

that this is a case of trivial underspecification.

2.8. Redundant laryngeal features

The redundant status of sonorants relative to the feature [voice] has already been mentioned here. I will outline now the evidence that R-values for [voice] are missing underlyingly.

2.8.1. Lyman's Law and Rendaku in Japanese

Ito and Mester (1986) have provided an explicit argument that sonorants are unspecified for [voice] in Japanese. The Japanese consonant inventory is identical in relevant respects to (3) above; only voiced sonorants occur. Ito and Mester's argument is based on the interaction between a voicing dissimilation (Lyman's Law, LL) and a rule which voices stem-initial obstruents in the second member of compounds (Rendaku, R). Lyman's Law is responsible for the fact that no two voiced obstruents can surface within a stem; and for the apparent failure of Rendaku in precisely the case where its output would contain a stem-internal sequence of two voiced obstruents. The latter fact is illustrated below:

(16)

- a. /garasu tana/ 'glass shelf' → garasu dana (R)
 b. /kami kaze/ 'divine wind' → kami gaze (R) → kami kaze (LL)

As the contrast between /garasu dana/ and /kami kaze/ indicates, a voiced sonorant like /n/ does not trigger Lyman's Law: Ito and Mester attribute this to the fact that its [voice] value is still missing at the relevant stage. Confirming this suggestion is the observation that when /n/ separates two voiced obstruents, Lyman's Law applies, as if their [+voice] autosegments are directly adjacent:

(17)

- a. /taikutsu ŷinogi/ 'time killing' → /taikutsu jinogi/ (R) →
 → taikutsu ŷinogi (LL).
 b. [+voice] [+voice] [+voice]
 | | |
 j i n o g i → ŷ i n o g i

3. Missing D-values

It is a common assumption in the recent literature on underspecification that only one value of any given feature may be present underlyingly. In many cases this entails that some segments with D-values for the relevant feature must be underlyingly unspecified for it. For instance, if we take [+voice] as the underlying value, the voiceless obstruents of Japanese must be represented as unspecified. Similarly, this entails that if [+lateral] is underlying, then the [-lateral] value of /r/ must be absent in the early stages.

I have suggested earlier, following in this Christdas (1986), that both D-values must sometimes be present underlyingly. I will examine now what appear to be the strongest cases for missing D-values. As it turns out, only two clear arguments of this sort

rspecification.

ants relative to the feature here. I will outline now the are missing underlyingly.

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i gaze (R) -> kami kaze (LL)

ana/ and /kami kaze/ indicates, it trigger Lyman's Law: Ito and that its [voice] value is still firming this suggestion is the two voiced obstruents, Lyman's [e] autosegments are directly

-> /taikutsu jinogi/ (R) ->

[voice]
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have so far been found.

3.1. Voiceless obstruents in Japanese

Ito and Mester (1986) have developed the test outlined above for determining whether a Japanese segment is underlyingly specified for [voice]. If it is, it will trigger and/or block Lyman's Law. If it is not, it will be transparent to it. Voiceless obstruents are, by this test, unspecified for [voice]: in a sequence [g...t...b], /g/ undergoes Lyman's Law despite the intervening /t/.

(18)

a. /onna kotoba/ 'feminine speech' -> onna gotoba (R) -> onna kotoba (LL)
b. [+voice] [+voice] [+voice]
 | |
 g o t o b a -> k o t o b a

I see no alternative to Ito and Mester's conclusion that the voicing value of Japanese voiceless obstruents is missing when Lyman's Law operates.

3.2. Front vowels in Finnish

In what follows I will restate Kiparsky's (1981) analysis of Finnish [back] harmony in terms of the distinction between distinctive and redundant specifications. Finnish has eight surface vowel qualities, of which six form minimal pairs with respect to [back]: (a, ä, o, ö, u, y). The front vowels (e, i) have no direct [+back] counterparts and behave as neutral segments: the harmony rule propagating stem [back] values onto suffixal vowels is not triggered or blocked by /i/ or /e/. In this respect Finnish is similar to Hungarian:

(19)

a. talo-ssa 'house-inessive', mykä-ssä 'mute-inessive'
b. lume-ssa 'snow-inessive', lasi-ssa 'glass-plural-inessive'
Pariisi-ssa 'Paris-inessive', Bysanti-ssa 'Byzantium-inessive'

Native stems are generally harmonic: their non-neutral vowels are either all back or all front. Loanwords may be disharmonic, mixing freely the vowels of the two sets:

(20)

a. marttyri 'martyr', jonglööri ' juggler', analyysi 'analysis'
b. syntaksi 'syntax', tyranni 'tyrant', dösa 'bus', följetongi 'feuilleton'

According to Campbell (1980), disharmonic forms like /analyysi/, whose last non-neutral vowel is front, take either front or back vocalic suffixes: both /analyysi-ä/ and /analyysi-a/ are considered acceptable, in different styles. /Analyysi-a/ is considered more learned, more prestigious, while /analyysi-ä/ counts as colloquial. In contrast, the stem type illustrated in (20)b, whose last non-neutral vowel is back, takes consistently back suffixes:

Campbell (1980) and Kiparsky (1981) report that /följetingi-ä/, /tyranni-kä/ are definitely impossible pronunciations. It appears that, until recently, the low front vowel /ä/ had an effect similar to that of back vowels: a disharmonic stem whose last non-neutral vowel was /ä/, would take exclusively front suffixes. This is the pattern described by Campbell: /hydrosfääri-ä/ but */hydrosfääri-a/. Paul Kiparsky, however, informs me that in contemporary Finnish front /ä/ behaves like /ö/ and /y/: all three are disregarded by harmony, if a back vowel precedes them. The generalization is then, at least for this recent variety of Finnish, that all front vowels optionally behave as neutral segments in disharmonic stems. The only obligatorily neutral vowels are the unpaired (e,i), the R-class for [back].

There are then two patterns to account for: the prestigious /analyysi-a/, /följetingi-a/ and the colloquial /analyysi-ä/, /följetingi-ä/. Kiparsky (1981) points out that the only difference between the two is whether front, non-neutral vowels are transparent or opaque. The shared characteristic of the two styles, the impossibility of */följetingi-ä/, reveals that back vowels are invariably opaque. This suggests that only [+back] is underlyingly present, as shown below:

- (21)
- | | |
|------------------------|----------------------------|
| a. a n a l y y s i - a | b. f ö l j e t o n g i - a |
| | |
| [+back][+back] | [+back] |

To account for the prestigious pattern, in which both (a) and (b) will surface with suffixal back vowels, one need only assume that the representations in (21) are the input to harmony:

- (22)
- | | |
|------------------------|----------------------------|
| a. a n a l y y s i - a | b. f ö l j e t o n g i - a |
| | |
| [+back][+back] | [+back] |

Kiparsky explains the fact that [+back] spreads only across the morpheme boundary rather than stem-internally (*/analuusi/, */foljetongi/) by assuming that harmony is cyclic, subject to the Strict Cycle. The derivation is completed by specifying as [-back] the vowels untouched by harmony.

To derive the alternative paradigm /foljetongi-a/, /analyysi-a/, Kiparsky postulates that the front non-neutral vowels are opaque in the colloquial style: although still unspecified for [back], they cannot be crossed by harmony:

- (23)
- * [+back]
- / \
- V V_i V , where V_i is a non-neutral vowel (ä, ö, y)

report that /följētongi-ä/, pronunciations. It appears that /ä/ had an effect similar to that of the stem whose last non-neutral vowel is front. This is the case with /hydrofääri-ä/ but not with /wever/, which informs me that in colloquial Finnish, like /ö/ and /y/: all three vowels precede them. The reason for this recent variety of behavior is that non-neutral vowels are only obligatorily neutralized in the context of [back].

For the count: the prestigious variety of Finnish, the colloquial /analyysi-ä/, points out that the only non-neutral vowels are front. The fact that the two varieties of /tongi-ä/, reveals that back vowels suggest that only [+back] is

j e t o n g i - ä
|
[+back]

tern, in which both (a) and (b) vowels, one need only assume the input to harmony:

j e t o n g i - ä
|
[+back]

back] spreads only across the stem-internally (*/analuusi/, which is cyclic, subject to the restriction specified by [-back]

/följētongi-a/, /analyysi-a/, non-neutral vowels are opaque in the context of [-back], they

vowel (ä, ö, y)

The spirit of Kiparsky's analysis is, however, better served without filters like (23), which would in principle allow us to describe the opacity of any random segment to any harmony type. Rather, the colloquial style simply shows that harmony applies when all D-values are present but before R-values are. Assuming this, the input representations to harmony in colloquial Finnish will be as shown in (24):

(24)
a. a n a l y y s i - ä b. f ö l j e t o n g i - ä
| | | | |
[+back][+back][-back] [-back] [-back] [+back] [-back]

Harmony in both sets of forms will be feature changing, a possibility we have explicitly left open at the outset. Finally, we observe that only the rightmost [back] value can dislodge the suffixal specification: this is the joint effect of strict cyclicity, which prevents stem internal harmony, and of the ban on crossed association lines.

Kiparsky's analysis of the prestigious paradigm is a compelling argument for missing D-values. One notes, however, that there is no straightforward extension of the analysis to the earlier variety of Finnish described by Campbell: that in which low front /a/ and all back vowels are opaque.

3.3. Round harmony in Mongolian

Mongolian has seven distinct vowel qualities, traditionally transcribed as (a, e, o, ö, i, u, ü). The vowels transcribed as front (ö, ü) are in fact phonetically [+ATR] rather than uniformly front. This indicates, as Djamouri and Riialand (1985) point out, that the Mongolian "front" harmony is really a rule propagating ATR values. In this harmony system, /a/ is the [-ATR] counterpart of /e/. With this in mind, we group the Mongolian vowels according to the features ATR, [round] and [high]:

(25)

		-ATR	+ATR
round	high	u	ü
	-high	o	ö
-round	high		i
	-high	a	e

From this classification two R-classes emerge: /i/ for ATR and /u/ for [round]. Looking first briefly at the ATR harmony we note the structural isomorphism between the Hungarian short vowel system and the Mongolian system: both have an R-class consisting of a unique segment, /i/. It is not surprising then that /i/ is the only transparent vowel in the Mongolian ATR system.

(26)
a. uls-aas 'from the country'; tögl-ööd 'having played'
b. ger-ees 'from the house'; xür-eed 'having reached'

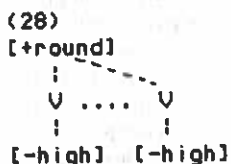
- c. saz-l-xii-l-aad 'having shaken violently';
 nugal-xii-l-aad 'having folded'
 d. düliig-ees 'from the mute'

The suffixal alternations caused by ATR harmony are illustrated in (26), with data from Djamouri and Riiland (1985). The forms in (c-d) indicate that /i/ is transparent.

We may consider now the more problematic case of Mongolian Round harmony. The fact is that in this case we have an unexpected transparent segment: /i/.

- (27)
 a. tögl-ööd 'having played'; odoog-ooos 'from now on';
 tör-öös 'from the state'
 b. ob-r-xii-l-ood 'having seemed furious';
 mol-ii-lg-ood 'having flattened'
 c. oduul-aad 'having sent'; ögүүл-үүл-eed 'having made speak'

The forms in (a) illustrate the basic [round] alternations. Those in (b) show that /i/ is transparent and that it fails to undergo [round] harmony. Those in (c) show that /ü/ and /u/ are opaque and that they fail to trigger [round] harmony. Leaving aside for the moment the characterization of transparent and blocking segments, let us simply note that [round] harmony operates in Mongolian only between non-high vowels.



It is clear that the distinction between D-values and R-values cannot help explain why /i/ is transparent while /u/ and /ü/ are opaque. If anything, the line of argument pursued in the preceding sections would make one expect that only /u/ should be transparent, as it is the only vowel whose [round] specifications are predictable: [+high, -ATR] → [+round]. Every other vowel has its [-round] counterpart. Let us admit then that harmony operates in this case after the redundant roundness of /u/ has been introduced.

We must still explain the behavior of /i/. One option would be to assume that distinctive [-round] values are absent when harmony takes place. This will mean that all unrounded vowels are unspecified for [round] at that stage. A non-high unrounded vowel will be a target of harmony, as (28) states. A high unrounded vowel will not be a target but neither will it block the rule, as a derivation of /moliilgd-ood/ indicates:

violently';

ed by ATR harmony are illustrated and Riialand (1985). The forms in arent.

roblematic case of Mongolian Round this case we have an unexpected

-g-ooos 'from now on';

furious';

d'
-üü]-eed 'having made speak'

the basic [round] alternations. transparent and that it fails to in (c) show that /ü/ and /u/ are trigger [round] harmony. Leaving racterization of transparent and note that [round] harmony operates h vowels.

tion between D-values and R-values transparent while /u/ and /ü/ are of argument pursued in the preceding hat only /u/ should be transparent, hose [round] specifications are -round]. Every other vowel has its dmit then that harmony operates in unt roundness of /u/ has been

avior of /i/. One option would be ind] values are absent when harmony that all unrounded vowels are stage. A non-high unrounded vowel as (28) states. A high unrounded either will it block the rule, as icates:

(29)
[+round] - - - - -
| | | | | | | |
m o l i i l g d - aa d
| | | | | | | |
[-high] [+high] [-high]

Finally, the vowels /u/ and /ü/ will block harmony because they are non-triggers specified as [+round]. (30) below represents the blocker sequence in /oduulaad/:

(30)
[+round] [+round]
| | | | |
o d uu l a d
| | | | |
[-high] [+high] [-high]

It appears then that an optimal analysis of [round] harmony in Mongolian must rely on the absence of the D-value [-round]. However, unlike features like [back], [high], [anterior] and [lateral], [round] does not appear to be a double-valued feature. There are no instances of [-round] assimilation or dissimilation and no other kind of evidence that unrounded segments have any specification for this feature. Mongolian may then illustrate trivial underspecification for [round], rather than the non-trivial absence of D-values.

By deciding that [round] is single-valued we can also avoid the assumption of language-specific orderings between redundancy rules introducing R-values and D-values. Recall that the analysis of Finnish front harmony requires that the redundant [-back] value of [i,e] be introduced after the distinctive [-back] value of [ä,ö,y]: the former is absent when harmony applies whereas the latter is present, at least in the colloquial style. In contrast, the Mongolian R-value for [round], that of /u/, must be present when [round] harmony applies. If we assume that the D-value [-round] is introduced at some point, this must happen after harmony, as indicated above. Thus, the assumption that [round] is double-valued forces us to stipulate that the relative order of R-rules and D-rules is a language specific matter. In contrast, if [round] fails to possess a second value, this issue does not arise.

I conclude from this that Mongolian harmony fails to establish the need for non-trivially absent D-values.

4. Conclusion

The picture emerging from this survey differs in some significant respects from that presented in some of the more recent work on underspecification, especially in Archangeli (1984) and Archangeli and Pulleyblank (1986). Let us review these differences.

We have seen here that the linguistically significant boundary is that separating distinctive and non-distinctive assignments of feature values. Thus, Latin liquid dissimilation distinguishes two types of [-lateral] values: the distinctive one (that of /r/) and the redundant one (that of the non-liquids). Finnish [back] harmony distinguishes two types of [-back] values: the distinctive one (that of {ä, ö, y}) and the redundant one (that of {i, e}). Similarly, Kinande ATR harmony requires special status for /a/, the only vowel whose ATR specification is non-distinctive. Finally, Chumash sibilant harmony distinguishes two types of [+anterior] segments: the sibilant /s/, whose anteriority is distinctive, and the stops, whose anteriority is redundant.

The alternative distinction proposed by Archangeli and Pulleyblank, that between Default assignments predictable from universal facts and Complement assignments predictable from language specific facts appears to play no role in the functioning of phonological systems that I am aware of. This distinction would, for instance, separate the [lateral] specifications of vocoids and nasals from that of other segment classes: vocoids and nasals are, perhaps, universally non-lateral whereas other segments, such as the obstruents and the liquids, have language specific assignments of [lateral]. As we have seen, however, the language specific non-laterality of obstruents is as irrelevant in Latin as the universal non-laterality of nasals and vowels. Similarly, the distinction between universally mandated feature values and language-specific ones is not the appropriate one for Chumash [anterior]: markedness facts require us to set up [-anterior] as the marked value and thus dictate, in Archangeli and Pulleyblank's terms, a Default rule of the form [] → [+anterior]/ [+coronal]. But this approach will incorrectly lump together Chumash /s/ and /t/ by specifying them simultaneously. What is needed is a stage where both /s/ and /t/ are specified, but not yet /t/.

At the outset of this search for evidence of underspecification I had decided to rely primarily on the typology of transparent segments. In a number of cases, my conclusions about missing values were also drawn from the typology of non-triggers: segments which are expected to trigger a rule by virtue of their surface specifications for some feature yet fail to do so. Both types of evidence support the idea that R-values are missing underlyingly.

In contrast, there is little evidence for missing D-values. First, we have seen that in some cases both D-values for a feature must be present in underlying lexical entries (cf. sections 2.1.3 (Ngbaka) and 2.2.2 (Tamil)). Second, the clear-cut arguments for the elimination of D-values from underlying representations reduce to two: the voicing of Japanese obstruents and the backness of Finnish non-neutral vowels (4). The disparity between the strength of the case for underspecification of R-values and D-values is striking and invites reanalysis of the Finnish and Japanese data. I have no clear suggestions on this score at present but it seems possible to experiment with the idea that the appearance of missing

phonetically significant boundary non-distinctive assignments of dissimilation distinguishes two distinctive one (that of /r/) and non-liquids). Finnish [back] [-back] values: the distinctive redundant one (that of (i,e)). gives special status for /a/, the /y/ is non-distinctive. Finally, it specifies two types of [+anterior] anteriority is distinctive, and redundant.

As proposed by Archangeli and others, the assignments predictable from the surface assignments predictable from the surface play no role in the functioning of the system. This distinction is not aware of. This distinction is the [lateral] specifications of the different segment classes: vocoids and non-lateral whereas other and the liquids, have language specific assignments. As we have seen, however, the distinction for obstruents is as irrelevant in the reality of nasals and vowels. The non-universally mandated feature is not the appropriate one for the facts require us to set up rules that thus dictate, in Archangeli and others, the form [] -> [+anterior]/ will incorrectly lump together /s/ and /z/ simultaneously. What is the evidence of underspecification on the typology of transparent segments, my conclusions about missing phonology of non-triggers: segments that fail to do so. Both types of values are missing underlyingly.

The evidence for missing D-values. specifies both D-values for a feature class entries (cf. sections 2.1.3 and 2.2.2), the clear-cut arguments for underlying representations reduce the disparity between the strength of the R-values and D-values is the Finnish and Japanese data. The score at present but it seems clear that the appearance of missing

D-values may be the effect of features such as Japanese [voice] and Finnish [back] acting as single-valued on a language specific basis.

As a final remark, I would like to speculate on the nature of the relations expressed by R-rules. As Stevens, Keyser and Kawasaki (1987) point out, some of these relations, such as the one between the backness of non-low vowels and their roundness ([+back] -> [+round]) reflect enhancement of perceptual salience. A different sort of relation expressed by R-rules takes as input a segment class defined in terms of stricture features ([consonantal], [sonorant], [continuant]) and states that a "content" feature has defective distribution within it. For instance [voice] has restricted distribution within the class of sonorants; [lateral] has restricted distribution within the class of obstruents and vocoids; [coronal] has restricted distribution within the class of continuant obstruents (in languages where all fricatives are coronals); [nasal] is restricted within the class of obstruents, continuant sonorants and, in languages lacking nasal vowels, within the class of vocoids. Interestingly, the opposite type of redundant relation is seldom if ever encountered: I know of no unambiguous cases requiring that the distribution of a stricture feature be restricted within a segmental class defined in terms of a content feature such as [coronal], [back], [labial] or [voice]. For instance, I know of no language in which all coronals are [+sonorant] or where all labials are [+continuant]. Suppose then that, aside from R-rules stemming from enhancement, there is only one other type of R-rule: it takes the form [αF] -> [βG], where F is a stricture feature and G is a content feature. In order to be able to extend this proposal to the R-rules observable within vowel systems, we must extend the term stricture feature to cover vocalic height as well: this seems natural, in that the features [high] and [low] define relative sonority among vowels, in the same way that [sonorant], [consonantal] and [continuant] define relative sonority among consonants. We can now express frequently encountered restrictions such as [+low] -> [+back], or [+high] -> [+ATR].

This proposal has a welcome empirical consequence: it excludes the possibility of defining an R-rule such as [+round] -> [+high]. The case I have in mind is a three-member vowel system (a,i,u) like that of Nyangumata. In analyzing such a system, Archangeli and Pulleyblank (1986:305) use two features, [high] and [round], and the following values:

(31)

	a	i	u
high		+	
round			+

In choosing to leave /u/ unspecified for height they remark that the [+high] value of this segment is predictable from the fact that it is the only [+round] vowel in the system: thus [+round] -> [+high]. Yet both /i/ and /u/ function as high throughout the

phonology of Nyangumata. More significantly, I know of no comparable system in which one surface high vowel functions as phonologically lacking in height values while the other one behaves as [+high]. This problem is not specific to Archangeli and Pulleyblank's theory of underspecification: the logic of the distinction between D-values and R-values made in (5) would also force one to leave out the height value of /u/ from a system based on the features [high] and [round]. Superficially, the relation between [round] and [high] in Nyangumata seems identical to that between [low] and [back] in Tamil and Ainu: yet, while we have good evidence that a unique low vowel is [0back] in Tamil, Ainu and elsewhere, we have no evidence that a unique rounded vowel is [0high] in systems like Nyangumata. The solution to this problem is to recognize that the statement [+round] → [+high] reverses what appears to be a constant relation between stricture and content features. This observation may provide the grounds for its exclusion.

Footnotes

<1> The fact that low vowels do not undergo height harmony should be interpreted along the lines suggested by Kiparsky (1985) and Ito and Mester (1986): a segment which cannot bear an underlying specification for F (in this case [high]) cannot be subject to a lexical rule that assigns it a value for F. This condition is referred to as structure preservation.

<2> The lax vowel /E(:)/ also fails to undergo height harmony (/KetE:skuahtemowaw/ 'your door') and blocks it (/KeswEituaq/ 'when they go home'). See Cole and Trigo (1986) for a possible explanation of this phenomenon.

<3> The rule [+back] → [+round] need not to be restricted to non-low vowels if we assume that the redundant backness of /a/ is not considered.

<4> The picture may change somewhat when tonal underspecification is evaluated in light of the distinctions proposed here. In contrast, the underspecification for [nasal], a feature not discussed here, is unlikely to alter my conclusions: as Lauren Trigo (p.c.) points out, [nasal] specifications in most consonant systems may fall into the class of R-values, by being predictable from features such as [sonorant] and [consonantal]. If this hypothesis is upheld, then the frequent existence of transparent consonants in nasal harmony systems will simply strengthen the case for the underspecification of R-values, without providing further cases of missing D-values.

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significantly, I know of no surface high vowel functions as such while the other one behaves as if specific to Archangeli and classification: the logic of the R-values made in (5) would also have the value of /u/ from a system based on [j]. Superficially, the relation in ngumata seems identical to that in Ainu: yet, while we have good evidence for [back] in Tamil, Ainu and what a unique rounded vowel is in Ainu. The solution to this problem is that [+round] -> [+high] reverses the relation between stricture and height, may provide the grounds for its

notes

do not undergo height harmony as suggested by Kiparsky (1985) in a segment which cannot bear an R-value in this case [high] cannot be assigned a value for F. This is the preservation.

fails to undergo height harmony and blocks it (/kewEittuaq/ 'when Trigo (1986) for a possible

[j] need not to be restricted to the redundant backness of /a/ is

range somewhat when tonal in light of the distinctions in underspecification for [nasal], a likely to alter my conclusions: as [nasal] specifications in most of the class of R-values, by being [sonorant] and [consonantal]. If in the frequent existence of height harmony systems will simply underspecification of R-values, without D-values.

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