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Phonology without Phonemes

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Overview

Theories of language structure generally provide two things: a list of allowable units of various types, and rules or constraints that determine how the various units may be combined to create larger units. Together the units and rules determine which larger units are part of the language and which are not. In general, acceptability is an all-or-nothing proposition: A given proposed larger unit either is or is not acceptable according to this approach.

In this talk I will argue instead that at there are neither rules nor units and that the acceptability of particular possible utterances is a matter of graded constraint satisfaction. The particular utterances I will consider are the word-forms of English. The argument will draw heavily on the prior work of Joan Bybee (2001) as well as on work with Karalyn Patterson (McClelland and Patterson, 2002a,b) and Gary Lupyan (Lupyan and McClelland, 2003) and continuing work with Bybee, Lupyan, Catherine Harris, and Brent Vanderwyk. Two aspects of this effort that will be discussed in this talk are described below.

Constraints on English Word Forms

The idea that candidate word forms have graded goodness values has been introduced by Kessler and Treiman (1997). Work currently in progress with Brent Vanderwyk extends this idea, accounting for the relative probabilities of the different word bodies that occur in stressed monomorphemic monosyllabic words. More traditional work by Harris (1994) describes a set of rules that dictate which phoneme sequences are legal in English and which are not. However, the analysis seems incomplete in that there are many sequences that are legal but which occur relatively infrequently (e.g., sequences of the form _vpt where *v* is a short vowel and the '_' indicates the missing word onset), while there are other sequences that occur very much more frequently (e.g. sequences such as _vnd, _vnt, _vld, _vlt, and _vst). Harris himself allows that some forms are less preferred than others but offers no systematic way to address this.

According to our analysis, word bodies may involve a (partial or complete) closure with the lips (as in *cuff* or *cup*), with the tip of the tongue (as in *bass* or *cat*), or with the back of the tongue (as in *tack*), or no closure at all (as in *bee*). Each closure adds a complexity cost (with labial and back closures adding more than tip closures), but embellishments of a closure already paid for are relatively cheep. Thus, adding nasality to a tongue tip closure (as in *hint* as compared to *hit*) costs relatively little while the combination of a labial closure and a tip closure is more expensive, thus explaining the relative prevalence of _vnt compared to _vpt. At the time of this writing we have been able to use these ideas to account for nearly 90% of the variance in the frequencies of occurrences of different English word bodies.

Language Change and Morphology

Bybee (2001) has argued that language change transcribed as a shift from one phoneme to another reflects an underlying continuity of gestural change. Gary Lupyan and I have been exploring models of language change that capture the ways in which a graded constraint on the length of a word form gradually results in the creation of quasi-regular past tense forms like did, said, had, and made. Such forms are treated as exceptions listed in the lexicon by rule-based approaches such as Pinker (1999); in our model, they arise from fully regular forms from a graded constraint that tends to result in the gradual shortening of very frequent forms. What is lost in shortening is not completely arbitrary; some sign of the regular past tense inflection is preserved in nearly all cases, while the vowel is shortened or a consonant is deleted from the regular form. Recent work extending our approach to account for a variety of aspects of the evolution of the English past tense system, building on Lupyan and McClelland (2003), will be presented.

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