Sound change without frequency effects: ramifications for phonological theory

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In usage-based models of phonology, words emerge from traces of phonetic memory. Different words should thus undergo regular phonetic change at different rates, as "any systematic bias on the allophonic outcome would incrementally impact high-frequency words at a greater rate" (Pierrehumbert 2002: 118; see also Bybee 2002). Labov (1994) suggests that homophone pairs form an ideal testing ground for distinguishing fine-grained contextual phonetic conditioning from frequency effects. Drager (2011) shows that in New Zealand English, the different roles (verb, quotative, etc.) of the word LIKE, essentially a homophone set, differ systematically in their phonetic realizations (/k/-release and ratio of /l/ to vowel); she attributes the differences partly to item frequency. These roles might also, then, be susceptible to divergence in sound change. Conveniently, LIKE participates in a recent change in Philadelphia, the raising of /aɪ/ before voiceless consonants (Labov 2001), allowing us to leverage the same comparison as Drager within the context of a change in progress. We show that /aɪ/-raising advances at the same rate in the different roles of LIKE, counter to the predictions of simple usage-based models. We suggest that hybrid phonological models allowing for an abstract level of representation are necessary to reconcile our results on sound change with Drager's findings on synchronic variation.

Our data come from a roughly age/sex-balanced sample of 37 white speakers from the Philadelphia Neighborhood Corpus (Labov & Rosenfelder 2011). Following D'Arcy (2005), each occurrence of LIKE was coded for its role:[1] lexical verb, preposition, conjunction, adverb, or discourse marker (quotatives are not used until late in the change). Tokens counts and frequencies for the roles are given in Table 1. Vowel height (F1) and duration were measured using the automatic formant extraction program FAVE-extract (Rosenfelder et al. 2011). F1 values were Lobanov-normalized and duration was log-transformed.

We fit linear mixed-effects regression models with speaker random effects to predict /aɪ/ height from birth year, vowel duration, and LIKE role. There is a significant effect of LIKE role, but the only significantly different role is verbal LIKE. Verbal LIKE is also longest in duration and the only content word. The other four roles, although they occur in the corpus at widely disparate rates, have the same degree of /aɪ/-raising throughout the change (Figure 1). Speakers born before 1920 have a significantly lower /aɪ/ in lexical verb LIKE than in other roles, but this difference is lost by speakers born after 1970. We argue that verbal LIKE, because it can occur in stressed position, most faithfully reflects the phonological target of the vowel /aɪ/ throughout the change; a surface process of function word reduction (here, vowel centralization) makes non-verbal LIKE appear more advanced early in the change. High frequency LIKE roles such as the discourse marker, then, have two advantages in /aɪ/-raising: they are both highly frequent and unstressed. Rather than these concomitant advantages in use accruing, with non-verbal LIKE accelerating beyond verbal LIKE, the difference is instead attenuated as the nucleus of /aɪ/ approaches a central target and there is no longer room for centralization.

Thus we contend that in Philadelphia the roles of LIKE undergo /aɪ/-raising as a unit. The highly-frequent discourse marker LIKE changes at the same rate as the comparatively-rare conjunction LIKE. Drager's (2011) results show that the roles of LIKE *can* be phonetically differentiated, which she interprets as requiring direct links between socio-syntactic representation in the lexicon and phonetic detail perceived and produced in language use. If these roles are available for phonetic differentiation, they should be susceptible to usage-based differentiation in the rate at which they undergo a sound change in progress. To the contrary, despite large differences in usage, they do not diverge throughout the course of the change. Our results thus indicate a need for phonological theories that can account for the failure of frequency effects to arise, but pure exemplar theoretic models do not offer such a constraining mechanism. Hybrid models with both a usage-dependent level and an abstract categorical level (e.g., Pierrehumbert 2006) are needed to account for the full range of facts.

[1] We remain agnostic as to the nature of the formal relationship between these roles, other than to note that they have different meanings and syntactic functions.

	Token count	Sample frequency
Adverb	138	664
Conjunction	129	621
Discourse	1149	5534
Preposition	274	1319
Verb	213	1025

Table 1. Token count and within-sample frequency per million words

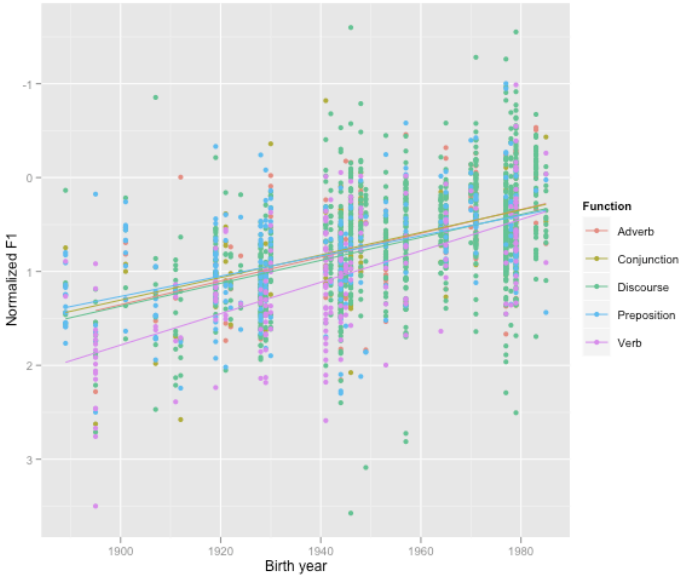

Figure 1. /aɪ/ height by LIKE role over time

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