Representing Phonological Evolution

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SUMMARY: The metaphor of evolution is commonly invoked in phonological theory, particularly with regard to the notion of markedness. However, Blevins’ Evolutionary Phonology denies markedness, attributing change to parses of perceptual ambiguity. The current paper seeks to enhance the power of the Evolutionary model by investigating an additional type of ambiguity based on the linearity problem in speech perception. It is shown how divergent parses of CV transitions, encoded as the Vocalic Onset node in the representations of the Onset Prominence framework, account for cross-linguistic differences in the evolution of seemingly unrelated phonetic properties.

Key words: capitalize (Evolutionary Phonology, Onset Prominence), phonological representation, VO node, vowel inherent spectral change, linking vs. glottalization

1. Introduction — Ambiguities in the Speech-Phonology Mapping

In the phonological literature, it is not difficult to find references to evolution. Many authors have suggested that there is at least a metaphorical relationship between the way sound systems and species of living beings develop over time. One area in which this metaphor is apparent is the principle of phonological markedness—phonologically unmarked patterns are claimed to be most stable diachronically leading to apparent commonalities in the sound systems of otherwise unrelated languages. These links seem especially robust in theoretical perspectives in which marked patterns may be associated with phonetic difficulty, such as Natural Phonology (Donegan and Stampe 1979) and phonetically-based Optimality Theory (Hayes et al. 2004). For example, aerodynamic considerations dictate that producing domain-final voiced obstruents is difficult, since speakers must maintain sufficient airflow through the glottis even as airflow decreases naturally toward the end of the domain. Thus, many languages prohibit voiced obstruents from occurring word-finally by means of devoicing, often neutralizing contrast in the process. Indeed, aerodynamic considerations may be invoked in the formulation of a more general restriction on voiced obstruents, since obstruct constrictions raise supralaryngeal pressure to impede the airflow necessary for phonation. In these cases, voiceless obstruents, which are said to be unmarked, are more likely to survive the natural forces of phonetic evolution. Additionally, the unmarked status of voiceless obstruents is claimed to be built into language users’ sub-conscious knowledge about sound systems—as an aspect of linguistic competence.

One notable theoretical perspective, Blevins’ (2004) Evolutionary Phonology, shares this fundamental perspective on the role of phonetics in shaping sound systems, yet has a radically different view on the question of markedness in phonology. Noting a number of phonetically ‘unnatural’ sound patterns that may be observed in many languages, Blevins claims that while patterns deriving from phonetically-motivated sound changes are by far the most common, they do not reflect any aspect of linguistic competence. Frequent sound patterns may be frequent because they are phonetically motivated, but they are not driven by any sub-conscious knowledge on the part of speakers. In other words, Blevins argues against the view, sometimes made explicit in markedness accounts, by which certain phenomena should be unattested, or nearly unattested, because they are excluded from the grammatical system. To support her arguments, Blevins describes certain ‘unnatural’ sound patterns across languages, including one of word-final voicing instead of devoicing.

The model that Blevins develops, which she refers to as the CCC (CHANGE, CHANCE, CHOICE) model, follows Ohala (1981) in claiming that the phonetically-driven
changes that determine phonological patterns are induced by listeners. For Ohala, mismatches between the acoustic signal and the perceived phonological string drive change. In some instances, change occurs when listeners fail to 'filter out' the effects of co-articulation. This is illustrated by the case of /u/ in a coronal context (e.g. as in a sequence /ut/), which may be fronted to [yt]. Ohala claims that listeners may reinterpret this fronted vowel as the speaker’s intention, inducing a change to /y/ that may (or may not) spread in a given language. This type of mechanism is incorporated into Blevins’ model under the label CHANGE. Another possibility is hypercorrection on the part of listeners, who in hearing [yt] from an intended sequence /yt/ may mistakenly attribute the frontness of the vowel to the effects of the coronal consonant, and assume that the speaker intended to say /ut/. This type of hypercorrection, which according to Ohala typically leads to dissipimatory changes, is labelled CHANGE in Blevins’ model. Finally, a third type of change, referred to as CHOICE by Blevins, may occur when variability in production forces listeners to choose from a large number of phonological representations of a given lexical item. Note that the listener-oriented perspective described here is not entirely acoustic in nature, since it includes a crucial role for articulation as the source of perceptual ambiguity.

In examining the relationships between the acoustic signal and the perceived string of phonological units, many ambiguities of the type discussed above may be identified. However, it is not entirely clear whether current phonological theory is equipped to deal with them. A single acoustic output [yt] may reflect (at least) two different phonological sequences /ut/ and /yt/, which in principle could be modelled as a single specification (denoting a front tongue position) spreading leftward from /t/ to /u/, or as the same specification appearing twice, once on each segment. At the same time, however, fronting of /u/ in coronal contexts is not automatic in every language, so we need a principled way of representing the difference between /ut/ that is fronted and realized as [yt] and /ut/ that is pronounced as [ut] without significant fronting.

On the face of it, it looks as if the example discussed above is a question of whether place features may spread from one phonological unit (the segment in this case) to another, or not. However, I would consider this issue in terms of an additional type of ambiguity in the relationship between the acoustic signal and the perceived phonological string, one that speaks to the structure of phonological units themselves. This ambiguity reflects a classic issue from the literature on speech perception: the ‘linearity’ problem (e.g. Wright et al. 1999). Since any given portion of the acoustic signal may contain information about multiple phonological units, and the acoustic cues associated with a single unit may span multiple acoustic events, there is ambiguity in the affiliation of a given portion of the signal with a particular unit in the phonological string. As an example, consider formant transitions associated with CV or VC sequences. With periodicity and robust formant structure, such transitions are phonetically vocalic; yet listeners use them to identify neighboring consonants. If we are to describe the relationship between speech and phonological units, our theory of phonology must have a way of resolving this type of ambiguity.

This paper will discuss such ‘ambiguities of affiliation’ in the mapping between the speech signal and the perceived string of phonological units, with particular attention to how such ambiguities are encoded in a relatively new phonological model, the Onset Prominence representational environment (OP; Schwartz 2013, 2016a, 2016b). It will be shown that divergent parses of structural ambiguities built into the OP model play an important role in driving phonological evolution, and provide a representational window to enrich the insights of Evolutionary Phonology. Section 2 gives a brief introduction to OP representations. Section 3 provides an overview of a selection of phonological phenomena whose origins may be insightfully described from the OP perspective. Section 4 offers some final remarks.

2. The Onset Prominence Representational Environment

This section will provide a brief introduction to Onset Prominence representations. For a more thorough presentation, see Schwartz (2016a, 2016b).

2.1 The OP Representational Hierarchy

The Onset Prominence representational environment is built on a hierarchical structure derived from the phonetic events associated with a CV sequence in which the consonant is a stop. This is envisioned in the tree in (1), in which each layer encodes a given event that is more or less discretely identifiable on an acoustic display. The top node (Closure) is derived from stop closure, the Noise node from aperiodic noise associated with frication and release bursts, the Vocalic Onset (VO) node captures periodicity with formant structure associated with CV transitions as well as sonorant con-

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sonants. The Vocalic Target (VT) node houses (more or less) stable formant frequencies that define vowel quality. The hierarchy is presented in (1).

(1) The Onset Prominence representational hierarchy

While the tree in (1) may be defined as a phonetic entity in that each layer of the hierarchy is a specific phonetic event, the structure also has phonological motivation derived from the fact that it is a CV unit. The CV ‘syllable’ is often seen as being a privileged unit for phonology, forming the fundamental building block for both representational frameworks (e.g. CVCV; Scheer 2004) and widely accepted constraints (ONSET, *CODA) within Optimality Theory (Prince and Smolensky 2004).

An important aspect of the structure in (1) is that linear order falls out directly from the sequence of phonetic events encoded in the CV. To visualize this, consider Figure 1, in which the labels for the structural nodes in the OP are projected onto a waveform and spectrogram display of a stop-vowel sequence. In a stop-vowel sequence, Closure precedes Noise, which precedes the onset of the vowel (VO), which in turn precedes the vocalic target (VT). When the consonant is not a stop, individual phonetic events are missing (Closure in the case of fricatives, Noise in the case of nasals, Closure and Noise in the case of approximants), but the basic sequence is universal. Closure, if present, is always first, VT is always last, VO precedes only VT, Noise is first if Closure is absent, etc.

The presence or absence of phonetic events in different types of CV sequences defines manner of articulation in segmental representations (2), which are extracted from the OP hierarchy. Manner of articulation is encoded as the active (binary) nodes in a given structure, while the unary nodes act as placeholders that reflect missing phonetic events with respect to the entire CV hierarchy. The segmental symbols are shorthand for place and laryngeal specifications to be developed in more detail shortly. An important aspect of the trees in (2) is that segments do not link to ‘timing slots’ that attach to prosodic structure. Rather, segments are prosodic structure, and different manners of articulation have different structural configurations.

(2) Individual segmental structures extracted from the OP hierarchy

The most fundamental mechanism determining the relations between segmental representations and prosodic constituents in the OP environment is referred to as absorption (Schwartz 2016, p. 43), by which lower-level vowels are joined into higher level consonant

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Figure 1  Sequence of OP structural nodes projected onto a CV sequence.
structures resulting in a CV. The absorption mechanism is motivated by a requirement for Minimal Constituents (MC constraint: Schwartz 2016, p. 44), which demands that prosodic units have active nodes both above and below the VT level. Absorption is illustrated in (3), which shows two ‘segmental’ structures, /t/ (3a) and /a/ (3b), joining into a /ta/ unit (3c).

2.2 The Realization of Place Specifications

The acoustic effects of manner and place of articulation differ in fundamental ways. Place of articulation is mainly associated with spectral properties that are dependent on vocal tract resonances, while manner is reflected in changes in the amplitude envelope. These differences are encoded in the OP model. Phonetic properties associated with manner of articulation produce a hierarchical structure that serves as a series of docking points for place specifications. Place specifications are ‘assigned’ at the highest binary node in a given segmental tree, and ‘trickle’ down the constituent structure. This is shown in (4), providing side by side representations for a stop /p/ and a fricative /f/. In the case of the stop, the [labial] specification is assigned at the Closure level and trickles down through the Noise and VO nodes. In the case of the fricative, [labial] is assigned at the Noise level and trickles down to VO. The presence or absence of square brackets represents a formal distinction between place at the level it is assigned and trickled place. The extent of the trickling mechanism is restricted by the number of active nodes in a given segmental representation. Trickling in (4) stops at the VO level; it is blocked from the VT node by the assignment of vowel-based melodic features.

In principle, the multiple layers of the OP hierarchy offer a number of possible places for place specifications to be housed. However, considering the phonetic origins of the OP structural nodes, we should expect these possibilities to be restricted. For example, the fundamental property that defines a stop is the location of its closure, so the Closure node is the natural location for place assignment. At the same time, acoustic properties associated with stop place are of course audible in the spectrum of the stop release burst (Noise), and formant transitions (VO). The postulate of ‘trickling’ encodes these phonetic patterns.

As an illustration of the trickling mechanism and the relationship between assigned and trickled place specifications, consider the common weakening process of spirantization, which in the OP framework is represented as the deactivation of the Closure node from the representation of a stop. In (5) we see the structures for a bilabial stop /p/ (5a), a bilabial fricative /ɸ/ resulting from spirantization (5b), and a labiodental stop /f/ (5c). When Closure of the spirantized stop is deactivated, the fricative that remains is still labial, as is represented by the labial specification on the Noise and VO nodes. By contrast, the /f/ assigns the labial feature directly to Noise.

Contrasts between labio-dental and bilabial fricatives are rare cross-linguistically, a fact that is predicted
by their nearly identical structures. The lone difference is that the \(/f/\) contains a full-fledged assigned [labial] specification, which reflects the fact that labio-dental frication is higher in amplitude than bilabial frication (e.g. Ladefoged and Maddieson 1996). This approach is superior to one using the feature [strident] that is traditionally assumed to distinguish bilabial from labio-dental fricatives. The representation of stridency with an additional feature encodes the similarity between \(/ɸ/\) and \(/f/\) in an arbitrary way. In the OP approach, stridency is captured by assigning place to the Noise node, which is intuitively appealing in that aperiodic noise is the fundamental phonetic property by which stridency is defined.

2.3 Ambiguity and VO Parameters

At this point we proceed to an important ambiguity built into the OP representational model, one that we claim drives a number of divergent evolutionary patterns in phonologies of different languages. This ambiguity was observed in Figure 1, which projects the OP representational hierarchy onto a waveform-spectrogram display of a CV sequence /ga/. In the figure, the initial portion of the acoustic vowel, corresponding to the VO node of the OP hierarchy, is ambiguous with respect to the its affiliation with the /g/ or the /a/. Acoustically, VO is vocalic as evidenced by the robust periodicity and formant structure, so it may be claimed that this node is built into the vowel’s representation. However, VO also contains acoustic information about the preceding /g/, so it may also be claimed that this part of the signal is encoded in the representation of the stop.

When individual segmental structures are extracted from the OP hierarchy, the ambiguity of VO with regard to the consonant-vowel distinction creates parametric choices that languages must resolve. Both consonant and vowel representations may or may not contain an active VO node. This is seen for consonants in (6), showing the two different available structures for a coronal stop. In the structure on the left, without VO, the coronal specification is realized only on the Closure and Noise nodes, while the structure on the right contains VO, so the trickling of the feature extends further.

(6) Coronal stops with and without VO specification

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             C
            /\cor /
             N
            /\cor /
             VO
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While in (6), VO is shown as part of the representation of consonants, the node is derived from a portion of the speech signal that is, strictly speaking, vocalic. Consequently, languages are faced with the choice of whether to incorporate VO into vowel representations. The trees in (7) present two types of vowel representation, with or without an active VO node.

(7) Vowels with or without VO specification

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S
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In the representation of vowels, VO specification may be seen as a built-in consonantal element, analogous to an ‘onset’ position in traditional structures. The presence or absence of VO in vowel representations has been shown to provide a useful perspective on the prosodically ambiguous behavior of onsetless syllables across languages (see Schwartz 2013). Briefly stated, VO-specification allows initial vowels to satisfy prosodic constraints requiring onsets. This may be manifested as prosodic well-formedness for processes such as stress assignment or reduplication (cf. Downing 1998 for discussion of prosodically ill-formed onsetless syllables), or a tendency for an initial vowel to be realized with glottalization.

The parametric view of VO affiliation in both consonants and vowels is summarized in (8), which shows the effects of the VO parameter on the representation of a stop and vowel. In the pair of structures on the left, the VO node is included in the higher-level obstruent representation (8a), whose place feature trickles onto VO, which is absent from the vowel (8b). In the pair on the right, VO is claimed by the vowel (8d), halting
the trickling of the consonant (8c) place feature at the Noise node. In what follows, we will show how these VO parameters may drive divergent cross-linguistic patterns of phonological evolution, reflected in a variety of language-specific phonetic details that appear at first glance to be unrelated.

\begin{equation}
\text{(8) VO node parametrically contained in vowels (left) and stops (right)}
\end{equation}

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3. The Phonological Evolution of Language-Specific Phonetics

In cases where one phonetic symbol is used to transcribe the ‘same’ segment in two different languages, systematic differences between those categories can easily be observed. Perhaps the best-known instance is voice onset time (VOT) in the realization of initial stops - /d/ in languages like English is very different along this parameter than in languages like French. In mainstream generative phonology such differences are said to be due to rules of phonetic implementation that assign language-specific numerical values for universal phonological categories. However, the pervasive nature of such language-specific differences suggests that the mainstream view is not correct. As suggested by Pierrehumbert (1999, p. 116) ‘every thorough study which has looked for a difference between two languages in details of phonetic implementation has found one’. As a consequence, we must conclude that (1) either there are no universal phonological categories and that phonological generalizations derive solely from language use, or (2) that phonological representations must reach below the segment, and that many language-specific phonetic details are attributable to categorial settings that are phonological in nature. The first of these conclusions is promoted by those working in Exemplar Theory (e.g. Johnson 1997), the second represents the perspective of Natural Phonology, which seeks to explore the hypothesis that “speech processing is categorical . . . right down to the level of the actual phonetic representation” (Donegan 2002, p. 79).

It is the latter perspective that is espoused here — the OP framework provides tools to encode the categorical nature of many phonetic details. In what follows, we shall see how the evolution of language-specific differences in two types of ‘phonetic detail’ is phonological in its origins, and may be predicted from the representational configurations of the OP environment. In both cases, VO parameter settings are shown to be responsible for systematic differences between English and Polish with respect to phonetic properties that are non-contrastive from a phonemic point of view.

### 3.1 Linking vs. Glottalization of Vowel-Initial Words

One phenomenon that has received attention in the literature is the glottalization of vowels in word-initial (and often syllable-initial) position. From the phonological point of view, it is typically assumed that vowel glottalization is the ‘insertion’ of an ‘onset’ consonant in a syllable that lacks one, improving its prosodic well-formedness. At the same time, phoneticians have observed that glottalization is subject to a great deal of variation, and appears to be governed by higher-level prosodic structure (e.g. Dilley et al. 1996, Garellek 2012), rather than syllable-level requirements. These general perspectives on the question of glottalization skirt around the important question of whether glottalization is more likely in some languages than in others. In what follows, it will be suggested that true insight into this question may be garnered by considering the evolutionary consequences of VO parameters in the OP environment. Glottalization is more likely when initial vowels evolve with the VO node built into their representations. In such cases, the process is one of fortification of a well-formed prosodic constituent, rather than the ‘insertion’ of something that is absent from the representation.

Comparison of a number of European languages suggests that it is possible to make a categorical generalization with regard to the relative likelihood of word-initial vowel glottalization in a given language. On the basis of a comparison between German and Spanish, Lleo and Vogel (2004) propose a typology of ‘demarcating’ vs. ‘grouping’ languages. In the former type, of which German is an example, word boundaries are strong, as evidenced by vowel glottalization. By contrast, Spanish is an example of a ‘grouping’ language in which words are linked by means of sandhi processes rendering word boundaries essentially indistinguishable. For example, due to a C#V resyllabification process, the items porosos ‘porous’ and por osas ‘for bears’, are identical, pronounced as /po.ro.sos/ (Lleo and Vogel 2004, 87). Another language that is known
for its linking processes is French, with its familiar phenomena of *enchaînement* and *liaison*. Textbooks dealing with English phonetics and phonology (e.g., Giegerich 1992, Cruttenden 2001) suggest that English is yet another language of the grouping type. For example, Giegerich (1992, p. 280) describes a sentence *These are old eggs,* syllabified as *[ðiːˌzaːrʊʊl.degz]* in which the word-final consonants become onsets to the following word-initial vowels. Related effects in English, such as the well-known phenomena of linking /r/ and intrusive /r/, have been observed in vowel hiatus contexts. Aside from German, demarcating languages in Europe include Czech and Polish, both of which have relatively high glottalization rates and either primary or secondary prominence on initial syllables (for discussion, see Schwartz 2016b).

Evidence for the proposed grouping-demarcating typology may be gleaned from L2 studies of L1–L2 pairs that differ according to the grouping-demarcating typology. For L1 speakers of a demarcating language such as Polish, proficiency in L2 English should be expected to be accompanied by the acquisition of linking processes involving vowel-initial words. Schwartz (2016b) describes an experiment in which B2-level Polish learners of English produced phrases with initial vowels both in L1 and L2. Glottalization rates in L1 Polish were higher than in L2 English, despite the fact that the dataset was designed to favor glottalization in English. In other words, the participants in this study had made progress in the suppression of L1 glottalization to produce linked L2 items. The learners nevertheless produced higher glottalization rates than a group of native controls, suggesting L1 interference persists in the glottalization of initial vowels in L2 English.

The results of the Schwartz (2016b) study discussed above suggest a categorical difference between Polish and English with regard to the realization of word-initial vowels. Exactly these effects are predicted by the parametric settings with regard to the status of the VO node in vowel representations outlined in the previous section. Polish initial vowels are specified with VO and satisfy prosodic minimality requirements. This contributes to higher glottalization rates, since glottalization serves to preserve the prosodic integrity of prosodic units, protecting them from linking processes that might be expected in running speech. In English, vowels lack VO, so vowel-initial 'syllables' cannot stand alone as prosodic constituents, and linking is more likely.

In this section we have discussed how proposed diachronic shifts in VO affiliation in Polish and English contribute to cross-linguistic differences in the phonological behavior and phonetic realization of vowel-initial words. These shifts also had consequences for other, seemingly unrelated aspects of the phonologies of these two languages: the relationship between the stability of vowel quality and the role of vowel-based formant transitions in the perception of consonant place of articulation. These phenomena may be unified under the label “consonant-vowel interactions.”

### 3.2 Consonant-Vowel Interactions

In a language in which the VO node is built into obstruent representations, the first portion of vowels containing CV transitions is claimed to extend further into the duration of the vowel than in languages without consonantal VO affiliation. There are two fundamental hypotheses that accompany this claim. First, CV formant transitions may be expected to be more acoustically robust and bear greater perceptual weight when VO is claimed by consonants. Second, the extended CV transitions result in a greater overall degree of formant movement over vowel duration, contributing to the evolution of Vowel Inherent Spectral Change (VISC; Nearey and Assmann 1986, Morrison and Assmann 2013) in the vowel system. In English and Polish, which are claimed to have opposing settings for the VO parameters, we would expect to observe differences in both of these areas. In what follows, we will summarize recently carried out experimental research that tests these hypotheses.

In two separate perception studies, Schwartz and Aperliński (2014) and Aperliński and Schwartz (2015) tested the relative perceptual perceptual weight weight of stop release bursts and CV formant transitions for listener identification of consonant place of articulation in English and Polish. The experiments included two types of stimuli for identification. In the first type, release bursts were removed, and listeners had to identify initial stops on the basis of the CV transitions alone. For this type of stimulus, English listeners performed consistently better than Polish listeners, suggesting that formant transitions play a greater role in place perception in English than Polish. This claim was confirmed in the responses to the second type of stimulus, in which bursts from one place of articulation were spliced onto transitions from another. For these ‘mixed-cue’ tokens, noise bursts dominated listener responses in Polish, while transitions were dominant in English, as shown summarized in Figure 20.23. These findings are consistent with the hypothesis that the VO node is built into obstruent representations in English, resulting in
greater perceptual weight of transitions relative to noise bursts. By contrast, in Polish VO is absent from obstruents and listeners attend more to noise bursts3).

With greater weight on formant transitions, there are consequences for vowel perception as well—listeners should be expected to pay less attention to static formant targets in vowel identification, instead relying on patterns of VISC, as suggested by the ‘Dynamic Specification’ approach to vowel perception (e.g. Hillenbrand 2013). One current of vowel perception research aimed at testing the Dynamic Specification hypothesis employs a ‘Silent Center’ paradigm, in which stimulus tokens are edited to remove the central portion of a vowel, presumably containing ‘target’ formant values, while leaving the vowel’s onset and offset containing CV and VC transitions. These items are compared with others in which the midpoint is presented but the onset and/or offset is removed. This research has consistently found that L1 English listeners identify silent center tokens at higher accuracy rates than edited tokens including vowel midpoint. These findings are compatible with the VO parametric settings of the OP environment, which predict the evolution of cross-linguistic differences in vowel perception. In languages like English, with VO built into consonant representations, we should expect to find a greater degree of VISC and dynamic specification effects. In languages with vocalic VO affiliation such as Polish, vowel quality should be more stable, and listeners should rely less on formant trajectories for vowel identification.

These predictions were tested in a described in Schwartz et al. (2016a). B2-level Polish learners of English identified L1 and L2 vowels in an identification task, responding to four types of stimuli: Silent Center (Initial and Final 20% of vowel), Initial (35% of vowel), Final (35%), and Middle (30%). Binary logistic regression analyses showed that in L1 Polish identification accuracy was not affected by stimulus type. By contrast, in L2 English there was an effect of type, by which Silent Center tokens were identified most accurately, thus mirroring results for L1 English listeners. A second study (Schwartz et al. 2016b) compares L2 English production by B1 level Polish students of English and Polish teachers of English with C2-level proficiency. Comparisons of several measures of formant dynamics revealed a greater degree of VISC in the more advanced group, suggesting that part of the acquisition process for Polish learners of English entails the mastery of English formant dynamics.

4. Conclusion

Taken together, the Polish–English differences described in this paper are compatible with the hypothesis that the two languages evolved differently with respect to how each language parses the initial portion of vowels into its phonological system. At first glance, these types of phenomena may not seem to be evolutionary relics so much as phonetic details associated with the production of speech. Since these phenomena are not associated with phonemic contrasts in the languages under study, they are not often considered to be phonological in nature. However, by incorporating perceptual ambiguities into our system of representation, we have shown how seemingly unrelated phonetic details may evolve differently in different languages in a way that is truly phonological in nature. The Onset Prominence framework, with its built-in ambiguities that reflect the linearity problem in speech perception, allows us to represent phonological evolution, affording a deeper understanding of phonetic differences across languages.

Notes

1) Flemming (2003) suggests that coronals that are [+anterior] should be expected to induce fronting. However, there are many languages in which anterior coronals do not induce fronting.

2) The “No ID” bars represent items whose percepts matched neither the burst nor transition (e.g. a labial burst on a dorsal transition identified as a coronal). Interestingly, more of these items occurred in English, and suggested a bias toward coronals.

3) This hypothesis entails an additional prediction, which also appears to obtain in the two languages. With greater relative perceptual weight on CV (and VC) transitions, listeners are better able to recover consonant place even when the consonant is weakened. Consequently, conso-
nant lenition is common in English, but not in Polish.

References

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