Title
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Publication Date
1968

Peer reviewed

STUDIES PRESENTED TO PROFESSOR ROMAN JAKOBSON BY HIS STUDENTS

SLAVICA PUBLISHERS, INC.
P.O. BOX 312
CAMBRIDGE, MASS. 02139
1968

PHONOLOGICAL RESTRUCTURING AND GRIMM'S LAW*

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By phonological restructuring I mean the following. Suppose that in the course of history a rule is added to the phonology of a language. The phonology is assumed to be maximally general before the addition of the rule. But the addition of the rule may change the phonetic output of the grammar in such a way that the old grammar together with the new rule may not embody the correct generalizations to account for the new phonetic output. In fact, the grammar with the correct generalizations may be radically different from the old set of rules with the innovation added.[1] Presumably the next generation of speakers learns the new maximally general grammar.

Kiparsky[2] points to Grimm's Law as a paradigm case of restructuring. He argues that by the time all of the changes of Grimm's Law had taken place, the phonology of Germanic would contain not the actual changes, but rules that had the opposite effect of the historical processes. I believe that Kiparsky's comments are essentially correct. But the situation is considerably more complicated than he portrays it in his brief treatment of the topic. As we shall see below, different versions of the theory of generative phonology make different claims as to what restructuring really did take place.

Before proceeding, we should discuss some points of theory that will enter into the discussion. (1) Kiparsky[3] assumes that there exist rules that change two segments at once. It is usually assumed that such rules are impossible, except for metathesis, rules that coalesce two vowels to form one, and a small number of others. But Kiparsky's example is a plausible one, as are a number of examples that we will consider below. One of the arguments that is sometimes brought forth against such rules is that the same changes can be effected by two successive rules which change only one segment at a time. But, as we will see below, there are apparent generalizations that cannot be captured this way. Consequently, a theory with such rules will make different claims about restructuring than a theory without such rules. (2) Chomsky and Halle have recently revived and renovated the Prague School notion of markedness. Though no one has yet come near to incorporating an adequate notion of markedness into the theory of generative phonology, certain things are clear. The following facts will have to be incorporated into any set of universal markedness rules: (i) Obstruents unmarked for voicing are voiceless; obstruents marked for voicing are voiced. (ii) Obstruents unmarked for aspiration are unaspirated; obstruents marked for aspiration are aspirated. I also assume, following Jakobson, that there cannot be a marked series of sounds without the corresponding unmarked series. This assumption has interesting consequences if one considers the system of stops in Indo-European. According to the usual reconstruction, the phonetic values of the stops were p-b-b^h. (We will assume the labials to represent the entire series.) The aspirates were distinguished from the non-aspirates by the single mark of aspiration. According to the above principle, the aspirates would be unmarked for voicing since there is no voice-voiceless contrast in the aspirate series. It we accept both this markedness principle and the phonetic values as they are usually reconstructed, we get the fol-

lowing situation with respect to markedness and feature values.

	p	b	b^h	p	b	b^h	
VOICING	u	m	u	-	+	+	(iii)
ASPIRATION	u	u	m	-	-	+	

But here we notice a discrepancy between the reconstructed phonetic values and the phonetic values given by markedness rule (i). If the aspirates are unmarked for voicing and if obstruents unmarked for voicing are voiceless, then the aspirates should be voiceless instead of voiced. It is for this reason that Jakobson has questioned the traditional reconstruction.[4] Within the framework of generative phonology, it may be possible to maintain both, though not without some cost. If one interprets markedness rules such as (i) and (ii) as supplying systematic phonemic feature-values rather than phonetic or taxonomic phonemic ones, then one might maintain that the aspirates are voiceless at the systematic phonemic level, but voiced at the phonetic level. The discrepancy would be accounted for by the following rule.

(iv') [+ASP] → [+VOICE]

The trouble with (iv') is that there is no independent motivation for it. It does not account for any phonological alternation, nor does it allow one to capture any phonological generalization that would otherwise be missed. In short, there is no empirical basis for (iv'); it is set up simply to avoid the above conflict. There is another possible alternative, though it is no more savory than (iv'). One could postulate the existence of markedness change rules such as (iv).

(iv) [mASP] → [mVOICE]

Such a language-particular markedness rule would apply before the application of the universal markedness interpretation rules, (i) and (ii). The effect would be the same as with (iv'). And as with (iv'), there is no empirical basis for (iv). Moreover, one must consider the question of whether language-particular markedness rules exist. There is no independent reason to believe that rules of form of (iv) exist, although we will give some evidence below that suggests that language-particular markedness rules of a somewhat different form exist.

Since I believe that Jakobson's markedness postulate is correct, and since I have no reason, aside from that belief, to question the traditional reconstruction, I will assume that either (iv) or (iv') was a rule of Indo-European. Any reader who wishes to disagree with this assumption must either give up Jakobson's markedness postulate or challenge the traditional reconstruction. In what follows I will consider the question of whether the changes in Grimm's Law forced phonological restructuring, and if so, how a change in markedness was involved in that restructuring. I will assume that there are language-par-

ticular markedness rules of the form of (iv) and will discuss changes in terms of them. If the reader has some preference for phonological rules like (iv') over such markedness rules, he can construct from each markedness rule the corresponding phonological rule by changing the m's to plusses and the u's to minuses.

I will assume the following chronology of the stages of Grimm's Law:

(1) Voiceless stops become aspirated, except after obstruents.

(2) Voiced unaspirated stops become voiceless.

(3) Aspirated stops become continuant.[5]

As Kiparsky points out, the usual arguments for the changes of Grimm's Law can be captured in the history of four forms:[6]

(v) skabian skabtas nasian nasitas

The usual arguments concerning the nature of the changes that occurred in Grimm's Law do not depend crucially on examples such as mizdʰo- and ozdos. These cases are usually only brought forth to show that s and z were not in phonemic contrast to Indo-European. I shall first consider the arguments for restructuring in Grimm's Law without these cases. Then I shall show that the inclusion of these cases changes those arguments.

Before the operation of Grimm's Law, there was a rule in the phonology of Indo-European that made all obstruents voiceless when they preceded a voiceless obstruent. I will call this Rule O.

Rule O. [+OBSTR] [+OBSTR] [-VOICE] → [-VOICE]

Rule O changes skabtas to skaptas.[7] Prior to Grimm's Law we have:

(vi) skabian skaptas nasian nasitas

In the first stage of Grimm's Law, Rule 1 is added to the grammar following Rule O.

Rule 1. {[-SEGMENT], [-OBSTR]} [+OBSTR] [-CONT] [-VOICE] → [+ASP]

After this stage of Grimm's Law, a synchronic phonology that mirrored the historical changes would have the underlying representations of (v) and Rules O and 1 in that order. I will call this GRAMMAR I.

At this point there are other possible grammars. Consider GRAMMAR IA, where a different consonant system (vii) and different systematic phonemic representations (viii) occur, though with the same markedness relationships.

	p^h	b	b^h		p^h	b	b^h	
VOICING	u	m	u		-	+	+	(vii)
ASPIRATION	u	u	m		+	-	+	

With such a consonant system, the systematic representations corresponding to the least marked lexical representations would be:

(viii) sk^habian sk^habt^has nasian $nasit^has$

In this consonant system we would need markedness rules (ix) and (x) instead of (iv).

(ix) [mASP] → [mVOICE]

(x) [uVOICE] [mOBSTR] → [mASP]

Given the representations of (viii), the correct output could be derived in one step by means of Rule 1A, which applies to two segments simultaneously.

Rule 1A. [+OBSTR] [β STRD] → [-β ASP]; [+OBSTR] [-VOICE] → [-ASP]

1A changes (viii) to (xi).

(xi) skabian $skap^htas$ nasian $nasit^has$

What is characteristic of GRAMMAR IA is that the consonant system has been changed without any change in the underlying markedness relationships (compare [iii] and [vii]). All voiceless stops have been replaced by voiceless aspirates. This is accomplished by (x), a segment structure rule. However, since (x) creates more aspirates than did the actual innovation (Rule 1), the new phonological rule of GRAMMAR IA must undo part of the work of (x). That is, it must operate in a direction opposite to that of the original change.

GRAMMAR IB, also possible at this stage, is similar to GRAMMAR IA in that p^h-b-b^h is assumed to be the consonant system. However, the markedness relationships in this consonant system are somewhat different in that /b/ is unmarked and /b^h/ is marked for voicing rather than for aspiration.

	p^h	b	b^h	p^h	b	b^h
VOICING	u	u	m	-	+	+
ASPIRATION	m	u	u	+	-	+

Instead of markedness rules (ix) and (x) we need rules (xiii) and (xiv).

(xiii) [mVOICE] [mOBSTR] → [mASP]

(xiv) [mOBSTR] [mASP] → [mVOICE]

Given this consonant system, the least marked underlying representations would be those of (xv).

(xv) sgabian sgabtʰas nasian nasitʰas

The correct output can now be derived by a single rule analogous to Rule 1A.

Rule 1B.

$$\begin{matrix} [+\text{OBSTR}] & [+\text{OBSTR}] \\ [\beta\ \text{STRD}] & \\ \downarrow & \downarrow \\ [-\text{VOICE}] & [-\text{VOICE}] \\ [-\beta\ \text{ASP}] & [\ -\text{ASP}\ ] \end{matrix}$$

1B will change (xv) to (xvi).

(xvi) skabian skapʰtas nasian nasitʰas

GRAMMARS I, IA, and IB show clearly the difference between lexical representation (in terms of markedness) and systematic phonemic representation (in terms of plusses and minuses). Consider the k in skab-. It has a different systematic phonemic representation in each of the three grammars.

GRAMMAR I: skab-

GRAMMAR IA: skʰab-

GRAMMAR IB: sgab-

But in all of these grammars, the k has the same *lexical* representation, that is, it is unmarked for both voicing and aspiration. Now consider the b in skab-. In all three grammars it has the same systematic phonemic representation, that is, as a b. But in GRAMMAR IB, it is lexically unmarked for voicing, while in GRAMMARS I and IA, it is lexically marked for voicing.

GRAMMAR I, IA, and IB are equally simple in that their phonological rules have the same number of features. Therefore, under the assumption that rules may apply to two segments simultaneously, we find no argument either for or against restructuring in this case.

Incidentally, GRAMMAR IB is equivalent to the assertion made by Kuryłowicz[8] that in the position following s voiceless stops were reinterpreted as voiced stops and the consonant system changed so that voiced stops became unmarked.

GRAMMARS IA and IB have very strange consonant systems--systems that just don't seem to occur in real natural languages. The source of the putative consonant systems lies in language-specific segment structure rules such as (x) and (xiv), which have u's in their environment statements. If we were to rule out such markedness rules from the theory of generative phonology, then GRAMMARS IA and IB would be impossible. In fact, the possibility of such consonant systems is a point of contention between Kuryłowicz and Fourquet.[9] Kuryłowicz considers the consonant system of IB to be possible, but unstable. The voiced stops, no longer carrying voicing as a distinctive mark, lose their voicing--just as a species might through evolution lose an unused appendage. Fourquet, on the other hand, considers the systems of IA and IB to be impossible and claims that stage one of Grimm's Law did not exist. Instead, he claims, the aspiration of the voiceless stops and the devoicing of the voiced stops oc-

curred simultaneously.

As we have seen, the question as to whether restructuring occurred after the first stage of Grimm's Law turns on a number of complicated theoretical issues. If, for example, we were to rule out all two-segment rules, then GRAMMARS IA and IB would have to be restated in terms of two one-segment rules. Since such grammars would be more complicated than GRAMMAR I, the claim that there are no two-segment rules would entail the assertion that restructuring did not occur after the first stage of Grimm's Law. However, as the stages of Grimm's Law progress, the arguments for restructuring become stronger. After stage two, they override all theoretical considerations.

In the second stage of Grimm's Law, voiced stops become voiceless. One possible grammar for this stage would be GRAMMAR I with rule 2 added after rules 0 and 1.

Rule 2.
$$\begin{bmatrix}+\text{OBSTR}\\ -\text{CONT}\\ -\text{ASP}\end{bmatrix} \rightarrow [-\text{VOICE}]$$

We will call this grammar GRAMMAR II. This is the grammar that recapitulates the historical changes.

Another possible grammar for this stage, GRAMMAR IIA, would have roughly the same consonant system as GRAMMAR IB, but without the markedness rule of (xiv).

	p^h	p	b^h	p^h	p	b^h	
VOICING	u	u	m	-	-	+	(xvii)
ASPIRATION	m	u	u	+	-	+	

The system would retain the markedness rule of (xiii).

GRAMMAR IIA would have the same systematic representations as GRAMMAR IA, but with all occurrences of /b/ replaced by /p/:

(xviii) sk^hapian sk^hapt^has nasian $nasit^has$

Rule 2A would then apply to these representations.

Rule 2A.
$$\begin{bmatrix}+\text{OBSTR}\\ -\text{STRID}\end{bmatrix} \begin{bmatrix}+\text{OBSTR}\\ -\text{VOICE}\end{bmatrix} \rightarrow [+\text{ASP}]\ [-\text{ASP}]$$

The application of 2A to the forms of (xviii) would yield:

(xix) skapian $skap^htas$ nasian $nasit^has$

We can form GRAMMAR IIB by taking the systematic phonemic representations of GRAMMAR IB (see [xvi]) and replacing all the voiced stops by voiceless stops. Thus we would have:

(xx) skapian $skapt^has$ nasian $nasit^has$

GRAMMAR IIB will be identical to GRAMMAR IIA, except for these representations. Note that in (xx) the only form at variance with the desired phonetic output is /$skapt^has$/. Rule 2A will

change this form to [skaphtas], which is the desired result.

The lexical representations of GRAMMAR IIA (xviii), which are carried over from the representations of GRAMMAR IA, are somewhat more marked than those of GRAMMAR IIB (xx). For example, in GRAMMAR IIA, the k^h in sk^{h}ap- is marked for aspiration, while in GRAMMAR IIB, the k in skap- is unmarked. Since the grammars are identical in all other respects, GRAMMAR IIB might be considered more highly valued than GRAMMAR IIA.

In a theory in which two-segment rules are permitted, GRAMMAR IIB would be more highly valued than GRAMMAR II by eight features. But even if two-segment rules were not permitted in phonological theory, a slightly more complicated grammar corresponding to GRAMMAR IIB would still be more highly valued than GRAMMAR II. We will call this grammar GRAMMAR IIB* and we will form it by replacing Rule 2A by the following two rules:

Rule 2A'.

$$\begin{matrix}[+\text{OBSTR}] & [+\text{OBSTR}] \\ [-\text{STRID}] & \end{matrix} \rightarrow [+\text{ASP}]$$

Rule 2A".

$$\begin{matrix}[+\text{OBSTR}] & [+\text{OBSTR}] \\ & [-\text{VOICE}] \end{matrix} \rightarrow [-\text{ASP}]$$

GRAMMAR IIB* would still be simpler than GRAMMAR II by six features. Thus, restructuring is favored at this stage, regardless of any theoretical considerations.

At the third stage of Grimm's Law aspirates become continuants. A grammar which recapitulates historical change would represent this stage if it were formed by adding Rule 3 to GRAMMAR II after Rule 2. We will call this GRAMMAR III.

Rule 3.

$$\begin{matrix}[+\text{OBSTR}] \\ [+\text{ASP}] \end{matrix} \rightarrow [+\text{CONT}]$$

Rule 3, applying to the output of stage two of Grimm's Law (xix) would yield:

(xxi) skapian skaftas nasian nasiθas

At this stage, there is a much simpler grammar than GRAMMAR III. It is analogous to GRAMMAR IIB, and we will refer to it as GRAMMAR IIIA. Essentially IIIA differs from IIB in that wherever the feature ASPIRATE played a role in IIB, the feature CONTINUANT plays that role in IIIA.

Consider, for example, the consonant system of IIB with the specification for the feature CONTINUANT included.

	p^h	p	b^h	p^h	p	b^h	
VOICING	u	u	m	-	-	+	
ASPIRATION	m	u	u	+	-	+	(xxii)
CONTINUANT	u	u	u	-	-	-	

The consonant system of IIIA would be:

	f	p	v	f	p	v	
VOICING	u	u	m	-	-	+	
ASPIRATION	u	u	u	-	-	-	(xxiii)
CONTINUANT	m	u	u	+	-	+	

Where IIB contains the markedness rule

$$[\text{mVOICE}] \rightarrow [\text{mASP}] \qquad \text{(xiii)}$$

IIIA contains the corresponding rule

$$[\text{mVOICE}] \rightarrow [\text{m CONT}] \qquad \text{(xxiv)}$$

The systematic phonemic representations of IIIA are the same as those of IIB, except that continuants have replaced aspirates in all positions. The systematic phonemic representation of IIIA would be:

(xxv)	skapian	skapθas	nasian	nasiθas

Where IIB has Rule 2A, IIIA will have the analogous Rule 3A:

Rule 3A. $[+\text{OBSTR}] \rightarrow [+\text{CONT}]$ / $[+\text{OBSTR}]$ $[-\text{STRID}]$ ___ $[-\text{CONT}]$

In (xxv), /skapθas/ is the only form that does not correspond to its phonetic interpretation. Rule 3A will convert it to [skaftas].

GRAMMAR IIIA is one feature simpler than GRAMMAR IIB. Since GRAMMAR III is three features more complex than GRAMMAR II, the argument in favor of restructuring at this stage of Grimm's Law is just that much more compelling.

So far we have not considered the cases of mizdʰo- and ozdos. Let us do so now. Indo-European /misdʰo-/ and /osdos/ were represented phonetically as [mizdʰo-] and [ozdos] respectively, there being no systematic phonemic contrast between /s/ and /z/. This indicates that Rule O as we have stated it is not sufficiently general. It should be restated

Rule O'. $[+\text{OBSTR}] \rightarrow [\alpha\text{VOICE}]$ / $[+\text{OBSTR}]$ ___

Stage 1 of Grimm's Law did not affect these forms at all. Their phonetic representations remained the same, and there is no reason to believe that their systematic phonemic representations would be any different regardless of any restructuring that might have taken place.

Although it is easy to change Rule O to accomodate this additional data in GRAMMAR I, this data cannot be accomodated at all in GRAMMAR IB. GRAMMAR IB, which is the best we could do in reconstructing the suggestions offered by Kuryłowicz in "Le Sens des Mutations Consonantiques," turns out to be inadequate. Kuryłowicz claims that there is a stage of Germanic after the aspiration of voiceless stops and before the devoicing of voiced stops at which voiceless stops which remained unaspirated after /s/ were reinterpreted as underlying voiced stops. Thus we would have to have the systematic phonemic /sgabian/ and /osdos/ appearing phonetically as [skabian] and [ozdos]. In one case (sgabian > skabian) the first member of the cluster determines the voicing of the cluster, while in the other case (osdos > ozdos) the second member of the cluster determines the voicing of the cluster. Kuryłowicz cannot have it both ways. If there is a single general process of voicing assimilation in consonant clusters, either the first consonant must assimilate to the second, or vice versa, but not both. The alternation [skab-] ∿ [skap-] in [skabian] and [skaptas] provides independent evidence that it is the second consonant in the cluster that determines the direction of the assimilation. There is no independent evidence whatever for Kuryłowicz' claim that the first member of the cluster may determine the direction of assimilation. One might conceivably (by some accidental quirks in the surviving data) be able to write rules which would map Kuryłowicz' underlying forms into the proper phonetic outputs, but the rules would be absurdly complicated and ad hoc--and they would miss the simple generalization stated in Rule O'.

GRAMMAR IA does not fail nearly as badly. The underlying representations of (vii) can be maintained provided that Rule O' is added to the grammar before Rule 1A. But now our revised version of GRAMMAR IA is more complicated (by three features) than the revised GRAMMAR I (which is exactly as complicated as the original GRAMMAR I). Thus our original data provide a three-feature argument that there was no restructuring after the first stage of Grimm's Law. If two-segment rules are proscribed, the argument becomes a five-feature one.

At stage 2 of Grimm's Law /misdʰo-/ and /osdos/ have the phonetic representations of [mizdʰo-] and [ostos].[10] What is most interesting about these facts is that GRAMMAR II (with Rule O' instead of Rule O), which presumably recapitulates the history of the changes, *cannot account for this data*. Let us apply the rules of GRAMMAR II to /osdos/.

osdos	systematic phonemic representation
ozdos	Rule O' (voicing assimilation)
ozdos	Rule 1
oztos	Rule 2

Thus, the grammar which contains what are presumably the historical changes in their correct order simply does not jibe with the data. Note that in order to get the correct output, one would need to apply a *second* voicing assimilation rule after Rule 2. Note that Rule 0' cannot simply be moved down to follow Rule 2, since it must apply before Rule 1 in the derivation applying to /skabtas/.

skabtas	systematic phonemic representation
skaptas	Rule 0'
skapʰtas	Rule 1
skapʰtas	Rule 2

If we want to maintain a grammar that partially reflects what seem to be the historical changes, then we must be prepared to give up all hope of accounting for voicing by a single general rule.

But the fact that GRAMMAR II cannot account for our additional data has more profound consequences than that. It has usually been assumed that what happened historically between the first and second stages of Grimm's Law was that Rule 2 was added to the grammar of stage 1. And it is hard to imagine how else such a change could have arisen. The fact that this cannot be described within the present theory of generative phonology without missing the generalization about assimilation in consonant clusters shows that there is something wrong with the present theory of generative phonology. However, I can imagine another version of the theory of generative phonology that does not have this defect. Chomsky and Halle[11] have proposed that universal markedness rules should operate throughout the phonology. Thus, a rule that changed /u/ to /i/ would only have to indicate a change in gravity. The corresponding change in rounding would follow from the universal rule which states that in the unmarked case rounding assimilates to gravity. The version of the theory which we have in mind is one in which there are not only universal markedness interpretation rules but language-particular ones as well. In this version, language-particular markedness rules as well as universal ones apply throughout the phonology (or down to a certain point). Now suppose we assume that in Germanic voicing assimilation is a language-particular markedness interpretation rule. (It is not clear how one might state such a rule formally.) If this rule were to apply everywhere in the phonology,[12] then the above difficulty would disappear.

The arguments that I have given for restructuring are based largely on the Chomsky-Halle evaluation metric. In this case, I think that the metric gives essentially the correct result, namely, that restructuring must have taken place after stage 2 of Grimm's Law. I am, however, extremely suspicious of feature-counting arguments and would like to avoid them if possible. I believe that the argument for restructuring should follow from general principles of phonology (such as Postal's naturalness condition) and from substantive constraints on what are possible rules. Unfortunately, there are to my knowledge no such principles known which would be specific enough to account for restructuring as well as the Chomsky-Halle metric does. Until such principles are found, I believe that our understanding of such phonological changes as Grimm's Law must remain incomplete.

Notes

*The author wishes to thank Richard Carter, Eric Hamp, Paul Kiparsky, Robin Lakoff, and Roy Wright for their comments on this paper. This work was in part supported by grant GN-329 from the National Science Foundation to Harvard University.

1. Halle, M. "Phonology in a Generative Grammar," Word, 1962.
2. Kiparsky, P. Phonological Change. M.I.T. Dissertation, 1965. Chapter 1.
3. Kiparsky, op. cit.
4. Jakobson, R. "Typological Studies and Their Contribution to Historical Comparative Linguistics," Selected Writings I, Mouton, 1962.
5. I have chosen this chronology since it seems to me the most reasonable one. However, other reasonable alternatives would yield similar results. For the sake of simplicity, I have excluded Verner's Law from consideration in this paper.
6. Kiparsky, op. cit.
7. There is also a late phonetic rule that changes i to j after consonants and before vowels. This would yield [skabjan] and [nasjan]. Since this rule plays no role in our discussion, we will ignore it and consider [skabian] and [nasian] as "phonetic" outputs of the phonology.
8. Kuryłowicz, J. "Le Sens des Mutations Consonantiques," in Esquisses Linguistiques, 1960, pp. 240-247.
9. Fourquet, J. Les Mutations Consonantiques du Germanique. Paris, 1948.
10. Since consonants are our main concern, we will ignore the problem of o changing to a to yield the Germanic *astas > *astaz > Gothic asts (Syncope of unstressed vowel).
11. Sound Pattern of English, Harper and Row, 1968.
12. To say that all such rules applied throughout the entire phonology would be much too strong a claim, since that would entail that the inventory of systematic phonemes could not be changed or enlarged through the operation of phonological rules. It has been proposed by Richard Carter and myself that markedness rules apply only down to some point in the phonology, but not below that point. This proposal would have the following consequences. The rules above that point would convert systematic phonemes into other systematic phonemes; no rule above that point in the grammar could introduce a complex of features that was not in the inventory of systematic phonemes. All the rules introducing new complexes of features would come below that point. This is an empirical claim, and it happens to be false. In fact, Rule III, the third stage of Grimm's Law, which changes aspirated obstruents to continuants, is a counterexample. If markedness conditions were to apply to Rule III, then it would follow by the principle that unmarked continuant obstruents are strident, that Rule III would produce strident continuants only. But Rule III changes t^h to θ (nasit^has > nasiθas), not to s. Thus the above markedness principle

does not apply, and according to our claim Rule III would have to occur below the point in the grammar where markedness rules cease to apply. Note, however, there is another universal markedness condition stating that continuant obstruents are not aspirated. Since the aspirates upon which Rule III operates must become unaspirated by virtue of their becoming continuant, this markedness principle must apply to those cases that undergo Rule III. According to our principle, Rule III must, on this evidence, be above the point in the grammar where markedness rules cease to operate. Our principle thus yields a contradiction. We do not know how markedness principles do operate, but this example shows one way in which they cannot operate.