

A GUIDE TO SANGUINE RELATIONSHIPS*

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One consequence of the theory of rule application advanced by Koutsoudas, Sanders and Noll (KSN) (1971) is that in general, bleeding relationships are precluded by the assumption that phonological rules apply whenever their structural descriptions are met. Since the manner of application predicted for rules in a potential bleeding relationship is simultaneous, such rules will effect counterbleeding relationships.

A bleeding relationship IS possible (in fact, logically necessary) within the KSN framework, however, whenever simultaneous application is impossible, i.e., whenever the structural changes of a pair of rules are contradictory. The correct application of rules related to each other in this way is determined by the (KSN) universal principle of PROPER INCLUSION PRECEDENCE, whereby the less general rule takes applicational precedence over the more general one just in case the structural description of one properly includes the other.

KSN leave open the question of whether this principle is restricted to only those rules whose structural changes are contradictory. That is, if simultaneity and the precedence assigned by their principle are both POSSIBLE applications for some pair of rules, which of the two is correct? This paper discusses that question and proposes certain revisions of the KSN theory of rule application.

1. A very interesting recent paper by Kenstowicz and Kisseberth (K&K) (1973a) suggests that in some cases, bleeding relationships are to be expected, namely, cases where one rule bleeds another by virtue of the proposed principle that rules which alter syllable structure take precedence over other kinds of rules.¹ Thus it is that in the Takelma language "...the aorist stem of verb bases ending in a consonant cluster is formed by placing a copy of the stem vowel within the stem final consonant cluster..." (p.7), i.e., a rule like:²

V - Copy (Aorist): V_1CC+
 ↑
 V_1

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another consonant

Neutralization:

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2. K&K assert that
Assimilation which
equivalent to the fi

Assimilation:

"In addition, Lithu
across a prefix bou

$$\begin{array}{l} \text{Epenthesis:} \\ \left[\begin{array}{l} \text{-sonorant} \\ \text{-continuant} \\ \alpha \text{ anterior} \\ \beta \text{ coronal} \end{array} \right] + \left[\begin{array}{l} \text{-sonorant} \\ \text{-continuant} \\ \alpha \text{ anterior} \\ \beta \text{ coronal} \end{array} \right] \\ \uparrow \\ i \end{array}$$

By assimilation, then, the prefix /ap/ shows a voiced stop in [ab]dirbti, but a voiceless one in [ap]arti; and by Epenthesis, *i* appears when this prefix is appended to *puti*: [ap]iputi. But if /ap/ is prefixed to *bègti*, yielding [ap]ibègti, it is obvious that Epenthesis has taken precedence over Assimilation, since /ap/ did not go to [ab]. That is, the rules could not have applied simultaneously; and Epenthesis bleeds Assimilation.

The difficulty here is that while the rules are not supposed to apply simultaneously, KSN predict that they in fact must, because neither properly includes the other. Notice, however, that the only point at which proper inclusion is not achieved is with regard to the specification [*a* voice] in the structural description of the Assimilation rule.³

But 'a' is a variable ranging over both the values '+' and '-'. The function of such variables, of course, is to show agreement or disagreement between segments. Yet in the structural description of Assimilation, there is only ONE variable; furthermore, the class of segments to which [-sonorant, *a* voice] refers is identical to that to which the simpler specification [-sonorant] refers. In addition, in the structural description of Epenthesis, no mention of [voice] is made at all, i.e., [voice] may be either '+' or '-', which is also the case when the structural description of any other rule refers to the feature [voice] by means of a single instance of a variable. Therefore, if [*a* voice] were not considered in the determination of proper inclusion, the expansion of Assimilation which overlaps with the structural description of Epenthesis would be properly included in the Epenthesis rule. Epenthesis would then take applicational precedence over Assimilation, as required. I therefore propose the following codicil to Proper Inclusion Precedence:

HAPAX LEGOMENON: The single occurrence of a variable on any feature in the structural description of a rule is not taken into account in the determination of proper inclusion.

3. There is another case for which HAPAX LEGOMENON may be appropriate: in English, sequences of strident coronal obstruents are broken up by a schwa-like vowel, and there is progressive assimilation in voice among obstruents:

Epenthesis:

Assimilation:

If [*a* voice] is disregarded, Epenthesis will take precedence over Assimilation: *dish/z/* will be [dɪʃz] rather than the voiceless *c*.

4. In their discussion of the Yawelmani language, Greenberg and Sag, note that the language has a rule which inserts a vowel before a consonant which is not a member of a certain class. This rule is described as 'might report', but

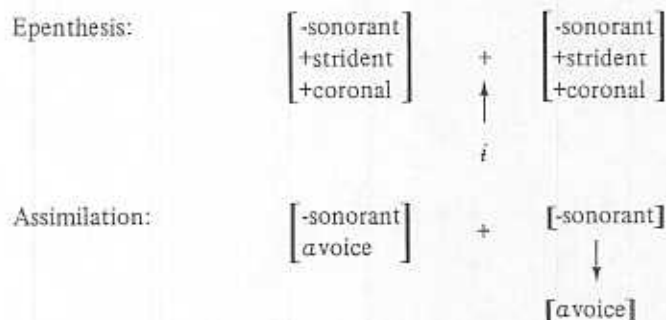
Shortening

"There is another case for which HAPAX LEGOMENON may be appropriate: in English, sequences of strident coronal obstruents are broken up by a schwa-like vowel, and there is progressive assimilation in voice among obstruents:

Epenthesis:

But in the underlying form, Epenthesis can be shown to be necessary: *ʔa: milhin*. In other words, the language has a rule which inserts a vowel before a consonant which is not a member of a certain class.

Simultaneous application of the two rules is a question here too, and no proper inclusion is achieved. Along with Perry (1968: 100), I therefore propose that the rule for Epenthesis should be stated so as to effectively



If [a voice] is disregarded in the determination of proper inclusion, then Epenthesis will take precedence over Assimilation in the formation of English plurals: *dish/z/* will come out with the proper voiced final obstruent rather than the voiceless one which simultaneous application would yield.⁴

4. In their discussion of quite a different sort of an example, K&K assert that the Yawelmani language "...has a rule shortening long vowels in a closed syllable, i.e., before a consonant cluster or before a single consonant at the end of a word. This rule accounts for alternations like the following: *do:s-ol*, 'might report', but *dos-hin*, 'reports'..." (p.4):



"There is another rule in Yawelmani which inserts *i* in the environment C—C {C, #}" (p.4):



But in the underlying form /ʔa:ml-hin/ 'helps', to which both Shortening and Epenthesis can potentially apply, only Epenthesis actually does apply, yielding ʔa:miłhin. In other words, Epenthesis bleeds Shortening.

Simultaneous application of the rules under consideration is out of the question here too, since it would produce the incorrect *amiłhin; and there is no proper inclusion of the structural description of one rule in the other. Along with Perry (1972a), therefore, we might complicate the Shortening rule so as to effectively preclude its overlapping with Epenthesis:

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in this prefix is ap-
yielding [ap]ibégti,
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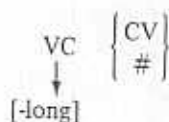
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may be appropriate:
oken up by a schwa-
ong obstruents:

Shortening
(Modified):



This modified version of Shortening is clearly a more complicated, less general rule than the original: a requirement that vowels be short in closed syllables should not have to make reference to vowels in other syllables. Yet, the rules cannot be permitted to apply simultaneously.

The K&K principle which assigns precedence to syllable structure changing rules does allow for the correct precedence of Epenthesis over Shortening. However, Kisseberth (1969a, 1970a) has argued for the incorporation of some quite important innovations into phonological theory, namely, simplifications in rule descriptions that are derivable from the notion CONSPIRACY. Briefly, he claims that there is a functional unity for several distinct rules in Yawelmani: they all conspire to do away with trilateral clusters (CCC or #CC or CC#). He proposes that this functional unity be made explicit in the phonology of Yawelmani by deleting from the structural descriptions of all rules that part which serves only to prevent the creation of a trilateral cluster. These rules are then characterized as relatively obligatory with respect to the trilateral cluster constraint, i.e., they fail to apply just in case they produce a trilateral cluster.

As an example for their proposal about syllable structure changing rules, K&K discuss the Yawelmani "...rule deleting the final vowel of a CV suffix like the imperative (which is underlyingly -k'a) provided the suffix is preceded by a vowel..." (p.4):



But, as Kisseberth (1969a) observes, the only reason the first V in V-Deletion must be specified is to prevent the emergence of a trilateral cluster. Given the overall constraint that rules cannot do this, a more general formulation is possible:



It is very important that V-Deletion not feed Epenthesis, and it will not, if the cluster constraint is observed. That is, a form like /xat+k'a/ may not go to *xatik (from *xatk), although /hoyo:+k'a/ may go to /hoyo:+k/, and then, by Shortening, to *hoyok*. Since either version of V-Deletion is a syllable structure changing rule, K&K predict that this rule will take precedence over Shortening

as is correct in the relationship between KSN's terms.

The participial does not create a literal cluster. If spiratorial targets removal of trilateral in Yawelmani ph- taneously with E- notion of syllable rule takes preced-

5. Up to this point construed as being contradictory structures covered by K&K ing rules versus are are not amenable which interacts in conspiratorial targets could be predictable rules take precedence conspiracy. Clear recognition of other

One might view product of a conspiracy demonstrates that followed by another case the aspirator cation of preword Deaspiration of C

Grassmann's Law (p.388)

Deaspiration of Consonant (p.388)

as is correct in the derivation of *hoyok*. But it should be noted that this relationship between V-Deletion and Shortening, i.e., feeding, is also predictable in KSN's terms.

The participation of a rule like V-Deletion in the trilateral cluster conspiracy is quite different from that of Epenthesis. The former applies just in case it does not create a trilateral cluster, whereas the latter actually DESTROYS trilateral clusters. If we claim that the motivation behind the destruction of conspiratorial targets is that the phonology be freed of their influence, e.g., the removal of trilateral clusters should not entail the operation of other processes in Yawelmani phonology, then the fact that Shortening does not apply simultaneously with Epenthesis would have an explanation quite apart from the notion of syllable structure changing rules: a target destroying conspiratory rule takes precedence over other rules.

5. Up to this point I have tried to show that if Proper Inclusion Precedence is construed as being valid for rule pairs other than just those which produce contradictory structural changes, then many of the bleeding relationships uncovered by K&K are predictable without reference to syllable structure changing rules versus any other kind. I also mentioned the fact that, although they are not amenable to Proper Inclusion Precedence, one of the Yawelmani rules which interacts in a bleeding relationship participates in the elimination of a conspiratorial target, and that the correct order of application of these rules could be predicted by a principle which held that target destroying conspiratory rules take precedence over rules whose existence is not derived from the conspiracy. Clearly, the usefulness of the latter notion is dependent upon the recognition of other kinds of conspiracies in other languages.

One might view the interaction of two deaspiration rules in Sanskrit as the product of a conspiracy to eliminate diaspirate roots. S. Anderson (1970) demonstrates that Grassmann's Law, which deaspirates a consonant if it is followed by another root internal aspirated consonant, fails to apply just in case the aspiration conditioning Grassmann's Law is removed by the application of preword boundary or pre-obstruent deaspiration, i.e., by the rule Deaspiration of Consonant.

Grassmann's Law: (p.388)	[+consonantal]	[+seg]	[+consonantal]
	↓		+aspiration
	↓		+Root
	↓		[-aspiration]
Deaspiration of Consonant (p.388)	[+consonantal]		[+obstruent]
	↓		#
	↓		[-aspiration]

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According to Grassmann's Law, then, the root /bhudh/ 'awakening' shows a deaspirated initial consonant in acc.sg. *budham*; but nom.sg. *bhut* (also with word-final devoicing) demonstrates that Deaspiration of Consonant has applied to the exclusion of Grassmann's Law, i.e., Deaspiration of Consonant bleeds Grassmann's Law.⁵ Since the structural description of neither rule is properly included in the other, and since simultaneous application of the two rules gives an incorrect output (**but*), perhaps it is the case that target destroying conspiracy precedence will account for the correct ordering.

The difficulty here is that both rules destroy diaspirate roots — neither simply avoids them. Whether it can be maintained that target destroying conspiratory rules take precedence over kinds of rules therefore remains a question to be answered by other investigations; but in light of what follows below this proposal appears to be quite superfluous.

Furthermore, it is not possible to predict the correct order of application of the above Sanskrit rules by resorting to the K&K notion that syllable structure changing rules apply before other rules, since neither affects syllable structure in the K&K sense. Nonetheless, the Yawelmani and Sanskrit examples are parallel in one respect: the application of one of the rules in each pair makes unnecessary the application of the other, while still assuring that the surface requirements of both are met. That is, the application of Epenthesis in Yawelmani eliminates both trilateral clusters and long vowels in closed syllables; and the application of Deaspiration of Consonant in Sanskrit eliminates both word final aspirates and diaspirate roots.

It is presumably on the evidence of the interaction of rules such as these from Sanskrit that Kisseberth (1973a) concludes that ALL such cases, i.e., bleeding relationships, are to be regarded as unmarked; and the acceptance of the unmarked status of all bleeding relationships obviates the need to refer either to syllable structure changing rules or to target destroying conspiracies. Thus, in Kisseberth's more recent view, the rules of both Yawelmani and Sanskrit apply precisely as they are expected to.⁶

From the claim that bleeding relationships are unmarked, it can be inferred not only that an obligatory phonological rule exists in order to ensure that no surface representation meets its structural description, but that, furthermore, THE GRAMMAR PERFORMS THIS FUNCTION IN THE MOST ECONOMICAL WAY POSSIBLE. That is, a rule fails to apply to some representation just in case the independently required application of some other rule ensures that its structural description is not met. Just as the complexity of rules and the abstractness of derivations are to be as minimal as generalization permits, so is the application of each rule. Stated explicitly, this principle, which I call MINIMAL APPLICATION is:

MINIMAL APPLICATION: For any representation R which meets the structural description of each of two rules A and B, where the application of A to

R results in a representation Rb: if satisfy the structural description of B over B.

Now, while Minimal Application of Deaspiration of Consonant bleeds Grassmann's Law in Sanskrit, Yawelmani (rendered in the natural language of the

6. An example of this is the interaction of Epenthesis and Devoicing in d (1968b, 199) and (1973a).

Spirantization:

Devoicing:

Minimal Application of Devoicing since the application of Devoicing is required, however, is not required.

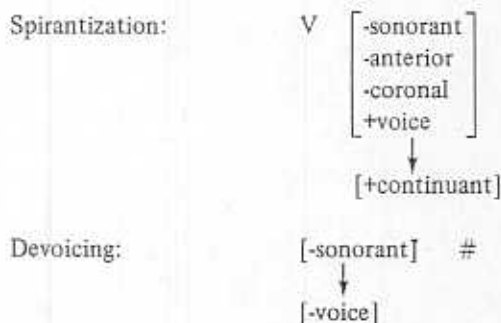
Notice that Proper Devoicing of the correct representation of the structure of the symbol.

On the other hand, if two rules overlap, the application of one segment to which the structure is specified in the representation is also true that the representation to which they apply has the precedence of the

R results in a representation Ra, and the application of B to R results in a representation Rb: if Rb satisfies the structural description of A, but Ra does not satisfy the structural description of B, then A takes applicational precedence over B.

Now, while Minimal Application correctly predicts the precedence of Deaspiration of Consonant over Grassmann's Law in Sanskrit (renders Grassmann's Law inapplicable), and of Epenthesis over Shortening in Yawelmani (renders Shortening unnecessary), this principle fails to allow for the existence of the numerous counterbleeding relationships which occur in natural language.

6. An example of a counterbleeding relationship is the case of Spirantization and Devoicing in dialects of German which was first mentioned by Kiparsky (1968b, 199) and discussed in both K&K and KSN.



Minimal Application would require /tag/, for example, to surface as *ta:k* 'day', since the application of Devoicing also eliminates the sequence *Vg*. What is required, however, is that both rules apply in order to generate *ta:x*.⁷

Notice that Proper Inclusion Precedence is incapable of allowing the generation of the correct form by predicting the precedence of Spirantization over Devoicing: proper inclusion between these rules is not achieved due to the absence of the symbol '#' in the structural description of Spirantization.

On the other hand, proper inclusion IS achieved at the point at which the two rules overlap. That is, in the representation /tag/, there is one and only one segment to which the structural descriptions of both rules refer, namely, /g/; and the structural description of Spirantization properly includes that specification in the structural description of Devoicing which refers to /g/. It is also true that the structural changes of both rules potentially affect the segment to which they jointly refer. We can employ these facts to account for the precedence of Spirantization over Devoicing in the following principle:

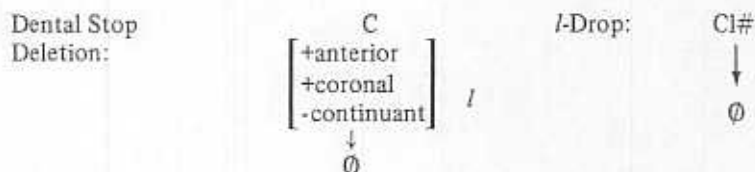
OVERLAP PRECEDENCE: In the structural description of a rule B, let B' indicate that part that is met by the representational string, S, to which the structural description of a rule A also refers. A takes applicational precedence over B if: (i) the structural changes of A and B potentially affect S, and (ii) the structural description of A properly includes B'.

In the German example above, that part of the structural description of Devoicing which is met by the representational string to which the structural description of Spirantization also refers is the specification [-sonorant]. Since the structural changes of both Devoicing and Spirantization potentially affect the common representation /g/, and since the structural description of Spirantization properly includes [-sonorant], Spirantization takes applicational precedence over Devoicing, yielding the correct *ta:x*.

Recall the Sanskrit rules of section 5. Even though the representation /dh/ in /bhudh/ is referred to in the structural description of Grassmann's Law, and the specification [+consonantal] in Deaspiration of Consonant is properly included in the structural description of Grassmann's Law, the structural changes of both rules do not affect the common representation /dh/. Similarly, in Yawelmani, where the CC specification of Shortening, as well as the CC specification of Epenthesis, refer to the representational string /ml/ in /ʔa:ml-hin/, and where the structural description of either rule properly includes this specification, it is not the case that the structural changes of both rules potentially affect /ml/. Overlap Precedence therefore is inapplicable in these cases.

7. As the German example demonstrates, it is possible that the conditions of both Minimal Application and Overlap Precedence can be satisfied by the same pair of rules. In such cases, Overlap Precedence is dominant. The Sanskrit and Yawelmani examples demonstrate that it is possible that only the conditions of Minimal Application might be satisfied by some pair of rules. It is also logically possible that the conditions of Overlap Precedence are satisfied by some pair of rules for which Minimal Application can make no prediction. Kenstowicz, Kim, and Kisseberth (KKK) (1972, 27-28) present an instance of this sort.

KKK show that in Russian verbs, a rule of Dental Stop Deletion must take precedence over a rule of /-Drop:⁸



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The derivation of /bred-l/ must proceed such that Dental Stop Deletion applies to the exclusion of *l*-Drop, so that the *l*-Drop rule is bled, yielding *bre*l. On the other hand, if *l*-Drop were to have taken precedence over Dental Stop Deletion, the latter will incorrectly have been bled, yielding **bre*d. Simultaneous application of these two rules also gives incorrect results: **bre*. Minimal Application is indeterminate here, for the application of either rule renders the application of the other unnecessary (impossible). Overlap Precedence, however, predicts the correct form. *Cl*, which is that part of the structural description of *l*-Drop that is met in the representation in question also falls within the domain (/dl/) of Dental Stop Deletion. Both rules thus potentially affect /dl/ in /bred-l/; but since the structural description of Dental Stop Deletion properly includes *Cl*, Dental Stop Deletion takes applicational precedence over *l*-Drop.

It is also true of these rules, with respect to /bred-l/, that only one of them can apply, i.e., they are disjunctively related. But this disjunction is only accidental, as the KKK derivation of /ros-l/ shows: /ros-l/ by the precedence of Dental Stop Deletion, then *ros* by *l*-Drop. A prediction by the principles of this paper, then, does not entail disjunction in the application of the rules involved.

8. Iverson (1973) discusses three additional cases where Overlap Precedence is required in order to predict the correct order of application of rules involved in historical change. Another example which demonstrates the hierarchical superiority of Overlap Precedence over Minimal Application is taken from Kisseberth's (1973a) elaboration of the interaction of the Yawelmani Shortening rule with a process which lowers long high vowels, evidently:

Lowering:
$$\left[\begin{array}{c} \text{V} \\ +\text{long} \end{array} \right] \rightarrow \{\text{high}\}$$

".../hiwi:t+hin/ 'walks' is realized as *hiwet-hin*, with both the lowering and shortening rule applying". Since it is with respect to the representation /i:/ that the two rules overlap, and since both affect /i:/, the fact that the structural description of Lowering properly includes the specification in Shortening which refers to /i:/ (i.e., *V*) requires that Lowering takes precedence over Shortening; and this enables both rules to apply. The incorrect prediction of Minimal Application, **hiwit-hin*, is thus avoided.

9. To summarize, the principles I have outlined here are arranged in a hierarchical order according to their applicability:

Cl#
↓
∅

- I. Overlap Precedence
- II. Minimal Application

The formulation of Overlap Precedence is such that it is intended to be a generalized version of Proper Inclusion Precedence, encompassing the predictions of both. For example, the Takelma example above allowed for the correct order of application of the relevant rules by virtue of Proper Inclusion Precedence.⁹ But since the entire structural description of Neutralization is also the point at which the rule overlaps with V-Copy (Aorist), Overlap Precedence gives the same prediction as Proper Inclusion Precedence.

It should be noticed that, as is the case in KSN, the notion of simultaneous application does not appear in the hierarchy of principles, nor does the notion which allows for sequential application so that feeding relationships might be achieved. These kinds of applications follow naturally in the absence of any contravening precedence.

10. Very little, really, is required to falsify either the proposed principles themselves, or the hierarchy I have imposed on them. One might therefore ask, for example, are there any cases in which Overlap Precedence is inapplicable but where Minimal Application is also wrong; i.e., are there cases where simultaneous application (or extrinsic ordering) is required?

KSN provide the following example from Uruguayan Spanish (p.7),

Lowering:	eC	s-Deletion:	s#
	↓		↓
	ε		∅

which is pertinent to this question. Simultaneous application of these rules converts underlying /klases/ 'classes' into *klase*, whereas Minimal Application predicts that only *s*-Deletion should apply, since this rule also eliminates the *eC* sequence. But **klase* is not right (although this IS the manifestation of singular 'class'.) The question here is, are the rules formulated properly? Norman (1973, fn.6) demonstrates the likelihood that the structural changes of these rules are morphologically rather than phonologically conditioned, similar to the status of singular/plural distinctions based on umlaut in Modern Standard German. If this is true, then there can be little motivation for positing an underlying *s* as an Uruguayan Spanish plural marker.

11. An apparent reversal in the hierarchical status of Overlap Precedence with respect to Minimal Application can be found in K&K's discussion of two rules taken from Pyle's (1970) description of West Greenlandic Eskimo. Pyle

(pp. 118-120) shows a categorical precedence word boundary:

Metathesis:

The derivation of plural marker, *mu* of Lowering, to yield of application cation would produce the correct output. Application will c

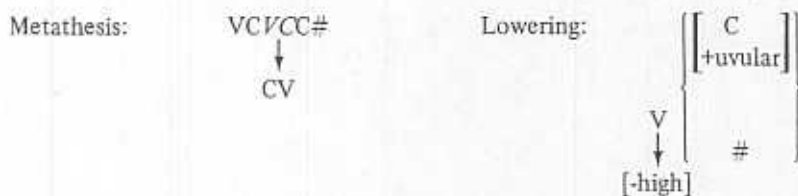
Lowering proper two rules overlap ant. According to Metathesis; and b the principles produce **ammēt*.

The curious fact is such that really were as generalizable West Greenlandic Schultz-Lorentzen plural of *aput* 'sn of *suluk* 'wing' or intervocalic *k*). A interchange of *Vc* subjected to an *i*-formulation of th

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Since the structure that of Lowering (Modified) over I This example the

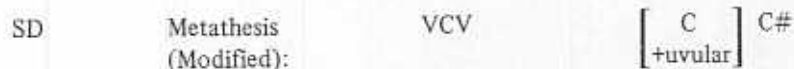
(pp. 118-120) shows that a Metathesis rule in this language must take applicational precedence over a rule which lowers high vowels before uvulars or a word boundary:



The derivation of a form such as /amiq-t/ 'skins', where the suffix *t* is the plural marker, must allow for the application of Metathesis, exclusive of that of Lowering, to yield *amqit*, later assimilated to *ammit*. Either the reverse order of application of these rules, Lowering–Metathesis, or simultaneous application would produce **amqet*, which would be assimilated to **ammet*. Since the correct output requires that only Metathesis apply, it appears that Minimal Application will once again give the proper prediction.

Lowering properly includes Metathesis, however, at the point at which the two rules overlap, i.e., vowel plus uvular consonant versus vowel plus consonant. According to Overlap Precedence, then, Lowering should apply prior to Metathesis; and because Overlap Precedence ranks above Minimal Application, the principles proposed in this paper permit only the generation of the incorrect **ammet*.

The curious fact is that every example Pyle presents which involves Metathesis is such that the affected consonant is always the uvular *q*. If Metathesis really were as general as Pyle leads one to believe, then one of the other two possible West Greenlandic morpheme-final consonants (*k* or *t*, according to Schultz-Lorentzen, 1945), ought to evidence application of the rule. The plural of *aput* 'snow' thus ought to be **aptut*, not *aputit*. Similarly, the plural of *suluk* 'wing' ought to be **sulkut*, not *sulukit* (later *suhit* by deletion of intervocalic *k*). As these examples illustrate, Metathesis is restricted to the interchange of *Vq* sequences. *VCVtC#* and *VCVkC#* sequences appear to be subjected to an *i*-epenthesis process, but never to Metathesis. The correct formulation of the structural description of Metathesis must therefore be:



Since the structural description of Metathesis (Modified) properly includes that of Lowering, which requires the applicational precedence of Metathesis (Modified) over Lowering, /amiq-t/ will be realized as *ammit*, not **ammet*. This example therefore confirms rather than falsifies the hierarchical relation

of Overlap Precedence with respect to Minimal Application.

12. Finally, a case in which Minimal Application actually does give a false prediction is presented in Kisseberth's (1973a) demonstration of the precedence of Epenthesis over Simplification in Washo:

Simplification:	$C_i C_i$	Epenthesis:	$CC \left\{ \begin{smallmatrix} \# \\ C \end{smallmatrix} \right\}$
	↓		↑
	C_i		i

Both Simplification and Epenthesis must be allowed to apply to a string such as /ʔl+išl+leg+i/ 'he gave me one', to yield *ʔlišilegi*, not, as Minimal Application would predict, **ʔlišlegi*. Since the identity specifications in the structural description of Simplification prevent its proper inclusion in the structural description of Epenthesis, no proposal advanced in this paper can predict the applicational precedence of Epenthesis over Simplification, or, with equivalent results, the simultaneous application of these two rules.

As Kisseberth notes, however, geminate clusters in Washo do not occur within morphemes; they arise only where morphemes come together. If forms indicating that Simplification fails to apply could be found in Washo, say perhaps in careful speech, it would be the case that this rule is optional. This seems to be the status of the same rule in English, where *bookkeeper* occurs both with and without a geminate consonant. In this event, the Obligatory Precedence principle proposed by Ringen (1972a) would account for the proper ordering of the rules.

Another possibility is that identity specifications not be considered in the determination of proper inclusion, in which case, of course, the structural description of Epenthesis would properly include that of Simplification. Overlap Precedence would then force the generation of the correct forms. The interaction of similar rules in other languages will have to determine whether identity is relevant to proper inclusion.

NOTES

- * This paper has Linda Norman, and Gerald Sanders, for 1. Kiparsky (1971a) which considerably basis of formal prop of whether structure other than the applic 2. Unless indicated (have followed the ge lines are used to ind tively concrete' repr transcriptions, wher enclose phonologica 3. The prefix bound vention that any rul 4. See Miner (1972) 5. As is probably w somewhat in those 1 cable. Iverson (1972 Grassmann's Law ar Law can also apply. the expense of inclu which is an automat Bartholomae's Law. 6. As Kisseberth (19 accounted for in ter or some other suita 7. See KSN for the German examples (f tain. Overlap Preced 8. The specification dental stops, since t Elimination of C frc be required by a fea more general than tl tal to the form of th for dental stops (in -vocalic) are distinc the determination o just in case they are the language's inven 9. Minimal Applicat the hierarchy. It ma principle distinct frc junctive application

NOTES

* This paper has benefited from the much appreciated comments of Kenneth Miner, Linda Norman, and Catherine Ringen. Particularly influential were the comments of Gerald Sanders, for whose phonology seminar the paper was originally written.

1. Kiparsky (1971a) deals with the K&K position from a different point of view, one which considerably transcends the determination of precedence relationships on the basis of formal properties of structural descriptions: he requires access to the information of whether structures equivalent to the output of a particular rule occur for reasons other than the application of that rule.

2. Unless indicated otherwise, the actual formulation of rules in this paper are mine. I have followed the generally accepted usage in the presentation of examples, i.e., parallel lines are used to indicate 'relatively abstract' representations, italics are used for 'relatively concrete' representations, and brackets are used to indicate 'narrow phonetic' transcriptions, where detail beyond that in italicized representations is required, and to enclose phonological features (e.g., [-voice]).

3. The prefix boundary '+' is taken to be subject to the Chomsky and Halle (1968) convention that any rule applicable to a string XY is also applicable to a string $X+Y$.

4. See Miner (1972b) for a persuasive alternative.

5. As is probably well known, the interaction of these Sanskrit rules is complicated somewhat in those representations to which another rule, Bartholomae's Law, is applicable. Iverson (1972) disputes S. Anderson's claim that the order of application of Grassmann's Law and Deaspiration of Consonant reverses itself just in case Bartholomae's Law can also apply. Invariance in the predicted application of these rules is achieved at the expense of including [+Root] in Bartholomae's Law, an additional consequence of which is an automatic explanation for the failure of the stem /dhadh/ to undergo Bartholomae's Law.

6. As Kisseberth (1973a) has it, though, counterbleeding relationships will have to be accounted for in terms of language-specific precedence statements (extrinsic ordering) or some other suitable *ad hoc* device.

7. See KSN for the dialect whose output actually is *ta:k*. KSN also discuss several other German examples (from Kiparsky, 1968b) where counterbleeding relationships must obtain. Overlap Precedence accounts for these as well.

8. The specification C in Dental Stop Deletion is not required to characterize the class of dental stops, since the feature [-continuant] necessarily refers only to consonants. Elimination of C from the structural description of Dental Stop Deletion would normally be required by a feature counting simplicity metric, implying that the resultant rule is more general than the one given here. This is a spurious generalization, however, accidental to the form of the rule: the features composing the specification C are not redundant for dental stops (in the sense [+voice] is for English vowels), since [+consonantal, -vocalic] are distinctive in the hierarchical feature representation of *t* and *d*. Insofar as the determination of proper inclusion is concerned, redundant features are disregarded just in case they are unspecified in the hierarchical distinctive feature representation of the language's inventory of segments.

9. Minimal Application would also give the correct output, but this principle is lowest in the hierarchy. It may be that Proper Inclusion Precedence should be singled out as a principle distinct from Overlap Precedence if the former but not the latter entails disjunctive application of rules.

DISCUSSION

ROBERT KING (University of Texas): I'd like to make a comment and then ask a question. The comment is this: this paper illustrates to me one of the things I find most distressing about the KSN approach, namely, that it started out with two relatively straightforward assumptions about the way rules apply—that is, they apply whenever their structural analysis is met, and Proper Inclusion Precedence is another principle. But you don't have to go very far before those principles break down; so now you've added in this paper alone a clause to the Proper Inclusion Precedence principle—Overlap Precedence and Minimal Application. I know from other papers that Obligatory Precedence has been added, and so on. I think I should also point out that even if those principles fail, you can always reanalyze the data. You can add a rule which in some cases has questionable motivation, as in the Alsatian and Low German example that Kiparsky (1968b) first talked about—you can propose a reanalysis which is not at all compatible with what we know about the history of those dialects. So as I said, it was very nice at the beginning to have a theory which so tightly constrains derivations, but with this proliferation of principles, I don't see how you could falsify anything. I mean there's bound to be at least one principle that's going to make it; and if it doesn't, you can always change the analysis. I would just like to point out that even if it may be that these objections are too strong, this kind of general patchwork attempt is reminiscent of the grim days of the late 1950's when people were trying to get principles which would enforce certain kinds of phonemic analysis. Eventually, I think what was recognized was that the theory itself was deficient. I would just like to pose the question to people who do believe in the theory: isn't it true that at some point, the number of principles adduced will simply outweigh the theory so badly that it will necessarily sink?

Another point I'd like to make concerns your Minimal Application principle. If I understood it correctly, the assumption is that languages like to have bleeding orders; and I don't think that's right. I mean, I think it's clear that the kind of cases that Kenstowicz and Kisseberth (1973a) talked about show that there are a lot of bleeding orders that are quite natural, but they do in general involve relations or interactions between syllable-type processes and assimilations, things like that. But if you take a look at historical changes, bleeding orders generally aren't maintained, especially when they're higher up in the phonology. The cases Paul Kiparsky gave in his 1968(b) paper that got it all started all involved cases where the bleeding order was not tolerated for very long and was gotten rid of. So I don't understand this claim that bleeding orders should be some kind of preferred sequencing of rules. That's a question; the other thing was a comment.

GREGORY IVERSON: Why is it that in natural languages? Well—that a lot of good paper (1973a). But interaction with another principle that way. I've tried to do that, but there is a well defined effect which effects count, but they're formally defined and have been applied in a block of Overlap Precedence. In fact possible in natural languages correct or not—who can obtain anywhere. I

In answer to one question, this as a proliferation of principles, placement for it. In fact, say, "simultaneous" words, if it's possible unless some precede the principle itself. Over Proper Inclusion Precedence compass both things to take care of, as well as of. Now it may be for example, of an analysis related to each other probably want to s

MICHAEL SCHUTT: In your example, where you have the dialect forms with rules which KSN universal sequencing of dialects co-exist. A two different ways of the analyses is wrong one dialect?

GREGORY IVERSON: Do we have different ordering of different principles?

GREGORY IVERSON (University of Minnesota): The question seems to me to be, why is it that I permit wholesale bleeding relationships to obtain in natural languages? Well, I do that because it seems to me that—as you pointed out—that a lot of good cases have been found in the Kenstowicz and Kisseberth paper (1973a). But I certainly don't subscribe to the view that any rule whose interaction with another could produce a bleeding relationship should apply that way. I've tried, with the principle of Overlap Precedence, to show that there is a well defined set of rules that can be predicted to apply in a manner which effects counterbleeding relationships; I just hope to be able to say that they're formally definable. The last three examples that I discussed could have applied in a bleeding relationship, but they didn't, and it's the principle of Overlap Precedence which assures that counterbleeding relationships are in fact possible in natural language. Now, it's an open question whether this is correct or not—whether the principle is correct or whether bleeding ought to obtain anywhere. But at least it's open to investigation; it is falsifiable. ...

In answer to one of the comments—if I might make one—I don't view all this as a proliferation of the KSN framework. In fact, I view it as a total replacement for it. Instead of "simultaneous application, where it's possible", I say, "simultaneous application only where it makes no difference". In other words, if it's possible to have rules apply minimally, I maintain that's correct, unless some precedence intervenes and won't let you do that. The precedence principle itself, Overlap Precedence, I view as not a replacement or a codicil to Proper Inclusion Precedence, but as a refinement of it. I intend for it to encompass both things—that is, the cases I've shown Overlap Precedence will take care of, as well as what Proper Inclusion Precedence itself will take care of. Now it may be that that's wrong. You might be able to make a good case, for example, of an honest-to-goodness disjunctive application between rules related to each other in a proper inclusion relation. In that event, then you'd probably want to separate these principles.

MICHAEL SCHUTT (Indiana University): You said in regard to the German example, where you have *tag* and *tax*, that you weren't going to account for the dialect forms which KSN accounted for; however, you take the same rules which KSN use to account for one dialect form, and by using your universal sequencing principles have accounted for the other dialect—but both dialects co-exist. Are you implying that the two different dialects are using two different ways of universal sequencing principles, or simply that one of the analyses is wrong and the rules are going to have to be reformulated in one dialect?

GREGORY IVERSON: The question was, how can you have two dialects that have different ordering of the same rules? In other words, do they have different principles? And the answer to that is obviously, no. The same prin-

ciples obtain in both dialects; but the rules are different. Now, in the Koutsoudas, Sanders and Noll paper (1971), as I recall, the rules that I have here of Spirantization and Devoicing were allowed to apply simultaneously, giving the same output they do if Spirantization takes precedence over Devoicing, thereby accounting for the dialect that has the voiceless fricative at the end. But you're worried about the dialect that has the voiceless stop. Well, in that dialect, the Spirantization rule has been claimed to be different. What's different about it is that it's not a post-vocalic spirantization process in that dialect; it's an INTERVOCALIC spirantization process.

CHARLES KISSEBERTH (University of Illinois): I'll try and be short. For one thing, I believe the move away from simultaneous application is a good one, for the following reason: I don't think anyone has evidence that there are sets of data that HAVE to be accounted for by simultaneous application. For example, suppose in the Russian case with the sequence *dl*, that both the *d* and the *l* DID drop. That COULDN'T be taken care of by sequencing. I think that approach claims such cases should exist, and I don't think any have been found.

My second comment has to do with the Yawelmani example that you gave—and I have to say right away that the analysis of Yawelmani is controversial about whether or not there's a Lowering rule. I believe there is. You show that the Shortening rule before a consonant cluster is going to follow the Lowering rule, and you try to predict this. However, there is one problem: there is another shortening rule that shortens vowels before glottal stops, and THAT shortening rule operates before the Lowering rule. One of the pieces of evidence for the underlying high vowel is that the underlying high vowel before suffixes with a glottal stop will shorten to a high vowel—it will not undergo Lowering.

And one last thing, this whole question about different dialects—you know whether they have the same rules? I realize you have the option of changing the rules, but let me give you a general comment, that there are lots of languages that have stress rules that place stress on a particular syllable, plus an Epenthesis rule; and one finds lots of difference about whether or not the epenthetic vowels are counted for stress or are not counted for stress. I don't think there's any universal principle there.

GREGORY IVERSON: That's right. I'll agree with you on that. Stress is very peculiar in lots of ways— makes it more interesting.

ANDREAS KOUTSOUDAS (Indiana University): I would like to address myself to Mr. King's comments. It seems to me that he has missed the point of the KSN paper because he missed the BEAUTY of the KSN hypothesis ... (laughter). First of all, the number of principles is small; second of all, the principles

are not *ad hoc*. But are theorems; they are theory saying that the Complex NP C principles are derived from Obligatory-Option; independent principles an obligatory and this is DERIVED. The rules must apply since principle of Obligatory principle which is DER not ever have a rule-principle precisely violated. The beauty principles is small—importantly, that the dependent principle can be easily falsified. Rule and there goes falsify.

GERALD SANDERS: ...It's obvious which has few principles in the universe is simple. thing. So that the body of facts is an the job and a theory choose the one which a theory which is determined, there or a hundred. Thus about various language rules independent principles that will and if we find the predictions, general to have another that that's more general going to be possible there's any disagreement.

are not *ad hoc*. But the beauty lies in that these principles are DERIVED. They are theorems; they are not axioms — like when you put an axiom in the metatheory saying that all rules must be extrinsically ordered, all rules must obey the Complex NP Constraint, or whatever have you. Notice that all these principles are derived from independently motivated principles. So, like the Obligatory-Optional principle that you mentioned, this is DERIVED from the independent principles that you must have if you're going to specify what is an obligatory and what is an optional rule. Notice the notion of simultaneity: this is DERIVED. I don't have a special principle in my metatheory saying rules must apply simultaneously, no; this is derived by the independent principle of Obligatory Rule. Notice the Proper Inclusion Principle: this is a principle which is DERIVED from the very definition of a rule, because you cannot ever have a rule in a grammar that doesn't apply — but the Proper Inclusion principle precisely gives you a precedence such that this principle can never be violated. The beauty of the KSN hypothesis is not only that the number of principles is small—not only the fact that they're not *ad hoc*—but most importantly, that they are not axioms; they are derived principles from other independent principles, either of theory construction or of grammar. So they can be easily falsified. All you have to do is falsify the notion of Obligatory Rule and there goes my Obligatory-Optional principle. They're very easy to falsify.

GERALD SANDERS (University of Minnesota): I'd like to make another comment. ...It's obviously desirable, other things being equal, to have a theory which has few principles. On the other hand, we can't assume *a priori* that the universe is simple. We can't assume that there's a single principle behind everything. So that the number of principles that are required to account for some body of facts is an empirical question; and if a theory with one principle does the job and a theory with ten principles does the job, naturally, we would choose the one with one principle. But there's no reason to assume that given a theory which claims that conditions on rule application are universally determined, there should be one principle, or two, or three, or four, or ten, or a hundred. Thus, presumably, what we want to do is investigate facts about various languages, attempting to formulate rules, attempting to motivate rules independently—to whatever extent we can—independently of questions concerning manner of application. We will attempt to formulate principles that will predict the appropriate application, and test them; and if we find that some given set of principles fails to make correct predictions, generates contradictory predictions, and so on — well, we'll have to have another theory. Now, we'd like to replace the old theory by a theory that's more general where possible; but there's no guarantee that this is in fact going to be possible. This is going to depend on the facts. And I don't think there's any disagreement concerning esthetics. I think we all prefer theories

that are simple and have a few general assumptions; but it seems we can't argue this independently of facts. And if people produce cases where, let's say, Proper Inclusion Precedence or Obligatory Precedence are incapable of accounting for some set of facts - well, we have to propose some other set of principles. Of course, it's true that at some point the number of principles, the number of footnotes, codicils and modifications, exception principles, sub-principles and so on becomes so great that we have a feeling that the theory now is a patchwork, that the theory now is in need of some gross overhaul or replacement. But I don't know of any *a priori* ways of deciding when we've reached this point. As Greg [Iverson] pointed out, and as Andreas [Koutsoudas] has pointed out, the particular proposals that Greg is making are not in any sense an addition; I mean there are still two principles. The KSN [hypothesis] had Obligatory Precedence and Proper Inclusion Precedence - two principles. Iverson has two principles: the Minimal Application and the Overlap Precedence, which is a more general principle than Proper Inclusion Precedence. So in this particular case, there isn't, as far as I can see, any proliferation of principles.

I wanted to make one substantive comment. There are a number of examples of application of subrules of a single rule where the Minimal Application principle doesn't seem to be applicable. One example is in the Jensen's paper (in this volume) - the Finnish Gradation and Degemination in closed syllables. That's a case where there's a single rule - degeminate a consonant in a closed syllable - where the correct outputs are derivable in all cases by simultaneous application, where you apply the rule at all points in the string where the structural description is met and you get the correct results. But as the Jensens point out, other kinds of applications will give wrong outputs, so that you don't want Minimal Application. This might suggest that there is some difference in the way subrules of a single rule are applied as opposed to single rules.

THE INTERACT AND THE POLA

CHARLES W. KISS

University of Illinois

Concepts such as naturally enough, a rules until the focus sound units in a large sound units to form units to their phon naturalness with re its infancy. Its begi Kiparsky in the mi of the natural inter Kiparsky, 1968b at

The first view de or NATURAL, inte ATION OF RULES. language which lea just in terms of a g also with respect t That is, if all repre meet the conditior then the rule will l the conditions of t input structures.

This identificati the relative extent more derivations i the more natural t several grounds. O without maximiza