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Harmony

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IN DEFENSE OF MORPHEME STRUCTURE RULES:  
EVIDENCE FROM VOWEL HARMONY

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There are four different views that have been held or are currently held concerning the existence, or lack thereof, of morpheme structure rules (MSRs). The first view, that of 'classical' generative phonology (e.g., Halle 1959, 1962), is that they do indeed exist, and furthermore are ordered in a block before all phonological rules proper, filling in unspecified (redundant) feature values; as a result, phonological rules operate only on fully-specified feature matrices. This view was challenged by Stanley 1967, who argued that generative MSRs should be replaced by static 'morpheme structure conditions' (MSCs) which govern permissible fully-specified underlying representations. The MSC approach has been adopted in most subsequent research, including the influential Chomsky and Halle 1968 and the popular textbook of Kenstowicz and Kisseberth 1979. A third view, advocated by Stampe 1973, Lee 1975, 1976, Donegan and Stampe 1979, Kiparsky 1982, and Churma 1984a, 1987, is that only MSRs exist, and that they can apply freely (subject to universal, and perhaps language-specific, constraints on rule interaction) in the phonology. On this view, MSRs (called 'natural processes' by Donegan and Stampe and 'universal redundancy rules' by Kiparsky) are members of a set of rules that is universal in nature, and a language is marked to the extent that it does **not** exhibit these processes.<sup>1</sup> There is no necessary distinction between MSRs and other kinds of phonological rules on this view, although phonological rules that are not MSRs may develop as a result of complications induced by phonological change (rule telescoping, rule inversion, analogical leveling, etc.). The final view (cf., for example, Stewart 1983, Archangeli and Pulleyblank 1986) maintains that both MSRs and MSCs (or something very much like these – Stewart employs 'word structure conditions' and rules triggered by violations of these conditions, and Archangeli and Pulleyblank's notation is somewhat exotic) exist. The rules in question may apply in the phonology in Archangeli and Pulleyblank's system, and may apply **only** in the phonology for Stewart.<sup>2</sup> In this paper, I will defend the third position, that constraints on morpheme structure may be stated only in terms of (universal) MSRs. The basis for my arguments will be the vowel harmony systems based on the feature [ATR] found in various African languages.<sup>3</sup>

1. Akan, Kinande, and Maasai.

As Kiparsky 1982:53-4, 58-84 has pointed out, there is one very strong piece of evidence that MSRs must be allowed to apply to the output of phonological rules: otherwise, we must posit phonological rules that either are identical to MSRs (if a 'standard' MSR approach is adopted) or have the effect of converting segments or sequences of segments that the MSCs disallow into permissible (sequences of) segments. In either case, as Kenstowicz and Kisseberth 1977 have pointed out, we will have a 'duplication problem': two distinct (albeit identical-looking, in the first case) mechanisms are being employed to prevent a single configuration from surfacing.

On the other hand, there appears to be evidence that MSCs must be permitted (cf. Kiparsky 1985), since employing them allows for an explanation of which vowels are 'opaque' to harmony. For example, there are no [+ATR] low vowels in Akan.<sup>4</sup> This constraint can be expressed by the following MSC:

(1) \*[V, +ATR, +low]

If we suppose that the application of phonological rules (in the lexical phonology) is constrained by a principle of 'Structure Preservation', so that no segment that violates an MSC may be created, then it follows that /a/ will block the spread of [+ATR], since otherwise a

non-permitted [+ATR] low vowel would be created. Notice that the only way of accounting for the opacity of /a/ in a theory that disallows MSCs like (1) is building this fact into the statement of the harmony rule, in this case by restricting the harmony rule so that it may affect only non-low vowels. But doing so appears to be making the claim that the fact that harmony affects only non-low vowels and the fact that an impermissible segment would result if harmony were to affect a low vowel are unrelated.

It is entirely possible that these facts are indeed unrelated. First of all, restrictions on harmony rules such as that suggested above are common even when no violations of putative MSCs would result, e.g., harmony may apply only when the target and trigger vowels agree in height, as in Yokuts, Bobangi, and Ngbaka (cf. Churma 1984a). Furthermore, there are languages that have ATR harmony and no [+ATR] low vowels, and in which these vowels are not opaque. In Kinande (Schlindwein 1987), /a/ is transparent to one of the two ATR harmony rules. In Maasai (Wallace 1981, Churma 1987), /a/ is opaque for purposes of leftward harmony, but not rightward harmony, where it surfaces as [o] in [+ATR] contexts. As argued in the works cited, the most plausible way of accounting for the *a/o* alternation is allowing harmony in its rightward incarnation (but not its leftward one) to create a [+ATR] low vowel, which is subsequently affected by MSRs. These MSRs are given in (2), and a schematic account of the derivation of [o] from /a/ is provided in (3):

(2) a. [V, +ATR] → [-low]                      b. [V, -low, +back] → [+round]

(3) /a/ → (harmony) ə → (rule (2a)) [V, -low, ...] → (rule (2b)) [o]

Clearly, this account is incompatible with a pure MSC/Structure Preservation approach.

The Maasai case might be viewed somewhat suspiciously in the light of the unusual difference between leftward and rightward harmony. There are, however, other cases of this nature. Pulleyblank 1986 has argued that a similar approach is required in order to account for the fact that in Okpe certain instances of /a/ surface as [e] in [+ATR] contexts. There is, once again, a left-right asymmetry in Okpe (although Pulleyblank doesn't treat the phenomenon in question in these terms), and in addition, the data that provide the basis for Pulleyblank's analysis are sufficiently scanty that I, at least would not be willing to draw any conclusions from the little that we know about Okpe.<sup>5</sup> I will therefore examine in a fair amount of detail a language for which the data are relatively abundant, and for which there is no left-right asymmetry. The language in question is Tunen, a Bantu language spoken in Cameroon, as described by Dugast 1967, 1971 and Mous 1986.

## 2. Tunen.

Tunen has a surface eight-vowel system:<sup>6</sup>

(4)	i	e	o	u	ə	[+ATR]
	ɛ	ɔ	a			[-ATR]

Like Maasai, Tunen has a harmony system in which [+ATR] is dominant, in the sense that, if a word contains a [+ATR] vowel, in either prefix, suffix, or root, all vowels in the word surface as [+ATR]; otherwise, all vowels surface as [-ATR]. Thus, there are some vowels which are invariably [+ATR], while others exhibit an alternation with respect to this feature. For example, there are some morphemes that invariably surface with [ə], while others have vowels that surface as [a] in [-ATR] environments and as [ə] in [+ATR] contexts. The mid vowels behave somewhat unexpectedly, however; consider the data in (5), where *-ɛn/in* can be glossed roughly '(to VERB) for somebody', and *-i* is a causativizer (following common practice, morphemes that contain a dominant vowel are starred):

(5)	a.	falab - ɛn / fələb - i* 'build'	d.	huk* - in / huk* - i* 'blow'
	b.	fəŋ* - in / fəŋ* - i* 'exchange'	e.	kol* - in / kol* - i* 'buy medicine'
	c.	fəl - ɛn / fol - i* 'borrow'	f.	kol - ɛn / kul - i* 'create'

The alternation involving the stem vowels in (5a) is straightforward, as is that in (5c); the underlyingly [+ATR] causative suffix triggers harmony in the stem. In (5b, d), we find that dominant stems appear to trigger both [+ATR] harmony with respect to recessive suffixes and some kind of raising process. Finally, in (5e, f), there are two different kinds of segments that may surface as [o], one which triggers harmony in a recessive suffix, and one that does not, and which, when in a [+ATR] context, also appears to undergo what may be the same raising rule as that just alluded to. Mous proposes that the second kind of *o* carries a diacritic [+R] (for recessive), and that the vowel harmony rule (a negative cooccurrence restriction, violation of which triggers application of an associated rule, actually) and the raising rule are sensitive to the presence or absence of this diacritic (p. 289). He dismisses what appears to be a fairly obvious alternative analysis, in which the vowels involved in the height alternation are underlyingly [-ATR] high vowels (cf. Stewart and Van Leynseele 1979 for a segmental account of this nature, and Edwards 1987 for an autosegmental account), on the grounds that it would involve excessive abstractness (p. 294). On this latter kind of analysis,  $\varepsilon/i$  would be /I/, and the *o* in (5f) /U/, while the *o* in (5e) would be /o/. If such an analysis is adopted, then ATR harmony can be accounted for by the mirror image rule in (6a), after which the absolute neutralization rules in (6b, c) would apply:<sup>7</sup>

- (6) a.  $V \rightarrow [+ATR] // [+ATR] C_0 \underline{\quad}$   
 b.  $[-ATR, +high] \rightarrow [+ATR, -high]$   
 c.  $[+ATR, -high, -back] \rightarrow [-ATR] / [X \underline{\quad} Y]_{root, suffix, Class\ 19\ prefix}$

Thus, when harmony is inapplicable, /I/ and /U/ will be subjected to the absolute neutralization rule (6b), thereby becoming /e/ and /o/, respectively. The former is then subjected to a further neutralization rule, and surfaces as [ɛ] in the rather motley collection of morphological environments specified in (6c). This rule would explain, in addition to the  $\varepsilon/i$  alternation, the greater number of roots with  $\varepsilon$  rather than  $e$  in the variety studied by Mous (cf. note 6). Derivations illustrating this kind of approach are given in (7):

(7)	a.	huk - In	b.	kol - In	c.	kUl - In	Underlying
		huk - in		kol - in		_____	Rule (6a)
		_____		_____		kol - en	Rule (6b)
		_____		_____		kol - en	Rule (6c)

When there is a dominant stem, it triggers harmony, and the suffix vowel surfaces as [i], as illustrated in (7a, b). When the root is (underlyingly) [-ATR], however, harmony is inapplicable, and the abstract high vowels surface as mid, due to the application of one or both of the neutralization rules, as in (7c).

There is a problem with this account, however, concerning the restrictions on rule (6b), at least within the theory of lexical phonology (cf. Kiparsky 1982, 1985, Mohanan 1982). Note first that this rule must apply post-lexically, because it is structure-changing and applies in non-derived environments, and the Strict Cycle Condition would therefore block its application in the lexical phonology. If it does apply in the post-lexical phonology, however, then it cannot have access to even morphological bracketing information (assuming some version of the bracket erasure convention), let alone such properties as being a Class 19 noun class prefix.<sup>8</sup> Thus, regardless of the position one takes on how much abstractness is allowable, the analysis under discussion is not tenable in the case of the front vowels, at least from the perspective of lexical phonology.<sup>9</sup>

Even apart from this theory-specific technical problem, there is reason to question this approach. If both underlying /e/ and /e/ from underlying /I/ are affected by rule (6c), then we might expect that those /ɛ/s that are derived from the former should behave like what they are underlyingly - in particular, [+ATR] - just as the different kinds of *o* in (5e, f)

do. However, vowels that can surface as [ɛ] uniformly fail to trigger harmony, and always surface as [i] in [+ATR] contexts;<sup>10</sup> they must all therefore be treated as being underlyingly [-ATR] (and [+high]). On this analysis, then, there would be an extremely odd distribution of underlying /e/s: they would occur only in a handful of pronominal class prefixes, and possibly a few roots.<sup>11</sup> What happened to all the /e/s?

Suppose, then, that we try an alternative approach. What if /I/ merges directly with /ɛ/ in the odd assortment of environments specified in (6c), instead of going through the intermediate stage? (This is, in fact, what Stewart and Van Leynseele 1979 have suggested in their informal diachronic account, if I have interpreted them correctly.) That is, the rules in (6) would be replaced by:

- (8) a. [-ATR, -back] →[-high] / [X \_\_\_ Y]<sub>root, suffix, Class 19 prefix</sub>  
 b. [-ATR, +high] →[+ATR, -high] (elsewhere)

Thus, /I/ will surface as [ɛ] in the right places (with a few possible exceptions – see below), and those /I/s that have not been affected by (8a) (i.e., those in prefixes other than the Class 19 prefix) will be subject to (8b) (= (6b)), which will necessarily follow (8a) by virtue of the Elsewhere Condition (cf. Kiparsky 1973), and these vowels will also behave for purposes of harmony like the [-ATR] vowels that, underlyingly, they are. Derivations illustrating this kind of approach are given in (9), where /I/ is the Class 7 prefix, /hI/ the Class 19 prefix, and the roots are glossed as ‘peigne’, ‘dossier’ and ‘banane’, respectively (cf. Dugast 1971:73, 84):

(9)	a.	I - fal	b.	hI - bɛnɛ	c.	hI - bul	Underlying
		—		—		hi - bul	Harmony
		—		hɛ - bɛnɛ		—	Rule (8a)
		e - fal		—		—	Rule (8b)

But once again, we will be positing a curiously asymmetrical (nearly) /e/-less vowel system, and the feature-changing neutralization rules will have to apply post-lexically in order to be able to affect their non-derived inputs, and so could not have access to the required morphological information. Furthermore, on this account, there would be no underlying /ɛ/s, and it is predicted that there can be no e/i alternations in roots, which, as pointed out in note 11, is not the case.

The source of much of the trouble with these accounts is the necessity for morphological restrictions on some neutralization rule. Suppose, then, that we get rid of any rule that requires such conditioning. The problem then becomes how to account for the ɛ/i alternation in the troublesome environments without setting up an abstract /I/. Let us try positing that [ɛ] is underlyingly just what it looks like, i.e., /ɛ/. When it is in a [+ATR] environment, it would then be expected to surface as [e], which, it will be recalled, actually occurs only rarely in roots. Because of this near lack of ɛs, Mous (p. 282) sets up a ‘Well Formedness Condition’ that disallows it. When in the course of a derivation a structure that violates a WFC arises, an associated ‘automatic rule’ applies to fix things up (cf. Stewart 1983), in this case ‘V →[+high]’. This approach is in this respect similar to the MSR approach (and, of course, incompatible with a pure MSC approach). On an MSR approach, however, there would be no need for a WFC, which would be implicit in the structural description of the MSR:

- (10) [V, +ATR, -back] →[+high]

On either an MSR or an automatic rule approach, underlying /ɛ/ would first be converted to /e/ in [+ATR] contexts by the harmony rule, and then undergo a rule that raises the

output of harmony to [i]. Notice also that, while we still have a vowel system with (almost) no /e/s, the presence of (10) in the grammar as an MSR can explain this lack **and** the fact that  $\varepsilon$  alternates with something other than its [+ATR] counterpart.<sup>12</sup> A static MSC approach would be unable to relate these two facts.

However, front vowels in prefixes other than the Class 19 prefix usually surface as [e] when in a [-ATR] context (e.g., the Class 7 prefix, as illustrated in (9a)),<sup>13</sup> and there may be a few root vowels which are invariably [e] (cf. note 11); these vowels must somehow be prevented from undergoing the raising rule. What is more, some way of accounting for the fact that these prefix vowels surface as [i] when they are in a [+ATR] context must be provided. But note that if these vowels were underlyingly /I/, they would be affected by rule (8b) – the one that has no morphological conditioning – unless this rule were bled by harmony, which would appropriately derive [i] in [+ATR] contexts.<sup>14</sup> Thus, if /I/ is underlying only in the case of the  $\varepsilon/i$  alternation, whereas the vowel that underlies the  $\varepsilon/i$  alternation is / $\varepsilon$ /, rule (8a) and the associated morphological restrictions can be dispensed with, as can the requirement that there be a preceding *h* only in prefixes (cf. note 8) if Stewart and Van Leynseele's suggestion is adopted. If these proposals are adopted, however, there will be a substantial mismatch between the underlying vowel inventory, which will now contain [-ATR] high vowels and no /e/s (cf., however, note 11), and the surface system of (4).

Mous' account does not entail such a mismatch, so it is worth investigating. On this approach, any vowel that can surface as mid is underlyingly mid, so that my /I, U,  $\varepsilon$ / are /e, o,  $\varepsilon$ /, respectively. In order to account for the alternations in question, Mous (pp. 287-90) sets up a raising rule which is sensitive in part to the diacritic alluded to at the beginning of this section, which I give in slightly revised form below:

$$(11) \quad [V, -\text{low}, \{-\text{round}, +\text{R}\}] \rightarrow [+high] // \text{ \_\_\_ } C_0 [V, -\text{R}, +\text{ATR}]$$

That is, mid vowels that are either unrounded or marked with the diacritic [+R] are raised in the environment of a [+ATR] vowel that is not [+R]. After this rule applies the regular harmony rule will convert the intermediate /I/ that is derived from / $\varepsilon$ / to the appropriate [i].

However, since on this account there are no underlying /I/s (and hence there would have to be an MSC that bars them), the raising rule will have to be allowed to violate Structure Preservation. It is fairly easy to get around this problem: we simply change rule (11) so that it also makes the output [+ATR]:

$$(11') \quad [V, -\text{low}, \{-\text{round}, +\text{R}\}] \rightarrow [+high, +\text{ATR}] // \text{ \_\_\_ } C_0 [V, -\text{R}, +\text{ATR}]$$

This account will handle all (almost – cf. note 16) of the relevant data. However, it looks rather odd: why should a vowel get raised in a [+ATR] environment? Furthermore, it is implicitly making the claim that the vowel harmony which we know exists in the language is not in part responsible for the  $\varepsilon/i$  alternation. Historically, at least, it seems clear that this is not the case; a sound change that corresponds to rule (10) is almost certainly responsible for the existence of this alternation. But we cannot assume that the diachrony is recapitulated in a synchronic grammar; languages can have rules that are quite 'crazy' (Bach and Harms 1972), and it could well be the case that we are dealing with one of them.

In fact, there appears to be some evidence that at least the *o/u* alternation is best treated in terms of a diacritic-based analysis. In addition to the kinds of segments that surface as [o] discussed in the previous subsection, there is third 'schizophrenic' *o*, as illustrated in the data below, taken from Mous 1986:288:

- (12) a. *faton* - εn / *faton* - i 'open'  
 b. *onjwan* - εn / *onjwən* - i 'blow'  
 c. *lobon* - εn / *lobun* - i 'weed'  
 d. *aloboton* - εn / *aloboton* - i 'answer summons'

Since the *o* in *faton* cooccurs with *a* within a root and fails to trigger harmony, it would be expected to be underlyingly [-ATR] and high (cf. (7c)). However, even if it is not underlyingly [+ATR], it should become so when the dominant causative suffix is added, and hence surface as [u] (cf., again, (7c)). But it doesn't. Similarly, because *o* and *a* cooccur in the root in (12b), the former would be expected to be /U/, but it fails to be affected by harmony (note that harmony cannot be restricted so as to prevent more than one vowel from being affected, due to the existence of forms such as those in (5a)). Since the root in (12c) does not trigger harmony, the final vowel of the root would be expected to be /U/, and since the first vowel cooccurs with it, it should also be [-ATR]; but only the second vowel is affected by harmony. And since the *os* in (12d) cooccur with *a*, and since the stem does not trigger harmony, they should all be /U/, but none of them is affected by harmony. Thus, regardless of the general position one takes on how much abstractness is allowable, the abstract approach encounters difficulties in this case.<sup>15</sup>

There is at least one root that contains still another kind of *o*, *sokom* 'work in vain'. This stem triggers harmony in suffixes (/sokom - εn/ → [sokomin]), but both vowels surface as [u] when a [+ATR] suffix is added (/sokom - i/ → [sukumi]). This suggests that speakers are taking all *os* except for the one that alternates with *ɔ* as being underlyingly /o/. Doing so, however, creates a problem: some /o/s trigger harmony, and some do not, and some surface as [u] in [+ATR] contexts, while some remain mid. Apparently what speakers have done is memorize which /o/s do which, on a case-by-case basis – i.e., assign the /o/s in question an appropriate diacritic – and in some cases, they have 'made the wrong guess' about how unfamiliar forms should behave. Notice that, since whether or not an /o/ triggers harmony need not correspond to whether or not it alternates with [u], two different diacritics are required; speakers apparently did not 'capture' the (former) generalization that the *os* that do not trigger harmony also undergo raising.<sup>16</sup> This is, I submit, very strong evidence against an abstract analysis that treats some instances of [o] as deriving from underlying /U/.

This does not, of course, provide any direct evidence concerning whether or not an account of the ε/i alternation should contain an abstract intermediate stage. There is one root whose behavior at least suggests that a one-step analysis should be preferred, although this behavior is sufficiently odd (and, apparently, isolated) that one should not give too much weight to it. The causative form of *obεm* 'brood' shows two variants, *obimi*, which is what we would expect (at least if the *o* is marked as not undergoing the raising rule), and *obεmε* (cf. Mous 1986:288). The causative suffix surfaces as [ε] only in this form, as far as I can tell, and it is not easy to see why it should, from the point of view of the harmony-plus-raising analysis. One might suggest that there is some minor rule that converts [+ATR] vowels to [-ATR] in the environment of a [-ATR] vowel, and in fact a rule of this sort would presumably be required in order to account for the behavior of prefixal *es* discussed in note 13. But this rule would in this case yield *I* (if it's allowed to), which should surface as [ε] via rule (6b). The existence of this variant thus seems not to be relatable to the rules used in the two-step account of the ε/i alternation. But it is possible to understand at least partially what is going on here if we assume that speakers find this alternation to be as bizarre as it appears to be at first glance, and are simply memorizing that ε and *i* are paired for purposes of harmony. Given this assumption, what is happening here is an application of the rule 'turn a [+ATR] vowel into its [-ATR] counterpart', albeit in a context that it

appears to be impossible to state.

These facts make me, at least, suspicious of the 'clever' (to use Kiparsky's 1971 term) two-step analysis; children learning Tunen (or other languages) may very well not be as good at doing internal reconstruction as professional linguists. This suspicion is increased by the apparent existence of cases of very common processes such as palatalization, which can be analyzed as two-step processes (in this case, fronting of a velar stop, plus affrication of the resulting palatal stop), but which appear not to be so analyzed by speakers. The particular case I have in mind is Italian palatalization, which has been discussed in some detail by Dressler 1985. Velar stops alternate with the corresponding palatal affricates in Italian, with the latter occurring before (some instances of) *i*. In order to characterize precisely which *i* trigger palatalization, one must first of all distinguish nouns from verbs, since this process may affect only non-geminate velars in nominals, whereas both geminates and simplex consonants may be affected in verbs (cf. Dressler 1985:170, 176-7). What is more, either further grammatical conditioning is required or there will have to be numerous lexical exceptions (cf. Dressler 1985 for the details).

Dressler argues (pp. 174-5) that this kind of palatalization is particularly liable to telescoping, since the required affrication process is context-free, and hence inherently unstable (due to the lack of direct support from phonological alternations). If so, then it is possible to see why the non-phonological complications to this rule might have arisen, since, as Clements 1985:246 has pointed out, telescoped rules 'typically [become] lexicalized and/or grammaticalized'. Thus, despite the rather frequent occurrence of palatalization rules that take stops as input and yield palatal affricates, and despite the fact that it is possible to derive the outputs from the inputs via the sequential application of two MSRs, it seems that palatalization rules of this nature should be formulated as one-step, non-natural, learned rules.

The neutralization rule (10), of course, is also context-free, so if we accept Dressler's line of reasoning, we would expect telescoping of it and any other rule that appears to interact with it - i.e., the harmony rule. The Maasai rules would, if anything, be even more susceptible to telescoping than those in Tunen, since in the former case not just one, but two context-free rules are required. There is thus some reason to question whether the 'clever' multi-step analyses should be adopted as synchronic analyses,<sup>17</sup> although diachronic analogs of them would appear to present an accurate picture of the history of the alternations in question. On the other hand, there is independent support for the harmony rules (from the other harmony alternations), whereas there is no such independent motivation for simple fronting of velars in Italian. Clearly, this issue is thus far from settled, and I will have to leave it unresolved here.

### 3. Conclusion.

If the purely phonological accounts of Maasai and Tunen are accepted, then they provide conclusive evidence against a pure MSC approach. Furthermore, we can reject the less restrictive combined MSC/MSR approach on general metatheoretical grounds, at least provisionally. It is important to note that, should the multi-step phonological accounts turn out not to be correct, this would not be evidence against the MSR approach; it would simply be lack of evidence in favor of it. As it turns out, the vowel system of Tunen provides a different kind of argument in favor of the MSR approach, as well. Given the distribution of [+ATR] vowels in the vowel systems of the world (cf. Churma 1987), something like (13) would belong to the universal set of MSRs:

$$(13) [V, -low] \rightarrow [+ATR]$$

This rule would provide an explanation for the dramatically larger number of [+ATR] non-low vowels found cross-linguistically. Within a pure MSC approach, the only way of accounting for such cross-linguistic generalizations appears to be setting up 'implicational

universals', along the lines of Jakobson 1941. This is the approach taken by Kaye, Lowenstamm, and Vergnaud 1985, who propose a principle of 'charm markedness' that has the effect of requiring that all languages have [+ATR] counterparts of any [-ATR] non-low vowels that are present. Like (most?) other implicational universals, this one has the unfortunate property of being false, at least if we take a reasonably strict position concerning how much 'normalization' is allowable (i.e., if a language has one high front vowel, and it's [i], we shouldn't be allowed to say it's /i/). Note that maintaining rule (13) as a universal rule does not commit one to this false implicational universal, although it does make the right claims about the markedness of [+/-ATR] vowels. In particular, since rules such as (13) can interact with (10) in such a way as to eliminate one of the [+ATR] vowels, without also eliminating the corresponding [-ATR] vowel, violations of this tendency are possible, as we have seen is (almost?) the case in Tunen, as well as in the languages discussed in Churma 1987. As Stampe 1973 has pointed out, it is only by allowing this kind of interaction between MSRs that what is true about the important inductive generalizations noted by Jakobson and others can be salvaged, in the face of examples in which these generalizations do not hold.

There are, however, apparent problems for the MSR approach, as Stanley was perhaps the first to point out. First of all, they are inherently directional, and frequently there is no evidence from the corpus being investigated concerning what the direction should be. Since I have discussed this issue elsewhere (cf. Churma 1984a, 1985), I will simply refer the reader to these papers. A related problem is what might be called the indeterminacy of MSRs. For example, in a language that has no [+ATR] low vowels, this fact can be accounted for by positing (2a), but it could also be accounted for by rule (14):

(14) [V, +low] → [-ATR]

In Maasai, assuming the three-step analysis of section 1, we would have evidence that (2a) must be present in the grammar, but in a language like Akan, neither of these rules is involved in any alternations, so there can be no corpus-internal evidence concerning which of these potential MSRs is responsible for the lack of underlying [+ATR] low vowels. But on the assumption that MSRs are universally present unless the facts of a given language require that the learner suppress them, this is not a problem: both of these rules are part of the grammars of Maasai and Akan (although a child learning Tunen would have to suppress both of them). Lovins' 1973 study of the nativization of loan words in Japanese, in which she found competing ways of repairing loans, suggests that, in some cases at least, this is exactly what is going on: different speakers are using different MSRs in the repair process. My own work (cf. Churma 1984a, also summarized in Churma 1985) indicates, moreover, that in some cases there is a thoroughgoing directionality in nativization, a fact which requires a directional device – i.e., an MSR, not an MSC.

A problem that is not specific to the MSR approach is the existence of neutral vowels. There are several possible ways of handling this phenomenon. The one which would appear to be most compatible with the MSR approach is to allow the harmony rule to affect the neutral vowel, and have an MSR subsequently undo its effects. This approach will not work for languages such as Khalkha Mongolian in which the neutral vowel has a counterpart with respect to the harmonic feature, and it would require violations of the Strict Cycle Condition, which appears to be needed in order to account for certain aspects of Maasai harmony (cf. Churma 1987 and the references cited there). Another possibility is to adopt Steriade's 1987 approach, in which neutral vowels, and only neutral vowels, are unspecified for the harmonic feature. However, as she points out (p. 360), this would require an appeal to Structure Preservation to prevent harmony from filling in the wrong value, and if the multi-step accounts of Maasai and Tunen are accepted, then this principle at least cannot hold universally. We may be stuck with the brute force approach of *SPE*, where the harmony

rule simply states, by the use of the parenthesis notation, that some vowels may be skipped. This actually may be what we are forced to, since when neutrality is examined carefully (cf. Kontra and Ringen 1986), we find that the situation is as messy as it is in the case of the Tunen *os*. Speakers may well find the idea of neutral vowels as difficult to handle in strictly phonological fashion as the idea of abstract absolutely-neutralizable vowels.

#### FOOTNOTES

I would like to thank the Department of Linguistics at Stanford University and the Center for the Study of Language and Information, which provided me with invaluable word processing facilities and support staff.

<sup>1</sup>One need not adopt the position that MSRs are universal (innate) processes in order to maintain a pure MSR position. It is a matter of fact that all advocates of this position have done so, however.

<sup>2</sup>It is thus somewhat misleading to call Stewart's rules MSRs; the lines between the various positions is are not always as clear as we might like them to be. In fact, Stanley's system might well be put in this last category, since he allows for a type of condition, the 'If-then Condition', which is, as he points out, a notational variant of an MSR. However, such a condition obviously cannot apply in the phonology, and in this respect Stanley's system is significantly different from the other approaches included in this group.

<sup>3</sup>In the interest of full disclosure from the start, I will warn the reader that I am not as convinced of the correctness of the analyses on which the arguments in large part depend as I was as late as a few weeks ago. This issue will be treated at the end of section 2.

<sup>4</sup>This is true only in the lexical phonology. Such vowels are created post-lexically in strictly local fashion by a low-level rule.

<sup>5</sup>Pulleyblank does not give a source for his data, but all of the forms he cites are also found in Hoffmann 1973. Hoffmann's data consist exclusively of the paradigms for the infinitive, imperative, and two tenses for a small number of monosyllabic verb roots.

<sup>6</sup>Dugast notes that the vowel *e* is rare in verb roots, and Mous states that for his informant, it 'is rare in [all] roots', and that he 'has *ε* where Dugast notes *e*' (p. 282).

<sup>7</sup>For purposes of discussion, I will assume fully-specified underlying representations, and segmental vowel harmony rules. The latter assumption is, of course, quite controversial, and I cannot defend it here. The case against radical underspecification of the type advocated in, e.g., Kiparsky 1985 appears to be quite strong; see Churma 1987, Steriade 1987.

<sup>8</sup>Stewart and Van Leynseele (1979), in their account of the diachronic development of the synchronic harmony system, suggest that the change that created the [e] of this prefix was phonologically conditioned by the initial *h* of this suffix. Even if some version of this rather suspect proposal (why should *h* have anything to do with ATRness?) is incorporated into a synchronic analysis, the remaining morphological information would not be available in the post-lexical phonology.

<sup>9</sup>Non-alternating root vowels (if they exist – cf. note 11) that surface as [e] would presumably have to be marked as exceptions to rule (6c), and post-lexical rules are said not to allow exceptions, so such vowels would also be problematic for this theory.

<sup>10</sup>There appears to be a single exception to this generalization (at least in the variety studied by Mous); see the discussion below of the causative of *obem*.

<sup>11</sup>There are four pronominal class prefixes that contain a vowel that surfaces invariably as [e], but which does not trigger harmony in roots. It is conceivable that some or all of the rare root *es* are underlyingly /I/, but neither Dugast nor Mous describes their behavior with respect to harmony, so it is impossible to establish the underlying identity of these vowels; the single root with an *e* that I have been able to find, the 'far demonstrative' *eye/iyi* (cf. Mous 1986:292) seems clearly to have underlying /I/s. The non-alternating *es* will have to be analyzed as /e/, however, so there are presumably at least four /e/s in the language.

<sup>12</sup>The non-alternating *es* described in note 11 will have to be analyzed as /e/; they will violate MSR (10), and hence be technically inadmissible, like English words with initial /sf/, which violate an otherwise exceptionless morpheme structure constraint against syllable-initial sequences of fricatives. Note that the prefixal /e/s are also odd in that they fail to trigger harmony.

<sup>13</sup>The qualification concerns the behavior of this vowel when the first syllable of the root contains  $\varepsilon$  or  $\upsilon$ , in which case the prefix vowel surfaces as either [e] or [ɛ], apparently depending idiosyncratically on each individual root. Dugast makes explicit note of the existence of this three-way alternation only in the case of the Class 5 prefix (p. 69), but her examples demonstrate that it exists in the case of the other relevant prefixes as well. Mous (p. 291) notes the existence of this phenomenon, as well, claiming that the [-ATR] variant 'is most frequent before stems with an  $\varepsilon$  as the first vowel, less frequent before stems which have an  $\upsilon$  as the first vowel and rare with an *a* as first stem vowel'. He also points out a similar alternation in the Class 14 prefix *bo-/bo-/bu-*, and notes that 'there is a lot of variation in these assimilation processes and both forms, assimilated or not assimilated, are acceptable in the majority of cases'. The lexical idiosyncrasies associated with this part of the alternation in question appear to support a blatantly diacritic approach to an account of these facts such as that suggested below in another context.

<sup>14</sup>This account thus appears to require the use of extrinsic rule ordering, which would be most unfortunate if this device should turn to be illegitimate, as it appears to be (cf. Churma 1984b and the references cited there). If one adopts a distinction between lexical and post-lexical rules, with the latter necessarily following the former, as in lexical phonology, then the ordering restriction will no longer be extrinsically imposed – nor will the requirement that the neutralization rule not feed rule (10). This account is viable, then, only if one buys either extrinsic rule ordering or some distinction of the lexical/post-lexical sort.

<sup>15</sup>There are conceivable ways of accounting for these data in purely 'phonological' terms, but they would require a pretty blatant 'diacritic use of a phonological feature' (cf. Kiparsky 1968), and I will not pursue them here. I suspect that these facts are a main concern of van der Hulst and Mous 1986, but I have been unable to consult this work.

<sup>16</sup>As a result, Mous' single-diacritic analysis will not work. Since it requires a Word Structure Constraint that contains diacritics (roughly, words may not contain diacriticless vowels that disagree with respect to [ATR]), it was not a very attractive candidate to begin with. (Since Mous had pointed out (p. 288) prior to giving the final form of his analysis that vowels that undergo raising do not always fail to trigger harmony, it is hard to understand why he went on to propose an account that does not allow for this kind of difference.) Notice also that (12c) shows the diacritics must be assigned to individual vowels, rather than morphemes as a whole, contra the standard position. For further evidence that individual segments must be allowed to host diacritics, see Churma 1986.

<sup>17</sup>Indeed, if this kind of approach is pushed far enough, it could be taken as evidence against allowing any rules of absolute neutralization in synchronic phonology, thus imposing a substantial constraint on allowable abstractness. The abstractness controversy has, unfortunately in my view, quieted down quite considerably, and the standard view appears to be that any alternation that can be handled in purely phonological terms should be so treated. The Tunen and Italian cases suggest strongly that such a position cannot be taken for granted.

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