

ON THE UNITY OF SANSKRIT ASPIRATION

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An important testing ground for the extent of and need for a relationship between phonological features and phonetic reality is to be found in the long-standing problem of the description of aspiration in Sanskrit. Sanskrit has two types of consonants with what is traditionally referred to as "aspiration", the so-called voiceless aspirated stops, **ph th th ch kh** (hereafter **Th**), and the so-called voiced aspirated stops, **bh dh dh jh gh** (hereafter **Dh**). Each of these stops stands in opposition to an unaspirated stop of like voicing at the same point of articulation, this giving a four-way opposition in the stops, e.g. **b : bh : ph : p**. Assuming that this traditional terminology has some basis in phonetic fact, this opposition between ostensibly aspirated and unaspirated elements would, at first glance, suggest the need to treat aspiration as a unified phenomenon at the phonological level, parallel to its apparent phonetic unity.

A more detailed examination of the phonetic evidence, however, as pointed out by Allen 1953 and Bare 1980, reveals that it is far from obvious that Sanskrit aspiration represents a unified phonetic phenomenon. In particular, the statements concerning the pronunciation of Sanskrit made by the native Indian grammarians in the ancient phonetic treatises known as the **prāṭisvākyās** make it clear that there are differences in the phonetic realization of the "voiceless aspirates" and the "voiced aspirates". For example, as Allen notes (p. 38), "the voiced aspirates are considered as more fully voiced than the non-aspirates, and the voiceless aspirates more fully breathed than the non-aspirates". Thus, the set of oppositions that **Th** and **Dh** respectively enter into are not entirely parallel at the phonetic level. This result would lead to a mismatch between the phonetics and the phonology of aspiration, if one adheres to a phonological account with a single cover feature "aspiration" for both **Th** and **Dh**.

Moreover, recent discussions of the phonology of aspiration in Sanskrit within an autosegmental framework, especially Borowsky & Mester 1983 and Kaye & Lowenstamm 1985, treat the "voiced aspiration" found with **Dh** and the "voiceless aspiration" found with **Th** as phonologically quite different. The most crucial set of facts in this regard is the "aspiration throwback" phenomenon, whereby a root with the basic form **DVDh-**, e.g. **budh-** 'know', is realized in certain devoicing contexts, especially before **-s-**, as **DhVT-**, as in the aorist stem **bhut-s-**, thus with the aspiration "thrown back" from the root-final segment to the initial segment.

In both of these accounts, the **budh-/bhut-** alternations are explained by positing different phonological representations for voiceless and for voiced aspiration. For both Borowsky & Mester and Kaye & Lowenstamm, voiceless aspiration is realized as part of the segmental feature bundle for the voiceless stops, whereas voiced aspiration is represented as an autosegment **H** and thus on a different tier from the segmental material. For Kaye & Lowenstamm, moreover, **H** is linked to a voicing autosegment (their "Z"). Thus in both accounts, autosegmental aspiration is associated only with voiced stops.

The differential representation of voiced and voiceless aspiration is justified partly by reference to the above-mentioned phonetic considerations, but also by what is taken as differential phonological behavior. For instance, Borowsky & Mester make much of the fact that only voiced stops participate in aspiration throwback but voiceless ones do not. In their view, with the devoicing of the root-final segment before **-s-**, the aspiration autosegment must find a voiced stop to reassociate onto, thereby connecting up with the

root-initial segment and giving apparent "aspiration throwback". When there is a voiceless aspirate in the root, aspiration throwback is blocked in one of two ways. If, on the one hand, the root-final segment is a voiceless aspirate, then there would be no aspiration autosegment that could reassociate (since voiceless aspiration is not represented autosegmentally). If, on the other hand, the root-initial segment is a voiceless aspirate, there would be no appropriate "host" that an aspiration autosegment could reassociate onto. As it happens, the only root on which to test such a claim of differential behavior is $\sqrt{\text{prach-}}$ 'ask', and apparently as predicted, it shows for the future stem, presumably from /prach-sya-/, the shape **praksya-**, not ***phraksya-**, that is, with no aspiration throwback effect.

In such autosegmental treatments, there is again a match between the apparent phonetic reality of aspiration and the phonological account for it, in keeping with any principle that would require a close connection between phonetic features and phonological features. However, the view that emerges from these treatments is that Sanskrit aspiration is neither a unified phonetic phenomenon nor a unified phonological phenomenon. Thus the existence of additional relevant evidence bearing on the unity of Sanskrit aspiration at both levels takes on an added significance in the context of the relation between phonetic and phonological features.

In particular, contrary to the negative indications noted above concerning the unity of voiced and voiceless aspiration in Sanskrit, there is good reason to believe, as brought out more fully in Joseph & Janda 1987, that there is phonetic unity to Sanskrit aspiration as well as phonological unity. Sanskrit aspiration, therefore, provides a good example of a close fit between phonetic features and phonological features, but does so on the positive side and not in the negative way required by the autosegmental treatments.

On the phonetic side, several recent investigations into the phonetics of aspiration have provided some clarification on how "aspiration" is to be defined, sanctioning the use of a broader definition under which both Sanskrit **Th** and **Dh** can be considered to be truly aspirated. Benguerel & Bhatia 1980, for instance, show that it is not improper to speak of "voiced aspirates", even if the term is a bit misleading phonetically. This is especially so if one adopts a broad definition of aspiration, following Ladefoged 1976, as "a period after the release of a stricture and before the start of regular voicing in which the vocal cords are further apart than they are in regularly voiced sounds", or, following Dixit 1979 (see also Dixit 1982), as "glottal friction produced with or without pulsing while the glottis is narrowly or widely open and the supraglottal vocal tract is unobstructed". The switch from earlier to current views is summed up neatly by the fact that, while Ladefoged 1975 explicitly denied that murmured stops were in any sense aspirated, Ladefoged 1982, the second edition of the earlier work, explicitly affirms the essential unity of the two types of aspiration. Voiced and voiceless aspiration can thus be considered to be one and the same phonetic phenomenon. Even the **prātisvākyās**, though they distinguish extent of aspiration/voicing as noted above, need not be taken to deny the parallelism between the two types; their observations may reflect merely a difference of degree perceived by the indisputably keen-eared Indian grammarians.

On the phonological side, several points argue against the autosegmental separation of voiced and voiceless aspiration. First, the one piece of evidence given for a phonological difference between voiced and voiceless aspiration, namely the future stem **praksya-** from $\sqrt{\text{prach-}}$ 'ask', is actually ambiguous. It is not necessarily the case that **praksya-** is based on the root form /prach-/ plus the future suffix /-sya-/; while $\sqrt{\text{prach-}}$ does behave in some ways like a full-fledged root, with derivatives such as **prcchā** 'question', there are also related derivatives without the voiceless aspirate, e.g. **prasna-** 'question', that point to the existence of a synchronic alternative root-form $\sqrt{\text{pras-}}$ from which **praksya-** would be the

expected future stem (i.e. /pras- + -sya- / ---> **praksya-**). In that case, the evidence of **praksya-** can hardly be considered probative of anything. Second, there are several phonological aspiration phenomena in which voiced and voiceless stops behave alike, for instance word-final deaspiration, as in /kaprth/ 'penis' ---> **kaprt** just like /samidh/ 'wood, fuel' ---> **samit**, and deaspiration in reduplication, as in **pa-phal-**, perfect stem of $\sqrt{\text{phal-}}$ 'burst', just like **bi-bhed-**, perfect stem of $\sqrt{\text{bhid-}}$ 'cut'. Finally, from a diachronic standpoint, both voiceless aspirates and voiced aspirates in nonreduplicated syllables not only deaspirate via Grassmann's Law but also trigger deaspiration via Grassmann's Law. The two most relevant examples here are **vidatha-** 'distribution' from *vi-dh-atha- (cf. **vi-** + $\sqrt{\text{dhä-}}$ 'distribute') and **kumbha-** 'pot' from *khumbha- (cf. Avestan **xumba-**). Such parallel phonological behavior, especially in light of the ambiguity in the interpretation of **praksya-**, points to a unified phonological treatment of aspiration. In fact, it would seem that a nonunified approach to Sanskrit aspiration would introduce a complication into the grammar in that there would be one rule to deaspirate **Th** in word-final position (as with /kaprth-/ above) by reference to the segmental tier and a different one to deaspirate **Dh** in the same position (as with /samidh-/ above) by reference to the aspiration autosegment.

The conclusion to be drawn, therefore, *pace* the existing autosegmental analyses of Sanskrit, is that aspiration in Sanskrit indeed is a unitary phenomenon at least from the phonological standpoint, and that the phonetic evidence can be reconciled with this phonological outcome. Sanskrit aspiration thus provides an example in which a phonological account can be fully responsive to phonetic reality, even to the extent that one type of feature can be used to motivate the other type. While it might be more interesting if there were a divergence here between phonetics and phonology, it is telling that in so prominent a test-case as Sanskrit phonology in general and aspiration in particular the features of phonetics and phonology again turn out to stand in an especially close relationship to one another.

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