

## Analogy, Levelling, Markedness





# Analogy, Levelling, Markedness

Principles of Change  
in Phonology and Morphology

Second and revised edition

*edited by*

Aditi Lahiri

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In acknowledgement of his past and continuing  
achievement and inspiration—

To one of the contributors, the others  
would like to dedicate this book:

*Paul Kiparsky*



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## **Preface to the paperback edition**

The title of the book captures the key notions in historical linguistics that have influenced the research lives of its contributors. The subject matter has evidently been of some interest to many readers too since we are about to launch a paperback edition. This is especially rewarding given that the chapters in this volume focus on languages, chiefly Germanic with some Romance and Indo-Aryan, where there is a temptation to consider all big questions asked and answered.

Except for the correction of typographical errors, noted and accurately amended by Wolfgang Schellinger, the paperback edition does not deviate from the original publication. We hope that the contents will continue to appeal to scholars of historical linguistics and will convey to many a student what it is about analogy, levelling, and markedness that continues to hold such fascination for historical linguists.

One change since the first edition we note with great sadness: the untimely death of a contributor and friend, Wolfgang U. Wurzel.

Aditi Lahiri

Konstanz, September 2002



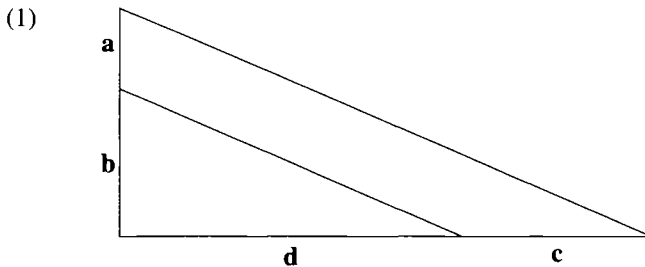
# Introduction

*Aditi Lahiri*

Although the notion “analogy” has been around for several centuries, different disciplines and different schools of thought have assigned disparate interpretations to the term.

The literature on this theme is vast and controversial. The term “markedness” is less used as a scientific notion in disciplines other than linguistics. Nevertheless, the expression is equally open to dispute. Since this book is on analogy and markedness in language change, I will indulge in referring to a few of the usages of these terms with illustrative quotes from the literature in past times.<sup>1</sup>

In mathematics, the term “analogy” expresses a similarity in relationships which are proportional (coming from Greek *analogon*, ‘according to a ratio’). In Aristotle’s usage, the analogy concerning the distances **a**, **b**, **c**, **d** in (1) can be stated as follows: as **a** is to **b**, so is **c** to **d**.



If distance **d** is unknown, but its relation to **c** is known to be similar to that in which known distances **a** and **b** stand, then it can be calculated on the basis of the equation of proportions  $a:b = c:x$ ,  $x = b*c/a$ . Among the numerous references to proportions in the literature, here are a few illustrative ones:<sup>2</sup>

**1557** Recorde Whetst. C ij, If any one proportion be continued in more then 2 numbers, there maie be then a conference also of

these proportions..that conference or comparison is named Analogie.

**1660** Barrow *Euclid* v. def. 4 That which is here termed Proportion is more rightly called Proportionality or Analogy.

**1742** Bailey, *Analogy* [in the *Mathematicks*] the Comparison of several Ratio's of Quantities or Numbers one to another.

Another form of analogy noted by the Greeks is that of inferring similarity of function, where the relationship is expressed as follows: as **a** is in **b**, so **c** is in **d**. Plato employed a functional analogy when he argued that the Idea of the Good makes knowledge possible in the intelligible world just as the Sun makes Vision possible in the perceptual world. Here a relationship not yet understood is analogous to one already familiar. Extending this notion, acceptance of the analogy “Knowledge is to the mind, what light is to the eye” makes *light*, or *enlightenment*, or *illumination*, an analogical word for *knowledge*.

In logic and philosophy the notion of inference is predominant in any use of analogy. The term is used in reference to the process of reasoning from parallel cases and presumptive reasoning based upon the assumption that if things have some similar attributes, their other attributes will be similar. The first *Encyclopædia Britannica* (1771) stated that “A great part of our philosophy has no other foundation than analogy, the utility of which consists in superseding all necessity of examining minutely every particular body; for it suffices us to know that every thing is governed by general and immutable laws, in order to regulate our conduct with regard to all similar bodies, as we may reasonably believe that they are endowed with the same propertie” (p. 142). Towards understanding whether inferences by analogy can arguably be a form of inductive reasoning, the following three quotes from the OED are instructive:

**1774** Goldsm. *Nat. Hist.* I. 143 Some philosophers have perceived so much analogy to man in the formation of the ocean, that they have not hesitated to assert its being made for him alone.

**1843** Mill *Logic* iii. xx. §1 The word Analogy as the name of a mode of reasoning is generally taken for some kind of argument

supposed to be of an inductive nature but not amounting to a complete induction.

**1875** Stubbs *Const. Hist.* I. i. 11 Analogy, however, is not proof, but illustration.

The message is that the adequacy of such analogies depends on whether any verifiable consequences can be deduced from them. And this is contingent on the resemblance being of a fundamental kind rather than merely of a superficial kind.

In Natural History the term analogy is used productively to indicate resemblance of form or function between organs which are *essentially* different (in different species) and have different origins. Thus, one can express the analogy of a common function between the tail of a fish and that of the whale, the wing of a bat and that of a bird, the tendril of the pea and that of the vine. The presence of the analogous structure (the tail, the wing or the tendril) does not reflect evolutionary closeness among the organisms that possess it. The following quotes illustrate this form of analogy:

**1857** Berkeley *Cryptog. Bot.* §25 We understand by analogy those cases in which organs have identity of function, but not identity of essence or origin.

**1854** Woodward *Man. Mollusca* 55 Resemblances of form and habits without agreement of structure..are termed relations of..analogy.

**1814** Sir H. Davy *Agric. Chem.* 62 Linnæus, whose lively imagination was continually employed in endeavours to discover analogies between the animal and vegetable systems, conceived 'that the pith performed for the plant the same functions as the brain and nerves in animated beings.'

In all these disciplines, scholars employing the method of analogy are aware that it should always be possible to show that the resemblances noted bear relevantly on the point to be established, whereas the differences are irrelevant. In many cases it is difficult to be sure of this distinction, and arguments from analogy are therefore precarious unless supported by considerations that can be established independently. This

concern is reflected throughout the history of the use of analogy. For instance, the use of analogy was widespread in early Greek speculative thought, particularly in drawing conclusions about meteorological and astronomical phenomena (Lloyd 1966). However, though Plato, and even more so Aristotle, were more cautious than their predecessors in their actual use of analogy in natural science, it remained an indispensable method in elucidating obscure phenomena in many areas. The application of analogy in language has encountered similar levels of support as well as censure.

The term analogy in its use in language has not always had the same relevance. The eighteenth-century *Encyclopædia Britannica* states that “Analogy among grammarians is the correspondence which a word or phrase bears to the genius and received forms of any language (p. 142). This reflects the thought of ancient Western grammarians like Aristarchus and Varro who used the notion of proportional analogy to establish paradigms. The grammarians classified nouns and verbs according to similarities and differences in inflection, and the regularities they showed were interpreted as complexes of mathematical proportions and hence analogy. However, soon the term came to be used synonymously with inflectional regularity. Any exception to the orderliness of paradigms and all irregularities were explained by empirical rules. This attitude is reflected also in the quotes below.

**1659** B. Walton *Consid. Considered* 264 There [is]..a particular Grammar analogy in each particular tongue, before it be reduced into rules.

**1706** Phillips, *Analogy*..in Grammar, the Declining of a Noun, or Conjugating of a Verb, according to its Rule or Standard.

Thus analogy referred to paradigmatic regularities of language, but not as an associative systematising process in language change. This latter view arose in the late nineteenth century, when the *Junggrammatiker* or *neogrammarians* took recourse to analogy not as before to explain regularities, but to account for the apparent irregularities which arose in contrast to regular sound laws. Even before the advent of the neogrammarians, scholars like Whitney, Curtius, Scherer, Schleicher recognised analogy, not as an explanation for exceptions but as a uni-

versal linguistic process. Whitney (1867), in speaking of children's extension of the plural *-s* and past tense *-d*, describes them as "extension of prevailing analogies beyond their historically correct limits, an analogy referred to a whole class of forms. In the earliest statements of the position of the *Junggrammatiker*, Leskien (1876), Brugmann (1876), and Osthoff and Brugmann (1878) established that (i) sound change operates due to mechanical laws and does not permit exceptions, and (ii) new forms are created through analogy. Here analogy refers to the process by which new inflectional forms replace existing forms, and in that sense it is "false analogy" seen from the traditional grammarian's approach. "False" because analogy refers to the regular paradigm, and analogical formation is an extension to form an "incorrect" form. However, as Brugmann and Paul insisted, the preferred term was "associative formations" since the analogical formations were directly linked to psychologically associated words. In addition, analogy is explicitly placed in opposition to "regular" sound change; i.e. analogical formations are *not* the result of sound change. And this started the analogy controversy which continues till this day.

Hermann Paul's stance on analogy was explicitly discussed in the fifth chapter of the *Prinzipien*. For him, analogy was not just a notion relevant for language change but was present all the time. According to him, words related in any way—phonologically, morphologically or semantically—fall into associated groups in the minds of speakers. Associated groups could be different nouns occurring in the same case, or different cases of the same noun, or different nouns of the same gender, and so on. Not only single words but analogous proportions between different words tend to coalesce into groups as in (2).

(2) Analogous proportions in German nouns

Tag : Tages : Tage = 'day'

Arm : Armes : Arme = 'arm'

Fisch : Fisches : Fische = 'fish'

For Paul, speakers did not learn every single form in a declension or conjugational class. In the process of mastering one's language, a number of connected examples which associate themselves into groups are learnt. Based on these associations, the speaker creates new forms.

Thus given the proportion  $Tag: Tage = Arm: x$ ,  $x$  is given a value and a new form is created, viz. *Arme*. Note that in Paul's view analogical formation or analogical association in the mind of the speaker is not another way of saying that a set of rules has been learned. To say that, Paul would have to assume that *Tage* is made up of the morphemes {*Tag*} and {*e*}, and {*e*} would have a similar status to that of {*Tag*}. This is not the level of abstraction Paul had in mind; to him words were learnt as free forms, each individually, *Tag* and *Tage*.

Now the question arises as to what role analogy plays in change. If a word fell into more than one associate group, then there was a possibility of two analogical creations. For instance, the neuter word *Wort* has the plural *Wörter* and *Worte*. In Old High German, due to the deletion of final high vowels after heavy syllables, the nominative plural ending *-u* did not surface, and the singular and plural nominative forms were identical: *Land*–*Land* 'country–countries'. In late Middle High German, many words of this class added a schwa in the plural (*Lande*) like the masculines of this class (*Tage*), and even later added the ending of the weak neuters *-er* as in *Länder* (cf. Wurzel, this volume). In Paul's view, *Land* fell into two associative classes:  $Tag: Tage = Land: x$  and  $Lamb: Lember^3 = Land: y$ . The analogical creations were *Lande* and *Länder*, both of which are in use with different meanings. Clearly what proportions are established and what associative group(s) a word falls into are crucial for new creations. The problem, of course, lies in defining the precise nature of the relationships within the proportions. Could any proportion be set up? Why do analogical changes occur in some groups and not in others? Paul argued that there must be "formal (i.e. sharing grammatical properties as *Tages* and *Armes* both sharing the genitive singular *-es*) and "material (i.e. sharing a single lexical value as in various forms of *Tag*) agreement among the proportions. His contemporaries, neogrammarians and structuralists, kept up their research on analogical change, and analogical proportions continued to flourish, but questions about the constraints on possible proportions continued to linger. Two examples will illustrate this point.

Saussure (1916, 1959) stated that analogy counterbalances the effect of "phonetic transformations and as an example cites the case of the change from *honōs* to *honor* in Latin. The proportion he had in mind



was  $\bar{o}r\bar{a}t\bar{o}rem:\bar{o}r\bar{a}tor = hon\bar{o}rem:x$ ,  $x=honor$ . But if the change was based entirely on proportions but without further guiding principles about setting up proportions, nothing would prevent the speaker from forming an equation of the type  $hon\bar{o}rem:hon\bar{o}s=\bar{o}r\bar{a}t\bar{o}rem:x$ , solve for  $x$ , thereby changing  $\bar{o}r\bar{a}tor$  to  $\bar{o}r\bar{a}t\bar{o}s$ . Yet this type of analogical change did not occur. Sapir cites the well attested example in Old English of  $f\bar{o}t-f\bar{e}t$  ‘foot’ where the paradigm changed somewhat at a later stage:

(3)		Earlier Old English	Late Old English/ early Middle English
	SG.NOM/ACC	$f\bar{o}t$	$f\bar{o}t$
	GEN	$f\bar{o}tes$	$f\bar{o}t$
	DAT	$f\bar{e}t$	$f\bar{o}te$
	PL.NOM/ACC	$f\bar{e}t$	$f\bar{e}t$
	GEN	$f\bar{o}ta$	$f\bar{e}te$
	DAT	$f\bar{o}tum$	$f\bar{e}ten$

According to Sapir, the dative singular changed by analogy to the  $a$ -stem nouns like  $d\bar{o}m$  ‘judgement’.

(4) Paradigm of  $a$ -nouns

SG.NOM/ACC	$d\bar{o}m$
GEN	$d\bar{o}mes$
DAT	$d\bar{o}me$
PL.NOM/ACC	$d\bar{o}mas$
GEN	$d\bar{o}ma$
DAT	$d\bar{o}mum$

The proportion he suggested was  $d\bar{o}m:d\bar{o}me = f\bar{o}t:x$ ,  $x=f\bar{o}te$ . But proportions on these lines provide no explanation for the change of the genitive and dative plural. The change in the genitive plural  $f\bar{o}ta$  to  $f\bar{e}te$  could not have been achieved by forming a proportion with the masculine  $a$ -stem nouns like  $d\bar{o}mas$  (NOM.PL): $d\bar{o}ma$  (GEN.PL)= $f\bar{e}t$  (NOM.PL): $x$ , since the nominative plurals do not agree. If, however, a proportion is made this time with the neuter nouns like *word*, one obtains *word*

(NOM.PL):*worda* (GEN.PL)=*fēt* (NOM.PL):*x*, *x*=*fēta*. Thus the associations and hence the proportions would have to be based on different sets of nouns and are clearly unpredictable. This account also misses the obvious generalisation that the analogy in this case was the levelling of the stem vowel *ō* in the singular and *ē* in the plural.

Concerns about which forms should constitute a proportion and what kind of influence the forms may exert on each other were issues which have preoccupied linguists ever since. One possible factor was that more numerous forms played a role in forming proportions. But even here there was disagreement. Sapir suggested that the more numerous represented forms pressured the others to change. Saussure, on the other hand, claimed that “the most numerous forms do not necessarily unleash analogy (p. 162). Kuryłowicz and later Mańczak attempted to provide a set of guidelines which could govern the direction of analogical change. For instance, Kuryłowicz’s fifth law states that in order to reestablish a central contrast, the language abandons a marginal contrast. “Central” and “marginal” are not clearly defined, but one might conclude that a central difference would be a difference in number and a marginal contrast would be a difference in case. One of his examples is as follows.

(5) Alternation in the 3MASC.DECLN in Latin

	SINGULAR	PLURAL
NOM	panis	panēs
ACC	panem	panēs

In Iberian Romance, due to the merger of the front vowels to *e* and the loss of final nasals the paradigm changed to:

(6)

	SINGULAR	PLURAL
NOM	panes	panes
ACC	pane	panes

That is, as a result of normal sound change the number distinction in the nominative was lost. Kuryłowicz argues that the number distinction was restored at the expense of the case distinction when the paradigm changed to:

(7)		SINGULAR	PLURAL
	NOM	pane	panes
	ACC	pane	panes

The relevant proportional equation was *panes* (ACC.PL):*panes* (NOM.PL) = *pane* (ACC.SG):*x*,  $x = \text{pane}$ . Kuryłowicz's suggestion that certain grammatical distinctions are more important is related to the markedness of certain forms. Note that the distinction in number in the accusative was maintained at the earlier stage. Nevertheless, the final *s* in the nominative was deleted to reinstate the number contrast in the nominative, making the nominative and accusative plural indistinguishable. And this brings us to the second notion of the book, viz. markedness, another concept which has been the focus of debate and controversy.

Developed in the Prague school for phonology, the notion of markedness has been subsequently extended to all levels of linguistic analysis. The terms "marked" and "unmarked" have often been related to various levels of complexity. On the subject of markedness in phonology, Chomsky and Halle (1968: 402) state: "Certain aspects of this general problem can be dealt with if we incorporate the Praguian notion of "marked" and "unmarked" values of features into our account in some systematic way, and if we then revise the evaluation measure so that unmarked values do not contribute to complexity. The problem of course is what constitutes complexity. A trivial differentiation is the overt marking of a grammatical function by an affix: the plural in English is usually marked by a sibilant, the singular is not and hence it is unmarked. Another use of the term is with reference to the general versus the more specific. For instance, for the two plural variants of German *Land* 'country', the form *Lande* is used in literary expressions like *durch die Lande ziehen* 'to roam abroad', while *Länder* is the general plural form as in *durch viele Länder reisen* 'to travel through many countries'. Here, *Lande* is the more marked plural. A third and equally common usage of markedness is in lexical distinctions like *dog* and *bitch*. The latter refers to a particular sex and is therefore more marked. Finally, Kuryłowicz's notion of central and marginal (or core and peripheral) are also references to markedness, in this case markedness of grammatical categories, moving away from the strict surface proportions of the neogrammarians.

In the last thirty years, research on analogy and markedness has seen many ups and downs. Kiparsky's seminal work on analogy and markedness (1965, 1968, 1982a, 1988, this volume) unleashed an equal amount of support and critique as did the neogrammarian proportions. The interpretation of analogy as grammar simplification, as proposed by Kiparsky, focuses not on surface analogy but on the phonological system. The direction of analogical change is proposed to be governed by the markedness of functional principles such as maximal utilisation of rules, bleeding/feeding ordering, and opacity/transparency of rules. Analogy in this context is not just surface analogy but change constrained by the phonological system. I think the most important distinction between this research and the neogrammarian position is not that analogy was no longer only based on an equation of proportions, but that "language change" was viewed as "grammar change", and hence there was no longer a dramatic difference between sound change and analogy like the neogrammarians, since both affect the grammar and are constrained by the grammar. This interpretation was difficult to understand for those who had long been influenced by the neogrammarian tradition. A quote from the psychologist Esper (1973: 190, n. 58) is germane to this issue: "Kiparsky (1968) gets rid of analogy by subsuming it under a concept of "simplification"; his treatment is confusing in that he seems to make no distinction between analogy and sound-change".<sup>4</sup> Kiparsky's treatment of language change was not confusing, but simply revolutionary. He *did* distinguish between sound-change and analogy, though not in the same manner as the neogrammarians. His treatment was merely drawing attention to the fact that all forms of change have an effect on the grammar, which may have confused those not used to conceiving of linguistic change as change of grammars.

Research in the last three decades has continued to address these issues, drawing attention to the fact that analogy is constrained by all levels of grammar. Given the separation of phonetics and phonology, and the various levels of interaction between morphology and phonology (cf. *Lexical Phonology*, Kiparsky 1982b), various types of phenomena could be subsumed under analogical change, including phonological restructuring of stems and affixes, various types of reanalyses, and generalisation of rules and constraints. Looking at phonological change

while being blind to the morphology, and vice versa, examining only morphological change while ignoring phonological phenomena, had caused tremendous problems in the past. Considering the grammar as a whole has altered the approach to the study of change, and is reflected in the research presented in this volume.

Issues of markedness and acquisition have continued to influence argumentation in accounting for types of changes. In my own research, as well, markedness has played a significant role in explaining certain changes. Given that many changes appeared not to be straightforward grammatical simplifications, Kiparsky (1977, 1978) was led to suggest that this was because first, language learners are not exposed to the same speech data, and second, even if innovations led to grammar simplification, they were less likely to succeed if they were functionally more blatant or salient. Contrary to this I claimed that the language learners always base their initial grammar on highly valued forms which are universal (nominative singular for nouns and third person singular in verbs, if languages have such categories) regardless of the order in which the data is presented to them (Dresher, this volume; Lahiri 1982; Lahiri and Dresher 1983; Lahiri, Riad, and Jacobs 1999). If the grammar formed at that stage includes innovations, they would be maintained regardless of whether this would prevent grammar simplification. Later attempts at innovations would be discarded. This suggests that there is a hierarchy of preferred forms and that the phonology of the system built by the language learner constrains possible and impossible analogies. And again, it is the grammar as a whole which is taken into consideration, even if the change involves a single lexical item. The restructuring of the underlying form of a stem, or opting towards a preferred metrical structure by lengthening vowels, or reanalysing morphemes by fusing them closer to the stem rather than inflection, are not perceived as being unrelated and categorically different types of change, but rather generally as affecting the grammatical system as a whole.

The notions of analogy and markedness have influenced the research lives of all the authors of this book (the measure is only dependent on age!). The papers in this volume do not necessarily agree on the precise interpretations of these notions, nor do they all subscribe to precisely the same theoretical framework, but they conform on one point: namely that analogy is not random and that change is constrained by the entire

grammatical system. The point of departure has been that examining items that have changed individually is meaningful only if the grammatical system as a whole is taken into consideration. The attempt has been to explain “what really happened”, “how it happened”, and even “why it did *not* happen”.

## Acknowledgements

The introduction has immensely benefited from detailed comments by Elan Dresher, Mirco Ghini, Astrid Kraehenmann, Frans Plank, and Henning Reetz. This volume stems from a workshop on the same topic held at Schloss Maurach near Konstanz, funded by the Max-Planck-Forschungspreis.

## Notes

1. This short commentary is not intended to be a comprehensive history of analogy and markedness. It only sketches out some of the usages of the terms, with a very abridged and selected set of references.
2. All such quotes, intended merely for illustration, are taken from the Oxford English Dictionary (OED 1971, 1993).
3. In Middle High German, the spelling would be *lamp:lember*.
4. Esper himself worked extensively on analogy and evidence for analogical associations in experimental psychology. He was rather dubious of psychological explanations of linguists from all traditions since such explanations were usually not validated by experimental research. He was particularly equivocal about modern linguistics influenced by “Chomskyan doctrines”.

## References

- Brugmann, Karl  
 1876 Nasalis sonans in der indogermanischen Grundsprache. *Studien zur griechischen und lateinischen Grammatik* (Curtius Studien), 9, 285–338.
- Chomsky, Noam and Morris Halle  
 1968 *Sound Pattern of English*. New York: Harper and Row.
- Encyclopædia Britannica; or a dictionary of arts and sciences compiled upon a new plan* (1771). By a Society of Gentlemen in Scotland. Edinburgh: Printed for Bell & Macfarquhar.

- Esper, Erwin A.  
 1973 *Analogy and Association in Linguistics and Psychology*. Athens: University of Georgia Press.
- Kiparsky, Paul  
 1965 Phonological change. Doctoral dissertation, MIT, Cambridge. Reproduced by the Indiana Linguistics Club, Bloomington, Indiana, 1971.  
 1968 Linguistic universals and linguistic change. In: Emmon Bach and Robert Harms (eds.), *Universals in Linguistic Theory*, 171–202. New York: Holt, Rinehart & Winston. [Reprinted in Kiparsky (1982), 13–43].  
 1977 How abstract is analogy. Unpublished manuscript. MIT.  
 1978 Analogical change as a problem for linguistic theory. In Kiparsky (1982a), 217–236.  
 1982a *Explanation in Phonology*. Dordrecht: Foris.  
 1982b From cyclic phonology to lexical phonology. In: Harry van der Hulst and Norval Smith (eds.), *The Structure of Phonological Representations: Part I*, 131–265. Dordrecht: Foris.  
 1988 Phonological change. In: Frederick Newmeyer (ed.), *Linguistics: The Cambridge Survey*. Volume I. *Linguistic Theory: Foundations*. Cambridge: Cambridge University Press.
- Kuryłowicz, Jerzy  
 1949 La nature des procès dits ‘analogiques’. *Acta Linguistica* 5: 15–37. Reprinted in: E. P. Hamp, F. W. Householder, and R. Austerlitz (eds.), (1966), *Readings in Linguistics II*, 157–174. Chicago: University of Chicago Press.
- Lahiri, Aditi  
 1982 Theoretical implications of analogical change: Evidence from Germanic languages. Unpublished Ph.D. dissertation, Brown University.
- Lahiri, Aditi and B. Elan Dresher  
 1983 Diachronic and synchronic implications of declension shifts. *The Linguistic Review* 31: 141–163.
- Lahiri, Aditi, Tomas Riad and Haike Jacobs  
 1999 Diachronic prosody. In: Harry van der Hulst (ed.), *Word Prosodic Systems in the Languages of Europe*, 335–422. Berlin: Mouton de Gruyter.
- Leskien, August  
 1876 *Die Declination im Slavisch-Litauischen und Germanischen*. Leipzig: Hirzel.
- Lloyd, G. E. R.  
 1966 *Polarity and Analogy: Two types of argumentation in early Greek thought*. Cambridge: Cambridge University Press.
- Mańczak, W.  
 1958 Tendences générale des changements analogiques. *Lingua* 7: 298–325, 387–420.

Osthoff, Hermann and Brugmann, Karl

1878 Vorwort. *Morphologische Untersuchungen*, I, iii–xx.

*Oxford English Dictionary*

1971 Oxford: Oxford University Press.

*Oxford English Dictionary*

1993 Compact Disk for the Macintosh. Oxford: Oxford University Press.

Paul, Hermann

1880/ *Prinzipien der Sprachgeschichte* (5th edn. 1st edition 1880). Halle: Nie-

1970 meyer.

Sapir, Edward

1921 *Language*. New York: Harcourt, Brace, and World, Inc.

Saussure, Ferdinand de

1916/ *Course in Modern Linguistics*. Translated, *Cours de linguistique générale*

1959 (1916). Wade Baskin. New York: The Philosophical Library, Inc.

Whitney, William Dwight

1867 *Language and the Study of Language. Twelve lectures on the principles of linguistic science*. New York: Charles Scribner & Co.



## Analogy as optimization: ‘exceptions’ to Sievers’ Law in Gothic

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## 1. Lexical representations as a site of optimization

Suppose the phonological rules/constraints of the language are such that underlying /A/ and /B/ lead to the same output [A].

(1) Underlying: /A/                  /B/  
Output: [A]

Lexical Phonology and Morphology (LPM) dictates that non-alternating [A] is then analyzed

- (a) as underlying /A/, other things being equal, but
- (b) as underlying /B/, if /B/ conforms better to the constraints on underlying representations.

Case (a) has been familiar for a long time, and is supported by a fair amount of historical evidence (Kiparsky 1968, 1973). It was adopted by Natural Generative Grammar (Vennemann 1973; Hooper 1976) and by Natural Phonology (Stampe 1972/1980). Prince and Smolensky (1993) dub it *lexicon optimization*, and show that it is a consequence of basic assumptions of OT.

It is case (b) that is controversial. Although it follows from LPM, where constraints on the phonological inventory or morpheme structure of a language are defined by its lexical phonology and morphology, it does not follow from theories such as those assumed in much current OT phonology, which define optimality only on output representations, and claim that the structure of the lexical input is derivative just from those constraints. Therefore evidence for (b) also calls into question the adequacy of such output-oriented theories.

This paper will contribute such evidence, in the form of analogical changes at the level of lexical (underlying) representations, driven by

constraints dominated at the level of output representations. The most interesting cases show that, under the stated conditions, /B/ is preferred even if it always occurs in a context where it is realized as [A].

Case (b) is of theoretical interest in another respect as well. It implies, as a diachronic corollary, the possibility that lexical constraints may induce reanalysis of [A] from /A/ to /B/. As usual, such reanalyses may be initially covert, and have overt consequences when /B/ is either generalized to new environments where its output is distinct from the output of /A/, or when /B/ triggers contextual effects that were not triggered by /A/. Viewed in terms of the pre-reanalysis underlying form /A/, the overt consequences of the reanalysis to /B/ can appear as phonological complications (exceptions, morphological conditions), or as ‘Paradigm Uniformity’ effects (for which workers in OT have proposed Output/Output or Paradigm Uniformity conditions). In reality, the phonology is unchanged—rather, it is the morphology that is simplified. Such reanalyses form part of a larger body of evidence demonstrating the insufficiency of proportional and other purely output-based accounts of analogy.

Before embarking on the argument, a word of caution. Material from a dead language obviously has certain limitations. Inevitably, the written documents on which our knowledge of Gothic is based leave out a lot of phonetic detail, and some types of words are accidentally lacking in the corpus. Still, the texts offer a remarkably consistent and largely complete rendering of the language’s contrastive phonological properties. We will not go far astray in inferring the output of the lexical phonology from them. If the details of Gothic pronunciation were accessible to study, we might well find, as in other languages, an overlay of additional postlexical processes.

## **2. The aftermath of Sievers’ Law in Gothic *ja*-stems**

The historical changes I will be concerned with here involve the morphological reorganization of allomorphy originally due to the phonological operation of Sievers’ Law in Gothic.

The paradigms in (2) show the inflection of singular *ja*-stem nouns in Gothic:<sup>1</sup>

(2)	Masculine nouns		Neuter nouns	
	Light	Heavy	Light	Heavy
NOM	<b>harjis</b>	herdiis	kuni	riiki
GEN	harjis	herdiis	kunjis	<b>riikjis</b>
DAT	harja	herdja	kunja	riikja
ACC	hari	herdi	kuni	riiki
	‘army’	‘shepherd’	‘kin(d)’	‘kingdom’

The alternation in the masculine (*harjis* vs. *herdiis*) is ultimately due to Sievers’ Law, a process that dates back at least to Proto-Germanic, by which glides were vocalized after heavy syllables. The Gothic paradigms in (2) reflect Sievers’ Law only indirectly, however, for they are descended from the reconstructed earlier stage in (3).

(3)	Masculine nouns		Neuter nouns	
	Light	Heavy	Light	Heavy
NOM	* <b>haris</b>	herdiis	kuni	riiki
GEN	harjis	herdiis	kunjis	* <b>riikiis</b>
DAT	harja	herdja	kunja	riikja
ACC	hari	herdi	kuni	riiki
	‘army’	‘shepherd’	‘kin(d)’	‘kingdom’

(2) developed from (3) by the analogical spread of *-jis* beyond its original phonologically conditioned limits in the two boldfaced forms. (3) represents the direct Gothic reflex of the original weight-conditioned *j/i* alternation. As (2) shows, the alternation was modified in the nominative masculine, and eliminated altogether in the neuter.

An important point is that the ending *-jis* seems to have spread in the light masculines earlier than in the heavy neuters. This relative chronology can be inferred from the fact that no residual forms like \**haris* are attested in the Gothic texts, whereas a number of heavy neuter forms in *-iis* (such as *andbahtiis*) still occur alongside the new type *riikjis*.

The change \**riikiis* > *riikjis* has been considered a case of analogy that creates exceptions to Sievers’ Law and complicates the grammatical system.<sup>2</sup> I claim that the contrary is true. No exceptions develop and

there is no morphologization. In fact, the change from (3) to (2) is a *simplification* of the system. It consists of a restructuring of nominal stems which brings them into line with a morphological constraint that arose within Gothic through final syncope. This sound change largely eliminated stems ending in short vowels. Remaining stems ending in short vowels came increasingly under the sway of the synchronic form of this constraint, and were adjusted to conform to it by analogical changes which changed their lexical form.

My evidence for this interpretation of the change from (3) to (2) is twofold. First, it unifies the changes with a more widespread pattern of restructuring in the nominal and verbal morphology, including the changes in (4).

- (4) a. The introduction of *-w* in the declension of *-wa* stems, e.g. *\*triggus* > *triggws* 'faithful', *\*worstu* > *worstw* 'work';
- b. the restoration of *-w* in the past tense of strong verbs, e.g. *\*walu* > *walw* 'robbed';
- c. the lengthening of final *-i* in the 2SG imperative of weak verbs of the first class, e.g. *\*nasi* > *nasii* 'save!', *\*sooki* > *sookii* 'seek!'.

Secondly, unlike previous analogical accounts it provides a rationale for the conditions under which the change in the nominal inflection occurred. It explains why precisely the changes *\*riikiis* > *riikjis* and *\*haris* > *harjis* took place, and other similar changes did not. Specifically, it offers answers to the following questions:

- (5) a. Why did only masculines change in the NOM.SG? Why not neuter *kuni* > *\*kunji*, like masculine *\*haris* > *harjis*?
- b. If heavy stems analogized to light stems in the GEN.SG of neuter nouns (heavy *\*riikiis* > *riikjis* on the model of light *kunjis*), why did heavy stems not analogize to light stems in the GEN.SG of masculine nouns? I.e. why not *herdiis* > *\*herdjis*, by analogy with *harjis*?
- c. Why did heavy stems not analogize to light stems in the weak *-jan* verbs? I.e. why not *sookiis* > *\*sookjis*, by analogy with light *nasjis*? See (6).

- d. Why did heavy stems not analogize to light stems in the GEN.SG of neuter adjectives? I.e. why not *wilþiis* > *\*wilþjis*, by analogy with *midjis*? See (6).

(6)	Neuter adjectives		Weak <i>jan</i> -verbs	
	Light	Heavy	Light	Heavy
GEN.SG	<i>midjis</i>	<i>wilþiis</i>	2SG <i>nasjis</i>	<i>sookiis</i>
NOM.PL	<i>midja</i>	<i>wilþja</i>	1SG <i>nasja</i>	<i>sookja</i>
	'mid'	'wild'	'save'	'seek'

In order to relate the changes from (3) to (2) to the other changes in (4), and to explain why the the hypothetical changes in (5) did not occur, we must first understand the phonology and morphology behind the pre-Gothic system (3). Its inflectional paradigms are determined both by phonological constraints which govern the realization of morpheme combinations, and by morphological constraints which govern the underlying shapes of stems and affixes. Spelling out these constraints and their interaction in a precise way is a nontrivial task, but once that is accomplished, the relationship to the changes in (4) will be obvious and the questions in (5) will practically answer themselves.

In what follows I first outline and justify the assumptions I make about Gothic phonology (Section 3) and morphology (Sections 4 and 5). I then show how these assumptions explain the morphological innovations in the nouns (Section 6) and in the verbs (Section 7). In Section 8 I state the constraints explicitly and provide constraint tables for the relevant forms. Section 9 restates the changes with a view to showing their structural affinity.

### 3. Gothic syllabification

On the phonological side, the main question is what lies behind the effects of syllable weight on the shape of *ja*-stems. Here I follow up a proposal introduced in Kiparsky (1998), which (like those of Dresher and Lahiri 1991, Riad 1992, and Calabrese 1994) treats Sievers' Law as a process of syllabification governed by metrical structure, but (unlike theirs) derives it as a direct result of the optimal parsing of words

into left-headed bimoraic feet (moraic trochees). The main idea is that syllabification avoids sequences which cannot be so parsed, given that the word-initial syllable must be stressed. Specifically, syllabification avoids initial light-heavy (LH) sequences, and syllables which contain more than two moras. A special dispensation holds at the end of a word, where a final mora may be extrametrical, thereby escaping the foot maximum constraint.

On these assumptions, the contrast between heavy and light stems in the genitive singular is derived by optimization of syllable and foot structure as follows:

- (7) a. GEN.SG /hari+is/ → [har].[jis] (not \**ha.riis* because an LH sequence cannot be exhaustively parsed into moraic trochees: parsed as [L][H], the first foot is too short, parsed as [LH], it is too long)
- b. GEN.SG /herdi+is/ → [her].[dii]s (\**herd.jis* has a non-final three-mora syllable)
- c. GEN.SG /ragini+is/ → [ra.gi].[nii]s (\**ra.gin.jis* cannot be exhaustively parsed into moraic trochees)

The metrical constraints are complemented by constraints on syllable margins, namely ONSET (a syllable must have an onset), \*COMPLEX (no consonant clusters), and \*Cj (no consonant clusters containing *j*), of which the last is undominated and hence unviolated, while the other two are dominated by the major metrical constraints.

The existence of an undominated \*Cj constraint means that Cj clusters are categorically excluded, while other clusters are merely disfavored. There are several pieces of independent evidence for this special status of Cj. First, in initial position Gothic allows CR- clusters, including Cw- clusters, but rigorously excludes all Cj- clusters. For example, there are words like *twai* ‘two’, *þwahan* ‘wash’, *swikns* ‘pure’, *dwals* ‘foolish’,<sup>3</sup> but there are no words beginning with \*tj-, \*þj-, \*sj-, \*dj-. Secondly, scribal practice indicates that medial VCjV was always syllabified as VC.jV, whereas other medial CR clusters were syllabified as VC.RV or V.CRV depending on syllable weight and foot structure:

- (8) a.  $\bar{V}.CRV$  ( $\bar{V}C.RV$  would have an initial three-mora syllable)  
 b.  $VC.CRV$  ( $VCC.RV$  would have an initial three-mora syllable)  
 c.  $\check{V}C.RV$  ( $\check{V}.CRV$  has a complex onset)

This pattern is observed in the word divisions of two major Gothic manuscripts (see Kiparsky 1998 and references cited there for fuller discussion).

The claim that Gothic foot structure is based on moraic trochees differs from previous accounts in predicting that disyllabic Heavy+Light disyllables pattern metrically with Light monosyllables, rather than with Heavy monosyllables. This prediction is supported by comparative Germanic phonology, and by such internal Gothic evidence as can be gleaned from scribal practice. Thus, *iupabroo* ‘from above’ is divided as *iupab|roo*, reflecting a metrical structure [iu].[paβ].[roo], rather than \*[iu].pa.[proo], with an unparsable syllable.

Since syllabification is predictable in Gothic, there is no lexical contrast between /i/ and /j/, or between /u/ and /w/.<sup>4</sup> I will write /i/ for the alternating segment in words like [harj-] ~ [hari-] ‘army’. While nothing at this point hangs on that choice, it is a principled one, for the constraint system to be introduced below selects /hari/ over /harj/ as the optimal lexical representation because the latter violates a more highly ranked constraint, namely *Cj*.

I further assume that tautosyllabic *Vi* and *Vj* (including *ii* and *ij*) are the same thing, not only in segmental content—since /i/ and /j/ are not featurally distinct—but also in syllabic structure, namely, both constitute a long nucleus of the form  $[\mu_s\mu_w]\sigma$ .

Heterosyllabic *i.V*, *i.jV* and *V.i*, *V.ji* (including *i.i* and *i.ji*) are excluded in Gothic. *i.V*, *V.i* violate ONSET. ONSET dominates the FAITHFULNESS constraints that preserve the input’s syllable structure in the output, so word-internally hiatus is eliminated by glide formation and contraction of like vowels wherever possible. This happens without exception in the native vocabulary; and in Greek loans, *ia* is often replaced by Gothic *ja*, e.g. *Mapia* > *Marja*, *Ἀντιόχεια* > *Antiokja* (Braune and Ebbinghaus 1961; Calabrese 1994). But melodic FAITHFULNESS in turn dominates ONSET, which means that hiatus cannot be removed by deletion or epenthesis. Hiatus therefore occurs even in

the native vocabulary where glide formation and contraction cannot apply. Such cases include *e.V* in *Ce-* reduplication of vowel-initial verbs, e.g. /e.auk/ (spelled *aiauk*) ‘increased’, and initial *CiV-* sequences such as /fi+an/ → [fi.an] (spelled *fian*, *fijan*) ‘hate’.<sup>5</sup>

As for *i.jV*, *V.ji* we must take care to exclude both the representation with two *i* melodies and the representation with one *i* melody spread over two syllabic positions. The two-melody representation is excluded by the OCP, assumed to be undominated, and the shared single-melody representation is excluded by the ONSET constraint, formulated as requiring a melodically independent and non-empty onset consonant.

#### 4. Allomorphy

With these phonological prerequisites in place, we are ready to return to the *ja*-stems. The first question is how to deal with the contrast between light and heavy nominatives in the original system (3). Light stem nominatives such as *\*haris* are unproblematically segmentable as /hari+s/, with the stem /hari/ that forms the basis for the entire paradigm, and the normal nominative ending /-s/. It is the long vowel in heavy stem nominatives such as *herdiis* that is the problem. Synchronically, no phonological process of Gothic, and certainly no version of Sievers’ Law, could turn /herdi+s/ into *herdiis*. Its long vowel must therefore be accounted for by positing a different underlying form for the nominative of heavy stems—either a different ending, as in (9a) or a different stem, as in (9b):

- (9) a. *Suffix allomorphy*: heavy stems take a NOM.SG allomorph /-is/,  
or  
b. *Stem allomorphy*: heavy stems have a NOM.SG stem in /-ii/.

Previous treatments have all assumed suffix allomorphy as in (9a) as a matter of course, but for no particular reason. In fact it is the inferior alternative, because it fails to relate the allomorphy to anything else in the language, and posits suffix shapes and alternation patterns otherwise



unknown in Gothic, whereas the stem allomorphy solution conforms to the rest of Gothic inflectional morphology and allows a significantly simpler overall analysis.

In the first place, the NOM.SG ending /-is/ postulated by the stem allomorphy solution would be exceptional, for the NOM.SG in other declensions is either /-s/ (*dags, gasts, qeens, sunus, nasjands, borgs*), or null (*word, giba, mawi, guma, tungoo, broopar*). Secondly, suffix selection governed by syllable weight of stem would be exceptional in Gothic: elsewhere its case allomorphs are selected in accord with the gender and final segment of the stem. For example, the main synchronic rule for the distribution of the two nominatives just mentioned is that most non-neuter consonant stems have /-s/, and other stems have no ending.

If, on the other hand, the alternations are treated as stem allomorphy (solution (9b)), they fit tidily into Gothic morphology as part of a larger pattern of stem alternations. Also, the context of the alternation can then be stated in a more general way. The long stem /herdii/ in *herdiis* is the *bound stem*, selected before *any* case ending, and the short stem /herdi/ in ACC.SG *herdi* is the *free stem*, selected when no case ending follows. This is because phonological constraints neutralize /-ii+V/ and /-i+V/ to -jV. For example, the optimal output of both /herdi+a/ and /herdii+a/ is *herdja*.

Once the V ~ VV-alternation of the *ja*-stems is generalized in this way, a further unifying theme emerges. The alternation falls in with a system of free/bound stem allomorphy that runs through the whole nominal morphology. In particular, there is a closely parallel V ~ VV-alternation in the *ō*- and *jō*- stems:<sup>6</sup>

- (10) a. *ja*-stems: free stem *herdi*, bound stem *herdii*- (e.g. GEN.SG *herdiis* 'shepherd')
- b. *ō*-stems: free stem *herda*, bound stem *herdoo*- (e.g. GEN.SG *herdoos* 'herd'; *a:oo* is the regular length alternation in low vowels)
- c. *jō*-stems: free stem *banja*, bound stem *banjoo*- (e.g. GEN.SG *banjoos* 'injury')

(11)		<i>ō</i> -stems	<i>jō</i> -stems
	SG	NOM	herda      banja
		GEN	herdoos    banjoos
		DAT	herdai     banjai
		ACC	herda     banja
	PL	NOM	herdoos    banjoos
		GEN	herdoo     banjoo
		DAT	herdooom   banjoom
		ACC	herdoos    banjoos
			‘herd’      ‘injury’

The dative singular is not an exception; its *-ai* is enforced by the fact that *-ooi* is an impossible diphthong in Gothic.

By the same token, two separate stem allomorphs need be posited only for that class of *ja*-stems where they are motivated by an overt alternation, namely in masculines. In neuters, a bound allomorph in */-ii/* could never be realized in the output, since they have no consonantal case endings. Because there is no positive reason to posit any allomorphy in neuters, simplicity (and lexicon optimization) dictate that they have a single underlying stem form.<sup>7</sup>

I conclude that Gothic morphophonology motivates the analysis of *herdiis* as */herdii+s/*, and more generally that heavy masculine *ja*-stems have a bound inflectional allomorph in */-ii/*.

## 5. The restructuring of nominal stems

In Proto-Germanic, most nominal stems ended in a vowel, e.g. *\*/daga-/* ‘day’, *\*/gasti-/* ‘guest’, although there were also some consonant stems, such as */broop(a)r-/* ‘brother’. At this stage, the stem-final vowel appeared overtly in most forms of the noun and would certainly have been part of the underlying representation. Subsequently, short vowels in word-final syllables were lost. As a result, former short-vowel noun stems were reanalyzed as consonant stems, e.g. *\*/daga/* as */dag/*, *\*/gasti/* as */gast/*, merging with original consonant stems. Nevertheless, the color of the original stem-final vowel continued to determine the shape of

certain inflectional endings in Gothic. For example, the endings of the accusative plural are *-ans*, *-ins*, or *-uns*, for the most part depending on whether the stem had formerly ended in *-a*, *i*, or *-u*. The resulting synchronic situation for Gothic is shown in (12).

(12)		<i>a</i> -stems	<i>i</i> -stems	<i>u</i> -stems	<i>r</i> -stems
SG	NOM	dags	gasts	sunus	broop̥ar
	GEN	dagis	gastis	sunaus	broop̥rs
	DAT	dags	gasta	sunau	broop̥r
	ACC	dag	gast	sunu	broop̥ar
PL	NOM	dagoos	gastiis	sunjus	broop̥rjus
	GEN	dagee	gastee	sunuwee	broop̥ree
	DAT	dagam	gastim	sunum	broop̥rum
	ACC	dagans	gastins	sununs	broop̥runs
		‘day’	‘guest’	‘son’	‘brother’

From the synchronic point of view, the vowel quality of the ending continues to be determined by the stem. The selection of suffixal allomorphy by the stem could be accounted for in two ways, (1) *declensionally*, with different stem classes determining particular sets of case endings, or (2) *phonologically*, with floating melodies corresponding to the lost stem vowel, which dock on to an empty nucleus in the case ending.

The difference between the declensional analysis and the phonological analysis can be illustrated by the accusative plural. The declensional analysis would posit three endings *-ans*, *-ins*, or *-uns*, respectively selected by noun stems like *dag-*, *gast-*, and *broop̥r-*. The phonological analysis would have just one accusative plural ending *-Vns*, with an unspecified vocalic nucleus which receives its segmental content from the floating stem-final melody, e.g. /dag<sup>a</sup>/, /gast<sup>i</sup>/, /broop̥r<sup>u</sup>/, /sun<sup>u</sup>/, /herdii<sup>a</sup>/. The theoretical justification for such an analysis comes from autosegmental phonology’s separation of syllabic skeleton and phonemic melody; in the case at hand, the stem is monosyllabic but has a final vowel in its phonemic melody, which can dock (subject to locality constraints) on a suffixal vowel.<sup>8</sup>

The choice between the declensional analysis and the phonological analysis with floating vowels is actually not crucial to what follows,

because the alternations in vowel color do not play much of a role in the analogical changes discussed here. It is syllable and foot structure and not vowel color that is really important here. In any case, the phonological analysis seems preferable because it captures a significant generalization about the Gothic data in (12), namely that for any given stem, the color of alternating suffix vowels is the same throughout the paradigm. For example, the stems that get accusative plural *-ans* also get dative plural *-am*, the stems that get accusative plural *-ins* also get dative plural *-im*, and the stems that get accusative plural *-uns* also get dative plural *-um*; similarly in the nominative plural. On a purely declensional analysis this would be an accident.

I will, therefore, be assuming the phonological analysis with floating vowels. Specifically, I posit the principal allomorphs of the declensional endings in (13), combining with the stem types shown in (14):

(13)	SG	PL
NOM	-s	-VVs
GEN	-is	-ee
DAT	-a	-Vm
ACC	-Ø	-Vns

(14)	NOM.SG	/dag <sup>a</sup> +s/ → <i>dags</i>
	GEN.SG	/dag <sup>a</sup> +is/ → <i>dagis</i>
	DAT.PL	/dag <sup>a</sup> +Vm/ → <i>dagam</i>
	NOM.PL	/dag <sup>a</sup> +VVs/ → <i>dagoos</i> (*aa → oo)
	NOM.SG	/gast <sup>i</sup> +s/ → <i>gasts</i>
	GEN.SG	/gast <sup>i</sup> +is/ → <i>gastis</i>
	DAT.PL	/gast <sup>i</sup> +Vm/ → <i>gastim</i>
	NOM.PL	/gast <sup>i</sup> +VVs/ → <i>gastiis</i>
	DAT.PL	/herdii <sup>a</sup> +Vm/ → <i>herdjam</i>
	NOM.PL	/herdii <sup>a</sup> +VVs/ → <i>herdjoos</i> (*aa → oo)
	DAT.PL	/giboo+Vm/ → <i>giboom</i>
	NOM.PL	/giboo+VVs/ → <i>giboos</i>

In the interests of simplicity, the floating vowel will be omitted from phonological representations below unless specifically relevant to the point.

The restructuring just outlined only affected short-vowel stems. Long vowels were retained in final syllables under certain conditions, and so Gothic retains bound allomorphs ending in underlying -VV, e.g. /giboo/. Indeed, the stock of inherited /-VV/ stem allomorphs was augmented by new ones that arose by analogy, as we shall see.

As a result of these developments, Gothic nominal and verbal inflectional stems tend to end either in -C (most original -V and -C stems) or in -VV (most original -VV stems). I assume that at this point Gothic acquires a constraint that stems should not end in a short vowel, which I dub STEM-FORM:

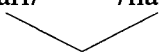
(15) STEM-FORM: \* $\check{V}$ ]<sub>STEM</sub>

STEM-FORM is dominated by certain Faithfulness and syllable structure constraints, and violable where those constraints demand it. Stems like /sunu/, and originally /hari/ as well, violate it in virtue of FAITHFULNESS to the underlying representation. Still, its synchronic effects are visible throughout the inflectional system, and its scope is extended to new cases by analogical change. In fact, the morphological changes we are considering, including not only the remodeling of the genitive singular of heavy neuter *ja*-stems (\**riikiis* > *riikjis*) and of the nominative singular of light masculine *ja*-stems (\**haris* > *harjis*), but also of *wa*-stems (\**triggus* > *triggws*, \**lasjus* > *lasiws*, \**worstu* > *worstw*), of the past tense of strong verbs (\**walu* > *walw*), and of the 2SG imperative of weak verbs in -*jan* (\**nasi* > *nasii*, \**sooki* > *sookii*), are so many generalizations of STEM-FORM, albeit with local variations due to other morphological factors.

With all the pieces of the puzzle now in place, we are ready to examine the analogical changes in the declension.

## 6. The innovations in the noun declension

The change from \**haris* to *harjis* in the nominative singular of light masculines can now be recognized as a *generalization of the bound form*: the /-ii/ stem<sup>9</sup> is extended to light stems. Prior to the change this stem type instantiates the situation represented by the schema in (1):

- (16) Underlying: /hari/      /harii/
- 
- Output: [harj-]

Of the two potential underlying forms for bound forms of the light stems, /-ii/ is preferred over /-i/, for two reasons. First, this form is positively required by the corresponding heavy stems, and secondly, it conforms to STEM-FORM. The generalization of the bound /-ii/ stem to short masculines thus both eliminates the weight condition from the allomorphy, making for a more general distribution of stem classes, and optimizes a class of stems by bringing them into complicity with the STEM-FORM constraint. In that respect, the innovation increases the simplicity and system-conformity of the grammatical system.

In most of the paradigm, the change is *covert*, in that the new base form yields the same output as the old base form did. For example, the change from /hari+a/ to /harii+a/ does not alter the output *harja*. But there is an *overt* effect in the nominative singular, where the change of underlying /hari+s/ to /harii+s/ entails the surface change of \**haris* to *harjis*, in accord with the constraints of Gothic phonology. The overt and covert changes for three of the singular forms are shown in (17).

(17) Old system		New system		
Underlying	Surface	Underlying	Surface	
/hari+a/	<i>harja</i>	/harii+a/	<i>harja</i>	(covert change)
/hari+is/	<i>harjis</i>	/harii+is/	<i>harjis</i>	(covert change)
/hari+s/	* <i>haris</i>	/harii+s/	<i>harjis</i>	(overt change)

Now consider the neuter *ja*-stems. Unlike the masculines, heavy neuters do not have an allomorph in /-ii/ because there is no alternation to motivate positing two allomorphs in the first place. Therefore, there is no question of neuters generalizing /-ii/ to light stems, as masculines did. This stem type retains a single underlying representation /riiki/—not /riikj/, in spite of STEM-FORM, because it would violate the higher-ranked, in fact undominated, constraint \*Cj, nor obviously /riikii/, which

would generate the wrong output *riikii* in the nominative and accusative singular.

Now consider the change in the genitive singular of heavy neuter stems, from *\*riiki+is* to *riikj+is*. We have just seen that the underlying form is /riiki+is/ in both stages. There are two competing realizations, the original *\*riiki+is* and the new *riikj+is*, of which each satisfies just one of two constraints, STEM-FORM, and \*SUPERHEAVY, which imposes a bimoraic foot maximum. The form *\*rii.ki+is* violates STEM-FORM, which prohibits a stem from ending in -V, but (in virtue of final C-extrametricity) it fulfills the requirement that syllables be maximally bimoraic. On the other hand, *riik.j+is* conforms to STEM-FORM but its three-mora first syllable exceeds the syllabic template. (The syllabification *\*rii.kj+is* with its forbidden Cj cluster violates an even more highly ranked constraint.) The historical change from *\*riikiis* to *riikjis* shows that the morphological constraint STEM-FORM has become more important than the phonological constraint on the size of the foot. Formally, the change corresponds to a *reranking*:<sup>10</sup>

- (18) a. Old system: \*SUPERHEAVY >> STEM-FORM (/riiki+is/ → *\*rii.ki+is*)  
 b. New system: STEM-FORM >> \*SUPERHEAVY (/riiki+is/ → *riik.j+is*)

Positing a reranking of STEM-FORM and \*SUPERHEAVY commits us to the prediction that other instances where these two constraints conflict should have changed in a parallel fashion. And this expectation is confirmed.

Another set of paradigms where syllable structure and stem shape place contradictory demands are the *wa*-stems. Here, the historically expected nominative singular forms in -u, -us have been replaced by forms in -w, -ws, e.g. *\*worstu* → *worstw* 'work', *\*triggu+s* → *triggw+s* 'faithful'. The reconstructed forms *\*worstu* and *\*triggu+s* obey \*SUPERHEAVY and violate STEM-FORM. The new forms *worstw* and *triggw+s* obey STEM-FORM and violate \*SUPERHEAVY. The appearance of -w, in spite of the resulting superheavy syllable, is thus another consequence of the promotion of the morphological constraint STEM-FORM over the phonological constraint \*SUPERHEAVY.<sup>11</sup>

- (19) a. Old system: \*SUPERHEAVY  $\gg$  STEM-FORM (output  
\**worstu*)  
b. New system: STEM-FORM  $\gg$  \*SUPERHEAVY (output  
*worstw*)

Another prosodic constraint, FOOT-FORM, which requires that words should be parsed into moraic trochees (feet consisting of long syllables or two short syllables) in turn dominates STEM-FORM; hence the output of /harii+s/ is *harjis* rather than \**hariis*.

Another reassertion of the morphological STEM-FORM constraint over prosodic markedness appears in the verb system. The analogical generalization of stem-final -w in the past tense of strong verbs, as in *walw*, for phonologically expected \**walu* (from *wilwan* 'rob'), and *blaggw*, for \**blaggu* (from *bliggwan* 'hit') extends the consonantal stem throughout the conjugation.

Moreover, our analysis explains why there was no parallel extension of -j in the free allomorph of *ja*-stems. From a purely morphological point of view, we might have expected *riiki*  $\rightarrow$  \**riikj*, like \**worstu*  $\rightarrow$  *worstw*. We know from Section 3 that *Cj* clusters are barred by a more stringent (higher-ranked, in fact undominated) constraint than all other consonant clusters, *Cw* included. Thus, the analogical changes are blocked by constraints that outrank the constraints that drive them. In this way, the analogical changes are shaped by the interplay of phonological and morphological conditions. STEM-FORM triggers only those analogical changes that its precise position in the ranked constraint system of the language enforces.

We have now provided a rationale for both morphological changes in (3) to (2). We have also answered the first question in (5). *Stem-Form* is generalized in two basic ways: underlying forms are modified to conform to it, and reranking brings additional output forms under its sway. Is there a connection between these changes? My guess is that there is, in that analogical change tends to make constraints dominant in the measure that they are unviolated. The more STEM-FORM approaches surface-trueness, the greater the pressure to eliminate the remaining violations of it.

I now turn to a final class of changes driven by STEM-FORM, after which I will formulate the constraint system and the relevant constraint