

## Letter to the Editor

HOW IS THE ASPIRATION OF ENGLISH /p, t, k/ "PREDICTABLE"? #561

LEIGH LISKER  
*University of Pennsylvania*  
 and  
*Haskins Laboratories*

Aspiration as a phonetic property of the English stop categories is usually said to be non-distinctive on the ground that its occurrence can be accounted for by context-sensitive rules. The word-pair *pin-spin* is often cited by way of example. The word-initial voiceless stop is aspirated; the post-/s/ voiceless stop is not. But the presence of aspiration is "predicted" only for some voiceless stops – namely those that are "spelled" phonologically /p/ and are either word-initial or in a position where the next vowel is stressed and in the same word. Initial stops that are spelled /b/, as in *bin*, may also be voiceless, so that a rule which predicts aspiration from the voicelessness of an initial stop will not work, since *bin* is never aspirated. Thus the knowledge on which the prediction is based is not the voicelessness of the stop, or indeed on any other ascertainable phonetic property. We know that in some words voiceless initial stops can be freely replaced by voiced stops without semantic effect, and that those voiceless stops are never aspirated, while in other words there are initial voiceless stops that are regularly aspirated, and cannot be freely replaced by voiced stops. In other words, we know whether a voiceless stop is to be aspirated or not if we know how it is spelled phonologically.

Few if any introductory linguistics textbooks in English address the subject of phonology without referring to the two kinds of *p* said to occur in words such as *pin* and *spin*, the first characterized by a feature of aspiration absent from the second. In a phonetic spelling of the forms the two are commonly represented as [p<sup>h</sup>] and [p]. Whether the phoneme /p/ is produced with or without aspiration is said to be determined by context, or, in current parlance, to be predictable by rule, this feature being present when /p/ is word-initial, but absent if a word-initial /s/ precedes it. The aspiration is then termed **redundant**, and moreover, so the argument often goes, it never serves as the sole basis by which lexical distinctions are signaled in English (thus Akmajian, Demers and Harnish, 1979; Anderson, 1974; Fromkin and Rodman, 1983). Phonologists seem not to have very clearly decided whether or not this redundant feature makes some (or even a major, cf. Hyman 1975) contribution to the auditory identification of the speech signal, nor might they all agree that the point should be decided on the basis of empirical data. These matters, while deserving discussion, are not at issue in this letter.

The view that the aspiration observed in *pin* ([p<sup>h</sup>ɪn]) is irrelevant to the phonological representation of the word appears to depend on the acceptability of certain other assertions about *pin* and *spin*. First of all, it would seem that we must unquestioningly accept the labial stop of *spin* as a member of the /p/ phoneme, despite the recognized

fact that in the position following a word-initial /s/ the so-called “p” has no **distinctive** status as a member of the /p/ rather than the /b/ phoneme; either a form /sbɪn/ or a form /spɪn/ is possible in English, but while there is for most phonologists a theoretical motivation for choosing at least one of them, there exists none for preferring one over the other, or for positing both. The status of the stop in *spin* as /p/ seems to rest on little more than the spelling convention of standard orthography, one that is simply copied in the linguist’s representation. To appeal to the phonetic difference(s) between the stops of *pin* and *spin* as the basis for the redundancy of aspiration is to construct a rather flimsy argument, one that any reasonably alert beginning student might be expected to question. However, though the argument is a poor one, a more convincing case for the redundant status of aspiration is easily made, since the sound type [p] also occurs in contexts where it is distinct from [b], e.g., in *rapid* (vs. *rabid*). Moreover, a comparison of *rapid* with *rapidity* gives additional motivation for assigning [p] and [p<sup>h</sup>] to the same phoneme, and thus for discounting the phonological significance of aspiration. In any event /p/ may be said to have both aspirated and unaspirated varieties, though to base this conclusion on the relation between *pin* and *spin* is pedagogically unfortunate.

The “predictability” of aspiration as a feature of word-initial /p/ is said to rest on the fact that /p/ is [–voiced] (e.g., Shane, 1973). Since, in point of fact, word-initial /b/ is often no more voiced than the labial stops of *spin* or *rapid*, it must be acknowledged that it is simply false to say that word-initial voiceless stops are regularly followed by aspiration. If phonologists did not persistently transcribe *bin* as [bɪn] and [b̥ɪn], but instead more straightforwardly wrote [bɪn] and [pɪn], the matter would be quite obvious. (Some observers have claimed that initial /b/ is not voiceless, but only “devoiced” or “partially voiced,” e.g., Trager and Smith (1951), Ladefoged (1982), but this seems more an effort to justify writing it [b̥] for phonological reasons than to capture any *phonetic* difference between this /b/ and the stop in *spin* or *rapid*.) It would, however, lead students, in comparing *bin* = [pɪn] with *pin* = [p<sup>h</sup>ɪn] (or [p<sup>h</sup>m]), to wonder about the redundant nature of the aspiration. What is true about the relation between voicing and aspiration is that a word-initial **voiced** stop is never followed by aspiration in English. Therefore, we can say that the presence of aspiration following a word-initial stop release allows us to infer the **absence** of pre-release voicing, though the absence of aspiration is compatible with both [+voiced] and [–voiced] closure. Thus, insofar as the presence or absence of one phonetic feature of the stop is to be predicted on the basis of another, we can state the rules as

$$[+aspirated] \longrightarrow [-voiced] (=p/)$$

and equivalently, by *modus tollens*

$$[+voiced] \longrightarrow [-aspirated] (=b/)$$

The phonological status of a stop that is [–voiced] and [–aspirated] is undecidable except on paradigmatic grounds, that is, on the basis of its contrasting with another homorganic stop. The [p] of *bin* is /b/ because it contrasts with the [p<sup>h</sup>] of *pin*, while the [p] of *rapid* is /p/ by virtue of the phonologically unambiguous [b] of the contrasting *rabid*. The [–voiced] stop in the first word is not subject to the aspiration rule

because it is assigned to the phoneme /b/, while the one in the second is not because its context makes the rule inapplicable. The stop of *spin* is not only [–voiced, –aspirated], and therefore of ambiguous phonological affiliation on phonetic grounds, but its status as between /p/ and /b/ cannot be decided on the basis of its contrasting with any stop that is either [+aspirated] (therefore /p/) or [+voiced] (and therefore /b/).

Of course these rules presuppose knowledge of two other kinds of information: 1) the location of word boundaries, which are not in general signaled phonetically, and 2) the location of “phonetic” segment boundaries, which are also determined by phonological considerations. In the absence of the first kind of information, no statement that either aspiration or voicing is phonologically redundant has validity, since (because there is the phoneme /h/) each feature freely occurs both with and without the other, with no third feature (i.e., stress) as a constraining factor. In the absence of phonological knowledge, on the basis of which \*/b<sup>h</sup>/ and \*/d<sup>h</sup>/ are not included in the English phoneme inventory, we should either have to exclude forms such as *abhor* and *adhere* from the English lexicon or consider the rule given above to be invalid. (A complicating fact is that the aspiration itself takes two forms, a voiceless one after a voiceless interval, and a voiced or murmured one after a voiced interval. The latter variety is never evaluated as a stop feature in English.)

The conclusion to be drawn from the points just presented is that the predictability of the aspiration feature of the English stops is not phonetically based. Neither its presence nor its absence hinges entirely on the presence or absence of any other phonetic feature. If we know that a stop is voiceless and does not form a cluster with a preceding /s/, and if we know that it is word-initial or that the next vowel is stressed and within the same word, and if we know that it is spelled phonologically /p/ and not /b/, then we can infer that its release will be aspirated. The absence of aspiration can be predicted, given a voiceless closure, from the knowledge that it is written phonologically as /b/, or that, if /p/, a following vowel is either unstressed and in the same word or is separated from the stop by a word boundary. Finally, the rule according to which /p/ is [–aspirated] after a word-initial /s/ is no more “interesting” than another possible rule, one of broader applicability, according to which /b, d, g/ are generally [–voiced] following any voiceless obstruent, without regard to word boundary. In other words, on phonetic grounds the so-called /p, t, k/ in post-/s/ position might just as plausibly be derived by a devoicing rule applied to underlying /b, d, g/ as by a de-aspirating rule applied to /p, t, k/, that is, provided the phonologist is willing to define the underlying /b, d, g/ as [+voiced, –aspirated] and the underlying [p, t, k] as [–voiced, +aspirated]. The native speaker knows when to aspirate an initial voiceless stop and when not to, but the stop is not aspirated **because** it is voiceless and initial; rather it is voiceless because it is aspirated. To produce an intelligible and “normal” *pin*, the native speaker knows (s)he must aspirate the stop, and this precludes any voicing; for *bin* (s)he knows aspiration would be a mistake, but voicing is *ad libitum*.

## REFERENCES

- AKMAJIAN, A., DEMERS, R.A. and HARNISH, R.M. (1979). *Linguistics: An Introduction to Language and Communication* (Cambridge, MA).
- ANDERSON, S.R. (1974). *The Organization of Phonology* (New York).
- FROMKIN, V. and RODMAN, R. (1983). *An Introduction to Language* (3rd ed.) (New York).
- HYMAN, L.M. (1975). *Phonology: Theory and Analysis* (New York).
- LADEFOGED, P. (1982). *A Course in phonetics* (2nd ed.) (New York).
- SHANE, S.A. (1973). *Generative Phonology* (Englewood Cliffs, NJ).
- TRAGER, G.L. and SMITH, H.L. Jr. (1951). *An Outline of English Structure* (Norman, OK).