Rules with exceptions: Using the Tolerance Principle to diagnose allophones

Betsy Sneller ~ University of Pennsylvania

Despite the vast phonetic variety in a language, these sounds can be reduced to a small inventory of contrastive units and abstract allophonic rules. While the difference between phonemes and allophones is robust and is taught to every first-year linguistics student, phonologists run into a notable problem in the boundaries, where some alternations are controversially analyzed as allophonic by some and phonemic by others. Perhaps the most widely cited case is that of the Philadelphia split in the TRAP vowel, which has been analyzed as both allophonic (e.g. Kiparsky 1995; Labov et al. 2016) and phonemic (e.g. Trager 1934; Labov 1989). Allophones are typically diagnosed using *Predictability* and *Contrastiveness*. In this paper, we argue that these diagnoses are insufficient and propose instead the application of Yang's Tolerance Principle (2016) as an alternative, precise diagnostic of allophony.

First, we address *Predictability*. Many phonologists assume allophonic distinctions require full regularity, meaning that an alternation ceases to be predictable the moment a single lexical exception emerges. This suggestion results in the dissatisfying prediction that two speakers of the same language may have a different phonemic inventory based on whether they happened to acquire a single exceptional word or not. On the other end of the spectrum lies the phonemic LOT-THOUGHT distinction in English, which nevertheless shows some level of predictability by phonological environment which emerge as significant in a logistic regression, with pre-/l/ and post-/r/ tokens more likely to be a THOUGHT vowel.

The problem with LOT-THOUGHT predictability is easily resolved by appealing to *Constrastiveness*, since there are a number of minimal pairs between the two classes. However, as many phonologists have pointed out, some distinctions show only marginal contrastiveness (Ebeling 1960; Kiparsky 1995), appearing in near-minimal pairs or as systematically peripheral segments, leading to the proposal of an intermediate category of "quasi-phoneme" between an allophone and a phoneme, and the assertion that the boundary between these categories is "fuzzy" (Scobbie and Stuart-Smith 2006).

We hold that quasi-phonemes do not exist. Instead, we argue that diagnosing an alternation as allophonic or phonemic may be clearly defined using the Tolerance Principle (Yang 2016), which is a model of productive rules that both allows exceptions to the rule and defines the precise limit of exceptions. The Tolerance Principle states that a productive rule applying to N lexical items may tolerate up to N/ln(N) exceptions to this rule. This has been shown to apply to a number of morphological and suprasegmental rules in a number of languages, including artificial language learning (Yang 2016; Schuler, Yang, and Newport 2015).

Using the Tolerance Principle as a diagnosis of productive allophonic rules has a number of implications for phonology and sound change. First, it extends Labov's (1981) assertion that "words float on the surface of sound change" by allowing a precise number of lexical exceptions to a regular sound change. Second, allowing a list of exceptions to an allophonic rule opens up the possibility for distinct lexical items to join or leave the list of exceptions, as found in the diachronic instability of the lexical exceptions to the Philadelphia TRAP rule. Finally, this offers

an elegant solution to regularity, defining productive rules in the same way across modules of the grammar.

Selected References

Ebeling, C. 1960. *Linguistic Units*. Hague: Mouton.

Kiparsky, P. 1995. The phonological basis of sound change. In John Goldsmith (ed.) *Handbook of Generative Phonology*. Oxford, Blackwell, 1995. Reprinted in R. Janda and B. Joseph (eds.) *Handbookof Historical Linguistics*. Oxford, Blackwell, 2003.

Labov, W. 1981. Resolving the Neogrammarian Controversy. *Language* 27:2.

Labov, W. 1989. The exact description of the speech community: short a in Philadelphia. In R. Fasold & D. Schiffrin (eds.), *Language Change and Variation.* Washington, Georgetown U.P. Pp. 1-57.

Labov, W, A. Henderson, S. Fisher, D. Gylfadottir, and B. Sneller. 2016. Competing Systems in Philadelphia Phonology. *Language Variation and Change* 28:3.

Schuler, K., Davis, J., Yang, C., and Newport, E. 2015. Testing the Tolerance Principle for rule productivity in an artificial grammar. In *The Cognitive Development Society conference*, Columbus, OH.

Scobbie, J. and J. Stuart-Smith. 2006. Quasi-phonemic contrast and the fuzzy inventory: examples from Scottish English. *QMUC Speech Science Research Centre Working Paper*. WP-8.

Trager, G. 1934. What conditions limit variants of a phoneme? *American Speech* 9:313-315.

Yang, C. 2016. *The Price of Productivity: How children learn and break the rules of language*. MIT Press.