

Grammatica et verba
Glamor and verve

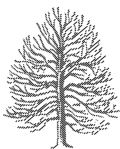
Studies in South Asian, historical, and Indo-European
linguistics in honor of

Hans Henrich Hock

on the occasion
of his seventy-fifth birthday

edited by

Shu-Fen Chen and Benjamin Slade



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Prosodic Structure in Sound Change*

JENNIFER COLE AND JOSÉ I. HUALDE

1 Introduction

Hock (1991:239–41) discusses German Final Devoicing (1), which is reflected in synchronic alternations like that in (2), as an example of a phonetically conditioned sound change extended by analogy to contexts where the phonetic conditioning is absent:

1. obstruent > –voice /__]Word
2. *Ra*[t] ‘wheel’ *Rä*[d]er ‘wheels’

This sound change presents two challenges. First, whereas the vast majority of all sound changes in the history of languages can be understood as arising from reduction of articulation and can be categorized as weakenings and assimilations, word-final devoicing of obstruents, as manifested in German in many other languages (see Iversen and Salmons 2011, Myers 2012), seems *prima facie* not to fall in these categories, since voiceless obstruents are not weaker segments than voiced ones. Hock provides a solution by suggesting that final devoicing is, in fact, a type of assimilation: to following silence. The second challenge presented by this sound change is the fact that the positional restriction (i.e. end of a word) seems not to be a phonetic factor. Thus although, as just mentioned, final devoicing can be understood to have a phonetic source through assimilation to a following silent pause at the end of an utterance, the majority of words encountered in spoken language are not followed by pause. Therefore, lacking a reliable phonetic source in word-final position, devoicing appears then to be conditioned by the presence of a word boundary, counter to the Neogrammarian view of sound change as having no grammatical conditioning, at least if we consider word boundary as grammatical structure.

Hock’s analysis of German Final Devoicing thus addresses both of these challenges. He maintains that devoicing originates in utterance-final position as an assimilation

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lation to the following silent pause (1991:80, 239). Devoicing is later extended to word-final position through an analogical process of leveling that eliminates the hypothesized alternation between obstruent-final words in utterance-final vs. utterance-medial position. Leveling applies to the hypothesized stage with utterance-final *das Ra[t]* ⟨SILENCE⟩ ‘the wheel’ and utterance-medial **das Ra[d] ist* ‘the wheel is’, and results in the single invariant form *Ra[t]* in both positions. The sound change in (1) is thus analyzed as actually involving two distinct processes, as in (3):

3. a. Sound change: obstruent > –voice / __ ⟨SILENCE⟩
 e.g. *das Ra[d]#* > *das Ra[t]#*
- b. Analogical extension,
 e.g. *das Ra[t] ~ das Ra[d] ist* > *das Ra[t] ~ das Ra[t] ist*

Leveling, through analogical extension of devoicing, serves to eliminate the voicing alternation for obstruent-final words according to their position in a prosodic phrase, but at some expense. First, word-final devoicing is no longer transparent to its phonetic source, so in *das Rad ist rund* ‘the wheel is round’, the devoicing of the final consonant of *rund* is motivated by its position before pause, but the devoicing of the prevocalic *-d* in *Rad* is not phonetically conditioned. Second, while the generalization of devoicing from phrase-final position eliminates phrasally conditioned alternations for the same word, it creates morphophonological alternations between (stem-final, word-internal) voiced and (stem-final, word-final) voiceless obstruents, as in *Ra[t]/Rä[d]er* ‘wheel/wheels’.

Hock’s analysis locates the source of the sound change in a phonetic process (devoicing) and invokes morphological structure, namely word boundaries, only in the analogical processes that extend devoicing from utterance-final to word-final contexts. No structural conditioning is required in the first stage of the sound change, where devoicing develops purely through phonetic factors.

Hock (1976) argues that word-final devoicing does not qualify as an example of sound change conditioned by grammatical structure, and the Neogrammarian principle of “no grammatical conditioning” is upheld. As Joseph (1999:8) remarks, this principle is critical for the theory of sound change because “in principle, once an arbitrary relationship between the conditioning environment for a change and the output of the change itself is tolerated, it is difficult to rule out any phonetically unmotivated relationship in any rule; at most, such rules could be made ‘expensive’ but they would have to be allowed.”

In this paper, while we generally agree with Hock’s analysis, we argue for a more gradual process of extension, where prosodic structure plays a greater role. In particular we suggest that the first extension of devoicing should be from prepausal to prosodic phrase-final position (whether or not followed by silence). More generally,

we suggest that sound changes that originate before pause may become established at the phrasal level before reaching the word-level. That is, the context in such changes extends gradually from “adjacent to silence” to “adjacent to phrasal boundary” to “adjacent to word boundary”. We make a parallel argument for prominence-conditioned sound changes. We provide some evidence for our hypothesis by examining a number of synchronic phenomena in other languages that show evidence for the type of intermediate stage that this account predicts, with stable patterns of alternation conditioned by phrasal position. These facts suggest that prosodic (structural) conditioning can play a role in each step of sound change.

In §2 we discuss the phenomenon of prosodically conditioned phonetic variation. We show that these effects may originate from mechanisms of speech production but they often stabilize and become conventional markers of phrasal prosodic structure within a language. In §3, we discuss evidence for a subsequent development in which recategorization/phonologization takes place, giving rise to phonological alternations or distributional restrictions that are dependent on the prosodic position of a word in its phrasal context. Such systems give rise to alternations between two forms of a word that are dependent on phrasal context. Commonly, such alternations are leveled. When the innovative form is selected, we have an accomplished sound change such as Final Devoicing in German. In §4 we suggest that Final Devoicing, as in German, will have gone through these intermediary stages, and we thus argue that prosodic structure may play a role in the extension of sound change.

2 Phonetic variation and prosodic context

There is a significant consensus that the prosodic structure of utterances is organized around two landmarks: phrasal boundaries and prominent positions. Thus, in the Autosegmental-Metrical analysis of intonation, two main elements are distinguished: boundary tones, marking the edge of prosodic phrases, and pitch-accents, which are tonal configurations associated with metrically prominent positions (Beckman and Pierrehumbert 1986; Ladd 2008). The intonational contour of the utterance is obtained by interpolating between phonologically induced pitch accents and boundary tones. Besides tone, such positions may be marked by duration, intensity, voice quality and segmental phonetic cues.

We may use the term “prosodically conditioned sound changes” to refer to those that have their origin in the phonetic properties that mark either prosodic boundaries or prosodic prominence. In both cases, we often find extension of the change to positions beyond those where the phonetic seeds of the change are found. In the following sections we introduce several examples of this sort, where prosodic boundaries and prominence induce phonetic variation that has its origins in factors having to do with speech production, with generalization of those phonetic patterns to a broader set of prosodically defined contexts.

2.1 Phonetic effects of prosodic boundaries

Phonetic modifications attributable to the presence of final phrasal boundaries have been reported for numerous languages. These effects can be understood as accommodations to the phonetic context at the end of a phrase, utterance or talker-turn, which are then generalized to occur in positions where the triggering context is absent. Consider the following three examples:

- a. Devoicing, creaky voicing, and glottalization of final segments (Chavarria et al. 2004; Choi, Hasegawa-Johnson, and Cole 2005; Carlson, Hirschberg, and Swerts 2005).
- b. Lengthening of segments preceding the boundary (Wightman et al. 1992; Cambier-Langeveld 2000; Kim et al. 2006; Turk and Shattuck-Hufnagel 2007; Mo 2011).
- c. Early alignment of accentual pitch peak on pre-boundary syllable (Silverman and Pierrehumbert 1990; Prieto, van Santen, and Hirschberg 1995; Arvaniti, Ladd, and Mennen 2006; Shue et al. 2010).

The voice quality effects (a) occur in combination with lowered intensity and the lowering of F_0 at the end of the utterance, as the consequence of the progressive opening of the glottis for breathing (Kohler 2000).¹ The pre-boundary lengthening effects (b) can be understood as a slowing down of articulatory movement as the speaker approaches the end of a planned utterance, similar to the pre-terminal slowing with other kinds of motor activity (Edwards, Beckman, and Fletcher 1991). The early alignment of accentual pitch peaks in pre-boundary position (c) is understood to result from tonal crowding, when an accented (prominent) syllable in phrase-final position must realize both the pitch peak associated with the accent *and* the (typically low) pitch movement that marks the prosodic boundary.

The cases of phonetic variation at prosodic phrase boundaries discussed above all concern phenomena that occur at the ends of prosodic phrases. In addition, common phonetic modifications at the beginning of the phrase are the strengthening of phrase-initial consonants (Fougeron and Keating 1997; Cho and Keating 2009) and glottalization of phrase-initial vowels (Redi and Shattuck-Hufnagel 2001). The basis of phrase-initial strengthening in speech production processes is less well understood.

¹In her discussion of the phonetic origins of Final Devoicing Blevins (2006) argues that in addition to a laryngeal opening gesture preceding pause, phonetic conditioning factors for phrase-final devoicing may include, in some languages, laryngeal closing gestures, final lengthening, and absence of release. Like the laryngeal opening gesture, these other phonetic factors introduce physiological and aerodynamic conditions that disfavor voicing in prepausal position.

2.2 Phonetic effects of prosodic prominence

In many languages greater prominence is assigned to words that bear phrasal stress and/or to words that are focused or bring new information to the discourse (Ladd 2008). The phonetic effects of phrasal prominence vary across languages, and include effects on F_0 , duration, intensity, vowel formants and spectral measures of vocal effort (Mo 2011). Here we focus on the durational effect of prominence, since it is this effect that is implicated as a basis for sound change. Across languages, many studies report that prominent words have increased duration (Beckman 1986; Sluijter and van Heuven 1995; Turk and Sawush 1996; Heldner and Strangert 2001), with lengthening effects especially concentrated in the stressed syllable of the prominent word in languages with word-level stress, such as English and many European languages (Beckman 1986).

In considering the basis for prominence lengthening, we turn to factors affecting higher-level, lexical processing. That is, while the phonetic effects of prosodic boundary reflect the local phonetic context, as described above, there is no direct source of prominence lengthening in the immediate phonetic context. Rather, the durational effects of prominence have been attributed to the greater difficulty of lexical access for words that are less predictable in a given context (Bell et al. 2003; Watson, Arnold, and Tanenhaus 2008; Cole, Mo, and Hasegawa-Johnson 2010). A similar argument can be made for prominence lengthening under focus, with lengthening arising from the processing demands of selecting the focused word from a set of competitors in the alternative set, which are salient from the broader context (Rooth 1992; see also Breen et al. 2010).

2.3 On the prosodic extension of locally defined phonetic variation

In the preceding subsections we have reviewed a number of examples of phonetic patterns that are conditioned by the local context, e.g. by the transition from speech to silence that occurs at the end of a talker-turn, by the coincidence of accentual and boundary tones at the end of an utterance, or by the temporal consequences of lexical processing under easy/predictable vs. hard/unpredictable conditions. These phenomena are presumed to arise, perhaps to varying degrees, for all languages and all speakers, yet our interest here is in the possibility that these more or less automatic consequences of speech production in some languages generalize to other locations defined on the basis of prosodic features.

For example, turn-final slowing down may result in a pattern of lengthening at the end of a prosodic phrase, including turn-internal phrases. We see evidence of this in American English, where lengthening is robust and reliably observed at the end of a talker's turn (Gorman 2006) and also characterizes the ends of prosodic phrases that are not final in a turn (Mo 2011). Moreover, as shown by Carlson, Hirschberg, and Swerts (2005) for English and Swedish, listeners are sensitive to such cues and use

them to identify upcoming prosodic boundaries. Notably, the listeners in that study were able to use the acoustic cues to discriminate between “strong” boundaries such as occur at the end of an utterance and “weak” boundaries such as occur at the end of a lower-level phonological phrase. From these findings we see that the phonetic patterns that occur as a speaker approaches the end of a speaking turn are extended to other locations to mark the end of a phrase which is not necessarily turn-final, and further, that listeners recognize these phonetic patterns as generalized boundary cues, which may occur independent of their original turn-final context.

As a first step, the phonetic modifications described above are generalized to occur in the phrase-level prosodic context that matches the original triggering context. This is the first step at which we see prosodic conditioning—low-level (non-contrastive) phonetic modifications stabilize as exponents of the phrasal prosody. To give another example from English, creaky voicing that is phonetically sourced in the transition to silence at the end of an utterance generalizes to occur with high frequency at the end of a prosodic phrase, regardless of whether the phrase is followed by silent pause. In this way creaky voice comes to function as a reliable indicator of the end of a prosodic phrase in languages such as American English (Yoon et al. 2009) and Swedish (Carlson, Hirschberg, and Swerts 2005). This is the first step in the phonologization process, because even though the phonetic modifications operate below the level of lexical contrast, the generalization of those patterns beyond their originating contexts is determined on the basis of phonological prosodic structure.

To be clear, the structural conditioning that determines this first step in stabilizing phonetic modifications such as obstruent devoicing, creaky voice, or pitch peak retraction is not based on syntactic structure; although prosodic phrases tend to align at one edge with the edge of a major syntactic category, studies that examine the phonology-syntax interface in a variety of languages consistently show that prosodic and syntactic phrases are very clearly not co-extensive (Selkirk 1986; Truckenbrodt 1999; Kisseberth 2010; see also Hock and Dutta 2010). Similarly, the structural conditioning that extends the lengthening effects of focused or unpredictable words, considered above to result from lexical processing demands, relies on the prosodic head-marking structures that locate prominence, and cannot be equated with any level of syntactic or semantic structure. In English, where the relationship between prominence and semantic focus has been heavily investigated (e.g., Calhoun 2010; Katz and Selkirk 2011; Wagner 2005), prominence is typically assigned to words that are discourse-new or semantically focused, but a full account of the distribution of prominence within a phrase depends on a complex interplay between phonological factors related to metrical structure and semantic factors. What is relevant to our point here is that the phonetic effect of prominence lengthening is not strictly dependent on the original triggering context, here having to do with lexical processing, but is generalized to positions defined by prosodic phonological structure.

To summarize, phenomena that arise under very specific and phonetically local

conditions can become generalized to prosodic positions defined at the level of the phrase. Once these patterns of variation are stabilized in phonological structure, we may expect a further development involving recategorization, i.e. sound change, in these structural prosodic contexts. The question here is whether there is any evidence for an intermediary stage in the development of a sound change like Final Devoicing, where the phonetic modification originating under specific conditions (like pre-pause or difficult-lexical-access) stabilizes and extends to a phrasal prosodic context. In other words, is there evidence for something like Phrase-Final Devoicing, as in pseudo-German *das Ra[t]* but *das Ra[d] ist*, in any language? The answer is yes, and we offer several examples in the following section.

3 Phrasally restricted sound patterns

Evidence for sound change resulting from prosodically conditioned phonetic variation comes in the form of phonological alternations or distributional restrictions whose conditioning environments are defined in terms of phrase-level prosodic structure.

3.1 Phrase-final devoicing

As just mentioned, Final Devoicing, in our view, would go through a stage where it applies at the end of a prosodic phrase (regardless of the presence of a following pause), before it generalizes at the word level. Blevins (2006:140–4) lists cases of phrase-final or utterance-final devoicing in several languages from different language families (see also Iverson and Salmons 2011). An example of final devoicing restricted to the phrase level is found in the Castilian Spanish speech of one of the authors. In this Spanish dialect, word-final /d/, which is spirantized in postvocalic position, is subject to devoicing and deletion, e.g. *verdad* /berdad/ [berðáθ] ~ [berðá] ‘truth’. In monosyllabic words, deletion is not an option, and before pause there seems to be complete neutralization with another phoneme, /θ/: compare the final consonant in *red* [reθ] ‘net’, *sed* [seθ] ‘thirst’ with the final consonant in words like *pez* [peθ] ‘fish’, *luz* [luθ] ‘light’. Like in the German case, this devoicing rule produces alternations in morphological paradigms *red* [reθ] vs. *redes* [reðes] ‘net/nets’, cf. invariant *pez* [peθ], *peces* [peθes] ‘fish sg./pl.’ The process is, however, less advanced than in German, since in word-final but phrase-medial position both voiceless and voiced realizations are possible for words like *red*; *la re*[θ ~ ð] *es* ‘the net is’. What we observe in this case is that devoicing is more systematic phrase-finally than in the middle of a phrase, suggesting a development where devoicing extends to phrase-medial environments after it has become a stable phonetic mark of phrase-final position.

3.2 Phrase-final accent and tone retraction

As Hock (1991:105–6; 2010:112) discusses, many languages have a nonfinality constraint on accent or high tone. A plausible source of nonfinality is the tonal crowding that results from the co-occurrence of boundary tones and accentual or lexical tones, given a range of evidence suggesting that a sufficient retraction of the pitch peak under tonal crowding can result in a reinterpretation of the phonological locus of the high tone, from the final to a penultimate (or earlier) syllable. Thus, in some African tonal languages, a High tone that is otherwise expected to surface on a word-final syllable will instead be realized on an earlier syllable (e.g., Downing 1990; Cassimjee and Kisseberth 1998), which is often analyzed in terms of a constraint enforcing nonfinality of high tone. In these cases, the displacement of the high tone from the final syllable occurs even in the absence of a triggering boundary tone. Similarly, in the Coastal Bizkaian Basque pitch-accent systems, sentential accent is generally assigned to the last syllable of the word immediately preceding the verb, but in some local varieties the accent has been retracted to the penultimate syllable (Hualde 2000).

Another pattern of nonfinality effects are observed in stress/accent languages and are likely reflected in the typological distribution of stress patterns, penultimate stress being rather more frequent than final stress (see e.g. Goedemans and van der Hulst 2011). Considering that word-level stress is very often realized with a high tone (pitch accent), this fact in the typology of word-stress appears to be an extension to word-final position of an effect whose phonetic origin must be sought in phrase-final position.

While the typological preference for penultimate over final stress illustrates nonfinality effects at the word level, we also find evidence for phrase-level nonfinality in languages where retraction is only found at the end of the utterance or the phrase, giving rise to synchronic patterns of alternations in the accentuation of individual words. Hock (1991:105–6) discusses variation in Serbian/Croatian dialects in this respect.

Another clear example of extension of nonfinality from the phrasal to the word level can be found when we compare local Central Basque dialects sharing a basic pattern of stress on the second syllable from the beginning of the word (Hualde 1997, 1999). Among these varieties (spoken in Gipuzkoa and neighboring areas of other Basque provinces), we find different patterns of avoidance of final stress. In some of them (e.g. Goizueta) final stress is not avoided: *emákumea* ‘the woman’, *mendía* ‘the mountain’, *mendí* ‘mountain’, *neská* ‘the girl’. In a few local dialects, only phrase-final stress is avoided, so that bisyllabic words show different patterns in phrase-final and phrase-medial position; e.g. *neska* ‘girl’, but *neská da* ‘girl is’. It is more common, however, for bisyllabic words to consistently show initial stress (*neska*, *neska da*) than for the position of the stress to depend on the position of the word in the phrase, and this pattern may also extend to longer inflected forms of the same words (*neskári* > *neskari* vs. *gizónari* ‘to the man’).

As we see there is compelling evidence for the phonologization at the phrasal level of final tonal peak retraction, a phenomenon whose explanation is the need to accommodate a phrase-final fall within the same syllable.

3.3 Prominence-conditioned vowel alternations

In many languages we find that word-level stressed syllables have a richer variety of phonological contrasts than unstressed ones, and in many cases long vowels and diphthongs are restricted to positions of word-level stress. The phonologization of stress-induced lengthening can be observed in the history of the Romance languages. In Spanish, the open mid vowels of Vulgar Latin diphthongized in stressed position but not in unstressed position, where they merged with their close mid counterparts, giving rise to alternations like *piérdo* ‘I lose’ (< PERDŌ) ~ *perdémus* ‘we lose’ (< PERDĒMUS). In French we also find diphthongization of these vowels, but only in stressed open syllables, PEDE > *piéd* but PERDŌ > *perd* ‘I lose’. This restriction naturally follows from the common fact that vowels are longer in open than in closed syllables. Thus in French it is only in positions where the combined lengthening effects of prominence and open syllables are united that the vowel was recategorized as a diphthong.

The reasoning here is that stressed syllables in such languages typically exhibit greater duration, which affords a better opportunity to fully realize the vowel target, while unstressed syllables are typically shorter, resulting in hypo-articulation and undershoot of the vowel target (Barnes 2006). English offers one such example, with full vowels restricted to stressed syllables and reduced schwa or [ɪ] vowels occurring in unstressed syllables. The explanation for word-level stress lengthening has to be found in the extension of phrase-level prominence lengthening to the word level, predicting the existence of a pattern where phrasal prominence lengthening is upgraded from a variable phenomenon to a categorical one, e.g. an alternation between monophthongs and diphthongs that is conditioned by phrase-level prominence. Whereas languages showing this stage are not common (and we will come back to this), some examples can be found.

Abete (2011) shows that in a few local dialects spoken in Southern Italy, the same lexical item may show quite different nuclei in its stressed syllable depending on whether the word is medial or final in the phrase. Thus, for instance, in the dialect of Pozzuoli, near Naples, the word for ‘fish’ is [piʃ:] in phrase-medial position, but this same word is pronounced [pviʃ:] phrase-finally; that is, under main phrasal stress.

One of the earliest examples of phrasal phonology discussed in the generative phonology literature is that of Chimwiini vowel shortening. The facts were first introduced by Kisseberth and Abasheikh (1974) and later analyzed by Selkirk (1986). Kisseberth (2010) provides independent evidence from the tone system of the language for the prosodic phrases invoked in the analysis of vowel shortening. The vowel

shortening facts are briefly summarized here. First, we observe that Chimwiini has a phonological contrast between long and short vowels (4):

4. Chimwiini vowel length contrasts (from Kisseberth 2010:219)

[x-kúla] ‘to grow’	[x-kúula] ‘to extract’
[sómo] ‘namesake’	[sóomu] ‘fasting’
[x-fanída] ‘to pick better specimen’	[x-faanána] ‘to resemble s.o.’
[ku-baláma] ‘to promise’	[ku-baaráma] ‘to talk’

Long vowels are lexically contrastive in some morphemes (as in the right column of (4)), and long vowels are also derived in certain phonological and morphological contexts. But whatever their source, long vowels are realized in surface phonetic form only when they occur in stressed position. Chimwiini stress is similar to the Latin pattern, with stress located on the antepenultimate when followed by a light penult, and otherwise on the penult, but as in French and unlike Latin, Chimwiini stress is defined only at the phrase level. Phrasal stress is an abstract property in Chimwiini governing the surface distribution of underlying long vowels. Crucially it is independent of lexical tone (acute accent marks in the examples signal high tone).

The examples in (5) and (6) show long vowels that are realized in stress position in the left column, and in the right column the same vowels in the same morphemes located in a different position in the word (5) or phrase (6) are not in the stressed position and therefore undergo vowel shortening. Notice that in these examples there is a high tone either on the penultimate or the final syllable, but this is not the syllable that Kisseberth and Selkirk take to have phrasal stress.

5. Chimwiini unstressed vowel shortening (Kisseberth 2010:219)

[mw-aalímu] ‘teacher’	[mw-alimú = w-e] ‘his/her teacher’
[ku-waafíqa] ‘to agree’	[ku-wafiqána] ‘to agree with one another’

6. Chimwiini unstressed vowel shortening (Kisseberth 2010:223)

[nii mú-le] ‘is tall’	[ni chi-góbe] ‘is short’
	[ni mu-lee nthó] ‘is very tall’
	[ni súura] ‘it is good, nice’

These facts from Chimwiini offer a clear example of a phonological pattern, here a restriction on the realization of phonological vowel length, that occurs in a phrasal prosodic context. As in the Spanish, Italian and Basque examples, the result of this pattern is an alternation in the phonological surface form of all affected words, between forms with long vowels (either underlying or derived by morphophonological rule) that are used only when the long vowel is located in a position of phrasal stress,

and forms with corresponding short vowels which appear in unstressed positions, e.g., [waafiq-] ~ [wafiq-] ‘to agree’.

3.4 On the instability of phrasally-conditioned lexical alternation

The examples above from Spanish, Italian, Basque, Chimwiini and other languages all present processes that exhibit lexical alternations conditioned by phrasal prosody. In each case, the alternation makes sense in light of the phonetic properties that frequently characterize prosodic boundaries and prominence across languages. For instance, the southern Italian dialects that we have discussed and Chimwiini exhibit alternations in vowel length or complexity, favoring vowels with complex nuclei or phonologically long vowels in positions of phrasal stress/prominence. This can be seen as a phonologization of the phonetic (non-contrastive) prominence-induced lengthening reported for many languages. The Spanish dialect described above exhibits an alternation between final voiced and voiceless obstruents, as in German, but restricted to the phrase-final position, where it can be understood as an example of anticipation of utterance-final pause, generalized as phrase-final. And the reported Central Basque dialect exhibits an alternation in the placement of stress, with stress retracted to the penultimate position in phrase-final position. As mentioned, this process can be seen as a reflex of the tonal crowding that results when pitch-accent and boundary tones are situated on the same final syllable.

The phonetic effects of prosodic boundary and prominence that underlie these lexical alternations are not universal, but they are very common. Given that the phonetic modifications due to prosodic context can be fairly robust within a language, we might expect many instances where prosodically conditioned variation leads to sound change, resulting in many languages with lexical alternations conditioned by phrasal prosodic context. Such cases are in fact rare. Instead, across languages we find a strong tendency against having phonologically distinct variants of the same lexical items conditioned by position in the phrase. New pronunciation variants that arise, for example, before pause readily spread to phrase-medial contexts, instead of remaining phonologized as phrase-final variants.

In considering why phrasally conditioned alternations are dispreferred, we call attention to the complexity of learning such alternations. Take the example from §3 of the Spanish Final Devoicing, which applies optionally in phrase-medial position. The dispreferred situation would be a systematic alternation between two forms of the same word, say /red/ and /reθ/, depending on whether the word appears in the middle or at the end of a phrase. The challenge for language acquisition arises especially if there is a class of word that shows an alternation (/red/ ~ /reθ/) and another one that does not (/peθ/, both phrase-medially and phrase-finally). The phenomenon of linking /r/ in English dialects that had lost this consonant in the coda presents an interesting example in this regard. In this case the alternant with coda /r/ that occurs

in the phrasal (prevocalic) context, (*that's a goph[a]* 'gopher'; *a gophe[r] in the garden*), is extended to previously non-alternating words (*the sofa[r] is*), in this case improving syllable contact (Hock 1999:187–8).

4 Final words

Hock's analysis of German Final Devoicing involves the extension of prepausal devoicing, a phonetically natural process, to word-final positions, regardless of the following context. In light of the above remarks, this extension, in our opinion, should be understood as a prosodically conditioned process that generalizes the phonetically based devoicing in pre-pause position to the prosodically defined phrase-final position, and subsequently to the (prosodic) word-final position. Under this interpretation, we assume that there was an intermediary stage in German with devoicing before a prosodic phrase boundary, which did not however affect words that are medial in a prosodic phrase. While we know of no direct evidence for this intermediary stage of the sound change in German, phrase-final devoicing is reported here for one variety of Spanish, and several other examples are reported by Blevins (2006). More generally, we have offered examples of phrasally conditioned alternation involving other features, in other languages.

There is one aspect of Hock's account of German Final Devoicing that is not covered by our analysis. Hock notices that in some varieties of German, devoicing extends to syllable-final obstruents, including those in word-medial position. Hock considers this another step in the analogical extension of devoicing: the first step is extension from utterance-final (prepausal) position to word-final position, and the second step is the extension to syllable-final position, on the basis that all word-final consonants are also syllable-final (see also Iverson and Salmons 2011). In the account proposed here, syllable-final devoicing is not predicted. The extension from phrase-final to word-final position resolves the alternation between competing word forms, by hypothesis simplifying lexical processing. But extension to syllable-final position is not similarly motivated. Here we suggest that syllable-final devoicing may have its origins in a different phonetic process, namely glottalization of consonants in unreleased position, i.e., when not followed by a vowel, which is one of many glottalization contexts documented in German connected speech (Kohler 2000).

We have argued that the feasibility of a phrase-final devoicing process is supported by the fact that low-level phonetic effects like (partial) devoicing, creaky voicing, lengthening, and pitch peak retraction do generalize to prosodic phrase-final position, without further extending to word-final position. This establishes the possibility of extension along a prosodic pathway. At the same time, the low-level phonetic effects conditioned by prosodic context differ from processes like Final Devoicing in being variable phenomena whose occurrence may depend on the individual speaker, speech style, rate and other factors (Mo 2011). Prosodically conditioned variation also does

not typically result in recategorization of contrastive phonological features. In other words, while prosodic factors regularly condition gradient variation, they do not typically condition alternant word forms that differ in categorical phonological features. Genuine cases of phrasally-conditioned lexical alternation are rare, and we suggest that when they arise, they readily give way to further generalization that removes the prosodic conditioning environment from the statement of the rule, resulting in more categorical and less variable processes like German Final Devoicing.

We return here to briefly consider an alternative account of Final Devoicing, in which devoicing is first phonologized as a variable phenomenon in prepausal position, e.g. /ra:ɪd / > /ra:ɪd/ ~ /ra:t/ , after which the devoiced word variants automatically spread to all phrasal positions, without any role being played by prosodic structure: speakers would simply fail to pay attention to the fact that voiceless variants are restricted to utterance-final, prepausal position, extending the variable pattern to all phrasal contexts. This analysis is simpler in denying any role to structural conditioning, but it also fails to relate devoicing to the very similar phonetic effects of devoicing observed at prosodic boundaries, and fails to predict the existence of systems in which the phrasally conditioned sound patterns are phonologized as lexical variants. Evidence for the existence of such systems leads us to reject the simpler analysis in favor of an analysis where prosodic factors condition the analogical extension of a phonetically based sound change.

To summarize, we have argued for a role of prosodic structure in the generalization or analogical extension of certain sound changes that in their final form appear to have been conditioned by morphophonological factors such as word boundaries and lexical stress. These sound changes have their inception in discourse contexts where they are motivated by phonetic and processing factors and, under our hypothesis, are generalized within prosodic phrasal contexts before being further regularized at the level of the word. Along these lines, we argue that Final Devoicing, which has its seeds in turn-final position, would go through a stage of phrase-final devoicing before giving rise to word-final devoicing.²

Viewed within the broader context of research that spans the speech chain from production to perception, it is perhaps not remarkable to find that prosodic structure has a role to play in sound change. There is ample cross-linguistic evidence that prosodic structure directly influences speech production (e.g., Browman and Goldstein 1991; Beckman et al. 1992), and furthermore, listeners identify the prosodic land-

²The same prediction is made by Blevins (2006) in an account of Final Devoicing within the framework of Evolutionary Phonology, which is largely compatible with the analysis offered here in locating the origins of devoicing in phonetic factors that arise in utterance-final position. Here we are focused on the role of prosodic structure in extending the phonetically conditioned sound pattern. See also Iverson and Salmons 2007. We would like to point out that the connection between final devoicing in Modern German and the analogous process in Old German is far from transparent (Salmons 2012:189–90), see Mihm 2004, Szczepaniak 2007 for different views. The account that we are defending in this paper is a general explanation of how word-final devoicing may arise.

marks of an utterance based on acoustic cues (e.g., Frazier, Carlson, and Clifton 2006; Ito and Speer 2008). It follows that any theory that claims sound change originates in processes of speech production and perception would predict the possibility that prosodic structure may condition sound change. With the increasing research focus on prosody as a phonetic and phonological phenomenon, and with new findings on the role of prosody in speech comprehension, we expect that future research will provide new empirical evidence for the role of prosody in sound change.

References

- Albete, Giovanni. 2011. *I processi di dittongazione nei dialetti dell'Italia meridionale: Un approccio sperimentale*. Rome: ARACNE.
- Arvaniti, Amalia, D. R. Ladd, and Ineke Mennen. 2006. "Phonetic effects of focus and 'tonal crowding' in intonation: Evidence from Greek polar questions." *Speech Communication* 48:667–96.
- Barnes, Jonathan. 2006. *Strength and Weakness at the Interface: Positional Neutralization in Phonetics and Phonology*. Berlin: de Gruyter.
- Beckman, Mary E. 1986. *Stress and Non-stress Accent*. Dordrecht: Foris.
- Beckman, Mary E., Kenneth de Jong, Sun-Ah Jun, and Sook-Hyang Lee. 1992. "The interaction of coarticulation and prosody in sound change." *Language and Speech* 35:45–58.
- Beckman, Mary E., and Janet B. Pierrehumbert. 1986. "Intonational structure in English and Japanese." *Phonology Yearbook* 3:255–309.
- Bell, Alan, Daniel Jurafsky, Eric Fosler-Lussier, Cynthia Girand, Michelle Gregory, and Daniel Gildea. 2003. "Effects of disfluencies, predictability, and utterance position on word form variation in English conversation." *Journal of the Acoustical Society of America* 113:1001–24.
- Blevins, Juliette. 2006. "A theoretical synopsis of Evolutionary Phonology." *Theoretical Linguistics* 32:117–66.
- Breen, Mara, Evelina Fedorenko, Michael Wagner, and Edward Gibson. 2010. "Acoustic correlates of information structure." *Language and Cognitive Processes* 25:1044–98.
- Browman, Catherine P., and Louis Goldstein. 1991. "Gestural structures: Distinctiveness, phonological processes, and historical change." In *Modularity and the Motor Theory of Speech Perception*, ed. Ignatius G. Mattingly and Michael Studdert-Kennedy, 313–38. Hillsdale: Erlbaum.
- Calhoun, Sasha. 2010. "The centrality of metrical structure in signaling information structure: A probabilistic perspective." *Language* 86:1–42.
- Cambier-Langeveld, Tina. 2000. "Temporal marking of accents and boundaries." Ph.D. dissertation, University of Amsterdam.
- Carlson, Rolf, Julia Hirschberg, and Marc Swerts. 2005. "Cues to upcoming Swedish

- prosodic boundaries: Subjective judgment studies and acoustic correlates.” *Speech Communication* 46:326–33.
- Cassimjee, Farida, and Charles W. Kisseberth. 1998. “Optimality Domains Theory and Bantu tonology: A case study from Isizhosa and Shingazidja.” In *Theoretical Aspects of Bantu Tone*, ed. Larry M. Hyman and Charles W. Kisseberth, 33–132. Stanford: CSLI.
- Chavarría, Sandra, Tae-Jin Yoon, Jennifer Cole, and Mark Hasegawa-Johnson. 2004. “Acoustic differentiation of ip and IP boundary levels: Comparison of L- and L-L% in the Switchboard Corpus.” *Proceedings of Speech Prosody 2004*, 333–6.
- Cho, Taehong, and Patricia A. Keating. 2009. “Effects of initial position versus prominence in English.” *Journal of Phonetics* 37:466–85.
- Choi, Jeong-Yoon, Mark Hasegawa-Johnson, and Jennifer Cole. 2005. “Finding intonational boundaries using acoustic cues related to the voice source.” *Journal of the Acoustical Society of America* 118:2579–88.
- Cole, Jennifer, Yoonsook Mo, and Mark Hasegawa-Johnson. 2010. “Signal-based and expectation-based factors in the perception of prosodic prominence.” *Laboratory Phonology* 1:425–52.
- Downing, Laura J. 1990. “Local and metrical tone shift in Nguni.” *Studies in African Linguistics* 21:261–317.
- Edwards, Jan, Mary E. Beckman, and Janet Fletcher. 1991. “The articulatory kinematics of final lengthening.” *Journal of the Acoustical Society of America* 89:369–82.
- Fougeron, Cécile, and Patricia A. Keating. 1997. “Articulatory strengthening at edges of prosodic domains.” *Journal of the Acoustical Society of America* 101:3728–40.
- Frazier, Lyn, Katy Carlson, and Charles Clifton, Jr. 2006. “Prosodic phrasing is central to language comprehension.” *Trends in Cognitive Sciences* 10:244–9.
- Goedemans, Rob, and Harry van der Hulst. 2011. “Fixed stress locations.” Chapter 14 of *The World Atlas of Language Structures Online*, ed. Matthew S. Dryer and Martin Haspelmath. Munich: Max Planck Digital Library. Available online at <http://wals.info/chapter/14> Accessed on 2012-08-15.
- Goldstein, Louis, Hosung Nam, Elliot Saltzman, and Ioana Chitoran. 2009. “Coupled oscillator planning model of speech timing and syllable structure.” In *Frontiers in Phonetics and Speech Science: Festschrift for Professor Wu Zongji's 100th Birthday*, ed. Gunnar Fant, Hirose Fujisaki, and Jiakuan Shen, 239–50. Beijing: Commercial.
- Gorman, Kyle. 2006. “Automatic detection of turn-taking cues in spontaneous speech based on prosodic factors.” M.A. thesis, University of Illinois.
- Heldner, Mattias, and Eva Strangert. 2001. “Temporal effects of focus in Swedish.” *Journal of Phonetics* 29: 329–61.
- Hock, Hans Henrich. 1976. Review of Raimo Antilla, *An Introduction to Historical and Comparative Linguistics*. *Language* 52:202–20.
- . 1991. *Principles of Historical Linguistics*. 2nd ed. Berlin: de Gruyter.
- . 1999. “Finality, prosody, and change.” In *Proceedings of LP '98: Item Order in*

- Language and Speech*, ed. Osamu Fujimura, Brian D. Joseph, and Bohumil Palek, 15–30. Prague: Charles University (Karolinum) Press.
- . 2010. “Suprasegmental and prosodic historical phonology.” In *Continuum Companion to Historical Linguistics*, ed. Silvia Luraghi and Vit Bubenik, 106–13. London: Continuum.
- Hock, Hans Henrich, and Indranil Dutta. 2010. “Prosody vs. syntax: Prosodic re-bracketing of final vocatives in English.” In *Proceedings of Speech Prosody 2010*. <http://speechprosody2010.illinois.edu/papers/100931.pdf>
- Hualde, José I. 1997. *Euskararen azentuerak*. Bilbao: Universidad del País Vasco/Euskal Herriko Unibertsitatea.
- . 1999. “Basque accentuation.” In *Word Prosodic Systems in the Languages of Europe*, ed. Harry van der Hulst, 947–93. Berlin: de Gruyter.
- . 2000. “On system-driven sound change: Accent shift in Markina Basque.” *Lingua* 110:99–129.
- Ito, Kiwako, and Shari Speer. 2008. “Anticipatory effects of intonation: Eye movements during instructed visual search.” *Journal of Memory and Language* 58:541–73.
- Iverson, Gregory, and Joseph Salmons. 2007. “Domains and directionality in the evolution of German final fortition.” *Phonology* 24:121–45.
- . 2011. “Final devoicing and final laryngeal neutralization.” In *The Blackwell Companion to Phonology*. Vol. 3, *Phonological Processes*, ed. Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume, and Keren Rice, 1622–43. Malden: Wiley-Blackwell.
- Joseph, Brian. 1999. “Utterance-finality: Framing the issues.” In *Proceedings of LP '98: Item Order in Language and Speech*, ed. Osamu Fujimura, Brian D. Joseph, and Bohumil Palek, 3–13. Prague: Charles University (Karolinum) Press.
- Katz, Jonah, and Elisabeth Selkirk. 2011. “Contrastive focus vs. discourse-new: Evidence from phonetic prominence in English.” *Language* 87:771–816.
- Kim, Heejin, Tae-Jin Yoon, Jennifer Cole, and Mark Hasegawa-Johnson. 2006. “Acoustic differentiation of L- and L-L% in Switchboard and Radio News speech.” *Proceedings of Speech Prosody 2006*, ed. Rüdiger Hoffmann and Hansjörg Mixdorff. Dresden: Technische Universität Dresden.
- Kisseberth, Charles W. 2010. “Optimality Theory and the theory of phonological phrasing: The Chimwiini evidence.” In *The Sound Pattern of Syntax*, ed. Nomi Erteschik-Shir and Lisa Rochman, 217–46. Oxford: Oxford University Press.
- Kisseberth, Charles W., and Mohammad I. Abasheikh. 1974. “Vowel length in Chi Mwi:ni: A case study of the role of grammar in phonology.” In *Papers from the Parasession on Natural Phonology*, ed. Anthony Bruck, Robert W. Fox, and Michael La Galy, 193–209. Chicago: Chicago Linguistic Society.
- Kohler, Klaus. 2000. “Linguistic and paralinguistic functions of non-modal voice in connected speech.” *Proceedings of the 5th Seminar on Speech Production: Models and*

- Data*, ed. Phil Hoole, 121–4. Munich: Institut für Phonetik und Sprachliche Kommunikation, Ludwig-Maximilians-Universität München.
- Ladd, D. Robert. 2008. *Intonational Phonology*. 2nd ed. Cambridge, UK: Cambridge University Press.
- Mahrt, Timothy, Jennifer Cole, Margaret Fleck, and Mark Hasegawa-Johnson. 2012. “Modeling speaker variation in cues to prominence using the Bayesian information criterion.” *Proceedings of Speech Prosody 2012*, ed. Qiuwu Ma, Hongwei Ding, and Daniel Hirst. Shanghai: Tongji University. <http://www.speechprosody2012.org/page.asp?id=157>
- Mihm, Arend. 2004. “Zur Geschichte der Auslautverhärtung und ihrer Erforschung.” *Sprachwissenschaft* 29:133–206.
- Mo, Yoonsook. 2011. “Prosody production and perception with conversational speech.” Ph.D. dissertation, University of Illinois.
- Myers, Scott. 2012. “Final devoicing: Production and perception studies.” In *Prosody Matters: Essays in Honor of Elisabeth Selkirk Borowsky*, ed. Toni Borowsky, Shigeto Kawahara, and Mariko Sugahara, 148–80. London: Equinox.
- Prieto, Pilar, Jan van Santen, and Julia Hirschberg. 1995. “Tonal alignment patterns in Spanish.” *Journal of Phonetics* 23:429–51.
- Redi, Laura, and Stefanie Shattuck-Hufnagel. 2001. “Variation in the realization of glottalization in normal speakers.” *Journal of Phonetics* 29:407–29.
- Rooth, Mats. 1992. “A theory of focus interpretation.” *Natural Language Semantics* 1:75–116.
- Salmons, Joseph. 2012. *A History of German: What the Past Reveals about Today’s Language*. Oxford: Oxford University Press.
- Selkirk, Elisabeth. 1986. “On derived domains in sentence phonology.” *Phonology Yearbook* 3:371–405.
- Shue, Yen-Liang, Stefanie Shattuck-Hufnagel, Markus Iseli, Sun-Ah Jun, Nanette Veilleux, and Abeer Alwan. 2010. “On the acoustic correlates of high and low nuclear pitch accents in American English.” *Speech Communication* 52:106–22.
- Silverman, Kim E. A., and Janet B. Pierrehumbert. 1990. “The timing of prenuclear high accents in English.” In *Papers in Laboratory Phonology 1: Between the Grammar and the Physics of Speech*, ed. John Kingston and Mary E. Beckman, 72–106. Cambridge, UK: Cambridge University Press.
- Sluijter, Agaath M. C., and Vincent J. van Heuven. 1995. “Effects of focus distribution, pitch accent and lexical stress on the temporal organization of syllables in Dutch.” *Phonetica* 52:71–89.
- Szczepaniak, Renata. 2007. *Der phonologisch-typologische Wandel des Deutschen von einer Silben- zu einer Wortsprache*. Berlin: de Gruyter.
- Truckenbrodt, Hubert. 1999. “On the relationship between syntactic phrases and phonological phrases.” *Linguistic Inquiry* 30:219–55.

- Turk, Alice E., and James R. Sawusch. 1996. "The processing of duration and intensity cues to prominence." *Journal of the Acoustical Society of America* 99:3782–90.
- Turk, Alice E., and Stefanie Shattuck-Hufnagel. 2007. "Multiple targets of phrase-final lengthening in American English words." *Journal of Phonetics* 35:445–72.
- Wagner, Michael. 2005. *Prosody and Recursion*. Ph.D. dissertation, MIT.
- Watson, Duane G., Jennifer E. Arnold, and Michael K. Tanenhaus. 2008. "Tic Tac TOE: Effects of predictability and importance on acoustic prominence in language production." *Cognition* 106:1548–57.
- Wightman, Colin W., Stefanie Shattuck-Hufnagel, Mari Ostendorf, and Patti J. Price. 1992. "Segmental durations in the vicinity of prosodic phrase boundaries." *Journal of the Acoustical Society of America* 91:1707–17.
- Yoon, Taejin, Xiaodan Zhuang, Jennifer Cole, and Mark Hasegawa-Johnson. 2009. "Voice quality dependent speech recognition." In *Linguistic Patterns of Spontaneous Speech*, ed. Shu-Chuan Tseng, 77–100. Taipei: Academica Sinica.