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Journal

Proceedings of the Annual Meeting of the Berkeley Linguistics Society, 2(2)

ISSN

2377-1666

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Publication Date

1976

Peer reviewed

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Proceedings of the 2nd Annual Meeting of the Berkeley Linguistics Society (1976), pp. 330-338

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The Annual Proceedings of the Berkeley Linguistics Society is published online via [eLanguage](#), the Linguistic Society of America's digital publishing platform.

BOUNDARIES and GRASSMANN'S LAW in SANSKRIT

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In attempting to find support for his account of the Sanskrit diaspirates, Hoard (1975) advances fallacious theoretical arguments and overlooks counterexamples to his statement of Grassmann's Law, which he adopts from Jensen (1974). It is my intention to show that even if Hoard's rules are revised so as to account for the facts, the analysis in Phelps (1975) is preferable because it derives from sounder theoretical principles.

The Sanskrit roots that begin and end with underlying voiced aspirates exhibit the following kinds of phonetic alternations:

- (1) bhudh- 'know; be awake'
- | | | | | |
|----|-----------|---|--------------|----------------------|
| a. | bhotsyati | < | bhodh-sya-ti | future, 3rd singular |
| b. | bhuddhis | < | bhudh-bhis | instrumental plural |
| c. | buddha | < | bhudh-ta | participle |
| d. | budham | < | bhudh-am | accusative singular |
| e. | bhut | < | bhudh-s | nominative singular |

There is general (although not universal) agreement that these and similar forms are to be accounted for by the following rules which would be required even if the diaspirates did not exist: Bartholomae's Law, which voices and aspirates t and th if they immediately follow a voiced aspirate (1c); Grassmann's Law, which is a rule of aspirate dissimilation that operates across intervening segments (1c, 1d); a rule (or rules) that deaspirates consonants before obstruents and word boundary (1a, 1b, 1c, 1e); and a rule of regressive voicing assimilation (1a, 1e). Controversy has centered around the ordering of the rules and their explicit content.

Hoard states that his 1975 analysis "differs only in minor ways from the earlier one of 1973", but this is inaccurate, since the later analysis is far less successful than the previous one. Following are the ordered rules that Hoard presents in his revision.

- (2) a. Deaspiration of Consonants (DC)
- $$[+asp] \rightarrow [-asp] / ___ \#$$
- b. Grassmann's Law (GL)
- $$\begin{bmatrix} -syll \\ +cons \\ +obst \end{bmatrix} \rightarrow [-asp] / ___ X \begin{bmatrix} -syll \\ +cons \\ +obst \\ +asp \end{bmatrix}$$
- c. Bartholomae's Law (BL)
- $$\begin{bmatrix} +voice \\ +asp \\ +obst \end{bmatrix} + \begin{bmatrix} -cont \\ +obst \end{bmatrix} \rightarrow \begin{bmatrix} +voice \\ -asp \end{bmatrix} + \begin{bmatrix} +voice \\ +asp \end{bmatrix}$$

Note that in this and the following set of rules there is no general rule that deaspirates consonants before obstruents. As we shall see, this requires the introduction of the # boundary in phonologically conditioned contexts.

For the purpose of comparison, the rules of Hoard's earlier version are given below.

(3) a. Deaspiration of Consonants = (2a)

b. Grassmann's Law

$$[+asp] \rightarrow [-asp] / \text{ ______ } V (C) \begin{bmatrix} +asp \\ +Root \end{bmatrix}$$

c. Bartholomae's Law

$$\begin{bmatrix} +voice \\ +asp \end{bmatrix} + \begin{bmatrix} -voice \\ -cont \end{bmatrix} \rightarrow \begin{bmatrix} +voice \\ -asp \end{bmatrix} + \begin{bmatrix} +voice \\ +asp \end{bmatrix}$$

Grassmann's Law applies iteratively, from left to right: bha+bhandh+a > ba+bhandh+a > ba+bandh+a. Hoard mistakenly states that Grassmann's Law is self-bleeding. He also implies that the direction of application is predictable from general principles, but there are counterexamples to each such principle that has been proposed. Both sets of rules are supposed to yield the following derivations.

(4)	dhugh+tha:m	dhugh#dhvam	bhibhr#tha	bhodh#sya+ti
DC	--	dhug#dhvam	--	bhod#sya+ti
GL	dugh+tha:m	--	bibhr#tha	--
BL	dug+dha:m	--	--	--
other	--	--	--	bhot#sya+ti

Hoard errs in assuming that the elimination of the specification [+Root] from the statement of Grassmann's Law in (2b) is a correct generalization. This form of the rule, taken from Jensen (1974), cannot account for the facts of Sanskrit. Jensen proposes a Relevancy Condition (1974:680) that is intended to determine what the variable X can represent. (Odden (1975) demonstrates that the relevancy condition fails seriously in a variety of ways.)

(5) Only IRRELEVANT segments may intervene between focus and determinant in phonological rules. The class of segments defined by the features common to the input and determinant of a rule is the class of segments RELEVANT to that rule, provided at least one of the common features is a major class feature. If there is no common major class feature, then ALL segments are relevant.

In order to allow X to represent nonobstruents in Grassmann's Law, redundant major class features must be included in the statement of the rule; since all [+asp] segments in Sanskrit are [-syll, +cons, +obst], these feature specifications are not otherwise needed.

There are two defects in the rule, however. First, s is an obstruent, and Grassmann's Law must be allowed to operate across s, as in tiṣṭha-, the reduplicated present stem of stha:- 'stand', from underlying thi+stha:-. It would therefore be necessary to add [-cont] to both terms of the structural description so as to include s in X.

This is the least of the failings of this version of Grassmann's Law. Without the specification [+Root], aspirates in suffixes will also condition deaspiration. Hoard asserts that this is in fact the case, and offers in evidence two highly irregular second person singular imperative forms containing the suffix -dhi. But Hoard and Jensen have overlooked the consequences for this version of Grassmann's Law that follow from the fact that, by universal convention, X may have a null expansion. That is, the presence of X in a rule, in conjunction with the relevancy condition, indicates the permissible segments that may, but need not, be intervening material; the presence or absence of the segments represented by X is irrelevant to the operation of the rule. Therefore, instead of the derivation shown in (4) for dugdha:m, we actually have the following, where the aspirate in the suffix deaspirates the root-final aspirate.

(6)		dhugh+tha:m
	DC (2a)	--
	GL (2b), 1st application	dugh+tha:m
	GL 2nd application	dug+tha:m
	BL (2c)	--
	(voicing assimilation)	*duk+tha:m

Thus, every time that an aspirate is immediately followed by a suffix-initial th, that is, when X is null, Grassmann's Law will incorrectly bleed Bartholomae's Law. In cases such as these, there is no remedy to be found in appealing to a difference in the boundary that occurs before the suffix, as Hoard does in the derivations of (4) and elsewhere. Bartholomae's Law is a rule of internal sandhi; it applies only across the + boundary, and only if the segment that precedes t or th is a voiced aspirate. No one disputes these conditions on the rule.

There are further problems associated with the absence of [+Root] from the statement of Grassmann's Law. Consider the following, which are representative of a large number of similar forms.

- (7) a. bhudh- 'know; be awake'
 bubudhathus < bhu+bhudh+athus, perf. ind., 2nd dual act.
 bubudha:the < bhu+bhudh+a:the, perf. ind., 2nd dual mid.
- b. bhu:- 'be'
 babhu:tha < bha+bhu:+tha, perf. ind., 2nd sing. act.
 babhu:vathus < bha+bhu:+athus, perf. ind., 2nd dual act.

c. bhr̥- 'bear'

bibhr̥thas < bhi+bhr̥+thas, pres. ind., 2nd dual act.

bibhra:the < bhi+bhr̥+a:the, pres. ind. 2nd dual mid.

bibhr̥tha < bhi+bhr̥+tha, pres. ind., 2nd pl. act.

d. stha:- 'stand'

asthitha:s < a+stha:+(i)+tha:s, aorist, 2nd dual act.

It is apparent from these examples that some device must be used to prevent the aspirates of the suffixes from deaspirating the aspirates of the roots. According to Hoard, it is the presence of the # boundary before the suffix that prevents Grassmann's Law from operating, as in the derivation of bibhr̥tha from underlying bhi+bhr̥#tha (4). However, as the following derivations show, no matter which boundary is assumed to occur before the suffix, the correct result cannot be obtained for the bhudh- forms (7a).

(8)	bhu+ <u>bhudh</u> +athus	bhu+ <u>bhudh#</u> athus
DC (2a)	—	bhu+ <u>bhud</u> #athus
GL (2b)	bu+ <u>bhudh</u> +athus	bu+ <u>bhud</u> #athus
GL	bu+ <u>budh</u> +athus	—
GL	bu+ <u>bud</u> +athus	—
BL	—	—
	* <u>bubud</u> athus	* <u>bubhud</u> athus

These and similar forms demonstrate that [+Root] must be included in Grassmann's Law.

The use of different word-internal boundaries, + versus #, is well motivated in Sanskrit, but this is true only for a relatively small number of suffixes where # is needed to explain other facts that are unrelated to Grassmann's Law or Bartholomae's Law. But, having made this important contribution to the solution of the diaspirate problem in his 1973 paper (earlier, and unknown to Hoard, also proposed by P. Stanley (1972)), Hoard has extended the use of this device in a totally arbitrary way in order to maintain the patently counterfactual assumption that suffix aspirates effect deaspiration by Grassmann's Law.

There is more at issue here than the empirical adequacy of the analysis. The evidence of (6) and (8) shows only that Grassmann's Law must include [+Root]. However, we must also consider whether the theory should permit the introduction of special boundaries in phonologically defined contexts. Under Hoard's analysis, the # boundary must occur before all nine conjugational suffixes that contain th if the suffix is preceded by a root that contains an aspirate followed by nonobstruents (or s). Note that this is almost identical to the context for the version of Grassmann's Law that Hoard is using. In no way could this be construed as a morphologically conditioned exception feature, which Hoard suggests it is, since the presence of # in these cases is completely

determined by the phonological structure of the root and an aspirate in the suffix.

This nonexplanatory use of boundary distinctions is not limited to the cases just mentioned. In Hoard's earlier analysis, as well as in the one under discussion, the # boundary has to be assumed before every suffix that begins with s (not just before the two suffixes he mentions) if the suffix is directly preceded by an aspirate. This is the result of Hoard's contention that there is no separate rule of internal deaspiration in Sanskrit. Root-final deaspiration is attributed by him either to the # boundary or to Bartholomae's Law. Thus, forms such as the following must all have # before the suffix.

(9) dhugh- 'milk'

adhuk-ṣa-	aojist stem
dhok-ṣya-	future stem
dudhuk-ṣa-	desiderative stem
dhuk-ṣva	imperative, 2nd sing. middle
dhok-ṣi	pres. ind., 2nd sing. active
dhuk-ṣe	pres. ind., 2nd sing. middle

Unlike the situation for other suffixes such as -su (locative plural), there is no independent evidence that any of these suffixes requires the # boundary. Here, the occurrence of # is completely predictable from the presence of a final aspirate in the root and an initial s in the suffix, a phonologically determined context. It is this # that is supposed to account for the nonapplication of Grassmann's Law via the bleeding effect of Deaspiration (2a), as in bhodh#syati > bhotsyati (4). But such forms can be explained without the use of internal # boundaries.

As stated earlier, there is a process of regressive voicing assimilation in Sanskrit, as shown in the following rules (Phelps 1975).

(10) a. Bartholomae's Law (BL)

$$\begin{bmatrix} -\text{voice} \\ -\text{cont} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{voice} \\ +\text{asp} \end{bmatrix} / \begin{bmatrix} +\text{voice} \\ +\text{asp} \end{bmatrix} \text{ ---}$$

b. Regressive Voicing Assimilation (RVA)

$$[+\text{obst}] \rightarrow [\alpha \text{voice}] / \text{---} (\#) \begin{bmatrix} +\text{obst} \\ \alpha \text{voice} \end{bmatrix}$$

c. External Deaspiration (ED) = (2a)

$$[+\text{asp}] \rightarrow [-\text{asp}] / \text{---} \#$$

d. Grassmann's Law (GL)

$$\left[\begin{array}{c} +asp \\ \alpha voice \end{array} \right] \rightarrow [-asp] / ___ [+seg]_1 \left[\begin{array}{c} +asp \\ +Root \\ \alpha voice \end{array} \right]$$

e. Internal Deaspiration (ID)

$$[+asp] \rightarrow [-asp] / ___ [+obst]$$

By restricting Grassmann's Law to aspirates that agree in voicing, and requiring the second aspirate to be [+Root], all of the phonetic variations in aspiration are accounted for as follows.

(11)	bhu+bhudh+athus	bhodh+sya+ti	bhudh#bhis	bhudh+ta
BL	---	---	---	bhudh+dha
RVA	---	bhoth+sya+ti	"	"
ED	---	---	bhud#bhis	---
GL	bu+bhudh+athus	---	---	budh+dha
GL	bu+budh+athus	---	---	---
ID	---	bhot+sya+ti	---	bud+dha
	bubudhathus	bhotsyati	bhuddbhis	buddha

Under this analysis, unlike Hoard's, the rules interact with one another in ways largely determined by the segmental structure of the strings to which they apply. With two exceptions, the # boundary that is posited before certain inflectional suffixes is needed to account for phonetic facts unrelated to Grassmann's Law. The two exceptions are the 2nd plural middle endings, -dhve and -dhvam. Diaspirates before these endings retain the initial aspirate: dhugd^hve, dhugd^hh^hvam. However, diaspirates before the 2nd singular active imperative ending, -dhi, do not retain the initial aspirate: dugd^hi. Since there is no phonetic basis for distinguishing between these cases, it is assumed that the # boundary occurs after aspirates before the suffixes -dhve and -dhvam, while the + boundary occurs before -dhi.

These rules, in contrast to Hoard's, provide a phonetic explanation for the fact that diaspirates that condition Bartholomae's Law also undergo Grassmann's Law: Bartholomae's Law prevents Regressive Voicing Assimilation from bleeding Grassmann's Law, as in bhudh+ta > buddha, compared with bhodh+sya+ti > bhotsyati.

Hoard objects to the inclusion of [α voice] in Grassmann's Law, stating (1975:217):

- (12) The formulation of GL with [α voice] is not well motivated. There are no diaspirate forms in Sanskrit which differ in voicing ... Independent evidence for including [α voice] is lacking because there are no roots like *bhath which would simply go through the rules unaltered ... While ED (= DC) is independently well motivated and bleeds the independently well motivated version of GL

that contains no α -variables, one is led to conclude that adding [α voice] to GL is merely a device which allows the independently well motivated rule RVA to bleed a now parasitic version of GL.

What this says is that phonetic contrasts, if derived and not underlying, cannot motivate rules, that the motivation for rules must be based on underlying contrasts, a suggestion that cannot be taken seriously by anyone who is concerned about the acquisition of language, the phonetic basis of phonological rules, or the abstractness of grammars. It would mean that rules of absolute neutralization, which some phonologists would exclude entirely, would be among the best motivated rules because they apply only if there is an underlying contrast that is never directly manifested phonetically. The actual state of affairs is that rules of absolute neutralization, when they are countenanced at all, require more justification than phonetically motivated rules.

Hoard's discussion of "independent motivation" is particularly incongruous in the context of an analysis that proliferates internal # boundaries whose sole motivation is to prevent suffix aspirates from triggering Grassmann's Law in derivations where the "independently well motivated" rule of External Deaspiration plays no role at all, as in bhi+bhṛ#tha > bibhṛtha. Underlying representations, including boundaries, must be as well motivated as the rules that relate them to surface forms.

Part of the problem of accounting for the diaspirates arises from the fact that Grassmann's Law is opaque in two ways. First, the root aspirate that conditions the deaspiration is often phonetically absent, but may be inferred from related forms, as in budham versus buddha. Second, there are forms which one would expect to behave similarly in respect to Grassmann's Law but which do not, as in dhugdhve versus dugdhi. But there is one phonetic situation in which Grassmann's Law never applies in Classical Sanskrit, and that is when the two underlying aspirates disagree phonetically in voicing. Thus, since dhadh-, the reduced reduplicated stem of the root dha:- 'put', is an exception to Bartholomae's Law, Grassmann's Law does not apply in the following forms because Regressive Voicing Assimilation devoices the second aspirate: dhadh+ta > dhatta, dhadh+tha > dhattha.¹ This is the one phonetically transparent fact associated with Grassmann's Law, but, according to Hoard, incorporating this information into the rule is unmotivated because there are no underlying forms in which the two aspirates disagree in voicing. He goes on to say:

- (13) Complicating GL so that RVA bleeds it may seem an innocuous strategy. But it is not. On the contrary, it must be a basic tenet of (natural) phonology that each phonological rule of a language be independently motivated in its entirety; that is, each rule must be stated in the most general way. Only if each rule is independently motivated in its entirety can questions concerning how rules interact

in a phonology have empirical significance ... Moreover, the whole enterprise of determining what constitutes a natural process or rule is also ultimately pointless in the absence of this tenet.

It seems to me, then, that, because GL has been 'degeneralized' to allow RVA to bleed it, Phelps' solution does not meet this very basic criterion of phonologies.

Although this passage rings with phrases that should stir the heart of any generative phonologist, it is totally lacking in substance. Hoard fails to grasp the distinction between rules and underlying representations that have a direct phonetic basis, and rules and underlying representations that can only be inferred from indirect evidence. It is the latter, not the former, of which it makes sense to say that they account for facts other than the ones for which they are proposed, that is, that there is independent evidence to support them. It is meaningless to talk of independent motivation in any other context, or to equate independent motivation with generality of rules.

I have no disagreement with the goal of stating rules in the most general way, provided the rules are also consistent with the facts. Some generalizations, however, are spurious, as we have seen in the case of Grassmann's Law without the specification [+Root], because they cannot be made to accord with the facts. Furthermore, a given rule must be evaluated in the context of a given grammar, not in isolation. It is not sufficient to compare two statements of a rule and select, on the basis of this comparison alone, the grammar that includes the more general rule. The generalization may have been purchased at the price of complicating other parts of the grammar. In this connection, it might be instructive to review the devices that Hoard uses to deal with deaspiration before obstruents.

In order to get by without a rule of Internal Deaspiration, Hoard requires exception features that introduce word-internal # boundaries in phonologically defined contexts. He thus treats as exceptional what every other analysis accounts for by a phonetically based phonological rule, Internal Deaspiration. This allows him to "generalize" Grassmann's Law by not requiring the aspirates to agree in voicing, but only at the further expense of complicating Bartholomae's Law, which must now include deaspiration.

I suggest that whenever a phonetic alternation can be attributed to the phonetic context by a simple phonological rule, it must be the phonetic context and not an abstract boundary, or exception feature, or morphological condition that governs the alternation. Without such a principle, we lose any hope of discovering anything about the phonetic basis for phonological rules and how phonetically motivated rules interact in a grammar. It is this principle that requires the inclusion of the rule of Internal Deaspiration in the grammar of Sanskrit; it is this principle that requires the inclusion of [α voice] in Grassmann's Law; and it is this principle that disallows both of Hoard's analyses.

NOTE

¹Hoard accounts for this irregularity of dhadh- by "a lexical exception feature associated with dhadh", which he gives as:
 + --> # / _____ [t, th]. This makes it appear to be mere chance that # occurs before exactly those segments that are affected by Bartholomae's Law. Hoard apparently thinks that an exceptional boundary "explains" something that the exception feature [-EL] does not.

REFERENCES

- Hoard, J. E. 1973. On incorporating Grassmann's Law into Sanskrit phonology. Paper presented at the Western Conference on Linguistics, October, 1973.
- Hoard, J. E. 1975. On incorporating Grassmann's Law into Sanskrit phonology. Proceedings of the First Annual Meeting of the Berkeley Linguistics Society.
- Jensen, J. T. 1974. A constraint on variables in phonology. *Language* 50.4, 675-686.
- Odden, D. 1975. A note on constraining variables in phonology. Manuscript, University of Washington.
- Phelps, E. 1975. Sanskrit diaspirates. *Linguistic Inquiry* 6.3, 447-464.
- Stanley, P. C. 1972. Topics in Sanskrit Verb Phonology. Doctoral Dissertation, University of Texas, Austin.