

## THE INTERACTION OF PHONOLOGICAL RULES AND THE POLARITY OF LANGUAGE

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Concepts such as 'natural' - 'unmarked' and 'marked' - 'unnatural' were not, naturally enough, applied by linguists to the INTERACTION of phonological rules until the focus of linguistic investigation turned from the inventory of sound units in a language to the rules which govern the combination of these sound units to form morphemes and words, and which relate these basic sound units to their phonetic manifestations. Thus, the investigation of problems of naturalness with respect to rule interaction is still, comparatively speaking, in its infancy. Its beginning can be dated back no further than the work of Paul Kiparsky in the mid-1960's; the two main attempts at a (preliminary) theory of the natural interaction of rules can both be credited to Kiparsky (see Kiparsky, 1968b and 1971a).

The first view developed by Kiparsky (1968b) was that the UNMARKED, or NATURAL, interaction of rules is the one that MAXIMIZES THE UTILIZATION OF RULES. According to this view, there is some inherent force in language which leads to a broadening of the scope of application of a rule, not just in terms of a generalization of the contexts in which the rule applies, but also with respect to what representations are available as inputs to the rule. That is, if all representations (whether 'deep' or closer to the surface) which meet the conditions for the application of a rule are in fact inputs to the rule, then the rule will have a wider domain than if there are structures which meet the conditions of the rule but for one reason or another are not available as input structures.

This identification of the 'naturalness' of an interaction of two rules with the relative extent to which these rules are utilized in derivations - i.e., the more derivations in which both these rules apply rather than just one of them, the more natural the interaction of these rules - seems, to me, misguided on several grounds. One difficulty is that pairs of rules may critically interact, without maximization of utilization being even relevant. Consider, for instance,

the following two rules:

Truncation:	$V \rightarrow \emptyset$	/	$V \_\_\_\_\_\_$
Copy:	$\emptyset \rightarrow V_a$	/	$V_a C \_\_\_\_\_\_ ?$

and an underlying structure such as /u-is-ʔa/. Assuming a theory where rule interaction is accounted for in terms of sequencing of rules, two different derivations are possible. In case Truncation precedes Copy, /u-is-ʔa/ will be converted to *usuʔa*. In case Copy precedes Truncation, /u-is-ʔa/ will be converted to *usʔa*. In both derivations, both the rules involved apply. Thus, we have two different interactions, but no difference in the extent to which the rules are utilized. Insofar as a distinction between a marked and unmarked mode of interaction is in fact relevant to pairs of rules of this sort, then the Maximal Utilization principle is not fully general as a theory of natural rule interaction. For some discussion of this point, see Kisseberth (1973a).

Not only is the Maximal Utilization principle not fully general in that it makes no claims about the relative naturalness of a significant number of rule interactions where it in fact seems that the concept marked/unmarked is pertinent, but it also seems to me to be at odds with the data. Certainly one of the best available bases for deciding whether a given mode of interaction of rules is marked or unmarked is in terms of the frequency of occurrence of the mode of interaction in question relative to the opposite mode. There are, however, many instances of pairs of rules which are rarely, if ever, applied in accordance with the principle of Maximal Utilization.

Consider, for example, a rule that assimilates the voicing of an obstruent to the voicing of an immediately following obstruent. If a language that has a Voicing Assimilation rule of this kind also has a rule that inserts a full vowel (not merely a transitional vocalic sound of indistinct quality) in certain consonantal environments, then the Maximal Utilization of rules principle claims that the unmarked interaction of the two rules would be the one where Voicing Assimilation applies between two obstruents, even if it is the case that an epenthetic vowel separates them in the surface form. That is, an underlying sequence /k-b/ would undergo the derivation:  $k-b > g-b$  (by Voicing Assimilation)  $> g-Vb$  (by Vowel Epenthesis). The claim that this interaction of the rules is unmarked is, I believe, incorrect. I know of no examples of such an interaction of voicing assimilation and vowel epenthesis processes, but I have encountered the reverse interaction (whereby  $k-b > k-Vb$  by Epenthesis, with Voicing Assimilation not applied) in every language known to me having both rule types. This may be an accident of the restricted number of languages known to me, but I seriously doubt it. (For discussion of the possible source of the infrequency of the mode of application of Voicing Assimilation and Vowel Epenthesis whereby  $g-Vb$  would be produced from more basic  $k-b$ , see below.)

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While other linguists have continued to work under the view that the normal state of affairs is for rules to be maximally utilized, Kiparsky (1971a) has suggested a different approach to the problem of naturalness as that concept relates to the interaction of phonological rules.

According to Kiparsky, one might look at the problem of rule interaction in terms of the relative ease with which a rule can be abstracted from the surface forms of a language by the language learner. For instance, a rule of the form  $x \rightarrow y / \_ z$  might be viewed as being more easily discovered if there are no occurrences of  $xz$  in surface forms than if  $xz$  does regularly occur. Furthermore, such a rule might be considered more easily discovered if all instances of  $y$  that must be derived from  $x$  do in fact occur before  $z$  in phonetic forms. Roughly speaking, a rule is more easily acquired if there are not regular surface counterexamples to the rule. Kiparsky refers to the existence of surface counterexamples as OPACITY OF TYPE (I), and if the conditioning factors that invoke the rule's application remain observable in the surface form. Kiparsky refers to cases where the conditions are not present as OPACITY OF TYPE (II). Kiparsky (1971a) suggests that the unmarked interaction of rules is the interaction which leads to maximally TRANSPARENT rules, i.e., rules without surface counterexamples and rules whose conditioning factors can be observed in the actual surface form where the rule operates. Marked interactions lead to OPAQUE rules, i.e., rules which do not hold for phonetic forms in the language and rules whose conditioning factors are present only in more abstract representations and not in the surface form itself.

Under this view, feeding interactions of rules — which were unmarked under the Maximal Utilization principle — continue to be unmarked, since if the output of a rule  $R_i$  is available as input to a rule  $R_j$ , then  $R_j$  is being prevented from creating counterexamples to the rule  $R_i$ . But bleeding interactions — which were marked under the Maximal Utilization principle — now become unmarked. To see this, recall the rules of Voicing Assimilation and Vowel Epenthesis. The derivation  $k-b > g-b$  (by Voicing Assimilation)  $> g-Vb$  (by Vowel Epenthesis) represents a counterbleeding interaction of the rules, since Vowel Epenthesis potentially prevents application of Voicing Assimilation, but does not in fact prevent the latter's application in this derivation. Notice, however, that given surface forms like  $g-Vb$ , from underlying  $k-b$ , the rule of Voicing Assimilation is opaque, since  $k$  is voiced to  $g$ , but is not in the right environment for such voicing ON THE SURFACE. A derivation where  $k-b$  goes to  $k-Vb$  with Voicing Assimilation not applying does not render either Voicing Assimilation or Vowel Epenthesis opaque. In this case,  $k-Vb$  would not be a counterexample to either rule, nor has any rule applied in the derivation of  $k-Vb$  where the environment that conditioned it is not present in the surface form.

I have attempted to show elsewhere (Kisseberth, 1973a) that the principle of Maximization of Transparency covers a substantially broader range of types

of rule interaction than does the principle of the Maximal Utilization of rules. The former principle represents a decided improvement over the latter. In this paper, I will discuss what I feel are inadequacies in the principle of the Maximization of Rule Transparency. It should be emphasized, perhaps, that I am referring here to this principle as it is presented in Kiparsky (1971a) for I have some reason to believe that the presentation there may not fully reveal Kiparsky's actual position.

The basic weakness that I find in the principle of the Maximization of Rule Transparency is that it fails to grant recognition to the basic POLARITY in language (see W. Leopold, 1930), the pervasive tension in language created by conflicting pressures exerted upon it. The basic requirement of language is that it keep semantically contrasting forms separated by phonetic means. It does this by assigning distinct semantic concepts distinct, and largely constant, phonetic form. By saying that it assigns a given concept a generally constant phonetic form, I mean simply that natural languages are based upon the principle that if, on any given day in any given sentence, a particular phonetic form is associated with a particular meaning, then on any other day, in any other sentence, that same phonetic form will be associated with the same meaning. There are, of course, complications, especially in the form of the existence of phonetic variation in the shape of a morpheme. The phonetic shape associated with a concept is not absolutely constant, but rather varies to a certain extent, according to the 'context' (taking that word in its broadest sense). This variation, in a sense, betrays the basic principle that the need to communicate requires a constant relationship between form and meaning. The variation in the shape of a single morpheme betrays what we may refer to as the semantic pole of language in another sense too, for in many cases, not only is the relationship of form and meaning not constant, but there is also a MERGING of contrasts, in that distinct concepts are phonetically distinct in some contexts but in other contexts are not. Thus, whereas the semantic pole of language requires that distinct concepts be separated by distinct forms, morphophonemic variation may betray this requirement by neutralizing the phonetic contrast.

The existence of morphophonemic variation, which undermines the semantic pole of language, is the consequence of the opposite force in language, the phonetic pole. Semantic contrasts are expressed by phonetic means, but sounds and their chaining together to form words and sentences are subject to forces that are basically independent of meaning. SOUNDS are the means by which semantic contrasts are conveyed, but sounds are subject to inherent forces that affect them in ways that are often detrimental to the ends for which they are used. Contiguous sounds are, of course, subject to ASSIMILATION; and assimilation neutralizes phonetic contrasts which serve to keep distinct concepts separated. But there are other forces besides assimilation which reduce phonetic contrasts — vowel reduction processes, truncation processes, etc. If we follow David Stampe (1969, 1972), and view the speech performance

of children as being, available of the inherent sounds in language (the principle of 'economy' being the opposite of children, fairly uncontrolled that the end result of phonetic contrasts, and

At the beginning of phonetic forces of language the force of the semantic Jakobson, 1968). This begins with the acquisition of the need to distinguish the acquisition of phonetic of the inherent phonetic contrast. Contrasts are restricting, or reordering

To summarize, an competing forces of natural state of affairs meaning-form relationship phonetic contrasts. The inherent phonetic point in history is the course of the history that the structure of this overriding tension language structure, and tension.

At this point, let opacity. Consider words (i) based on the speech Velten, 1943). Joan governed by the following play in the speech of the set of inherent phonetic

(1) Initial Voicing

(2) Final Devoicing

That is, obstruents are

of children as being, along with linguistic change, the most direct source available of the inherent phonetic processes governing the utilization of sounds in language (cf., in this respect, Leopold [1947], who views the principle of 'economy' – the polar force in language that he sees as being the opposite of 'distinctiveness' – as being dominant in the speech of children, fairly unconstrained by the distinctiveness pole), then we might say that the end result of unbridled phonetic processes is total merging of phonetic contrasts, and thus of semantic contrasts as well.

At the beginning of the language acquisition process, when the inherent phonetic forces of language are at the point of absolute dominance, unopposed by the force of the semantic pole, we may find a period of complete silence (see Jakobson, 1968). The child may say nothing at all. The acquisition of language begins with the acquisition of phonological contrasts. It is the semantic pole – the need to distinguish linguistic forms by phonetic means – that leads to the acquisition of phonetic contrasts. But each contrast is learned at the expense of the inherent phonetic processes tending towards the neutralization of that contrast. Contrasts are acquired, in Stampe's view, by means of suppressing, restricting, or reordering the inherent phonetic processes.

To summarize, any linguistic system is in a state of tension arising from the competing forces of the semantic and the phonetic poles of language. The natural state of affairs, semantically speaking, is for there to be a constant meaning-form relationship and for semantic contrasts to be conveyed by phonetic contrasts. The natural state of affairs, phonetically speaking, is for the inherent phonetic processes to regulate speech. Any language system at any point in history is the result of the constant interplay of these forces over the course of the history of the development of that system. It is my contention that the structure of a language system must be understood in the light of this overriding tension in language. Insofar as rule interaction is a part of language structure, rule interaction too must be understood in terms of this tension.

At this point, let me return to the notion of rule transparency and rule opacity. Consider what would be viewed as an instance of rule opacity of type (i) based on the speech of H. Velten's daughter, Joan, at 22 months of age (see Velten, 1943). Joan's realization of obstruents in the adult speech model is governed by the following two phonetic processes (processes which have wide play in the speech of children and might therefore be regarded as belonging to the set of inherent phonetic processes of language):

(1) Initial Voicing [-sonorant] → [+voiced] / # —

(2) Final Devoicing [-sonorant] → [-voiced] / — #

That is, obstruents in Joan's speech are voiced initially, devoiced finally. Some

examples of Joan's speech illustrating the effects of (1) and (2) are given in (3):

(3) <i>bu</i> (=bear)	<i>du</i> (=toe)	<i>bup</i> (=book)
<i>but</i> (=bread)	<i>ba</i> (=pie)	<i>da</i> (=star)
<i>bat</i> (=bad)	<i>zup</i> (=soup)	<i>uts</i> (=oats)

Despite the existence of Final Devoicing in Joan's speech, it is not true that her pronunciation does not contain final voiced oral stops. It does. At this same stage in Joan's speech development, she has a rule of Denasalization whereby a final nasal stop is replaced by the corresponding voiced oral stop when an oral sound precedes. (For a discussion of the precise character of this rule and its interrelations with other rules in Joan's speech, see Stampe, 1972.) The effects of the rule of Denasalization are illustrated in (4):

(4) <i>bub</i> (=broom)	<i>bud</i> (=spoon)	<i>dab</i> (=jam)
<i>dud</i> (=train)	<i>fub</i> (=swim)	<i>wub</i> (=room)
<i>wud</i> (=rain)	<i>nabud</i> (=napkin)	
cf.,		
<i>man</i> (=man)	<i>mun</i> (=moon)	

The existence of surface forms like *bud* renders the rule of Final Devoicing opaque, in the sense that there are surface counterexamples to the rule. The interaction of Denasalization and Final Devoicing is a counterfeeding one, and it is thus marked one – both according to the Maximal Utilization of rules principle and also according to the Maximization of Rule Transparency principle.

But if we look at an example of this sort from the point of view of the polarity of language, then we see that while indeed a form such as *bud* (=spoon) is marked from the point of view of the phonetic pole of language (it is a violation of the phonetic process which devoices final obstruents; thus, the inherent phonetic process of Final Devoicing must be suspended just in forms like this). Nevertheless, from the point of view of the semantic pole of language, the form *bud* could well be said to represent an unmarked interaction of the rules. This is because, by not permitting the final voiced obstruents derived by means of Denasalization to undergo Final Devoicing, the underlying nasal-oral contrast in final position is maintained. The underlying nasal-oral contrast is realized on the surface as a voiced-voiceless contrast, but the crucial point here is that semantically distinct forms are prevented from merging.

The interaction of Denasalization and Final Devoicing observed in Joan's speech can be viewed as a semantically unmarked state of affairs at the cost of a phonetically marked state of affairs. But this is just another example of the conflict that necessarily exists between the semantic and the phonetic poles of

language. Now, does the markedness of Final Devoicing and Final Denasalization, without markedness of the other? That is, does it unmarkedness from some other pole of language? We could do so only if that is, by saying that generally dominate out to be true that, to prevail over some significant point is the rules which are opaque for this phonetic operation.

At this point, it is primarily the only force of phonetic processes that is developed in the rules is opaque. On Campbell (1973) note

(5)  $k \rightarrow k^w$

(6)  $k^w \rightarrow k$

Given an underlying structure *ok#* represented by (5), the semantic pole of language in (5) and (6) cannot contradict one another if the rule is different from the rule.

So far we have been leading to opacity in the following example (1940). In this language, the preceding contact or else separation



verbs *ʔuhki* 'he is' and *ʔaki* 'she is' are suffixed to verbal roots to indicate tense and person: *yá-ʔuhki* 'he did' and *yá-ʔaki* 'she did'. When the root ends in a vowel other than *a*, it causes the vowel of *ʔaki* to assimilate; e.g., *čú-ʔuhki* 'he took', but *čú-ʔaki* 'she took' (cf., *čú-hk-ʔaki* 'she is taking', where the progressive morpheme *-hk-* prevents the assimilation of the vowel of *ʔaki*).

In addition to the rule of Vowel Assimilation, Tunica also has a rule (of Syncope) that drops an unstressed vowel if it is immediately followed by a morpheme beginning with a glottal stop: *hára* 'to sing', but *há-ʔuhki* 'he sang' and *há-ʔaki* 'she sang'. That Syncope interacts crucially with Vowel Assimilation is revealed by the examples in (7):

- |                           |   |                              |
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| (7) <i>náši</i> 'to lead' | <i>náš-ʔuhki</i> 'he led'                 | <i>náš-ʔeki</i> 'she led'    |
|                           | cf., <i>náši-hk-ʔaki</i> 'she is leading' |                              |
| <i>hipu</i> 'to dance'    | <i>hip-ʔuhki</i> 'he danced'              | <i>hip-ʔaki</i> 'she danced' |
|                           | cf., <i>hipu-hk-ʔaki</i> 'she is dancing' |                              |

The correct derivation of *náš-ʔeki* and *hip-ʔaki* depends upon the underlying *a* of *ʔaki* assimilating the quality of the underlying final vowel of the preceding verb stem, even though that vowel is itself deleted and thus does not appear in the surface form. The interaction of Syncope and Vowel Assimilation is one that renders the latter process opaque (the vowel *a* is assimilated even though it is not, on the surface, in the appropriate environment), but the result is semantically natural in the sense that this interaction preserves (in part) the underlying contrast in the final vowel of CVCV stems in position before a glottal stop. Although the final vowel of such stems is not phonetically present, and thus the contrast not maintained in any direct fashion, the basic character of the vowel is indicated by its effect on a following underlying *a* vowel. A contrast at one point in the underlying structure — /hára-ʔaki/ vs. /náši-ʔaki/ — is displaced to another point in the surface structure — *há-ʔaki* vs. *náš-ʔeki*. This phonetic contrast, which helps preserve the underlying contrast, is achieved only as a result of the way that Syncope and Vowel Assimilation interact with one another. Once again, then, semantic transparency is purchased at the cost of phonological opacity.

I showed earlier that opacity of type (i) sometimes results not from the pressure of the semantic pole, but rather from the existence of partially contradictory phonetic processes. Opacity of type (ii) often can be attributed as much to the character of the phonetic processes themselves as to the requirements of the semantic pole of language. Consider, for example, the Bantu language, Lomóngó (see Hulstaert, 1965). The following rules are operative in this language:

- (8) Glide Formation:  $\begin{bmatrix} -low \\ +syll \end{bmatrix} \rightarrow [-syll] / \text{---} V$

(9) Affrication:

(10) y-Drop

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- (12) ...*lia*...  
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(9) Affrication:  $\left\{ \begin{array}{c} t \\ d, l \end{array} \right\} \rightarrow \left\{ \begin{array}{c} c \\ j \end{array} \right\} / \text{---} \left[ \begin{array}{l} \text{-conson} \\ \text{-syll} \end{array} \right]$

(10) y-Drop  $y \rightarrow \emptyset / \left\{ \begin{array}{c} c \\ j \end{array} \right\} \text{---}$

The way these rules interact in Lomóngo is illustrated in (11):

(11) ... <i>loa</i> ...	... <i>lia</i> ...	
<i>lwa</i>	<i>lya</i>	Glide Formation
<i>jwa</i>	<i>jya</i>	Affrication
—	<i>ja</i>	y-Drop

Observe that in the case of ...*ja*..., the rule of Affrication is opaque, since the *y* that conditions the change of *l* to *j* is not present in the surface form. Thus we have an instance of opacity of type (ii) here. But if the rules had been applied in such a way as to avoid this opacity, the derivation in (12) would obtain:

(12) ... <i>lia</i> ...	
<i>lya</i>	Glide Formation
—	y-Drop
<i>jya</i>	Affrication

In the case of ...*jya*..., the rule of y-Drop is opaque, since ...*jya*... meets the structural description of the rule and it has not been applied. Thus, we have an instance of opacity of type (i) here. What we have seen, then, is that given the rules of Affrication and y-Drop, one of the rules must be opaque. In such situations, it seems to be the case that opacity of type (i) tends to be avoided, even though the result is opacity of type (ii) for some other rule.

I have attempted to show that in certain cases, phonological opacity may be offset by semantic transparency. Other instances of phonological opacity may be attributed to the nature of the phonetic processes themselves. In all of the cases discussed, phonological opacity was MOTIVATED, either by the semantic pole or by the nature of phonetic processes. On the basis of these observations we might put forward the following hypothesis: phonological rules will not (normally) interact in such a way as to create phonological opacity unless motivated to do so. That is, phonological opacity is either due to the semantic value attached to interactions that result in phonological opacity, or to the exigencies of the phonetic processes themselves (i.e., the processes partially contradict one other, or one process can be transparent only at the cost of rendering the other opaque). A somewhat extended form of this hypothesis

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*hár-ʔuhki* 'he sang'  
h Vowel Assimi-

*ki* 'she led'  
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*ki* 'she danced'  
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would be that an interaction that results in phonological opacity is relatively more likely to occur the more motivated it is and the less strong the opacity involved (I am assuming that in fact there are degrees of phonological opacity).

Let me illustrate these points by discussing a few examples where phonologically opaque rules are almost entirely unexpected; in each case, the extreme unexpectedness of the phonological opacity may be attributed to the lack of significant semantic value associated with the interaction of rules which results in the phonological opacity.

Consider the following example from Lamba (Doke, 1938). *t* and *d* in this language are alveolar in the environment before an *i* or *y*, but dental elsewhere. As Doke remarks, "The homorganic *n* naturally assimilates to the position of the plosive following it" (pp. 14 - 15). Assuming that the dental position represents the basic point of articulation, a rule is required that specifies *t* and *d* as alveolar *t* and *d* before *i* and *y*. The rule that assimilates a nasal to the point of articulation of a following consonant must then be assumed to apply to the output of the Alveolarization rule. This is shown schematically, where N stands for an unspecified nasal consonant, in (13):

- |      |            |                     |
|------|------------|---------------------|
| (13) | <i>Nti</i> |                     |
|      | <i>Nɰi</i> | Alveolarization     |
|      | <i>nɰi</i> | Nasal Assimilation. |

This interaction of the rules is, of course, one that leads to phonologically transparent rules. An alternative derivation is (14):

- |      |            |                    |
|------|------------|--------------------|
| (14) | <i>Nti</i> |                    |
|      | <i>nti</i> | Nasal Assimilation |
|      | <i>nɰi</i> | Alveolarization    |

This interaction renders the Nasal Assimilation rule opaque — the rule requires a nasal to be homorganic to the following consonant, but *nɰi* violates this principle. We next need to consider whether such an interaction contributes to semantic naturalness in any way. The sequence *nɰi* in (14) reflects the underlying character of the *t* — i.e., the dental nature of *n* is an indirect reflection of the dental nature of the *t* underlying *ɰ*. But although the *n* reflects this fact about the underlying nature of the surface *ɰ*, there is little value attached to the preservation of this information: underlying *t* does not contrast with an underlying *ɰ*, so *nɰi* < *nti* does not contrast with *nɰi* < *nɰi*; thus there is no displaced contrast involved. Nor is there any other semantic value (regularization of paradigms, for example) to be attached to the hypothetical *nɰi*. Consequently, *nɰi* represents a case of phonological opacity uncompensated for by any semantic value.

Another example of unexpected phonologically opaque rules are the fol-

lowing rules in Kaing

- (15) [+cont] →

- (16)  $\left[ \begin{array}{l} -\text{syll} \\ +\text{nasal} \end{array} \right]$

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The first rule nasalizes vowel; the second consonant and a following vowel. The basic structure of the vails in the language:

- (17) *mrV*  
*mɰV*

An alternative derivation:

- (18) *mrV*  
*mbrV*  
*mbrV*

\**mbrV* would render the surface *r* before an oral sound. We have a situation where we have a situation of semantic naturalness: the surface *r*; but since there is no contrast between *r* and *ɰ*, that a case of displacement conveyed by normality involved.

My third example is Vowel Epenthesis in Kaing. It is a rule that is strident to the voiceless consonants. Examples are *taval* 'he will break' and *yi-ɰbor* 'he will break'. The examples of Vowel Epenthesis with *-i* (which are a number) to stems e-

following rules in Kaingáng (Wiesemann, 1972):

(15) [+cont] → [+nasal] / — V̄

(16)  $\begin{bmatrix} \text{-syll} \\ \text{+nasal} \end{bmatrix}$  [-nasal]

1                    2                    →                    1                     $\begin{bmatrix} 1 \\ \text{-nasal} \end{bmatrix}$                     2

The first rule nasalizes a continuant sound that is in position before a nasalized vowel; the second rule inserts a homorganic oral stop between a nasal consonant and a following oral sound (vowel or consonant). Now consider a basic structure of the form  $mr\bar{V}$ . The following derivation is the one that prevails in the language:

(17)  $mr\bar{V}$   
 $m\bar{r}\bar{V}$                     Nasalization  
 —                    Oral Offset rule

An alternative derivation would be:

(18)  $mr\bar{V}$   
 $m\bar{b}r\bar{V}$                     Oral Offset rule  
 $m\bar{b}\bar{r}\bar{V}$                     Nasalization

$*m\bar{b}\bar{r}\bar{V}$  would render the Oral Offset rule opaque in that  $b$  should appear only before an oral sound; and here it occurs before a nasal sound. But once again we have a situation where phonological opacity buys nothing in the way of semantic naturalness.  $*m\bar{b}\bar{r}\bar{V}$  would reflect the underlying oral character of the surface  $\bar{r}$ ; but since underlying  $r$  does not contrast with an underlying  $\bar{r}$ , there is no contrast between  $m\bar{b}\bar{r}\bar{V}$  from  $/mr\bar{V}/$  and  $m\bar{r}\bar{V}$  from  $/mr\bar{V}/$  such that a case of displaced contrast is present. There is no real semantic information conveyed by  $m\bar{b}\bar{r}\bar{V}$ , and thus no motivation for the phonological abnormality involved.

My third example is provided by the rules of Voicing Assimilation and Vowel Epenthesis in Modern Hebrew. The assimilation of the voicing of an obstruent to the voicing of a following obstruent in Hebrew is illustrated by such examples as *taval* 'he immersed', *ti-dbol* 'you will immerse', *šavar* 'he broke', *yi-šbor* 'he will break', *bicea* 'he operated', *mi-fea* 'an operation', etc. The rule of Vowel Epenthesis involves the juxtaposition of several suffixes beginning with  $-t$  (which are appended to imperfective verb stems to indicate person and number) to stems ending in  $t$  and  $d$ . Such stems may optionally be separated

from the *-t* initial suffixes by an epenthetic *e* vowel (phonetically a schwa). For example, the representation /kišat-ti/ 'I decorated' may be pronounced *kišateti*; and the representation /yarad-ti/ 'I descended' may be pronounced *yaradeti*. If, however, the optional Epenthesis of *e* does not occur, the resulting forms are *kišatti* and *yaratti*. In the latter example, the stem-final *d* has undergone Voicing Assimilation before the initial *t* of the suffix.

Clearly, the optional rule of *e*-Epenthesis must be applied before Voicing Assimilation, for otherwise /yarad-ti/ would become \**yarateti*. I contend that an output such as \**yarateti* would be highly marked. Such an output results in a phonologically opaque Voicing Assimilation rule (since Voicing Assimilation ordinarily affects an obstruent when followed by an obstruent, but in \**yarateti* the *t* that must be assumed to have undergone Voicing Assimilation is not in pre-obstruent position). But that is only part of the story. In this case, the phonological opacity involved is not offset by any substantial semantic gain. Notice that instead of preserving semantic contrast, this interaction merges such a contrast – because \**yarateti* looks just like a stem ending in a voiceless obstruent (cf., *kišateti*). This contrast between stem-final *t* and *d* would be merged if Voicing Assimilation were to precede *e*-Epenthesis, but is preserved by the ordering of *e*-Epenthesis before Voicing Assimilation.

Certain varieties of Istanbul Turkish provide another relevant example. In Turkish, as is well known, words are subject to a rule of Backness Harmony, whereby all vowels in a word will agree in backness; i.e., either all vowels will be front, or all vowels will be back. In particular, the vowels of suffixes will assume the backness of the vowels of the preceding root. In addition to Backness Harmony, Turkish also shows the effects of Labial Harmony, whereby a high vowel is round if preceded by a round vowel. In general, noninitial vowels are round just in case they meet the conditions for Labial Harmony; in other words, rounding is generally not an independently selectable feature in noninitial vowels.

In some Istanbul idiolects (see Kumbaracı, 1966) a vowel is raised and unrounded before the alveopalatal consonants *y*, *ş* (=ş in Turkish orthography), and *ç* (=ç in Turkish orthography), subject to certain limitations that are of no relevance here. Call this rule Palatal Umlaut. This rule accounts for the fact that the roots /*ye*/ 'eat', /*sakla*/ 'hide', /*üşü*/ 'be cold' and /*oku*/ 'read' – cf., the infinitives *ye-mak*, *üşü-mek*, and *oku-mak* – are raised and unrounded in, for example, imperative forms: *iyin*, *sakliyin*, *üşiyin*, and *okiyin*.

Let us consider in detail a form like *okiyin*. Assuming the correctness of Kiparsky's analysis (1968a) of Vowel Harmony, which would require that the root meaning 'read' be represented as /'oku/, the derivation of *okiyin* must proceed as follows. The underlying representation will be /oku-yIn/ (ignoring the question of the proper representation of the vowel of the suffix). Notice that in order to achieve the correct phonetic output, the rule of Palatal Umlaut must prevail over the rule of Labial Harmony, since the final vowel of the

stem is not round. The rule of Labial Harmony is a surface counterexample required by the existence that Labial Harmony of the suffix is not if it is preceded by a conditioned the appearance of the surface form 'an extremely marked the suffix is not observed. The appearance of semantic transparency meaning-for

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To sum up: Labial Harmony may be connected with a tribute to phonological semantic transparency rule interaction. In interaction of the rules in these cases these interactions

## DISCUSSION

KENNETH MINER:  
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stem is not round (in accordance with Palatal Umlaut) in the phonetic form. The rule of Labial Harmony is phonologically opaque, since *okiyin* represents a surface counterexample to the rule. Here then is an example of opacity required by the existence of partially contradictory phonetic processes. But notice that Labial Harmony is also, in part at least, transparent, since the vowel of the suffix is not rounded, which is just what would be expected given that it is preceded by a nonround vowel. If the underlying *u* of /oku/ had conditioned the appearance of a round vowel in the suffix, we would have had the surface form \**okiyun*. I contend that this form could be obtained only by an extremely marked interaction of the rules, since the appearance of an *u* in the suffix is not only phonologically opaque, but has no semantic value whatsoever. The appearance of an *u* in the suffix does not work in any way toward semantic transparency: it preserves no contrast, it does not create a more constant meaning-form relationship, etc.

The preceding examples have been cited as instances where semantic transparency is not in competition with phonological transparency, and in such cases the rules do seem to interact in such a way as to maximize the latter. Perhaps this is always the case, though I am rather (perhaps overly) cautious on this point. Languages seem to develop, for whatever reasons, fairly improbable looking rules; maybe improbable interactions exist, for whatever reasons.

To sum up: Language is in a state of tension. Phonological and semantic transparency may often be at odds. The way that rules interact may be seen as connected with these competing forces: while certain interactions may contribute to phonological transparency, often the reverse interaction will lead to semantic transparency. In such cases, one may expect to find either type of rule interaction. In other cases, no semantic value may be attached to the interaction of the rules that would create phonological opacity; and in such cases these interactions appear to rarely, if ever, occur.

## DISCUSSION

KENNETH MINER: (Indiana University): On your Hebrew example, I don't see how you can offer, as an explanation of why you get *yaradeti* instead of \**yarateti*, the fact that in the second, an underlying contrast would be wiped out, since this very same underlying contrast is optionally wiped out if you choose not to epenthesize, and get *yaratti*.

CHARLES KISSEBERTH (University of Illinois): Certainly, but that is to maintain phonetic transparency. That is, if you DIDN'T neutralize there, you'd be violating a phonetic principle of the language. Languages merge underlying

contrasts because of phonetic principles all over the place. What I'm saying here is that, if you first of all devoiced in *yarad + ti* and then got schwa inserted, you would not be merging an underlying contrast there in order to PRESERVE the phonetic principles of the language. All I'm suggesting is that maybe you don't merge an underlying contrast in order to serve no purpose at all.

KENNETH MINER: Another thing is that you said you couldn't think of any reason why language should work so as to apply rules maximally, as Kiparsky (1968b) proposed. ...I think the reason was that in that case, languages could be seen as evolving toward states where the language learner had less ordering restrictions to learn.

CHARLES KISSEBERTH: Yes, but if rules applied maximally, you would learn very unnatural relationships between surface and underlying forms.

KENNETH MINER: Yes, this may be true. But how do you weigh one type of learning difficulty over the other?

CHARLES KISSEBERTH: All I'm saying is that there's a sort of inherent conflict in language between what happens when you chain sounds together on the one hand, and the need to use those sounds to keep things in contrast, on the other. It has nothing to do with whether it would be easier to apply the rules maximally or not.

## VACUOUS APPLI REAPPLICATION UNORDERED RU

CATHERINE O. RI

*University of Iowa*

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