

REDUNDANCY, MARKEDNESS, AND SIMULTANEOUS CONSTRAINTS IN PHONOLOGY

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In the markedness model of *SPE* (Chomsky & Halle 1968), redundancy rules lose their ability to characterize regularities and must convert 'optimal' phonemes to 'real' ones. Lexical redundancy and low-level segmental redundancy are confused in the *SPE* model, in which values are specified for all features in lexical matrices. In assigning values to features with no phonetic correlates in certain major classes, absolute marking conventions create unnatural classes and unpronounceable segments; their output should be expressed in *u*'s, and interpretive marking conventions should assign values only to meaningful features.

In this paper I shall discuss two aspects of phonological theory, segmental redundancy and simultaneous constraints, and the implications for them in the model of markedness in phonology proposed in Chapter 9 of Chomsky & Halle 1968 (henceforth *SPE*). I shall not dispute the validity of the model as a theory of phonology, but I wish to point out certain undesirable consequences of its formulation in *SPE*, and to give some suggestions for improvement. Section 1 of this paper is a brief history of previous treatments of segmental redundancy; sections 2–4 discuss its treatment in *SPE*; and section 5 examines the effects of marking conventions on the co-occurrence restrictions of features.

PRE-MARKEDNESS SEGMENTAL REDUNDANCY

1.1. Until the development of the model of phonology exemplified by Halle 1959, the phonemic level of representation in a grammar could be characterized as a redundancy-free version of the phonetic level. In classical phonemics, a phoneme is 'a class of non-contrastive and phonetically similar phones ... defined by the quality or combination of qualities present in all its members and absent from all other phones of the dialect' (Bloch 1950:90). Any feature not distinctive in a phone *P* is 'not properly part of the definition of the phoneme to which *P* belongs' (ibid.) For instance, in a language with the vowel phonemes /i e u o a/, the allophones of /e/ might be [e] in stressed syllables and [ɛ] in unstressed syllables. The phoneme /e/ is then defined by the midness and frontness of [e] and [ɛ]; this is the combination of qualities, or features, which differentiates them from the allophones of /i u o a/. If both [e] and [ɛ] are nasalized only before nasal consonants, nasalization is said to be a **CONDITIONED** feature in them; the feature [nasal] is not part of the definition of /e/. The feature [tense], which differentiates [e] from [ɛ], is introduced by rules and considered **DETERMINED** in [e] and [ɛ]. Thus [tense] is not part of the definition of /e/; rather /e/ is defined by the facts (a) that it is not /i/, /u/, /o/, or /a/, and (b) that its allophones are [e] and [ɛ]—with the defining, determined, and conditioned features mentioned above. Classical phonemes, in the strictest sense, have no phonetic features associated directly with them. The features are associated with their allophones; and the rules which describe the relationship between the

phonemes and their allophones add specifications for all the phonetic features necessary to characterize the pronunciation of the allophones.¹

In early distinctive-feature analyses, phonemic representations were similarly redundancy-free versions of the corresponding phonetic representations, although the former were defined in phonetic terms (Jakobson, Fant & Halle 1963:4 ff., 43–5). In the vowel system described above, the feature [tense] is redundant, since no vowel phoneme is in a tense–lax opposition with any other. The tenseness of [e] and the laxness of [ɛ] are supplied by rules adding the redundant features in the appropriate environments (cf. Stanley 1967:396). It is therefore possible to say that the phonological rules (however expressed) of both classical and distinctive-feature phonemics are, in fact, redundancy rules.

1.2. Practitioners of the model of phonology exemplified by Halle 1959 found that, in order for morphemes to be represented in the lexicon with unique shapes defined with phonetic features, and in order for these entities to be mapped directly onto their systematic phonetic variants (alias allomorphs), the power of phonological rules would have to be extended beyond their previous function of filling in blanks. They would have to be able to change feature values—adding, deleting, or permuting entire segments at intermediate levels in derivations. Morphemes were to be represented lexically without values for the redundant features of the systematic phonemes by which they were ‘spelled’. These redundant features were to be filled in (a) by the morpheme-structure rules, which specify the possible shapes for morphemes in the language, and (b) by the phonological rules, which add redundant feature values as needed for the operation of other rules.

Morpheme-structure rules, in predicting the values of some features in lexical matrices, express sequential redundancies. Segmental redundancies—the constraints on (and thus the predictability of) the co-occurrence of feature specifications in the paradigmatic environment of one segment—are not codified in a particular place in the 1959 model, but can be inferred from the phonological rules which appear in the course of derivations (Stanley, 396–7, 398).

A possible 1959 treatment of the vowel system described in §1.1 would be as follows. The systematic vowel phonemes, or ‘incompletely specified morphonemes’ (Halle 1959), are /i e u o a/. They are distinguished by the features [high], [low], and [back].² Ignoring sequential redundancy, they can be represented like this:

(1)		/i	e	u	o	a/
	High	+	–	+	–	–
	Low		–		–	+
	Back	–	–	+	+	

In the course of derivations, phonological rules add feature values to 1, filling in the blanks—as well as changing and deleting whole segments, of course.

¹ I am aware that the above is a considerable simplification of the views of Bloomfieldian and post-Bloomfieldian phonologists; but I believe that this compression of their ideas does not result in serious distortion.

² The 1959 model, of course, used other features; but this does not alter the facts under discussion.

What is important here is that, in principle, two types of rules are operating. Rules of the first type fill the blanks in 1, i.e. specifying that [+high] vowels are [−low], while [+low] vowels are [+back]; such rules add feature VALUES. Rules of the second type add features that play no role in lexical representations of the language (i.e. are not needed to keep morphemes distinct), but that are needed to specify fully the segments at the systematic phonetic level of representation. Such rules add ENTIRE FEATURES, not just feature values. Very little importance is attached, in models other than classical phonemics, to these latter features and rules, because of the preoccupation of phonologists with higher-level phenomena (Schane 1971).

In the remainder of this paper, the rules which fill in the blanks by adding values to matrices like 1 will be called LEXICAL REDUNDANCY RULES, or L-RULES; and those which add whole features such as [tense] will be called SEGMENTAL REDUNDANCY RULES, or S-RULES. Thus it is an L-rule which adds the value minus to the feature [high] for /a/; it is an S-rule which states that the systematic phonetic representatives of /e/ are [+tense] in stressed syllables and [−tense] in unstressed syllables. S-rules have traditionally been thought of in generative phonology as 'detail rules' (Postal 1968); but as seen in §1.1, they are actually phonetic redundancy rules, in that they add features which are not part of the definition of phonemes.

1.3. Stanley 1967 proposes a change in the form and function of morpheme-structure and redundancy rules. He suggests that these rules belong in the lexicon, no longer forming a subset of the phonological rules; the latter should operate on 'fully specified' systematic phonemic matrices. The unordered morpheme-structure and segment-structure conditions proposed by Stanley are to replace both the morpheme-structure rules and those phonological rules of the 1959 model which add feature values; but the latter are precisely the L-rules. Stanley's segment-structure conditions (398) are not intended to replace S-rules: 'At the systematic phonemic level there is an inventory of SYSTEMATIC PHONEMES, each of which is represented by a one-column, n-row matrix, where n is the number of distinctive features in the language.' It is clear that Stanley means segment-structure conditions to replace only L-rules, since he goes on to say (405): 'We have stressed that MS rules represent redundancies at the systematic phonemic level; they say nothing about redundancies at the systematic phonetic level.'

In the Stanley model, then, the vowel system described above can be represented as the following set of one-column, three-row matrices:³

(2)	/i	e	u	o	a/
High	+	−	+	−	
Low				−	+
Back	−	−	+	+	

Segment-structure conditions (as well as sequence-structure conditions when the vowels appear in morphemes), or L-rules, fill in the blanks in 2, and the phonological rules proper operate on systematic phonemes which are fully specified (in terms of the three features above). But the S-rule which adds the feature [tense] to the system-

³ The lack of 'distinctness' in 2 would be acceptable under Stanley's weaker 'true generalization' condition (421).

atic phonetic representatives of /e/ is not an MS rule, since it states a redundancy at the end of the phonological rules rather than at the beginning.

1.4. To summarize this brief history, it is fair to say that, since phonemes in the classical phonemic model have no phonetic features directly associated with them, all phonological rules there are S-rules. In the early distinctive-feature model, phonemes are redundancy-free versions of the corresponding phones, but 'no language uses all [twelve] features' (Jakobson et al., 40); all rules are therefore L-rules, since they fill in blanks only for features already present. In the 1959 and Stanley models, all redundancy rules are L-rules, S-rules being 'detail rules' that come at the end of the phonological rules. So far, then, /e/'s allophones [e] and [ɛ] appear with their determined feature [tense] only in the classical model, since only the classical model gives S-rules. No other model supplies values for this feature, because it is needed neither for distinctness nor for fully specified systematic phonemes.

REDUNDANCY IN THE *SPE* MARKEDNESS MODEL

2. The system of markedness in phonology proposed in *SPE* represents in many ways a radical change from previous models. Marking conventions state what are considered to be universal redundancies, e.g. that if a segment is a vowel, it is not an obstruent. Previously, in order for matrices to be formally complete, facts like this had to be included in the redundancy rules of individual languages. But now marking conventions state that all vowels are sonorants and non-anterior; facts such as this are 'not determined separately for each language but are given ONCE FOR ALL within the theory of natural or expected segment types' (Schane 1973:115). They are presented not as facts 'specific to [e.g.] English but rather as a universal convention for interpreting grammars' (*SPE*, 416).

Along with conventions of this type, which they call absolute conventions, Chomsky & Halle propose a set of interpretive conventions, which are statements of the marked and unmarked values of features in various syntagmatic and paradigmatic environments. The interpretive conventions also assume the function of many of an individual language's redundancy rules. Lexical entries are represented with *u*'s and *m*'s, rather than with plusses, minuses, and blanks. Since only *m*'s are counted in evaluating lexical complexity, no feature values are left blank in lexical matrices: 'Since unmarked features do not add to the complexity of a grammar, there is no point in allowing unspecified features in the lexicon' (*SPE*, 403).

We have seen that neither the 1959 model nor the Stanley model includes S-rules. The *SPE* model, however, gives interpretive conventions for every feature in the proposed universal phonetic framework. Thus, for the first time in generative phonology, S-rules are present; and they appear, not at the end of the grammar, but at the point at which the phonological rules begin. Values are present in all systematic phonemic matrices for ALL features from the beginning. I shall return to the consequences of this in §4.

L-RULES IN THE *SPE* MODEL

3.1. As noted above, marking conventions assume many of the functions of what were previously language-specific L-rules. No blanks are left in lexical matrices,

since a marking convention will change the *u*'s and *m*'s into plusses and minuses. Many of the redundancies of individual languages are seen to be universal, and thus do not need to be expressed by language-specific L-rules. Since only *m*'s count in the evaluation of a language's complexity, individual L-rules CONTRIBUTE to complexity, as we shall see below, rather than reducing it.

Since marking conventions describe what are thought to be universal regularities, they must ignore language-specific regularities if these do not fit with what is universally regular. In Persian, which has no underlying tense mid vowels, the six underlying vowels would be represented as follows (Henderson 1972):

(3)		/i e ū o ā a/
	High	<i>u m u m u u</i>
	Low	<i>u u u u u u</i>
	Back	— — + + <i>u u</i>
	Tense	<i>u m u m u m</i>
	Complexity	1 3 1 3 0 1 = 9

In Persian lexical matrices, every /e/ or /o/ will have an *m* in the [tense] row, because [*u* tense] is [+tense]. In earlier models, an L-rule would simply have been included in the grammar as follows:

$$(4) \begin{bmatrix} V \\ -\text{high} \\ -\text{low} \end{bmatrix} \rightarrow [-\text{tense}]$$

But in the *SPE* model, rule 4 would only contribute to the complexity of the grammar.⁴ What, then, is the function of L-rules in the *SPE* model?

Chomsky & Halle suggest that lexical matrices be spelled with the 'optimal' segments obtainable from the marking conventions and from the criteria they suggest for hierarchies of vocalic features. After this, language-specific redundancy rules CONVERT 'the optimally represented lexical matrices into those required for the phonological rules. The complexity of these rules ... is the measure of the complexity of this language with respect to its vocalic system' (*SPE*, 411). Thus the Persian vowel system would be represented with underlying tense mid vowels /ē ō/, decreasing the complexity of 3 by two *m*'s, to 7. A Persian-specific L-rule would then convert the 'optimally' tense mid vowels into the lax vowels needed for the phonological rules.

The difficulty with this approach is that L-rules must change feature values in order to patch up lexical entries for the phonological rules; if they do this, they will lose their ability to define at a single level the set of systematic phonemes of a language, and will become once again a subset of the phonological rules (cf. Stanley, 409–11, 421–4).⁵ A rule that changes α to $-\alpha$ does not tell us that some-

⁴ In fact, 4 would be disallowed in the *SPE* model (though it is fairly obvious that such was not the intention of Chomsky & Halle): redundancy rules can be added to a grammar 'if the number of predicted coefficients is greater than the number of specified features of the rule in question' (*SPE*, 381). While 4 includes several feature values, it predicts none, because they have all been specified already by the marking conventions.

⁵ 'Optimal' lexical matrices, in addition, may bear little resemblance to the 'real' ones needed for the phonological rules.

thing is redundant or predictable; it just changes something 'optimal' to something 'real'. The *SPE* model's use of L-rules, then, leaves much to be desired. But there are ways in which L-rules can retain their character as true generalizations about a language's systematic phonemes, without changing feature values, and with a minimum of distortion to the theory of markedness.

3.2. All that is needed is a slight amendment of the evaluation measure, so that an L-rule is evaluated not by the number of blanks it fills in lexical matrices, but by the number of feature specifications that it COULD remove from fully specified matrices while retaining the distinctness of those matrices. In the Persian example, the *m*'s in the [tense] row will be interpreted as minuses by the marking conventions; but the statement that lax vowels are universally more complex than tense vowels would stand. The Persian-specific L-rule will then simply state that mid vowels are lax, and its statement cost will be weighed against the number of minuses that it can remove from Persian lexical matrices (cf. Stanley, 434). Thus an L-rule will be included in a grammar on the basis of the strength of its predictions about a language's structure, rather than on the basis of the number of *m*'s, *u*'s, plusses, or minuses it changes.

Another way would be to delay *m*-counting until after the application of the L-rules, with the latter taking over the work of interpreting *u*'s and *m*'s—precisely insofar as they can do so and express the non-universal regularities of the language. In Persian lexical matrices, [*m* tense] /e o/ would be converted to 'minus' by the L-rule, rather than by the marking convention. To the *m*-counting evaluation measure, then, the complexity of the Persian vowel system would still be 9, if plusses and minuses count the same as *m*'s.⁶

S-RULES IN THE *SPE* MODEL

4.1. It was noted in §2 above that, for the first time since the adoption of distinctive features, S-rules are now part of generative phonology.⁷ Since the *SPE* model includes, in principle, marking conventions for every feature in the universal phonetic framework, many marking conventions are themselves S-rules.

Consider again the five-vowel system described in §1, /i e u o a/. Here the feature [tense] is determined, i.e. predictable from stress placement, in [e] and [ɛ], the allophones of /e/. In all the models considered above, the feature [tense] would play no role in the definition of /e/, at either the classical or systematic phonemic level of representation. But in the *SPE* model, all these vowels would be [*u* tense]—which, as we saw above, is [+tense]. The convention which supplies a value for this feature to /e/ is thus an S-rule, since [tense] is necessary only for characterizing the difference between [e] and [ɛ], not for keeping /e/ distinct from /i u o a/. After the

⁶ It is not clear to me, however, that this is correct: I think it quite likely that *m*'s should be at least 50% more expensive than plusses and minuses. In any case, as has been pointed out by Sanford Schane (personal communication), it seems otiose to have L-rules duplicate the function of marking conventions by interpreting *m*'s and *u*'s; therefore the first solution is more satisfying.

⁷ The very detailed rules for Spanish obstruent–glide alternations in Harris 1969 are NOT S-rules, because they do not add features other than those used to define the systematic phonemes.

application of the phonological rules, we want a rule describing the distribution of the allophones of /e/. Nothing is more natural than one of the following form:⁸

$$(5) \begin{bmatrix} V \\ -\text{high} \\ -\text{low} \\ -\text{back} \end{bmatrix} \rightarrow [\alpha\text{tense}] / \begin{bmatrix} ____ \\ \alpha\text{stress} \end{bmatrix}$$

But 5 applies vacuously to stressed vowels, since they are already [+tense], as all [u tense] vowels are, by virtue of the marking convention. Vacuous application of half of a Greek-letter variable rule is presumably more costly than the straightforward application of a feature-changing rule, so 5 must be replaced by 6:

$$(6) \begin{bmatrix} V \\ -\text{high} \\ -\text{low} \\ -\text{back} \\ +\text{tense} \end{bmatrix} \rightarrow [-\text{tense}] / \begin{bmatrix} ____ \\ -\text{stress} \end{bmatrix}$$

Note that 6 has two faults: (a) it operates on an incorrect input, resulting directly from the inclusion of S-rules at the beginning of the grammar; and (b) it barely approaches descriptive adequacy, stating only half the truth and obscuring a generalization. Something is wrong with a model that disallows valid generalizations about the pronunciation of a language, and furthermore requires predictable features to have the opposite values in underlying representations from their surface values, when no economies result. This is a clear violation of Postal's 'naturalness condition' (79-84), and of the following from Chap. 8 of *SPE* (381):

Other things being equal, the more direct the relationship between classificatory and phonetic matrices, the less complex—the more highly valued—will be the resulting grammar. Insofar as language-specific rules are proposed that express an indirect relation between classificatory and phonetic matrices, these rules must be justified by showing that they lead to economies in other parts of the grammar that more than compensate for the complexity that they introduce.

Even more in need of justification than language-specific rules that express such indirect relationships are universal rules that impose them on individual grammars.

4.2. We see that marking conventions have appropriated many of the functions of S-rules in a grammar, in a manner analogous to that in which they have appropriated many of the functions of L-rules; the result is a loss of naturalness. What we want is a means whereby marking conventions can 'reward' languages for having simple structures, while allowing S-rules to add features in the most economical way that allows them to make true generalizations about a language's pronunciation.

I think the best way to achieve this is to limit the lexical matrices of individual languages to those features that are needed to keep the matrices distinct, and to allow marking conventions to supply values for only those features. That is, marking conventions should function as universal L-rules, but not as universal S-rules. Since the feature [tense] plays no role in the systematic phonemic vowel system

⁸ Actually, the rule would apply to all non-low vowels, and would be considerably more general than this.

/i e u o a/ mentioned above, marking conventions should fill in the blanks only for [high], [low], and [back]; the features [tense], [round], [glottal constriction] etc. should be added by S-rules at the end of the phonological rules. Restricting the power of marking conventions in this way will limit their harmful effects on the S-rules of a language; this will be easy if we simply adopt the convention that no marking convention can apply to a feature in a lexical matrix unless there is already a row of *u*'s and *m*'s for that feature in the matrix.

SIMULTANEOUS CONSTRAINTS

5.1. Chomsky & Halle (5) make the following observation:

Among the 'simultaneous constraints' of universal phonetics would be the condition that no phonetic segment can be both [−consonantal] and [+strident]; the feature 'strident' does not provide a further classification of [−consonantal] segments.

This simultaneous constraint is incorporated into the *SPE* marking conventions as Convention V (405).⁹ In this section I shall examine some of the simultaneous constraints obtaining among the phonological features used in *SPE*, and I shall suggest a way of incorporating them into marking conventions in a way that I believe expresses them better than *SPE*'s Convention V.

The values assigned to the features of phonological matrices at all levels of representation are answers to questions. At the lexical level, an *m* represents the answer 'yes' to the question 'Is this segment marked for this feature?', and a *u* represents the answer 'no' to the same question. At intermediate levels of representation, a plus represents the answer 'yes', and a minus the answer 'no', to the question 'Is this feature present in this segment?' At the phonetic level of representation, integer values represent answers to the question 'To what extent is this feature present or absent in this segment?' If there were no simultaneous constraints, these questions could be asked about each feature in all segments, since the answers would provide further classifications. But there are simultaneous constraints, and the grammar must be prevented from asking the wrong questions. It must not ask, e.g., whether a [−consonantal] segment is marked for stridency or not, or whether it is [+strident] or not, or even how strident or non-strident it is. These questions are unanswerable, as we shall see below.

Chomsky & Halle prevent vacuous questioning in *SPE* by including, in their proposed marking conventions, a number of 'absolute conventions [which] ... express in a natural way ... that certain feature complexes are impossible' (406). Among the suggested absolute conventions are those which indicate that [+low] segments must be [−high], and [+high] segments [−low], as well as Convention V, which 'contains an incomplete listing of all features that are not available for marking in vowels' (408). Absolute conventions are 'but another way of expressing the fact that the feature in question is not subject to marking and will therefore always remain unmarked' (404).

Absolute conventions prevent the grammar from asking the wrong questions; but the absolute conventions in *SPE* do this by answering the questions before they can be asked. By specifying the value of a feature which must be unmarked in a

⁹ Cf. also Cherry et al. (1953:39), Halle (1964:327), and Schane (1973:28, 38).

certain context, they indirectly state that this feature must be unmarked. But this leads, in many instances, to precisely the consequences that we want to avoid. Consider a constraint on feature co-occurrence which states that [+vocalic] segments must not be marked for the feature [delayed release]. In the *SPE* model, this is stated by an absolute convention:

(7) [+vocalic] → [–delayed release]

When the feature [del rel] is used to subcategorize obstruents, [–del rel] means [+instantaneous release] or [+abrupt offset] (cf. Postal, 71); thus [p t k] are pronounced with instantaneous release, and [p^f c č] are pronounced with delayed release. But what does [–del rel] mean in [+vocalic] segments? It cannot mean [+instantaneous release], because [+vocalic] segments have no release. In [+vocalic] segments, [–del rel] must mean ‘nothing; no answer’ (cf. Sampson 1970: 600). There are thus (at least) two meanings for minus in the supposedly binary system of phonological feature values: sometimes minus means ‘the opposite of plus’, and sometimes it means ‘nothing’. But at the systematic phonetic level, feature specifications must be interpreted into articulatory gestures, if we are to maintain seriously that at this level features ‘provide a representation of an utterance which can be interpreted as a set of instructions to the physical articulatory system’ (*SPE*, 65). Somewhere, then, a rule is necessary which tells the physical articulatory system to interpret the specification [–del rel] as [+instantaneous release] in obstruents, but to ignore it elsewhere.

If such a rule is present in the grammar, it invalidates the specification [–del rel] in [+vocalic] segments by declaring it null and void at the systematic phonetic level, i.e. phonetically meaningless. The absolute convention shown in 7 above, which assigns the meaningless specification at the most abstract level of representation, is also supposed to nullify it by declaring it unmarkable; but 7 does not do this. It says nothing about marking, and it assigns a value to a feature which must later be erased.

If [+vocalic] segments are [–del rel], they form a natural class with unaffricated stops. But we do not find out until the very end of the grammar, when the cancellation takes place, that [+vocalic, –del rel] means nothing remotely like [–vocalic, –del rel]; hence there is nothing to prevent all [–del rel] segments from functioning as a natural class in phonological rules (cf. Wheeler 1972).

Absolute conventions such as 7, then, do too little: they state which paradigmatic combinations of features are universally prohibited, but they do not state that these combinations are meaningless. They also do too much: they prevent the marking of certain features by assigning values which (a) must not be used to make an unnatural class natural, and (b) must be nullified later. Both (a) and (b), as matters now stand, are left to the analyst’s taste.

What is needed is an algorithm whereby we can specify that certain features must be unmarked when they co-occur with certain other features, without resort to the assignment of meaningless specifications. Not all features which are unmarkable in certain contexts are meaningless in those contexts, of course: it is possible that vowels must be unmarked for the feature [voice] in lexical matrices (Postal, 183), but it is not meaningless to say that the obligatorily unmarked value

of the feature [voice] in vowels is 'plus'. Yet the absolute conventions in *SPE* do not differentiate between meaningful and meaningless obligatorily unmarked features. Such differentiation is necessary, and I shall suggest a way to achieve it.

5.2. I propose that absolute conventions be restricted in function to statements of the obligatory UNMARKEDNESS of certain features in certain contexts, and that they not assign values to those features. This functional restriction can be reflected formally by the requirement that absolute conventions have their output expressed in *u*'s instead of in plusses and minuses. For example, a statement is needed to the effect that the features [del rel] and [distributed] are not available for marking in vowels, which would be expressed in the *SPE* model as follows:

$$(8) \begin{bmatrix} +\text{vocalic} \\ -\text{consonantal} \end{bmatrix} \rightarrow \begin{bmatrix} -\text{del rel} \\ -\text{distributed} \end{bmatrix}$$

But since neither of the specifications on the right-hand side of the arrow in 8 makes any sense, I would replace it with 9:

$$(9) \begin{bmatrix} +\text{vocalic} \\ -\text{consonantal} \end{bmatrix} \rightarrow \begin{bmatrix} u \text{ del rel} \\ u \text{ distributed} \end{bmatrix}$$

An immediate objection is that 9 does nothing to block the subsequent assignment of values to the features on the right-hand side of the arrow by interpretive conventions; thus, while it states the truth, it is formally inadequate. But we want to do two things here. First, we want to make sure that certain features always remain unmarked in certain contexts: this is insured by 9, which provides *u*'s in lexical matrices for the features [del rel] and [distributed], in the columns where [+vocalic] and [−consonantal] are present. Second, we want to block the assignment of any values at all to the obligatorily unmarked features. This is easy to achieve if the interpretive conventions which replace *u*'s and *m*'s with plusses and minuses include a reference to the contexts in which these features are meaningful, i.e. [−vocalic, +consonantal]. If we do this, the absolute conventions will accomplish their primary purpose, which is to act as metaconstraints on the co-occurrence of marked features of whatever value—and in a direct way, without the subterfuge of assigning meaningless values. After the application of 9, vowels will be [*u* del rel, *u* distributed]. The interpretive conventions which assign values to these features will assign them to only those segments which are [−vocalic, +consonantal]. Since vowels are excluded from this context, no interpretive convention will assign any value to [*u* del rel] or [*u* distributed] in vowels, and the vowels will emerge from the marking conventions with *u* as their value for these features. A *u* before a feature in any matrix below the level to which the marking conventions apply will be interpreted as 'nothing' by the phonological rules, which do not operate on *u*'s and *m*'s; thus the specious formation of unnatural classes, as well as the meaningless phonetic specifications discussed above, will be avoided.

In the case of a feature which must be unmarked in a certain context but is not meaningless in that context, e.g. the feature [voice] in vowels, an absolute convention can state that vowels must be [*u* voice]; but the interpretive convention which specifies the value of the feature need not be restricted to non-vowels, since [voice] is not only meaningful but necessary in the phonetic representation of vowels.

While it may be the case that all vowels should be represented in lexical matrices as [+voice], phonetic representations often include voiceless vowels. If we found that a voice contrast in vowels was needed in lexical representations, then the convention that vowels must be [*u* voice] could simply be dropped.

The effect of this proposed modification of the form and function of marking conventions is to include what Wilson (1966:196) calls the 'universal zero' in phonological representations, with none of the disadvantages of 'zero' functioning as a third value distinct from 'plus' and 'minus' (cf. Stanley, 409–11; Harms 1968: 15; Postal, 163 ff.; *SPE*, 382–8).

Statements of the unavailability of certain features for marking in certain contexts can now take the following form:¹⁰

$$\begin{array}{ll}
 (10) \text{ If } \left[\begin{array}{l} -\text{consonantal} \\ +\text{sonorant} \\ \langle -\text{vocalic} \rangle \end{array} \right] & \text{then } \left[\begin{array}{l} u \text{ anterior} \\ u \text{ continuant} \\ u \text{ lateral} \\ u \text{ distributed} \\ u \text{ del rel} \\ u \text{ voice} \\ \langle u \text{ coronal} \rangle \end{array} \right] \\
 \\
 (11) \text{ If } \left[\begin{array}{l} -\text{consonantal} \\ -\text{sonorant} \\ -\text{vocalic} \end{array} \right] & \text{then } \left[\begin{array}{l} u \text{ anterior} \\ u \text{ coronal} \\ u \text{ tense} \\ u \text{ lateral} \\ u \text{ distributed} \\ u \text{ del rel} \end{array} \right]
 \end{array}$$

Conventions 10–11 are expressed as segment-structure conditions after the Stanley model. It seems preferable to express absolute conventions as conditions rather than as rules, reserving the rewrite arrow for interpretive conventions, in which the same feature appears in the SD as in the SC. The arrow then means 'is interpreted as'. The condition form expresses directly the fact that no *u*'s or *m*'s are being changed to plusses or minuses, and nothing is being interpreted.

A typical interpretive convention which would apply after the above absolute conventions would assign values for [*u* voice] and [*m* voice], and could take the following form:

$$(12) [u \text{ voice}] \rightarrow [\alpha \text{ voice}] / \left[\begin{array}{c} \text{—} \\ \alpha \text{sonorant} \end{array} \right]$$

Since all non-consonantal sonorants are obligatorily [*u* voice] by convention 10, the value [+voice] will automatically be assigned to them. Similarly, neither glides nor glottals may be marked for the feature [coronal], as expressed by 10–11. The interpretive convention which assigns a value for this feature will therefore mention the contexts in which it is meaningful—i.e. obstruents, nasals, and vowels.

Negative conditions can also be used to express simultaneous constraints, such as the fact that no segment can be both [+high] and [+low]:

¹⁰ I am considering the glottals /h ʔ/ to be [–consonantal, –vocalic, –sonorant] (cf. Postal, 131; Schane 1968:128–9; and Ladefoged 1971:109, 111).

$$(13) \sim \begin{bmatrix} m \text{ high} \\ m \text{ low} \end{bmatrix}$$

Condition 13 is to be interpreted as a statement that no segment can be marked for one of the features mentioned if it is marked for the other. Negative conditions (Stanley, 427–8) are used when there is no clear reason to specify that one of the features mentioned in them is primary and the other secondary, and 13 expresses clearly and concisely the facts suggested in a more arbitrary and less economical way by SPE Conventions VII and IX (405). In a segment that is $[m \text{ high}]$ or $[m \text{ low}]$, the obligatorily unmarked value of the other feature will be specified by the relevant interpretive convention.

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