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MidPhon: A 3D Ultrasound Examination of the Place of Articulation of Arabic Voiceless Dorsal Fricatives

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Abstract:
Sibawayh's traditional description of the place of articulation of the voiceless dorsal fricative in Arabic classifies it as the same as /ʁ/ and /q/, resulting in its typical transcription as /χ/ (Al-Nassir, 1985). However, more recent, mostly impressionistic, examinations of Arabic varieties provide varied descriptions of the dorsal fricative /χ/ place of articulation, ranging from velar to uvular. Watson (2002) and Zawaydeh (1997) describe the standard Arabic voiceless fricative /χ/ as either velar or post-velar, depending on dialect. In Najdi Arabic, the same fricative is described as post-velar by Abboud (1978) and as uvular by Ingham (2008). Saiegh–Haddad (2003) describes it as uvular in Modern Standard Arabic, but McCarus (2008) describes the same Modern Standard phoneme as velar /x/. Hence, while some descriptions attribute this variation to dialectal differences, descriptions of the same dialect also vary.

3D ultrasound data were collected from six native speakers of different dialects of Arabic, one each from Syria, Palestine, Faifi (in Saudi Arabia), Egypt, Algeria, and Morocco. Apart from the dorsal fricatives, the corpus included productions of palatal, pharyngeal, and contrasting velar and uvular stops to provide comparative standards for various points of articulation. The Syrian speaker showed very similar articulations for /χ/ with uvular stops, while the other speakers variably showed a more anterior articulation between the velar and uvular stops. The most anterior articulations were apparent in the Moroccan and Algerian speakers, giving some suggestion of a dialectal difference; however, point of articulation of the dorsal fricative was variable for most of the speakers and not obviously dialectally restricted. The effect of these articulatory observations on the acoustic noise spectra are ongoing.

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On the Status of Word Internal Superheavy Syllables in the Sakaka Dialect of Arabic

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One aspect in Arabic that still merits further analysis is the patterning of internal superheavy syllables. Examples of these syllable shapes are in the underlying forms /kalb/ 'a dog', /baab/ 'a door', and /ʕaamm/ 'public/general'. The point of central divergence among Arabic varieties is where these types of syllables appear in word internal (non-final) position often resulting from morphological concatenation as in the underlying forms /kalb-kum/ 'your dog', /baab-kum/ 'your door', and /ʕaamm.kum/ 'your general/public (n.)'. Arabic varieties differ in their treatment of such potential internal syllable types. The most common treatment in Arabic is avoidance via vowel epenthesis (See, e.g., Broselow 1992, Watson 2002, 2011, Kiparksy 2003, Bamakhramah 2009, among others). On the other hand, the tolerance of such superheavy syllables (i.e., [baab.kum]) in other Arabic dialects such as some varieties of Levantine Arabic (Abu-Salim & Abdel-Jawad 1988) called for proposals pertaining to the representational status of the coda in these syllables given that there is a strong ban on trimoraic syllables (See Broselow et al.1997, Kiparsky 2003, and Watson 2007).

In this paper, I report on a dialect of Arabic called the Sakaka Dialect (SD), spoken in the northwestern region of Saudi Arabia, which challenges the pan-dialectal observation that the maximal and optimal syllable in Arabic is bimoraic. Under moraic theory, the evidence that Arabic dialects in which the maximal syllable weight is argued to be bimoraic is derived from the fact that potential trimoraic syllables are totally banned from surfacing word-internally either by vowel shortening, vowel epenthesis, consonant degemination or mora sharing. In SD, however, these processes usually do not occur and a crucial distinction is made word-internally between a heavy syllable (bimoraic) closed by a geminate consonant (G) of the shape CVG as in /ʕamm-na/ 'our uncle' surfacing as [ʕamm.na], a heavy CVVC syllable closed by a singleton as in /ʕaam-na/ 'our year' surfacing as [ʕaam.na] and a superheavy syllable with a long vowel closed by a geminate consonant CVVG as in /ʕaamm-na/ 'our public' surfacing as [ʕaamm.na]. This three-way contrast provides strong evidence that at least the syllable type CVVG is trimoraic and that there is no outright ban on trimoraic syllables in SD as in other dialects.

To account for the patterning of superheavy syllables in SD under OT, the analysis hinges on the markedness constraint *3μ which militates against trimoraic syllables (Kager 1999) and a high-ranked moraic faithfulness constraint (Morén 1999) that preserves both the length of underlying long vowels (i.e. no vowel shortening) and underlying geminate (i.e. moraic) consonants so that there is no degemination. The ranking of these constraints helps to explain why SD allows word-internal CVVG syllables to surface faithfully as trimoraic unlike in many other Arabic dialects. With respect to CVVC syllables, Non-Finality militates against the insertion of a final consonantal mora, thus outranking Weight-By-Position; whereas word-internally the coda of a CVVC syllable may be analyzed as sharing a mora with the nucleus. Through the interaction between various constraints in the grammar of SD, it will be shown that the preference for moraic faithfulness constraints to outrank Markedness constraints makes Sakaka dialect unlike other documented Arabic varieties in allowing word-internal trimoraic syllables.

Small L1-L2 phonetic contrasts in bilingual societies: sibilants in Azpeitia Basque and Spanish

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Conservative varieties of Basque have two voiceless sibilant or *s*-like fricatives, characterizable as apico-alveolar (orthographic <s>) and lamino-dental (orth. <z>) (Hualde, 2013). In some other Basque varieties, however, these two phonemes have merged, with varying results. In particular, in Azpeitia the sound resulting from this neutralization has been impressionistically described as a dentalized /s/, similar to the <z> of conservative varieties of Basque and quite different from the type of /s/ that prevails in the Spanish of the Basque Country and other areas of northern Spain. Since the Spanish /s/ and its phonological counterpart in Azpeitia, although different, would appear to fall both within the range of the phoneme /s/ in other languages (such as English), this situation provides a good test for Flege's (1987) model of L2 acquisition, according to which small differences between L1 and L2 sounds will be particularly difficult to acquire (since bilingual speakers will tend to establish an equivalence between both phonemes). Whereas Flege and other authors have tested this claim with sequencial bilinguals, in the Basque Country there is a situation of societal bilingualism, where essentially all Basque speakers also learn Spanish in childhood (but not vice versa). The question is, thus, do L1-Basque (or Basque-dominant) bilingual speakers have different phonetic targets for /s/ in Spanish and Basque?

A production experiment is reported, where 12 young Basque-Spanish bilingual speakers from Azpeitia were recorded reading sentences in both languages. In target words, the quality of the vowels preceding and following /s/ was controlled. For the analysis, speakers were divided into two groups, balanced bilinguals (N=6) and Basque-dominant (N=6), depending on the language that they speak with their parents, since in the town of Azpeitia Basque is the normal language of social interaction. It was expected that Basque-dominant speakers would use the dentalized /s/ of Azpeitia Basque in both languages and that balanced bilinguals would tend to differentiate /s/ in the two languages.

Here are presented data on the analysis of the center of gravity (COG), which is known to offer information on the place of articulation of fricatives (Jongman, Wayland, & Wong, 2000). Results are plotted in Figure 1. A linear mixed effects regression analysis (with speaker and word as random factors) shows that Bq <s> is different from Spanish <s> ($p < .01$) but not different from Basque <z>, and that there is also an effect of Bilingual Type. Splitting the two groups of speakers and performing separate regressions, it is found that for balanced bilinguals Spanish and Basque /s/ are different ($p < .0001$). Spanish /s/ has a significantly lower COG for these speakers, indicating a more retracted articulation. For Basque-dominant speakers, on the other hand, no significant effect was found. These results suggest that a high amount of exposure to both languages in childhood may be necessary for bilingual speakers to acquire two distinct targets for Spanish and for Basque /s/.

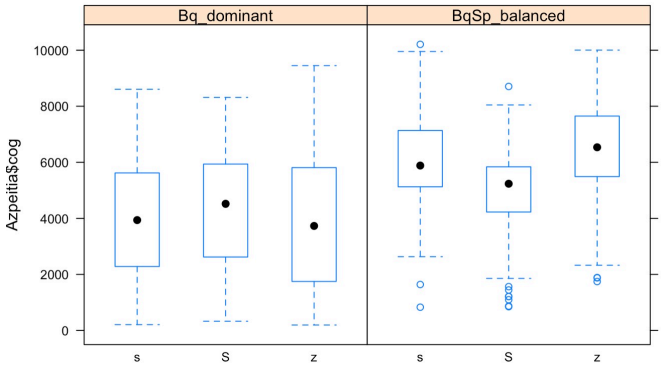

Figure 1. COG of sibilants by Bilingual Type: s = Basque <s>, S = Spanish <s>, z = Basque <z>

Tongue Root Contrasts in Gua

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In vowel systems in West African languages which feature tongue root (TR) contrasts, vowel pairs are said to differ with regards to tongue root position. In the high front vowels in such a system, for instance, /i/ is characterized as Advanced (or [+ATR]) while /ɪ/ is characterized as Retracted (RTR, or commonly [-ATR]). The contrast has received a great deal of attention in the phonological literature, in large part because these vowels often participate in harmony systems (see Casali 2008 for an overview). Instrumental work investigating the acoustic correlates of TR contrasts in many languages also exists (among many others, Fulop, Kari and Ladefoged 1998; Guion, Post, and Payne 2004; Hess 1992; Starwalt 2008). A theme that emerges in these studies is the central importance of F1 in tongue root contrasts, with [+ATR] vowels typically showing a lower F1 than their [-ATR] counterparts. Imaging data of the production of the contrast, meanwhile, are available for only a small subset of languages (as noted in Casali 2008, Washington 2016). In some languages, pairs of vowels (e.g. /i/ and /ɪ/) differ mainly with regards to tongue root position—X-ray studies have shown this to be true of Igbo, for instance (Ladefoged and Maddieson 1990). In others, such as Akan, such pairs differ in both tongue root advancement and tongue body height (Ladefoged and Maddieson 1990).

We add to the body of existing literature by presenting imaging data for Gua, a Kwa language from the Niger Congo family spoken in coastal Ghana (Simons and Fennig 2017, Yeboah-Obiri 2013). Gua is a critically under-documented language which contains TR contrasts in all high and mid vowels (Advanced TR: /i e o u/; Retracted TR: /ɪ ɛ a ɔ ʊ/). Data are from a single male native speaker who was recorded producing target words in isolation and in running speech. Articulatory data from 3D/4D ultrasound recordings reveal that RTR vowels show a variety of deformations of the tongue surface which vary across vowels. These deformations are linked by the mechanics of tongue root retraction, however. Differences in tongue height in addition to TR advancement are often present. Acoustically, the vowels pattern as expected—F1 values of [+ATR] vowels are lower than their [-ATR] counterparts, and while front [-ATR] vowels show a tendency towards centralization the [-ATR] back vowels are slightly more peripheral than their [+ATR] counterparts.

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The PIN/PEN merger and the time course of nasality

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A well-documented phonetic factor regarding nasalization is the interplay between nasalization and vowel height. The addition of a second resonator may cause the hearer to perceive a change in vowel height and judge two different nasal(ized) vowel types to be similar (Beddor, Krakow & Goldstein, 1986). In this study, we employ nasometry to examine the timing and degree patterns of acoustic vowel nasality with word classes involved in the PIN/PEN merger. How does nasality contribute to the merger? Do speakers who are merged present earlier onset of nasality or a generally greater degree of nasality? To answer these questions, we present an exploratory analysis of the speech of three speakers of American English from different dialect regions who present different patterns of contrast (or lack thereof) for /ɪ/ and /ɛ/ in pre-nasal contexts.

Participants read a list of 130 monosyllabic words. Stimuli were designed to compare between contextually nasalized vowels (as in "ben") and their oral counterparts (as in "bed"), as well as other word types for comparison purposes (CV, CVC, CVCC and CVNC). We employed a Glottal Enterprises Nasalance system, which consists of a split-channel set of microphones separated by a removable plate, that records oral and nasal signals simultaneously on separate channels. To capture the time course of nasality, energy measurements in each signal were taken at 10 equidistant time points over the course of the vowel, and the proportion of nasal energy over total energy (i.e. nasalance) was calculated. Additionally, in order to examine vowel quality, F1 and F2 were taken at each time point and normalized according to Lobonov's (1971) formula.

Preliminary findings indicate that in CVC contexts, no speakers have substantial nasalization during the vocalic portion, which indicates that no participant is inherently 'nasal'. All speakers show average nasalance at or above 50% for prenasal vowels in nearly all contexts. For the most part, nasalance is steady throughout the vowel. That is, nasalance does not sharply increase at any point near, approximately, 1/3 through the duration. Rather, any increase is steady and shallow. Degree of nasalance in prenasal contexts, however, is greater for the speakers from regions affected by the PIN/PEN merger than for the speaker from a region where the vowel classes remain distinct.

These early findings suggest that the time course of nasality does not play a role in the merger of the PIN/PEN vowels. Rather, it suggests that overall degree of nasalance is more important for maintaining or losing a distinction. This research is part of a larger project that investigates the PIN/PEN merger in Oklahoma English by examining the perception and production of this contrast by people in that state. Thus, it explores the relationship between production and perception as it relates to an ongoing phonologically conditioned sound change.

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Directionality and Stress Effects in V-to-V and V-to-C Coarticulation in Spanish Non-Words

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Vowel-to-vowel coarticulation refers to measurable acoustic and articulatory assimilation between vowels in adjacent syllables due to gestural overlap. Previous studies, such as de Jong, Beckman, & Edwards (1993), have shown that vowels in stressed syllables tend to resist coarticulation, while Recasens (2015) found that stress affected the size of the coarticulatory effect in Catalan, though not the direction. This study attempts to quantify the effect of stress on vowel-to-vowel coarticulation in Spanish to confirm the hypotheses that stressed target vowels resist coarticulation more than unstressed targets and that stressed trigger vowels cause coarticulation in unstressed targets more readily than unstressed triggers do.

Twenty native speakers of Spanish produced three-syllable nonce words of the form /CVCVCV/, where the target vowel /e/ or /o/ appeared in the second syllable, the trigger vowel /i, e, o, or u/ appeared in the first or the third syllable, and the remaining vowel matched the target vowel. Nonce words were stressed either on the target vowel, trigger vowel, or remaining vowel, and the placement of the trigger vowel relative to the target determined the direction of coarticulation measured (carryover or anticipatory). The coarticulatory effects of each trigger, direction, intervening consonant, and location of stress on target vowels /e/ and /o/ were measured at vowel midpoint and at the point 10% into vowel's duration from the edge nearest the trigger vowel. When the target and trigger differed with regard to height, coarticulation in F1 was measured, while triggers and targets differing in backness were analyzed with regard to F2.

A significant main effect of Trigger, indicating coarticulation, was present at vowel edge in all conditions, while the coarticulatory effect extended to vowel midpoint when the trigger and target differed in backness and the trigger preceded the target (carryover coarticulation). Stressed targets were coarticulated significantly less often than unstressed targets only in the carryover direction and for target /o/ under the influence of trigger /e/, suggesting that the role of stress is not consistent across all directions of coarticulation and target/trigger combinations. This data upholds the hypothesis that stressed vowels make better triggers and worse targets of coarticulation – but only in some conditions.

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The Sound System of Menominee: Dealing with Vowels and Length

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This paper takes a new look at Menominee vowel length and shows that the Simplified Bracketing Grid (Halle and Idsardi 1995) approach can account for more Menominee length rules with fewer exceptions than previous approaches.

Menominee has two lengthening and two shortening rules. The Even Syllable Lengthening (ESL) and Even Syllable Shortening (ESS) rules (Milligan 2004) are typologically rare and well-known as "crazy rules," shown in (1) where the short vowel (L for light) becomes long (H for heavy) and (2) where the long vowel (H) becomes short (L) here:

(1) ESL: The head of a disyllabic foot must contain a long vowel if the syllable is closed

a.	/ahpaket	-aeqnaen/		b.	(ah pa)	(ke **taeq**)	(naen)	=>	c.	ahpāke**tāēq**naen							
	down	-blow			L L	L **L**	L			L H L **H** L							

'it is blown onto something'

(2) ESS: The head of a disyllabic foot must contain a short vowel if the syllable is open

a.	/acēt-	-e	-kāpowe	-w/	b.	(a cē)	(ce **kā**)	(po wew)	=>	c.	acēce**ka**powew						
	upside.down	-EPEN	-stand	-3		L H	L **H**	L L			L H L **L** L L						

'it stands upside down'

Previous metrical approaches to Menominee length result in ad hoc rules to account for the "crazy rules." For example, Hayes (1995) accounts for them by proposing a restructuring of the "universal" reverse rule (short vowels in closed syllables, long vowels in open syllables) followed by a process of grammaticalization. He sums up his analysis by saying that the "crazy rule" does violate his metrical structure, but "like many phenomena, the rule is a counterexample to more than one principle" (Hayes 1995:221).

This paper uses the framework of Simplified Bracketing Grid (SBG) theory as an alternative approach to look at vowel length in Menominee. Following Pesetsky (1979), the two "crazy rules" can be combined as a single Even Syllable Rule. Where Pesetsky works within an SPE framework, SBG can also combine the two rules and they are no longer atypical or "crazy" when analyzed as in the following examples:

	(3)	(4)	(5)	(6)
Line 1	* *	* *	* * *	* *
Line 0	* *)* *)	* *) * *)	* *)*] * *)	* *] *] *
UR	L L L L	L L L L	L L H L L	L H H L
SR	s l s s s	s l s s s s	s l l s s	s l s s s s
σ	c o o o c	c o o o o c	o o o o c	c c o o o c
UR	ahpaket-aen	ahpaekt-aenaw	awat-ācemi	ahpēht-wāēpaen
SR	ahpāketaenam	ahpāketaenawaew	awātācemow	ahpēhcewaepaenaew

In these examples, the right bracket,] , is marked first to represent where the underlying length is in the prosodic structure. This is important because it affects the headedness of the syllable groupings. The right parenthesis represents the bi-syllabic count of the vowels. They are marked at every second segment, with the count starting over when a right bracket is encountered. Line 1 then shows where the heads of the feet are. An 'avoidance constraint' (Milligan 2004) can apply to prevent the head of a final L syllable from lengthening.

Future work with this data set will look more closely at allophonic variation of vowels in Menominee. Milligan (2004) shows that long vowels have less allophonic variation than the short vowels. This work will involve acoustic measurements of the short vowels to determine the predictability of the allophony and how the system fits within a Dresherian hierarchy.

Speech intelligibility in noise: Listener, talker, and stimulus factors

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Familiar dialects can facilitate speech processing (Mason, 1946; Labov & Ash, 1997; Bradlow & Bent, 2003; Clopper, Pierrehumbert, & Tamati, 2010). However, recent investigations of speech processing differences between the Northern and Midland dialects of American English reveal a different pattern: listeners from both dialect regions identify Midland speech in noise with higher accuracy than Northern speech in noise, suggesting a processing benefit for Midland speech (Clopper & Bradlow, 2008; Jones & Clopper, 2015; Dailey & Clopper, 2017). Lexical, discourse, and social factors also affect speech intelligibility. For example, low frequency and high density words, semantically unpredictable words, words in a casual or plain speech style, words mentioned for the second time in a discourse, and male speech all inhibit speech processing (Broadbent, 1967; Munson & Solomon, 2004; Kalikow, Stevens, & Elliot, 1977; Picheny, Durlach, & Braida, 1986; Fowler & Housum, 1987; Bradlow, Torreta, & Pisoni, 1996). Previous studies examining these factors in the context of talker regional dialect further suggest that speech processing differences between talker dialects interact with other linguistic and contextual factors that inhibit speech processing (Jones, Dailey, & Clopper, 2016). The current study aims to explore the possible interactions among these listener, talker, and stimulus factors on speech processing.

A speech intelligibility in noise task was conducted to determine Northern and Midland listeners' relative success in processing Northern and Midland speech. 67 Midland listeners and 63 Northern listeners transcribed short phrases mixed with speech-shaped noise at a 0dB SNR. The phrases were extracted from short stories read by 8 Northern and 8 Midland speakers, and were balanced for target word frequency, neighborhood density, semantic predictability, speech style (plain or clear lab speech), mention in a discourse (1st or 2nd), talker dialect, and talker gender. Accuracy of the target words in the phrases was measured.

A logistic mixed-effects regression model revealed that, consistent with previous findings, target word accuracy was lower when a combination of factors that inhibit speech processing interact: accuracy was lower for various combinations of Northern, male, plain, and 2nd mention words relative to Midland, female, clear, and 1st mention words. Additionally, semantic predictability facilitates speech processing in some contexts: target word accuracy was better for 2nd mention words as semantic predictability increased. Lastly, high frequency words showed greater target word accuracy than low frequency words, suggesting that lexical response biases for high frequency words outweigh any recognition difficulties stemming from their phonetic reduction. Taken together, these results suggest that factors of phonetic reduction that inhibit the intelligibility of words in isolation also affect the intelligibility of words in phrasal context, but contextual and lexical factors, such as semantic predictability and word frequency, allow listeners to recover highly-reduced tokens. All of these results were consistent across the two listener dialects, further supporting a processing benefit for Midland speech. The results further suggest that the lack of a listener effect is not mediated by other lexical, discourse, or social factors, but holds across the full range of materials included in the study.

The eye-raising nature of incipient ay-raising: Phonetic /ay/-raising in Fort Wayne, Indiana

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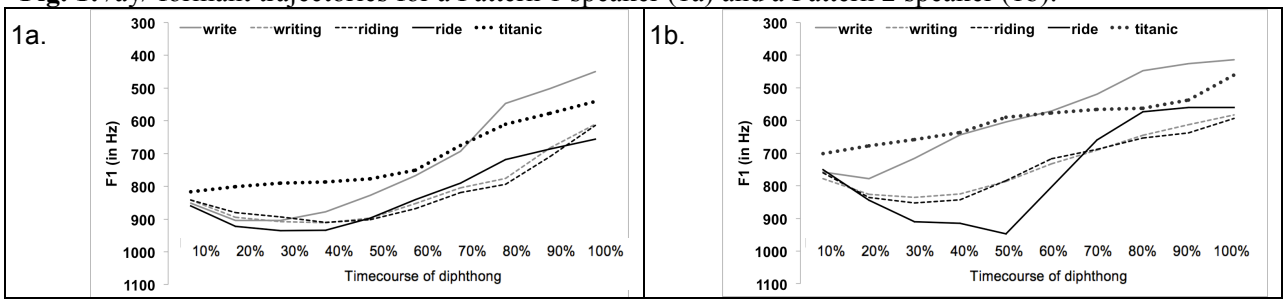
In canonical Canadian raising the diphthongs /ay/ and /aw/ raise to [ʌy] and [ʌw] not only before a voiceless consonant (*write* → [ɹʌyt]) but also before a flapped /t/ (*writing* → [ɹʌyɾɪŋ]). It is the underlying phonological specification of the trigger, then—not its phonetic realization—that is relevant to the process, raising lively debate about phonological opacity. Raising of /ay/ (but not /aw/) has been documented in geographically distinct dialects of US English such as Ann Arbor (Dailey O'Cain 1997), New Orleans (Carmichael 2015), and Philadelphia (Fruehwald 2013, 2016). Fruehwald notes that raising in Philadelphia appears to have been phonological from its inception, positing that "the period of purely phonetic conditioning either was too brief to be identified or was nonexistent" (p. 404). In fact, there is no evidence that Canadian raising ever had a stage that was purely phonetic: in all acoustically documented dialects of /ay/-raising, the raising always occurs before a phonetically voiced /t/-flap (*writing* → [ɹʌyɾɪŋ]). In this paper, we present data identifying phonetic raising in the dialect of American English spoken in northeastern Indiana, in and around Fort Wayne (FW). Data collection is ongoing. Results indicate that /ay/-raising is of recent origin, allowing us to document the incipient nature of the sound change. In the present research we share acoustic analysis of this incipient raising variety of English, and suggest a possible developmental trajectory for Canadian Raising.

Inspired by casual observation that raising had begun to occur in FW within the last decade, we began recording FW speakers producing a wordlist. Data from 27 participants have been analyzed thus far (11 male, 16 female, 19-78 yrs old), revealing that FW speakers fall into four broad patterns. Briefly: four talkers have **Pattern 0**, in which no raising occurs; eight have **Pattern 1**, in which only the very shortest diphthongs—those immediately before a primary stress, in words like titánic and citátion—are raised; nine talkers have **Pattern 2**, the phonetic pattern, wherein /ay/ raises before surface-voiceless triggers as in *write* and *titanic* but—crucially—does not raise before t-flaps; and, six have **Pattern 3**, the phonological pattern similar to what has been described for other varieties of English. Sample plots of time-normalized F1 trajectories are in (1), with data from a Pattern 1 talker in (1a) and from a Pattern 2 talker in (1b) (focusing on the 30% point of the /ay/ nucleus). While Pattern 2 provides clear documentation of phonetic raising and thus is of importance, what is of particular interest is the more incipient raising in Pattern 1, where raising only occurs in words like <u>titánic</u> and <u>citátion</u> and where the diphthong is of the shortest duration immediately before the syllable with primary stress. These are the very first words that undergo raising in an incipient dialect. That raising only occurs in such words in Pattern 1 is supportive of a view like that of Bermúdez-Otero (2014) that connects ay-raising to the clipped nature of the vowel. We suspect that other researchers, such as Fruehwald, have not focused on such words in their study of incipient Canadian raising. Further, as Chambers (1989) notes, in **Canadian** Canadian raising, there is no raising of /ay/ in words like <u>titánic</u> and <u>citátion</u>. Here we suggest that the imposition of this stress- (or foot-) based condition on Canadian raising is part of the phonologization process.

Fig. 1: /ay/ formant trajectories for a Pattern 1 speaker (1a) and a Pattern 2 speaker (1b).



Perceptual Adaptation to Regional Vowel Variation

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Previous research in speech perception has shown that listeners adjust their phonemic category boundaries for individual talkers based on evidence from the talker's speech (e.g. Norris, McQueen, and Cutler, 2003; Kraljic, Samuel, and Brennan, 2008). However, certain factors may influence the likelihood of this perceptual adaptation. Rakerd and Plichta (2010) found that listeners who were from a particular dialect region were better able to perceptually adapt to account for the phonetic variation associated with that dialect. They suggest that this is because these listeners are more familiar with the dialect and therefore more sensitive to the patterns of variation associated with it. The current project further investigates this claim, examining the role that a listener's regional background plays in their ability to perceptually adapt to regional vowel variation given differing amounts of speech input from talkers.

The dialects of interest in this study are the U.S. Midland and Inland North, which differ systematically across their vowel systems. A vowel continuum was created that ranged acoustically from a Midland-sounding /ɛ/ to a Northern-sounding /ʌ/; in the North, both /ɛ/ and /ʌ/ are relatively backed compared to the Midland. The continuum steps were embedded in consonantal contexts that formed real words at either end of the continuum. Participants from each region completed a forced-choice lexical identification task in which they identified each stimulus token as, for example, "bed" or "bud." In the first block of trials, participants responded to the stimulus tokens in isolation. In eight subsequent blocks of trials, participants responded to the stimulus tokens following carrier sentences spoken by either a Northern or Midland talker. The carrier sentences were blocked by talker and vowel, so that each block only featured one vowel from one talker, and that over the course of the experiment participants were exposed to incrementally more of each talker's vowel space. It was predicted that all participants would adjust their category boundaries appropriately after hearing realizations of the talkers' actual /ɛ/ and /ʌ/, but that listeners who were more sensitive to the dialect variation would adapt after being exposed to other dialect-consistent vowels.

For each participant in each block, the perceptual crossover point was calculated. This is the point in the acoustic continuum where responses cross the 50% threshold from one phoneme to another, and is used to represent the perceptual category boundary between the two phonemes. Preliminary data from 18 Midlanders and 12 Northerners were analyzed to examine the effects of talker region, vowel, and participant region on perceptual crossover point. Results showed that, overall, crossover points occurred at a lower F2 following Northern carrier sentences, consistent with the acoustic difference between the two dialects. For both groups of listeners, adaptation occurred in carrier sentence blocks featuring /ɛ/, /ʌ/, or /æ/, but not /ɑ/. A follow-up survey revealed that the Northern variant of /æ/ was socially salient for many Midland listeners, while Northerners were less able to identify specific phonetic patterns associated with their home dialect. These results show that listeners can perceptually adapt to account for regional dialect variation. Unlike in previous studies, there is no evidence that one's dialect background influences their ability to adapt to regional variation. It is possible that both groups of listeners in this study were sensitive to the dialect variation in different ways.

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MidPhon Abstract

Reconsidering the Superfoot

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In this paper, I reconsider arguments for the superfoot, including the Strict Layer Hypothesis (SLH, Selkirk 1980a, b), Prosodic Licensing (Ito 1986), and aspiration in English (Davis 2005 and others). I show that none of them offer compelling evidence. Specifically, while SLH requires syllables to be dominated by feet, the superfoot itself violates SLH. Similarly, while prosodic licensing requires every prosodic category to be dominated by a higher category, it allows syllables at word edges to be 'extrametrical', in which case they are exempt from prosodic licensing. Finally, with regard to aspiration of voiceless stops in American English, there are two competing analyses, shown in (1) and (2).

(1) <u>One-source analysis</u>: Voiceless stops are aspirated in foot-initial position.
(2) <u>Two-source analysis</u>: Voiceless stops are aspirated in either (i) foot-initial position or (ii) word-initial position.

In the one-source analysis, the metrical structure of *potato* [pʰ]-[tʰ]-[ɾ] is a superfoot (W(SW)), where [pʰ] is superfoot initial, [tʰ] is regular-foot initial, and [ɾ] is neither. In the two-source analysis, the metrical structure of *potato* [pʰ]-[tʰ]-[ɾ] has a regular foot W(SW), where [pʰ] is word initial, [tʰ] is foot initial, and [ɾ] is neither. Thus, both analyses seem to cover the facts.

To distinguish (1) and (2), we need to find cases that are word initial but not foot initial, such as those in (3), where relevant words are underlined and relevant stops in boldface.

(3) Voiceless stops in word-initial but not foot-initial positions

Expression	Foot	Aspiration
What are you <u>up **t**o</u>?	(SW)	[tʰ]
You can choose <u>up **t**o</u> three items.	(SW)	[tʰ]

The one-source analysis predicts stops in such positions to be unaspirated, whereas the two-source analysis predicts them to be aspirated. Evidence supports the latter.

Positive evidence can be found in Chinese, too. Many scholars assume that trisyllabic expressions form a superfoot (e.g. Feng 1996). However, evidence from compound verbs support the regular (SW) foot and not superfeet. Compound verbs are morphologically VA (e.g. *da-sui* 'hit-broken') or VO (e.g. *fu-ze* 'shoulder responsibility'), but syntactically work like single verbs by being able to take an object.

In summary, there is no compelling evidence for the superfoot and the regular binary foot (SW) is sufficient to account for all known facts in both English and Chinese.

Evidence for Markedness Hierarchies from Continuancy Neutralizations in Icelandic

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In Icelandic, continuancy for *lenis* (non-aspirated) obstruents is contrastive root-initially but not root-internally. This paper analyzes the complex yet systematic continuancy neutralizations of the root-internal *lenis* obstruents, a phenomenon which to my knowledge has not been described or analyzed in previous work on Icelandic phonology. Of note in these neutralizations is the fact that the surface specification for [±continuant] is predictable on the basis of the preceding sound and the place of articulation (PoA) of the target obstruent. After vowels, *lenis* obstruents at all PoAs neutralize to fricatives. After nasals, all PoAs surface as stops. After [r] and [l], however, the three PoAs exhibit divergent behavior.

This pattern is illustrated in (1), with representative words organized vertically by PoA of the last (neutralized) segment and horizontally by preceding sonorant context (V= [-cons], N= [+cons, +nas]). The gradient distribution of continuancy is delineated with a step-wise blue line: outputs to the left of the line feature a [+cont] final segment, and outputs to the right [-cont].

(1) Root-internal continuancy neutralizations in the *lenis* series

	V_	r_	l_	N_
LAB	[n̥iːf] “knife”.ACC.SG	[tʰɔrf] “turf”.NOM.SG	[kʰaulf] “calf”.ACC.SG	[kʰamp] “comb”.ACC.SG
COR	[huːθ] “hide”.NOM.SG	[çœrθ] “herd”.NOM.SG	[kʰœlt] “cold”.NEUT.NOM.PL	[hœnt] “hand”.NOM.SG
DOR	[sœːx] “saw”.NOM.SG	[sɔrk] “sorrow”.NOM.SG	[pɛlk] “bellows”.ACC.SG	[løyŋk] “long”.NEUT.NOM.PL

Given these data, Icelandic provides crucial evidence to further sub-categorize the general “liquid” category in Kirchner’s (2001) “Aperture Conditioning Generalization:” rhotics are more likely to encourage lenition than laterals (or alternately, laterals are more likely to condition fortition than rhotics). I depart from Kirchner’s “LAZY” constraints, however, and formulate a series of fortition constraints given below in (2).[1]

(2) OT Constraints for Post-Sonorant Fortition

- *N[+cont]: Assign a violation for every nasal consonant followed directly by a fricative.
- *l[+cont]: Assign a violation for every lateral consonant followed directly by a fricative.
- *r[+cont]: Assign a violation for every rhotic consonant followed directly by a fricative.

I claim that the ranking of these constraints motivated for Icelandic (*N[+cont] > *l[+cont] > *r[+cont]) is universally fixed. Data collected from seven additional languages support this assertion. This contribution accounts then not only for post-sonorant behavior in lenition/fortition phenomena, but also makes strong implicational predictions for post-sonorant gaps in the distribution of fricatives in the world’s languages.

[1] Even though the generalizations about continuancy neutralizations made here are on the basis of static phonotactics, I analyze the surface forms given in (1) as the result of synchronic markedness constraint conflict, since the principle of Richness of the Base states that restrictions may only be placed on outputs, not inputs (Prince & Smolensky 1993: Ch. 9.3).

Duration of Japanese devoiced vowels in spontaneous speech

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This paper aims to evaluate the duration of devoiced vowels in Japanese through a corpus-based approach. The Corpus of Spontaneous Japanese (CSJ, National Institute for Japanese Language and Linguistics 2004) was employed in the analysis. It consists of a large-scale speech database containing about 7.5 million words of Standard Japanese from spontaneous monologues produced by 1,417 speakers. It is a richly annotated corpus, including segmental duration and vowel devoicing information. Vowel devoicing in Japanese is usually observed in high vowels between two voiceless obstruents (Han 1962). For instance, the word /kiken/ 'danger' may be realized as [kḭkeŋ], with a devoiced [ḭ]. Although vowel devoicing affects primarily high vowels, recent research showed that non-high vowels [a, e, o] may also devoice: [kạkaru] 'to take' (Maekawa and Kikuchi 2005).

It has been tested in an experimental corpus (Kondo 2005) that Japanese devoiced vowels are shorter with respect to not devoiced ones. It is also known that high vowels are intrinsically shorter than non-high ones (Beckman 1996). This paper intends to investigate whether the same tendencies related to vowel devoicing obtained in lab speech are observed in a corpus of spontaneous data. By doing so, we will contribute to the existing debate in the literature between lab and spontaneous speech (Rischel 1992, Beckman 1997). Furthermore, an interesting question arises when the duration of devoiced vowels is considered. Are devoiced high vowels intrinsically longer than non-high vowels? I hypothesize that vowel duration plays a crucial role in the implementation of vowel devoicing. I predict that devoiced vowels will be shorter in comparison with voiced ones and that that voiced [i, u] will be shorter than devoiced [a, e, o]. Moreover, if the intrinsic duration of non-high vowels with respect to high vowels is maintained in devoiced vowels, I predict that devoiced [i, u] will be shorter than devoiced [a, e, o].

A random sample of 20000 vowels, their duration in milliseconds, voicing and vowel type were extracted from the CSJ. It was not possible to analyze all vowels from the corpus due to current hardware limitations. A mixed effect linear regression with the log transformation of vowel duration as the dependent variable, voicing (two levels: voiced and devoiced) and vowel type (two levels: i/u) as independent variables, and subject and recording setting as random effects was run. There was a main effect of vowel type ($\chi^2(19750.43)= 456.62$, $p < 0.001$) and voicing ($\chi^2(19753.73)= 33.14$, $p < 0.001$). There was also an effect of the interaction of both predictors (χ^2 $(19755.04)= 27.93$, $p < 0.001$). Pairwise comparisons of the estimates were also conducted to compare the levels of the predictors. The estimates of voiced [a, e, o] were higher than the estimates of voiced [i, u] (all p-values < 0.001). Moreover, all the estimates of voiced vowels were higher than their devoiced counterparts (all p-values < 0.001). The comparisons of the estimates of devoiced vowels indicate that devoiced [a] is longer than devoiced [i] ($\beta= 0.31$, $p < 0.0001$ and devoiced [u] ($\beta=0.27$, $p < 0.001$). No significance was found for the other comparisons between the estimates of high and non-high devoiced vowels ([e] vs. [i], [e] vs. [u], [i] vs. [o], [o] vs. [u]).

The results indicate devoiced vowels are shorter than voiced ones and voiced high vowels are shorter than voiced non-high vowels. These results are similar to the ones obtained in experimental settings (Kondo 2005). Therefore, it is possible to argue for Japanese vowel devoicing the tendencies found in lab speech are equivalent to the tendencies observed in spontaneous speech. The results of the comparisons between the duration of devoiced vowels indicate that only devoiced [a] is longer than the devoiced high vowels. This indicates that the intrinsic duration of non-high vowels is only maintained for [a]. In future research, I intend to employ all vowels of the corpus in the analysis.

The Age Variation on the Acquisition of Mandarin tones: Perception and Production of Uyghur L1 Speakers

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Standard Mandarin is a typical tonal language in that the pitch contour over a syllable can distinguish word meanings (Duanmu 2007). On non-final full syllables there are four tones, in which T1 is a high level tone (*ma* 55 'mother'), T2 is a rising tone (*ma* 35 'hemp') , T3 is a low-falling rising (*ma* 214 'horse') and T4 is a high-falling (*ma* 51 'scold'). Unlike Standard Mandarin, Uyghur—which is a Turkic language of the Eastern or Chaghatay branch—is not tonal-contrastive (Hahn 1991).

Uyghur serve as an official and first-learned language in the Xinjiang Uyghur Autonomous Region of Northwestern China (Hahn 1991). Since 1949, the massive influx of Chinese migrants to Xinjiang have resulted in intense contact of these two languages, and the language contact becomes more salient over time. This research presents a sociophonetic study on how native Uyghur speakers perceive and produce Mandarin tones, the topic of which has been rarely studied before.

Read speech was elicited from a wordlist written in Chinese characters. The stimuli contains 10 pairs of tonal-contrastive minimal pairs. 12 Uyghur speakers (20s=6, 30s&40s=6; 6 from Mandarin-dominant city—Urumqi, 6 from Uyghur-dominant regions; F=5, M=7) participated in the research.

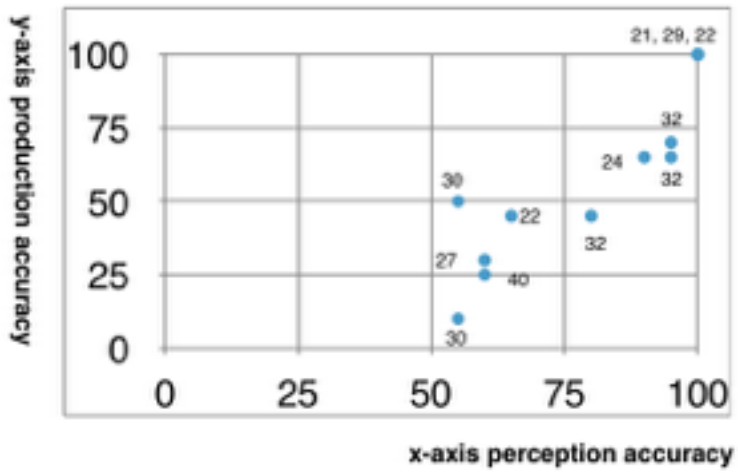
Acoustic analysis involve only tonal differences. A mixed-effect model was built, and based on the analysis, age was a very significant predictor: younger Uyghur speakers generally had better performance on perceiving and producing Mandarin tonal contrasts than elder speakers; generally, perception performance is much better than production performance. Results are given in (1).

Further examination of the age variation was implemented. In the perception task—shown in (2) and (3), the accuracy rates are generally high except for T2-T3 confusion, yet the younger participants (age<30) are characterized by higher accuracy rate (around 80%-90%) for each tonal category and less error distribution than elder generation. In the production task—shown in (4) and (5), both two groups have salient confusions in T2, but elder speakers (age >= 30) tend to misproduce T2 as either T1 (30%) or T3 (40%), while young speakers (age<30) as either T3 (35%) or T4 (20%). As for T3 production, elder speakers have multiple distributions (28.6% as T1, 14.3% as T2 and 11.9% as T4) as opposed to significantly higher accuracy rate (76.2% T3-T3) of younger speakers. In addition, both two groups of speakers have encountered with T1-T4 confusion, yet the tendency is more salient with elder speakers.

Overall, the age effect suggests that Uyghur speakers above 30 have difficulty distinguishing the four-way tonal contrast in Mandarin, especially T2-T3 and T1-T4 confusions, while younger generations tend to have less confusion. This age effect could be attributed to the increasing Mandarin education in Uyghur Autonomous Region. For those under 30, they receive mandatory Mandarin education since school age, reinforcing the tonal distinctions of Standard Mandarin.

Tables and chart

(1) Individual performance in perception and production tasks



(2) Confusion matrix of tonal accuracy and error patterns in perception task: age >= 30

		Input Tones			
	Tone	**1**	**2**	**3**	**4**
Output Tones	**1**	83.3%	0	4.8%	2.8%
	2	0	63.3%	19%	8.3%
	3	8.3%	26.7%	69%	11.1%
	4	8.3%	10%	7.1%	77.8%
	Percentage	100%	100%	100%	100%

(3) Confusion matrix of tonal accuracy and error patterns in perception task: age < 30

		Input Tones			
	Tone	**1**	**2**	**3**	**4**
Output Tones	**1**	91.7%	0	2.4%	5.6%
	2	0	90%	9.5%	5.6%
	3	0	10%	85.7%	8.3%
	4	8.3%	0	2.4%	80.6%
	Percentage	100%	100%	100%	100%

(4) Confusion matrix of tonal accuracy and error patterns in production task: age >= 30

		Input Tones			
	Tone	**1**	**2**	**3**	**4**
Output Tones	**1**	50%	30%	28.6%	25%
	2	0	26.7%	14.3%	5.6%
	3	8.3%	40%	45.2%	11.1%
	4	41.6%	3.3%	11.9%	58.3%
	Percentage	100%	100%	100%	100%

(5) Confusion matrix of tonal accuracy and error patterns in production task: age < 30

		Input Tones			
	Tone	**1**	**2**	**3**	**4**
Output Tones	**1**	66.7%	5%	7.1%	5.6%
	2	0	40%	7.1%	2.8%
	3	8.3%	35%	76.2%	11.1%
	4	25%	20%	9.5%	80.6%
	Percentage	100%	100%	100%	100%

Appendix

1. Perception stimuli

1	卖 [51] 买 [214]	6	百 [214] 白 [35]	11	绿 [53] 驴 [35]	16	吃 [55] 齿 [214]
2	玉 [51] 鱼 [35]	7	雪 [214] 学 [35]	12	百 [214] 白 [35]	17	湖 [35] 虎 [214]
3	虎 [214] 湖 [35]	8	海 [213] 害 [53]	13	玉 [51] 鱼 [35]	18	雪 [214] 学 [35]
4	树 [53] 书 [55]	9	吃 [55] 齿 [214]	14	卖 [51] 买 [214]	19	睡 [53] 水 [214]
5	绿 [53] 驴 [35]	10	睡 [53] 水 [214]	15	树 [53] 书 [55]	20	害 [53] 海 [213]

2. Production stimuli

1	玉 [51]	6	白 [35]	11	吃 [55]	16	湖 [35]
2	睡 [53]	7	齿 [214]	12	海 [213]	17	卖 [51]
3	虎 [214]	8	书 [55]	13	鱼 [35]	18	学 [35]
4	雪 [214]	9	买 [214]	14	百 [214]	19	害 [53]
5	树 [53]	10	驴 [35]	15	绿 [53]	20	水 [214]

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Dissimilation and markedness-reduction: Evidence from typologies

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Dissimilation has been viewed as a phonological process whereby the co-occurrence of two like segments is prohibited, with the prohibition resolved by changing one or more features. From a historical perspective, dissimilation (along with metathesis) has been viewed as an irregular type of sound change since the Neogrammarians. Due to its irregularity in application and its infrequency across languages (in comparison to other sound changes and phonological processes), understanding dissimilation remains a difficult venture.

This project looks at dissimilation with two aims. The first involves trends in terms of the segments that can participate in dissimilation (inputs) and how the aforementioned co-occurrence prohibition is ultimately resolved (outputs). That is, what kinds of sounds participate in dissimilation and what do they dissimilate to. The second aim involves the issue of how to view dissimilation with regards to markedness, namely whether it can be classified as a markedness-reducing process. In other words, do we see a strong tendency where the outputs of dissimilation are less marked than their inputs?

The data for this project comes from previous dissimilation typologies (Suzuki 1998; Bye 2011), with the large bulk derived from Bennett (2013, 2015). From these typologies, four specific subtypes of long-distance dissimilation were looked at: changes in (1) place of articulation, (2) manner of articulation, (3) voicing, and (4) spread glottis/ aspiration. The data includes both synchronic alternations/ positional restrictions and diachronic changes. The results of this survey show that while there are strong trends in favor of markedness-reduction, specifically with regards to place of articulation and spread glottis subtypes, similar trends are not present for voicing and manner of articulation dissimilation patterns, which show the opposite of markedness-reduction (voicing) or no trend at all (manner of articulation). These results may point to the conclusion that the term *dissimilation* might better be treated as a descriptive term for the surface similarities of various sound patterns.

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The Phonology of English Loanwords in Japanese: On the Realizations of /r/ and /l/

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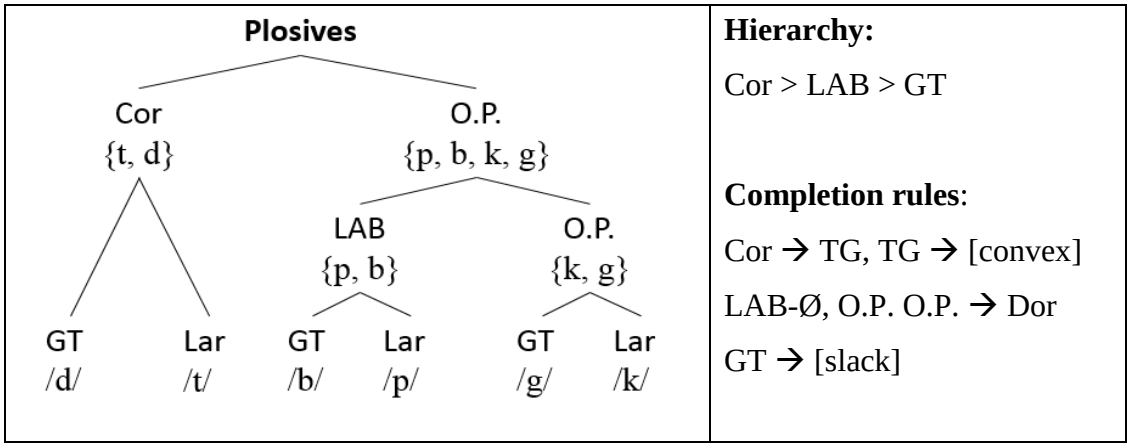
In Dresher's account of the contrast in phonology, it is argued that "contrastive features are determined by establishing a feature hierarchy for a language and applying the Successive Division Algorithm" (Dresher, 2008: 28). On the other hand, the model of phonological representations provided by Avery and Idsardi (2001) lay out a feature geometry for the purpose of representational economy. According to Brown (1998), the phonological features in L1 grammar would also influence the perception of non-native contrasts. Based on the above theories, the current project examines the realizations of English /r/ and /l/ in loanwords in Japanese.

Japanese speakers do not contrast /r/ and /l/ phonemically, and the phonemic inventory of Japanese only contains a flap, in which case both liquids would be treated as /ɾ/ in loanword adaptation such as "rally → [**ɾ**a:**ɾ**i]". However, when it comes to the coda position, the realizations of the /l~r/ pair would be different in that the coda /l/ is still treated as a consonant which triggers vowel epenthesis as in "call → [ko:**ɾ**ɯ]" whereas the coda /r/ is actually assigned a vowel-like realization whether in word-medial position like "pork → po**o**ku" or in word-final position like "door → do**a**" (all data cited from Mutsukawa 2009).

Our proposal is that the L1 phonology can help Japanese speakers perceive a non-native contrast which may result in the different corresponding patterns of /l/ and /r/. Following Dresher's account and the AI system, we will first develop a contrastive hierarchy for the Japanese stops.



In this case, the alveolar stops {t, d} are marked as Cor leaving the rest of them unspecified in their places of articulation. Adopting Brown's idea about the role of L1 grammar, we assume that Cor which gets completed as TG allows /l/ to be recovered as a consonant, while /r/ is not TG and thus fails to be recovered. In addition, we will present a hierarchy of approximants to see how the representations of the Japanese flap and all the vowels would influence the loanword adaptation, accompanied by a parsing analysis of the word pair "pork~volt".

In conclusion, it is the phonological features specified in L1 grammar that enable Japanese speakers to recognize English /l/ as a consonant but not the English /r/. This makes no difference in the onset position, but in the coda position, the perceived consonant /l/ will trigger vowel epenthesis while the coda /r/ is treated as a vowel instead.

Word-prosody and dialectal substrate in standard Basque

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In this paper we examine the substrate influence of local Basque varieties on Standard Basque prosody. We focus on the singular/plural distinction, which in many traditional varieties is conveyed by differences in accentuation and in Standard Basque, instead, is expressed by differences in the segmental shape of suffixes. The results of our preliminary investigation show that accentual distinctions between singular and plurals are generally not transferred to Standard Basque; that is, some speakers use different accentual rules in Standard Basque and when speaking their native dialect. In Standard Basque, a rule placing the accent on the second syllable, without a singular/plural contrast has gained widespread currency. On the other hand, at the phonetic level, the realization of accentual prominence in Standard Basque may show influence of the dialectal substrate.

An analysis of Voice Onset Time and onset f0 in L2 learners of French

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When it comes to perceiving speech sounds, there are multiple acoustic cues that can contribute. For stop consonant voicing, Voice Onset Time (VOT- the period of time between the release of the consonant and the onset of voicing) and onset f0 (the fundamental frequency, f0, at the onset of the vowel following a stop consonant), have been shown to correlate and can help contribute to the perception of voicing (a couple of references here). As VOT and onset f0 vary cross-linguistically, a second language (L2) learner must acquire these acoustic cues necessary for correct production and perception of their L2. Although the primary acoustic cue, VOT, has been studied extensively in the acquisition of L2 speech, the current study aims to determine how the secondary cue, onset f0, is acquired in second language learners. As onset f0 has been shown to aid in distinguishing between [+voice] and [-voice] consonants (especially when other cues, like VOT, are ambiguous or inhibited), it is necessary to look into the acquisition of the cue in L2 learners.

The aim of the current study is to determine how L2 proficiency level affects production of VOT and onset f0, the order in which these acoustic cues are acquired and produced, and the effect of back transfer occurring in the learners. That is, whether participants can transfer both French VOT and onset of f0 back into their English speech. The study examines the acquisition of VOT and onset f0 in 19 American English students acquiring French in a university setting. Participants completed a production task in which they produced stimuli containing word initial bilabial stops in both English and French. VOT and onset f0 were analyzed using Praat. It is hypothesized based on previous research that participants with high proficiency will distinguish between French and English VOT and onset f0, therefore producing French stops in a more native-like fashion Additionally, when comparing the L2 learners to a monolingual English control group, it is proposed that learners with higher French proficiency could exhibit a back transfer of acoustic properties of stop consonants. The presentation will present preliminary findings based on the collected data as well as the relevant implications of the results.

Evaluating the domain of F0 encoding with imitated speech

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Studies of speech imitation show that speakers are capable of reproducing the fine phonetic detail related to segmental features [Nye & Fowler 2003; Shockley et al. 2004; Pardo 2006; Nielson 2011] and intonational features [D'Imperio et al. 2014; German 2012] in recently heard speech. Phonetic detail must be cognitively encoded in order to be imitated, so these findings are taken as evidence for the mental representation of fine phonetic detail for segmental and prosodic information. But how much detail is encoded? An exemplar model predicts that all perceived acoustic detail is available for imitation, but the cited studies assess imitation of phonetic detail by comparing few summary measures of one or a small number of acoustic parameters. This raises the question of whether some aspects of phonetic detail are more likely to be imitated than others—e.g., cues to contrastive features—or whether all perceived acoustic detail is equally likely to be imitated. Recent evidence suggests that imitation of phonetic detail is incomplete, with a bias for imitation that preserves primary cues to contrastive features over acoustic detail that is variable across utterances or speakers [Cole 2015; Cole & Shattuck-Hufnagel *in press*].

The question of whether speech encoding is comprehensive over all perceived acoustic detail is interesting for intonation because the phonological specification of intonational features is sparse — relatively few tones define targets for the f0 contour that extends over an entire utterance. Does a listener encode all the details of an f0 contour that spans a prosodic phrase, or does encoding privilege intervals of f0 that correspond to the targets of pitch accent and boundary tones, while disregarding intervals of f0 interpolation between the tonal targets? This study turns to the analysis of imitated speech to investigate this question, examining the similarity of an imitated utterance to a stimulus produced by a different speaker, in terms of differences in the shapes of their f0 contours. Our hypothesis is that **the interval in which imitated and stimulus f0 contours are the most similar corresponds to the interval of cognitive encoding of f0.**

We examine f0 contours in our previously collected corpus of imitated speech. 33 speakers of American English (23 females) were asked to imitate 12 aural sentence stimuli, with the instruction to repeat what they heard in the manner the model speaker said it. We analyze f0 contours in complex subject NPs (e.g., *the regulation of child labor*), which were produced by the model speaker with one or two pitch accents and a following prosodic phrase break (ip). Four separate analyses were conducted comparing each imitated f0 contour with its corresponding stimulus for contours in decreasing intervals: (Model 1) the entire prosodic phrase (=subject NP); (M2) individual accented words in the phrase; (M3) each stressed syllable; and (M4) each syllable. Intervals in each model were time normalized with 30 f0 measures extracted at equal distances. Generalized Additive Mixed Models [Wood, 2006] were run to model the difference between stimulus and imitation f0 (ERB) at each time step (dependent variable) as a function of step number, accent pattern of stimulus, and gender as fixed effects, and with speaker and item as random effects. The model with the best fit represents the interval in which the stimulus best predicts the imitated f0, allowing for systematic, non-linear divergences across the interval, and by phonological accent pattern and gender. Model comparison is currently underway, and results will be discussed in terms of the phonological domains for the cognitive encoding of f0 detail.

Is phonological specification reflected in phonetic variability?

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The Toronto School of Contrast (Dresher, Rice & Piggot 1994; Avery & Idsardi 2011) assumes that only contrastive features are present phonologically. Purnell & Raimy's (2015) analysis of English long vowels, which follows this school of thought and which I adapt for present purposes below, employs privative or monovalent features, such that there is no feature [back] at the phonological level. By this approach, /i, e, æ/ form the set of front vowels, with /i/ and /æ/ being marked for height ([high] and [RTR], respectively) and /e/ being unmarked for height.

Specification	/i/	/e/	/æ/	/u/	/o/	/ɔ/	/a/	/ʌ/
[RTR]			x			x	x	
[front]	x	x	x					
[high]	x			x				
[round]					x	x		

Hall (2011: 41–44), working with the same assumptions of phonological contrast, posits that asymmetries in the phonetic dispersedness and variability of two vowel phonemes may reflect their privative phonological specification. This proposal would predict that English /e/ should be more phonetically variable than /i/, especially in terms of height, since /i/ is specified for height but /e/ is not. Iverson & Kuhl (1995), however, found the opposite in a perceptual experiment: they presented participants with thirteen computer-generated vowel sounds on a continuum from a canonical /i/ to a canonical /e/, and they found that participants reported hearing an /i/ for more than half the continuum. This experiment used synthesized vowels rather than natural tokens.

Subjects participated in a yes-no perception task. They were presented with a prompt word displayed in text, and then they were presented with an audio stimulus word, after which they were asked whether the two were the same. The prompt displayed should influence subject responses by manipulating the markedness scale for the audio stimuli. The audio stimuli consisted of resynthesized tokens of *bead* and *bade* ([high, front] vs. [front]), *bod* and *bud* ([low] vs. [Ø]), and as a control *booed* and *bode* ([high] vs. [round]). Each original token was resynthesized into a continuum of six tokens from the original vowel to its paired vowel, and each resulting stimulus was played with both words in its pair as a prompt (i.e., the six *bead* stimuli and the six *bade* stimuli were each played while "bead" was displayed as well as while "bade" was displayed).

The crossover points on the stimulus continua from "yes" to "no" responses will be determined. For each of the six continua, two crossover points will be identified corresponding to the two prompt words (i.e., the crossover point for *bead* stimuli while "bead" was displayed versus that of *bead* stimuli while "bade" was displayed). It is hypothesized that, for *bead/bade* and *bod/bud* but not *booed/bode*, the prompts displayed will set up a marked or unmarked comparison to the audio stimuli, leading to different crossover points for the marked and unmarked prompts for each audio stimulus continuum.

Clements' Economy Theory, Contrastive Hierarchies and Distinctive Features

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We apply Clements (2009)'s Economy Theory (ET) for feature based segmental inventories to contrastive hierarchies created by Dresher (2009)'s Successive Division Algorithm (SDA) based on the phonetic features used in UPSID (Maddieson 1984) and the gestures from Avery & Idsardi (2001). Clements (2009) summarizes work on the principles of Feature Bounding, Feature Economy, Marked Feature Avoidance and Phonological Enhancement. We identify the structural analogs of these principles in contrastive hierarchies and compare results between the two feature systems.

We developed the KK Dresher Machine (KKDM), which implements an algorithm that produces all possible contrastive hierarchies based on input phonetic specification for a given set of segments. A contrastive hierarchy defines the number of contrasts, segments and features that describes a phonemic inventory and determines phonological representations for each segment. We apply the KKDM to vowel inventories from UPSID coded in two ways. One coding is based on the naive phonetic descriptions directly from UPSID and the other has the segments coded into 'gestures' from Avery & Idsardi (2001). The difference between the two coding systems demonstrates distinct assumptions about phonetic and phonological representations.

We report KKDM results for all of the vowel systems in UPSID (3 to 28). This data provides theoretical limits to how ET applies to contrastive hierarchies and empirical data about variation in these principles found in human language.

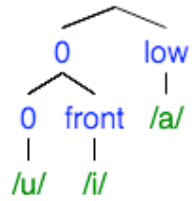
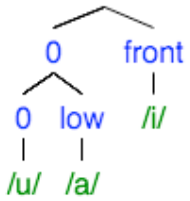
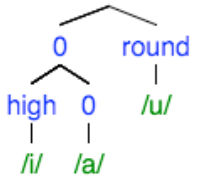
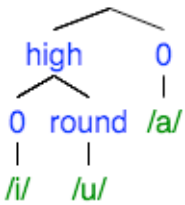
Feature Bounding defines relationships among the number of segments, features and contrasts. We report the new relationship to contrastive hierarchies. Clements (2009) provides lower bounds for these numbers but we find that the SDA provides upper bounds for phonological features based on the number of segments and not input phonetic features. The SDA will posit no more than n-1 features where n = number of segments regardless of the set of input phonetic features. There is variation in how many phonological features are necessary to code contrasts based on the input phonetic features and we identify different inventories with different characteristics.

Feature Economy applies to contrastive hierarchies as a metric that distinguishes different hierarchical orders using the same features. The number of features each segment is marked with is dependent on the order of features in the hierarchy consequently some hierarchies show more economy than others if economy is calculated on the total number of feature tokens needed to encode an inventory. We encode this as Lexical Economy (LEcon) and it is different than the standard Clements's Economy calculation (Econ). We report empirical upper and lower bounds based on the actual inventories in UPSID.

Marked Feature Avoidance is interpreted as a bias placed on which features are chosen from the input set of phonetic features. We report frequencies of feature use in the hierarchies across all of the inventories in UPSID based on both coding systems to compare which features are 'marked'. Features used for *Phonological Enhancement* are identified as features used in the input coding but not in the contrastive hierarchy for an inventory (EnhF below).

This work replicates previous results and expands them to cover the entirety of UPSID vowel systems and compares different theories of distinctive features in contrast. Future work will expand the number of phonemic inventories analyzed, look at consonantal systems and add different distinctive feature systems for further comparison.

3V-dominant system [i, u, a] (10 of 19 attested)
input features: UPSID = [atr, back, front, high, low, round, rtr, son]
Hierarchy Features: ... [low, front] ≻ [high, round] ...

			
low > front	front > low	round > high	high > round
Econ = 1.5	Econ = 1.5	Econ = 1.5	Econ = 1.5
LEcon = 1.5	LEcon = 1.5	LEcon = 1.5	LEcon = 1
MF = 'more favored'	MF = 'more favored'	MF = 'less favored'	MF = 'less favored'
EnhF = [atr, back, high, round, rtr]	EnhF = [atr, back, high, round, rtr]	EnhF = [atr, back, front, low, rtr]	EnhF = [atr, back, front, low, rtr]

The Role of Speech Rate in High Phonetic Variability Training: The Case of Korean Stops

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It has been widely accepted that high phonetic variability training with multiple talkers is more effective than with single talker materials (e.g., Logan, Lively & Pisoni, 1991; Lively, Logan, & Pisoni, 1993). When trainees are exposed to a wider range of exemplars of categories, the learners will build more robust representations of the learned categories. To provide more phonetic variability, researchers often increase the number of talkers producing the training materials or the number of phonetic environments (e.g., onset, coda). In the current study, we investigated whether speech rate is a legitimate dimension providing phonetic variability in second language category training. We examined whether native speakers of English would learn three-way contrast Korean stops more effectively with training materials consisting of three speech rates (slow, normal, and fast) than with those with only a single speech rate (slow).

Two groups of English native speakers without any prior experience with Korean were trained to learn the association between 18 Korean bi-syllabic pseudowords consisting of 6 minimal triplets and corresponding pictures. In these words, the first syllable was a combination of either /p'/, /p/, or /p^h/ with vowel /a/, /e/, /i/, /o/, /u/, or /ʌ/ and the second syllable was always /ta/ (e.g., /p'eta/, /peta/, /p^heta/). Four Korean native female talkers produced materials for training in three different speech rates and two other female talkers produced materials for the generalization test. A three-day computer based training started with a daily familiarization comprised of an auditory presentation of the words with corresponding pictures. Then, during the training phase, the participants were asked to choose one of the three pictures for the word heard and were given feedback on each trial. One group (Multi-group) was trained with the stimuli with different speech rates, while the other group (Single-group) only with the slow rate stimuli. Each day ended with an identification task (*Everyday ID*) similar to the one during the training session but without feedback. We assessed the training effects by examining the test scores (%) of Everyday IDs, the generalization identification task to new talkers, and the retention test given a week after the last training session. For the assessment tests, only slow-rate stimuli were used.

Overall, both groups improved in their ability to identify targeted sounds over the course of training. However, the degree of improvement was greater for the Multi-group (17%) than for the Single-group (6%) in the Everyday ID test scores, even though the latter group was more exposed to the (slow-rate) test material. The Multi-group also performed better in the new talker generalization test: 81% vs. 63%. Lastly, we observed the same trend in the retention test. These results suggest that speech-rate is another legitimate dimension in high phonetic variability training, and can be considered in developing training materials for second language categories.

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Phonological contrast maintenance in language contact: A preliminary analysis of rhotics in bilingual Guatemalan Spanish

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The present study investigates the Spanish phonological contrast between the alveolar tap and trill with eight bilingual Spanish-Kaqchikel speakers from Antigua, Guatemala. Despite the increase in (socio-)phonetic research on language contact in the Spanish-speaking world, one language family, Mayan, has remained relatively unexplored, with the exception of Spanish in contact with K'ichee' (Baird, 2015, in press) and Yucatec Maya (e.g., Michnowicz, 2015). This is surprising given the fact that Guatemala is home to 21 Mayan languages that are potentially in contact with Spanish.

The Spanish and Kaqchikel Maya phonemic rhotics form a potential conflict site (Poplack & Meechan, 1998), in that Spanish phonemically contrasts between two rhotics while Kaqchikel does not. Specifically, in Spanish the tap and trill form minimal pairs in word-medial intervocalic position (e.g. /peɾo/ *pero* 'but' vs. /pero/ *perro* 'dog', Hualde, 2005), however the contrast is limited to less than 30 minimal pairs (Willis & Bradley, 2008). Furthermore, empirical research on rhotics in Spanish has shown great variation in both rhotic phonemes (e.g., Bradley & Willis, 2012; Henriksen & Willis, 2010; Willis, 2006, 2007), but the contrast can be maintained through differences in duration (Bradley & Willis, 2012; Henriksen, 2015; Willis & Bradley, 2008). In Kaqchikel, there is only one rhotic phoneme /ɾ/ that has two allophones in complementary distribution (e.g., García Matzar, Toj Cotzajay & Coc Tuiz, 1999): an assibilated rhotic [ɹ̝̊] (e.g., /q'oɾ/ → [q'oɹ̝̊] *q'or* 'atole'), and a tap in all other contexts (/ɾaʔ/ → [ɾaʔ] *ra'* 'his leg,' /ɾoqoɾik/ → [ɾoqoɾik^{h}] *roqorik* 'loose'). However, this distribution is based on prescriptive grammars and there are currently no (socio-)phonetic studies that have examined rhotics in Kaqchikel. Given this difference between the languages the hypothesis of the present study is that Kaqchikel-Spanish bilinguals will not maintain the Spanish rhotic phonological contrast since: 1) it is not productive in Spanish; 2) Kaqchikel only has one rhotic phoneme; 3) the loss of phonemic distinctions is a common outcome in language shift situations (Winford, 2003).

The data come from sociolinguistic interviews collected in the summer of 2015. For the acoustic analysis, 261 tap and 146 trill phonemic tokens in word-medial intervocalic position were segmented in Praat and measured for the number of occlusions present and the segment's duration, following previous research on Spanish rhotics. Results show that for the taps 30.3% of the tokens did not contain a measurable occlusion, a slightly lower percentage than what was found of Veracruz Mexican Spanish (Bradley & Willis, 2012). For the phonemic trill only 40% of the tokens were produced with two or more occlusions (i.e. the canonical trill), and a full 32.4% did not contain any occlusion in the segment; this low number of canonical trills parallels findings from previous research (Henriksen, 2015; Henriksen & Willis, 2010). However, the results for duration show that all participants maintain the phonological contrast through this acoustic correlate, which is in line with previous research on Spanish (Bradley & Willis, 2012; Henriksen, 2015; Willis & Bradley, 2008).

Overall, this study demonstrates that there is considerable variation in bilingual Spanish-Kaqchikel rhotic productions that parallels results from non-contact varieties of Spanish; this finding may be due to the high articulatory effort required to produce these segments (Blecua Falgueras, 2001; Dhananjaya, Yegnanarayana & Bhaskararao, 2012; Lewis, 2004; Solé, 2002) and not due to effects of language contact. This is to say, despite the on-going language shift in Guatemala from indigenous Mayan languages to Spanish, this sample of bilingual speakers is maintaining the Spanish rhotic phonological contrast contrary to the initial hypothesis.

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A Representationally Consistent Model of Vowel Nasalization

Rebecca L. Morley

Rich representational theories hold that linguistic categories possess measurable extent in a continuous phonetic space. These categories are often realized as collections of specific experienced instances, or exemplars, that retain fine-grained acoustic information. Exemplar storage has been used to model synchronic variation (e.g., Pierrehumbert 2001), language change over time (e.g., Garrett and Johnson 2013), and the evolution of language (e.g. Wedel 2006). Explanatory power in such models is usually based on the perception-production feedback loop, in which perceptual tokens become production tokens, which in turn become perception tokens, and so on. In practice, this mechanism is based on one or more of the following assumptions: 1) perception maps directly to production; 2) words are generated by concatenating phonemes and 3) phonetic processes (such as 'lengthening' or 'nasalization'), apply indefinitely. This work demonstrates that these assumptions lead to internally inconsistent representational systems, and provides an alternative model of sound change and stability.

The model is characterized by a non-trivial perception-production mapping with a connected lexical and sub-lexical level; contextual factors act stochastically and bi-directionally. At the word level a vowel+nasal sequence (as in the word "am") is perceived as a triple of duration values corresponding to the vowel portion, the nasal portion, and the amount of overlap. The model listener converts these perceptual values to production values via induction of the original articulatory targets. It is assumed that the perceptual token is inherently ambiguous between two possible underlying structures: a single unit – nasalized vowel – , or a sequence of two units – oral vowel followed by nasal consonant (cf. the CHANCE route to sound change within the theory of Evolutionary Phonology (Blevins 2004)).

Selection of the single-unit analysis entails that the vowel duration be coextensive with the rhyme duration.Vowel and overlap durations are altered accordingly prior to being stored as production targets. In the two-unit analysis no alterations are made to the input tokens during the conversion process, and only vowel and consonant duration are stored at the sub-lexical level; overlap is determined at the word level. The token stored at the word level is, in turn, biased weakly towards the inferred sub-lexical units.

Different proportions of analysis 1 versus analysis 2 result in different realizations of the three acoustic parameters at the word level. These proportions, in turn, are conditioned by aspects of the acoustic tokens. In one simulation, the shorter the overall word duration, the higher the likelihood of a single-phoneme analysis; in another: the longer the overlap duration, the higher the likelihood. Change is possible when external factors affect the distribution in such a way as to alter the relative likelihood of the two analyses (see Sóskuthy (2013) for a similar actuation scenario); for example, if probability is conditioned on word duration, and word durations decrease over time, a positive feedback loop results.

For comparison, a standard exemplarist model of nasalization attributes sound change to word use over time via a unidirectional phonetic bias. Nasalized vowels are stored as perceptual tokens, and then nasalized again when used in production, a feedback loop that relies on perception and production tokens having identical phonetic dimensions. This approach also assumes that there is a nasalization rule, the application of which adds some constant amount of nasality to its target. But phonetic nasalization is a timing-based effect. In order for production to mirror perception there would have to be some decision made about the relative timing of the vowel and nasal gestures.

‘Adding’ nasalization would require shifting the lowering of the velum earlier in the realization of the vowel. And the mechanism that would incrementally shift the timing relation in a particular direction is missing from this model.

The representational framework adopted here leads to a very different conceptualization of phonetic and phonological phenomena in general. In fact, it calls into question the very existence of a nasalization rule. The vowel+nasal analysis has no primacy, and the nasalized vowel analysis requires no additional burden of evidence. Ambiguity is inherent to the input, and arises from the fundamental problem of segmentation. This modeling decision further entails that there is no single ‘phonologization’ event by which the phonetic pattern of vowel nasalization achieves phonological, i.e., categorical, status. Instead, each individual token at any time may be analyzed either as the product of phonetic nasalization, or as deriving from underlying nasality.

In historical linguistics the chicken-egg problem of actuation is debated in the following terms: either loss of nasal consonants triggers the formation of phonemically nasalized vowels (e.g., Hajek 1997) or ‘covert’ vowel nasalization facilitates the loss of now-superfluous nasals (e.g., Janda and Joseph 2003). In either case there is a negative correlation between nasality on the vowel and nasality on the nasal. This relationship is explicitly represented in the present model by the perceptual consequences of analysis choice. Nasals that completely overlap vowels (‘deleted’ nasals) are more likely if the proportion of nasal vowel analyses is higher for a given word. This can be viewed as a kind of phonetic enhancement, which brings the experienced token into line with the mental categorization of that token. This mechanism has promise not just as an instigator of sound change, but as the basis for a stable system of synchronic representations.

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Derivational restrictions on dorsals in Tundra Nenets

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Optimality Theory allows no restrictions on the input, a principle dubbed RICHNESS OF THE BASE by Prince & Smolensky (2004). This paper presents an argument for input restrictions based on a study of dorsals in Tundra Nenets (TN for short). I propose to implement non-surface distributional generalizations as stem-level phonotactic constraints within Stratal OT (Kiparsky, 2000; Bermúdez-Otero, 2001).

Problem. This study is based on fieldwork and corpus data from TN, and the generalizations largely match the existing descriptions (Janhunen, 1986; Salminen, 1997, 2012; Nikolaeva, 2014). In TN, [k] is prohibited word-initially, even though cross-linguistically initial position is known to favor preservation of contrasts (Beckman, 1998). Janhunen (1986) proposes that [k] is always derived from /x/ via a general process of fricative strengthening after a consonant, illustrated in (1) ('°' is an over-short vowel resulting from reduction of /ʌ/). Since strengthening only happens after consonants, [k] never arises word-initially.

(1) /jar-xʌna/ [jark°na] 'side-LOC.SG' but /ja-xʌna/ [jax°na] 'earth-LOC.SG'

Next, TN post-vocalic stops /p p^j t t^j/ undergo voicing, as in (2). No parallel alternations are found for [k], and hence the undergoers of voicing arguably form an unnatural class (Mielke, 2008). However, underlying obstruent clusters are simplified to a single consonant that fails to undergo voicing, see (3). In parallel to (3), underlying clusters where C_2 is /x/ surface as intervocalic [k] (4). Assuming that intervocalic [k] always results from C+x clusters can account for the fact that [k] never undergoes voicing.

(2) /ja-ta/ [jada] 'earth-POSS.3SG' but /jar-ta/ [jarta] 'side-POSS.3SG'

(3) /m^jat-ta/ [m^jata], *[m^jada] 'tent-POSS.3SG'

(4) /m^jat-xʌna/ [m^jak°na], *[m^jag°na] 'tent-LOC.SG'

To summarize, assuming that [k] is prohibited in the input and is always derived from /x/, helps us to understand otherwise mysterious examples of apparent unnatural class patterning and typologically unusual restrictions in word-initial position. However the ban on input /k/ is inherently problematic for parallel OT.

Analysis. I propose to implement non-surface distributional generalizations as constraints on the output of the stem level in Stratal OT (Kiparsky, 2000; Bermúdez-Otero, 2001). The constraint prohibiting [k] is ranked above IDENT-[CONTINUANT] at the stem level, but later reranked below this faithfulness constraint. As a result, surface [k] is allowed only in the environments where it is derived from /x/. There is also independent evidence that the alternations in (1 – 4) apply only post-lexically in TN (Staroverov & Kavitskaya, 2017).

Obstruent stops resulting from cluster simplification do not undergo voicing (3 – 4), resulting in a chain shift, e.g. /Vt/ → [Vd] but /Vtt/ → [Vt]. Following Staroverov & Kavitskaya (2017), I analyze cluster simplification as coalescence, and propose to view the blocking of voicing for underlying clusters a gang effect.

Conclusion. The talk argues that non-surface inventory restrictions can be used to understand some otherwise puzzling patterns in TN. My analysis is implemented within Stratal OT, and it crucially involves grammar differences (reranking) between strata. Other derivational versions of OT would not be able to state the TN generalizations. This analysis bears on the problem of unnatural classes, and on the role of abstractness in phonology.

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Effects of the loss of prenasalization in Nyere

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The Nyere dialect of Kikuyu exhibits a particularly interesting case of diachronic fossilization of sound change phenomena. Even though nasal segments in nasal-consonant clusters have been deleted from Nyere, the phonological effects of a prenasalization process are still present. The origins of this phenomenon are most strongly evidenced by analyzing the prefix system. These prefixes are affixed to nouns partially in order to mark semantic category and to verbs in order to mark 1st person singular subject and object. Among these prefixes is a prenasalization morphophoneme which historically often led to the formation of nasal-consonant clusters. In Kikuyu, this morphophoneme has two primary applications. Prenasalization is used as a noun class marker in Classes 9 and 10 and as a first-person singular subject and object marker for verbs. The presence of the nasal segment in nasal-consonant clusters led to a prenasalization process of voicing and fortition on following voiceless obstruents. Analysis of present-day Nyere shows that despite no longer containing nasal-consonant clusters, historically prenasalized consonants still maintain the features that are a result of this process.

Stress and Tonal Prominence in Teochew

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Abstract.
This paper looks into a metrical representation for complex tone languages. In the Chaoyang dialect of Teochew (Southern Min, Hong Kong/China), stress-triggered trochaic-type sandhi is found along with its general iambic rhythm. Given a disyllabic unit, anterior sandhi changes the tone on the first syllable (iamb-type) whereas posterior sandhi changes the tone on the second syllable (trochee-type). For example, [sua teŋ] refers to 'the top of a hill' when sandhi occurs on [sua], but '(on) a hill' when sandhi happens on [teŋ]. While the citation tone inventory has six tones, the anterior position after sandhi holds four different tones and the posterior position holds only two.

This paper illustrates how tone sandhi can be related to the interaction between tone and stress, mediated by rhythm type. With tone sandhi of both types, phonetic data of ten sandhi minimal pairs is collected to compare the duration and intensity of different syllables. Results show a duration asymmetry between the two sandhi types, less prominent sandhi syllables when compared with their citation tone counterparts, and the adoption of either acoustic cues to signal prominence depending on their position within a disyllabic unit.

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Examining the Phonological Status of Onset [w] in Beijing Dialect

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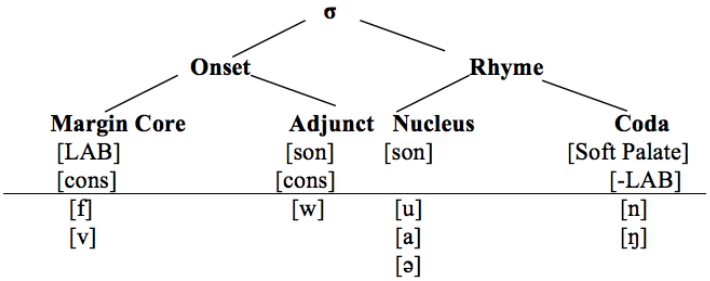
Among Mandarin speakers, it has been observed that many of them who are also native speakers of Beijing Dialect pronounce the glide [w] as a labiodental [ʋ] when it occurs initially without a consonant on the onset position (Shen 1987; Hu 1991). This unique phenomenon also influences Beijing speakers' learning of English as a second language because their onset glide [w] does not obtain the rounding feature and sometimes would because a labiodental sound, such as [vei] for *way* and [vai] for *why*. Based on this observation, this research aims to answer the question: whether /w/ in Beijing Dialect should be classified as a glide/consonant phoneme that should be included in the consonant inventory; a variant of the vowel phoneme [u]; or something else. In this study, I propose a new consonant inventory of Beijing Dialect where the onset [w] is underlyingly a labiodental [v], which indicates that Beijing Dialect may have a different phonological structure than Mandarin Chinese.

The study is conducted with three major theoretical frameworks: Dresherian hierarchy (Dresher, 2008), distinctive feature theory from Avery and Idsardi (2001) which concentrates on phonetic contrastive detentions based on laryngeal system, and theories related to syllable structures (Cairns & Feinstein, 1982; Duanmu, 2007). In addition, I also collected speech data on the pronunciation of the onset [w] and its variant labiodental [ʋ]/[v] from 10 native speakers of Beijing Dialect, the results of which supports the reports of this behavior in the existing literatures.

The analysis of this proposed new consonant inventory as well as its corresponding Dresherian hierarchy suggests that there might be a GT (Glottal Tension) insertion for fricatives in Beijing Dialect which creates the possibility for the /w/→/v/ change as the reverse process of Sisterhood Merger (Oxford, 2012) where one phoneme derives from the other and they become contrastive sisters.

	Labial	Coronal		Dorsal
Stops	p, p^h	t, t^h		k, k^h
Affricates (fricative stops)		ts, ts^h	tʃ, $tʃ^h$	
Fricatives	f, (v)	s	ʃ, ʒ	x
Nasals	m	n		(ŋ)
Liquid		l		
Glides	w		j	ɥ

It also can be implied by the re-examination of the underlying syllable structure that the Adjunct slot where the glides occur also plays an important role in such phonological change, where if the phoneme [v] is now available in the consonant phonemic inventory as a result of diachronic sound change process, it can take up the Margin Core slot and the glide [w] therefore is not necessarily needed.



Diachronic Change and Differing Readings of Mandarin /ŋ/-Coda Words in Suzhou Dialect of Chinese

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The tension between standard language varieties and regional or vernacular dialects has always been a target of linguistic scrutiny. Variation and change may arise when a speech community is actively utilizing both the standard language and the dialectical variant. Moreover, the level of influence a dialect gets from standard language contact may vary across different linguistic aspects, or even across different items within one aspect.

This study looks at the Differing Literary and Colloquial Readings—an alternating pronunciation phenomenon closely related to conversation register—of Mandarin /ŋ/-coda words in relation to the diachronic phonological change of a not yet fully studied regional dialect: Suzhou dialect of Chinese. The study proposes that Suzhou took a slightly different path than Mandarin Chinese did, as the modern dialect has more phonological association with the reconstruction of Old Chinese by Baxter & Sagart (2014), rather than that of Middle Chinese.

To fully understand the distributional pattern of these differing readings, I adopt the model of Lindblom (1990) and Ohala (2012) in assuming phonetic processes as a major source of initial change and change in progress. Three major conclusions can be drawn from the examination and analysis of the alternating data: (i). The difference between Suzhou and Mandarin along with the differing readings within Suzhou itself confirms the claim that the phonological system of Suzhou has more association to that of Old Chinese; (ii). Influence or imposition of Mandarin arise when the phonology (i.e. underlying representations) of Suzhou is in conflict with that of Mandarin; (iii). Diachronic change of the realizations of the /ŋ/-coda words over a course of sixty years within Suzhou is mainly due to the effect of speaker-initiated Articulatory Ease and listener-initiated Misperception & Reconstruction processes. Along with an ongoing vowel merger found among different generations, we may expect the phonologization of these alternating readings as well.

This study presents a rather complicated case where both influences of the standard language and regular sound change within the speech community take place, and tries to tease apart the interaction between the two effects. The analysis contributes to a more complete phonological account of Suzhou, and serves as a piece of evidence for the phonological diversity among the Chinese dialects as well.

Keywords: Suzhou dialect of Chinese, Sound Change, Differing Literary and Colloquial Readings, Articulatory Ease, Misperception & Reconstruction.