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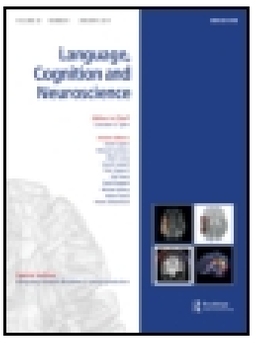

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Phonemes, segments and features

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As the token generative phonologist invited to comment on the article by Hickok (henceforth H.), I feel that it is incumbent upon me to both clarify some terms and to counter an assumption about the content of generative theories of phonology made in H.'s article. While I restrict myself most specifically to H.'s article, I hope that these comments are also of some use to others who, like H., aim to integrate the ideas of various traditions in models of speech processing.

Keywords: phonology; phonological theory; phonemes; segments; features

Phonemes and segments

As the second half of the title of H.'s article makes clear, one of H.'s goals is to say something about "the role of the phoneme in speech processing". What H. refers to throughout the article, however — except in one instance, to which I turn momentarily — is not, strictly speaking, what phonologists call *phonemes*, but rather what we call *segments* (or, as H. more properly calls these on p. 15, "individual speech sounds"): a central unit of representation corresponding — though sometimes only roughly — to the union of what we call consonants and vowels.

A substantial class of phonological generalisations (whether these are expressed procedurally or declaratively) is *segmental* in that they make specific reference to these units of representation; the generalisation "word-final obstruents are voiceless" refers to those word-final segments specified with the feature(s) that define "obstruents" and further specifies these segments as "voiceless" and the generalisation "non-low back vowels are round" refers to those segments specified with the feature(s) that define "non-low back vowels" and further specifies these segments as "round".

Depending on the details of particular representational theories, segments are understood to be either unstructured feature matrices (Chomsky & Halle, 1968), bundles of semi-autonomous features (Goldsmith, 1979) or semi-structured feature-geometric representations (Clements, 1985). Features are thus *subsegmental* units of phonological representation. Segments are in turn grouped (sequentially) into *suprasegmental* units of phonological representation, which include syllables, metrical feet, prosodic words and phrases, and so on. H.'s references to *phonemes* when talking about their featural composition and their sequencing in syllables, then, should be properly understood as references to *segments*.

What are phonemes, then? As noted above, there is one instance of a proper reference to phonemes in H.'s article: on p. 14, where H. notes that one kind of thing that research in generative phonology aims to explain is "why the same phoneme, [say] /t/, is aspirated [t^h] in one context like *table* and unaspirated [t] in another context like *stable*". This reference is proper because it refers – albeit obliquely – to the central idea of the phoneme: it is a single underlying/mental unit of categorisation, represented as a segment like /t/, that has contextually determined variant surface pronunciations (*allophones*), represented as segments like [t^h] and [t]. In short, phonemes *contrast* with each other because they serve to distinguish different words from each other; allophones of the same phoneme do not.[2]

But while it is true that a subset of research in generative phonology is often characterised this way (e.g., in introductory linguistic textbooks and courses, and in basic descriptions where theoretical issues are not at stake), it is not the case that there is widespread agreement among generative phonologists on the proper analysis of the complementary distribution of surface segments like [t^h] and [t] (more generally, aspirated and unaspirated voiceless stops) in English. While for some phonologists it is necessary to declare a single underlying unit of categorisation and to state generalisations concerning the distributions of all but one of the surface pronunciations (the remaining one surfacing "elsewhere"), as in (1a), for others it is instead only necessary to state the same generalisations plus the one for the "elsewhere" case, as in (1b).[3]

(1) Alternative analyses of complementary distribution
  (a) underlying /t/; /t/ → [t^h] word-initially
  (b) /t,t^h/ → [t^h] word-initially; /t,t^h/ → [t] elsewhere

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Either approach to the analysis of complementary distribution is compatible with the basic assumptions of most if not all generative theories of phonology, but the approach in (1a) is most strongly associated with the ordered-rule theory of Chomsky and Halle (1968), and the approach in (1b) is most strongly associated with the ranked-constraint theory of Prince and Smolensky (2004). The approach in (1a) might be called the phoneme-based approach, because it first presumes that there are a-priori, language-particular restrictions on the set of underlying units of contrastive categorisation (= phonemes); the approach in (1b) has been called the "richness of the base" approach, because it presumes that the set of underlying units (= the base) is not so restricted and that the distribution of surface segments is entirely determined by grammatical generalisations.

Finally, and importantly, the units of contrastive categorisation that are called "phonemic" in phonological analyses are not restricted to segment-level representational units. An individual feature, for example, is said to be phonemic when it serves to distinguish segmental phonemes; e.g., when voiceless /p,t,k/ contrasts with voiced /b, d,g/, the voicing feature is phonemic. Likewise with suprasegmentals such as stress; e.g., if there are words in a language that differ only in terms of their stress pattern, then stress is phonemic. In sum, it is simply not the case that the terms *phoneme* and *segment* can be used interchangeably.

Feature substance

Much of H.'s argument for "abandoning the phoneme" – now properly understood as "abandoning the segment" – appears to depend on H.'s reading of the relevant literature in generative phonology, in particular his conclusion that generative phonologists all assume that segments are to be represented solely in terms of articulatory features. This is indeed a well-represented position and is probably the (over)simplified view presented in most phonology textbooks and courses. But among those to whom the question is of central importance, the matter is hardly settled.

As Halle (1983) makes particularly clear, the evidence for theories of distinctive feature representation comes both from articulatory and from acoustic/auditory aspects of speech sounds. Speaking of his original work with Jakobson and Fant (Jakobson, Fant, & Halle, 1961), Halle (1983, pp. 94–95) writes that:

> it was these considerations that led us to draw a sharp distinction between distinctive features, which were abstract phonological entities, and their concrete articulatory and acoustic implementation. Thus […] we spoke not of 'articulatory features' or of 'acoustic features,' but of 'articulatory' and/or 'acoustic correlates' of particular distinctive features. […] On this view the distinctive features correspond to controls in the central nervous system which are connected in specific ways to the human motor and auditory systems.

And then:

> My discussion […] focusses exclusively on speech production […]. This restriction is due not to a feeling on my part that perception is any less important than production but rather because at this stage in our study of language, we have a somewhat better grasp of the issues in the articulatory domain than in that of speech perception and processing. (Halle, 1983, pp. 95–96).[4]

Even while mainstream theories of featural representation (e.g. Clements, 1985) reinforced this bias toward articulatory correlates, there have always been alternative feature theories that were simply not mainstream (e.g., Particle Phonology; Schane, 1984) that have referenced auditory correlates. The relatively recent resurgence of interest in phonetic motivation has brought auditory features back into the mainstream (Flemming, 2002; Hayes, Kirchner, & Steriade, 2004).[5]

H.'s response to a reviewer on p. 13 thus misses the point, not the other way around. There is no agreed-upon single "linguistic representation of the phoneme /t/", and in some theories of featural representation /t/ might very well "have the feature [+release]" (or its surrogate; see e.g. Steriade, 1993) and might also encode the acoustic effects of the release of stop closure. Indeed, if the promise of the second conjunct of the title of Halle (2002) – *From Memory to Speech and Back* – is to be kept, then there *must* be well-defined acoustic correlates for phonological features.

Conclusion

H.'s stated goal of integrating the ideas of various traditions in models of speech processing is well-worth pursuing. As I hope these remarks have made clear, however, it appears that H.'s misunderstanding of ideas from the generative phonology tradition might actually impede the achievement of this goal.

Notes

1. Thanks to Matt Goldrick for useful and encouraging discussion of these comments as I contemplated how to write them up, and to Matt and an anonymous reviewer for helpful feedback. Remaining errors are mine.
2. I am rather conveniently avoiding here the important difference between the structuralist and generativist conceptions of the phoneme, defined by a break in tradition and analysis that is commonly attributed to Halle (1959). When making this difference mattered a great deal, what I am calling a "phoneme" here would more properly have been called a "morphophoneme". See Anderson (1985) for discussion of this history.
3. See Baković (2013) for in-depth discussion of particular versions of these and other analyses.
4. Similarly, while the features employed by Chomsky and Halle (1968) were described primarily in terms of their articulatory correlates, the authors are clear that "the acoustical and perceptual correlates" of features are given a back seat only "because such discussions would make this

section, which is itself a digression from the main theme of our book, much too long" (Chomsky & Halle, 1968, p. 299).

5. Also to be noted here is the "substance-free" approach (Hale & Reiss, 2008), largely defined in opposition to the resurgence of interest in phonetic motivation noted in the text, denying that there is *any* phonetic content to phonological representations (auditory, articulatory or otherwise).

References

Anderson, S. R. (1985). *Phonology in the twentieth century*. Chicago: University of Chicago Press.

Baković, E. (2013). *Blocking and complementarity in phonological theory*. London: Equinox.

Chomsky, N., & Halle, M. (1968). *The sound pattern of English*. New York, NY: Harper and Row.

Clements, G. N. (1985). The geometry of phonological features. *Phonology Yearbook*, *2*, 225–252. doi:10.1017/S0952675700000440

Flemming, E. (2002). *Auditory representations in phonology*. New York, NY: Routledge.

Goldsmith, J. (1979). *Autosegmental phonology*. New York, NY: Garland.

Hale, M., & Reiss, C. (2008). *The phonological enterprise*. Oxford: Oxford University Press.

Halle, M. (1959). *The sound pattern of Russian*. The Hague: Mouton.

Halle, M. (1983). On distinctive features and their articulatory implementation. *Natural Language and Linguistic Theory*, *1*, 91–105. [Reprinted in Halle, 2002: 105–121.] doi:10.1007/BF00210377

Halle, M. (2002). *From memory to speech and back: Papers on phonetics and phonology 1954–2002*. Berlin: Mouton de Gruyter.

Hayes, B., Kirchner, R., & Steriade, D. (2004). *Phonetically-based phonology*. Cambridge: Cambridge University Press.

Jakobson, R., Fant, G., & Halle, M. (1961). *Preliminaries to speech analysis: The distinctive features and their correlates* (MIT Acoustics Lab Technical Report No. 13). Cambridge: MIT Press.

Prince, A., & Smolensky, P. (2004). *Optimality Theory: Constraint interaction in generative grammar*. Malden, MA: Blackwell.

Schane, S. A. (1984). The fundamentals of Particle Phonology. *Phonology Yearbook*, *1*, 129–155. http://www.jstor.org/stable/4615385

Steriade, D. (1993). Closure, release, and nasal contours. In M. K. Huffman & R. A. Krakow (Eds.), *Phonetics & phonology 5: Nasals, nasalization, and the velum* (pp. 401–470). New York, NY: Academic Press.