The Twenty-Sixth Manchester Phonology Meeting

ABSTRACTS BOOKLET

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Organised by a collaboration of phonologists at the **University of Edinburgh**, the **University of Manchester**, and elsewhere.

This booklet contains the abstracts for all the papers presented at the **twenty-sixth Manchester Phonology Meeting**, held at Hulme Hall, Manchester, in May 2018.

The abstracts are arranged in alphabetical order by the surname of the (first named) presenter. If any abstracts are missing from this booklet, it is most likely because the authors did not submit a non-anonymous version of their abstract.

The abstracts for the **oral paper sessions** are presented first, followed by the abstracts for the **poster paper sessions**, and the booklet concludes with abstracts for the **special session**.

The **final programme**, included in your registration pack and available on the conference website, gives the details of which papers are in which room, and at which times.

Oral papers

Outward-Looking Phonologically Conditioned Allomorphy in the Koryak Verb

Rafael Abramovitz (MIT) - rafabr@mit.edu

One of the most widely-cited predictions stemming from research in realizational theories of morphology is Bobaljik (2000)'s concerning the directionality of allomorphy: outward-looking allomorphy can only be sensitive to the morphosyntactic properties of its trigger, and inward-looking allomorphy can only be sensitive to the morphophonological properties of its trigger. In this paper, I propose a counterexample to this prediction from the verbal complex of Koryak (Chukotko-Kamchatkan, Kamchatka), where, in transitive verbs, the suffixal portion of the present tense circumfix (*ku- -ŋ*) shows allomorphy triggered by the segmental content of the following morpheme in the verb. In particular, if the following morpheme begins in a noncoronal consonant, the *ŋ* deletes, as shown by the contrast between (1) and (2), where the suffixes are coronal-initial and noncoronal-initial, respectively.

(1) a. t-ə-ku-nmelew-ŋ-ə-**tək** 'I heal you (du)'
b. t-ə-ku-nmelew-ŋ-ə-**n** 'I heal him'

(2) a. t-ə-ku-nmelew-∅-**ɣi** 'I heal you'
b. ne- ku-nmelew-∅-**ɣəm** 'X heals me'

However, the opposite is observed in intransitive verbs: the agreement suffix deletes if it begins in a noncoronal consonant, whereas the *ŋ* of the tense morpheme remains. This is shown by the contrast between the witnessed past and present forms in the (a) and (b) examples below, where the labial-initial 1NSG agreement suffix is deleted in the present.

(3) a. məlaw-**tək** 'You (du) danced'
b. ko-mlaw-ŋ-ə-**tək** 'You (du) dance'

(4) a. mət-ə-mlaw-**mək** 'We (du) danced'
b. mət-ko-mlav-ə-ŋ-∅ 'We (du) dance'

Viewed in this light, the facts under discussion constitute a conspiracy: *the suffixal portion of the present circumfix may not surface followed by a morpheme that begins in a noncoronal consonant.* It is tempting to try to account for this conspiracy purely phonologically, using a markedness constraint that implements the insight above (***ŋC**$_{[-cor]}$), thereby preserving Bobaljik's generalization about insertion. I will argue that purely phonological accounts of this phenomenon are impossible in monostratal theories like standard OT (Prince and Smolensky 2004) because epenthesis between the *ŋ* and a following noncoronal stop does not prevent deletion from being triggered. This requires the constraint to apply to an intermediate representation without epenthetic vowels, which is not possible in a monostratal framework. Stratal OT (Bermúdez-Otero 2008) does not share this problem, but it cannot account nonstipulatively for the fact that the attested solution to the marked structure involves supraminimal faithfulness violations: rather than deleting just enough to satisfy the markedness constraint, the entire suffix deletes (cf. (4b), where deleting the suffix's first segment would be enough to satisfy the constraint.) Furthermore, licensing *ŋ* before a consonant only if it is coronal appears to be unattested crosslinguistically (Anderson 2008). This casts doubt on the plausibility of a purely phonological account of these facts, especially since it is not a general fact of Koryak phonology that *ŋ* cannot precede a noncoronal consonant: the circumfix *je- -ŋ* 'want' does not trigger or undergo deletion preceding *ŋ*.

(5) t-ə-ku-**je**-ləʔu-**ŋ**-ŋ-ə-n 'I want to see him.'

Optimal Interleaving (Wolf 2008) provides a mechanism for constraints referring to segmental features to enforce the non-exponence of nodes, which seems to be the most natural way of accounting for the conspiracy. In particular, by ranking an indexed version of ***ŋC**$_{[-cor]}$ over **REALIZE MORPH** at a point in the derivation before the normal phonological operations take place, we can account for the all-or-nothing solution to the problem posed by the marked structure. This alone underdetermines the correct solution, as deleting either the *ŋ* or the suffix would satisfy this equally well. I will suggest that constraints requiring the realization of particular morphosyntactic features of the arguments coindexed by the agreement morphemes are necessary to account for the pattern, further supporting analyzing this phenomenon outside of the normal phonology.

Partial vowel reduction in initial syllables in American English

Adam Albright, MIT (albright@mit.edu)

Vowel reduction is one of the most pervasive phonological processes of English, and many arguments in *The Sound Pattern of English* (Chomsky and Halle 1968) rested on a simple assumption: stressless short vowels reduce. Chomsky and Halle noted that reduction is more limited in certain contexts (especially, prevocalic vowels and final non-low vowels), but the SPE grammar is generally designed to ensure that unreduced short vowels bear some degree of stress, either on the surface or at some earlier derivational stage. In this talk, I demonstrate an additional restriction: vowels in absolute word-initial position show a more limited and complex pattern of reduction, maintaining a two-way height distinction in stressless syllables: ɪ/ɛ vs. ə in light syllables, and ɪ vs. ɛ/æ in heavy syllables. I argue that the occurrence of non-ə vowels cannot be attributed to stress, but instead requires a grammar that allows for a more limited inventory of short lax vowels in phonetically long stressless syllables.

The pattern of reduction for short front vowels is shown in (1). As is well known, reduction depends on speech rate, frequency, foreignness, and morphologically related forms. Controlling for these, the distribution in (1) holds phrase-initially in careful speech. It is well-known that reduced vowels vary between higher (ɪ-like) and lower (ə-like) vowels. However, there is more to be said: in fact, a limited height contrast is maintained in absolute initial position. The restriction to absolute initial position is important for (1a–d), which show reduction to [ə] word-internally ([ɛ]stónia vs. b[ə]stów) and phrase-internally (*an* [ə]*gregious error*).

(1) Partial contrasts maintained in absolute-initial position

		/ɪ/		/ɛ/		/æ/	
a.	/__ CV	ɪ/i	illícit, imáginary	ɪ/i	elástic, epístle	ə	allége, aphásia
b.	/__ TRV	ɪ/i	igúana, Iglésias	ɪ/i	ecláir, Etrúscan	ə	acquíre, acrópolis
c.	/__ STV	ɪ	Islámic, Iscáriot	ɛ/ɪ	Estónia	ə	Astória
d.	/__ TCV	ɪ	igníte, ignóble	ɛ/ɪ	eccéntric, egrégious	æ/**ɛ**	accéntuate, admíre
e.	/__ RCV	ɪ	impárt	ɛ	Elmíra	æ	alpáca, ambássador

These data are not obscure (the transcriptions follow Kenyon and Knott 1949), but as far as I can tell, the special status of absolute-initial vowels has not received careful analytical attention. Chomsky and Halle (1968:118) posit secondary stresses on initial syllables with clusters (#(C)V̀CC), covering cases such as [æ]*sbéstos*. Secondary stress cannot account for the full pattern, however, since it predicts full maintenance of the underlying vowel quality. This is indeed found in (1e), where reduction is impossible. However, the SPE rule also predicts secondary stress in (1d), but reduction to [ə] is impossible for /ɪ/ and /ɛ/, and optional for /æ/ ([æ]∼[ə]*dmíre*). In other (previously undescribed?) dialects, /æ/ reduces to [ɛ] in this context ([ɛ]*dmíre*), yielding a pattern of partial reduction that is completely unlike medial stressless syllables. Thus, (1d) cannot be due to secondary stress. Instead, I argue for a more nuanced vowel reduction process: stressless initial /æ/ reduces to [ə] obligatorily in light syllables, and optionally in heavy syllables (reducting to [ɛ] otherwise, in some dialects).

We could easily add stipulations to the SPE Vowel Reduction rule to capture these restrictions, but the real question is why they hold. In fact, vowel reduction is often blocked in absolute initial position, plausibly due to longer duration in this position (Barnes 2006, Lunden 2013). I argue that the pattern in (1) reflects a set of reduced vowel inventories, depending on vowel duration (Herrick 2003, Flemming 2007). In the longest contexts (stressed syllables), all contrasts are maintained, while in the shortest contexts (medial stressless syllables), only [ə] is allowed. In initial position, depending on the VCC interval duration, inventories of two (ɪ vs. ə/ɛ) or three (ɪ, ɛ, ə) front vowels are tolerated. This is analyzed using MinDist constraints (Flemming 2002) and markedness constraints against low vowels in short syllables.

Stress position in novel *-ory* derivatives: Phonology, morphology, and the speaker

Sabine Arndt-Lappe and Javier Sanz, University of Trier (sanz@uni-trier.de)

Descriptions of English morphophonology and theories of the morphology-phonology interface building on such descriptions traditionally make a distinction between stress-neutral and stress-shifting affixes. Stress position in polymorphemic words with stress-shifting affixes is often assumed to be determined by the same stress rules that also apply to monomorphemic words in the language. Complex words with stress-neutral affixes, by contrast, preserve the stress of their bases.

Looking at English derivational morphophonology, there are two wellknown problems with the distinction between stress-shifting and stress-neutral affixes. The first is that some affixes are not easily accomodated within this dichotomy, but show variation in stress position. One such affix is adjectival *-ory* (e.g. *óscillatory*, *oscíllatory*, *oscillátory* > *óscillate*; e.g. Liberman & Prince 1977, Burzio 1995, Zamma 2012, Bauer et al. 2013: 288ff.). The second problem is that it is not entirely clear what the default stress rules of the language are. From an empirical perspective, the problem is aggravated by the fact that most accounts are based on existing words. This is a problem because, as has been shown in Arndt-Lappe and Sanz (2017), the degree of lexicalisation of stress may be a key factor in explaining stress position in existing English *-ory* derivatives.

The present study investigates how native speakers productively stress novel *-ory* words. In a reading study we elicited 20 different non-existing *-ory* adjectives in context from 30 speakers of British English. All nonce bases are at least three syllables long and end in syllables frequently encountered in existing derivatives: *-atory* (e.g. *serigtory*), *-icatory* (e.g. *helificatory*), *-utory* (e.g. *celesutory*), and *-isory* (e.g. *levenisory*). Furthermore, all derivatives were presented in two conditions simulating differences in morphological status of the base: one in which the derivative was embedded in a context that also provided the nonce base used as a verb (e.g. *serigate*, *helify*, *celesute*, *levenise*), and one in which there was no evidence that the nonce base was a free form.

We find that, in general, stress on the final syllable before the suffix is the clear majority option, regardless of how the base ends (e.g. *serig*[ˈeɪ]*tory*, *helific*[ˈeɪ]*tory*, *celes*[ˈu]*tory*, *leven*[ˈaɪ]*sory*). At the same time 24 of our 30 speakers show substantial variation. Statistical analysis (conditional inference trees, mixed-effects regression) reveals effects of the morphological status of the base (in the sense defined above) and stress in the base when it occurs as a free form, as well as substantial differences between different groups of speakers. Different groups of speakers are characterised by (a) the extent to which base-final stress is a default pattern, and (b) the extent to which speakers are sensitive to the morphological status of the base and, if applicable, to its stress. Finally, (c) speakers are found to differ in terms of how they vary among different retraction patterns (e.g. *sérigatory* vs. *serígatory*).

For example, for almost all speakers presentation of the test words as involving bound bases lead to significantly more stresses on the penultimate syllable before the suffix (e.g. *serígatory*, *helificatory*, *celésutory*, *levénisory*). In the condition in which the derivative was presented with a verbal base, some speakers systematically preserved stresses in the verbal base (e.g. *sérigatory* > *sérigate*, *hélificatory* > *hélify*). Whereas, however, stress on the antepenultimate syllable before the suffix is systematic in some speakers, others show more idiosyncratic patterns of variation among different derivatives.

Our findings complement those of an earlier study of existing *-ory* words (Arndt-Lappe and Sanz 2017). The two studies provide converging evidence that productive stress assignment in *-ory* derivatives in British English is characterised by both markedness and faithfulness effects, and a probabilistic interaction of the two types of effect. The division of labour between morphological and phonological aspects of the computation seems to be different for different speakers. By contrast, evidence for a single, categorical default rule along the lines often assumed for monomorphemic words seems rather weak.

Three laryngeal cues to two laryngeal contrasts

Maya L. Barzilai, Georgetown University, mlb290@georgetown.edu
Kate Riestenberg, Smithsonian Institution, kate.riestenberg@gmail.com

Languages often employ multiple acoustic cues to convey a single phonological contrast (e.g., Denes, 1955; Lisker, 1986). Tone and phonation, two laryngeal features, tend to exist in this redundant relationship: contrastive tone is often additionally cued by non-contrastive creaky phonation; conversely, contrastive phonation type can be additionally cued by non-contrastive pitch movement (Gordon & Ladefoged, 2001). This paper examines the relationship between tone and phonation cues in Macuiltianguis Zapotec (MacZ), a Northern Zapotec language in the Otomanguean family that contains both contrastive phonation and lexical tone (Riestenberg, 2017). We present a previously undocumented phenomenon of MacZ, a spike in F0 that surfaces significantly more frequently on modally voiced vowels than on checked ([V^{ʔ}]) ones, in addition to and independently of the F0 cues to phonemic tone. We posit two possible analyses of this F0 spike, ultimately arguing that it is a cue to phonation type, which occurs in addition to the phonetic phonation cue itself, yielding a system in which F0 provides the cue to two separate laryngeal contrasts.

This study examines phonologically modal and checked MacZ tokens produced by three native speakers, elicited from a word list. The F0 spike analyzed is operationalized as a visible rise followed by a fall in F0, occurring during the last third of the vowel duration, with a total difference in F0 of approximately 20Hz and lasting 5-10 ms. Presence or absence of the F0 spike was coded by acoustic profiling of the pitch track. A test of equal proportions on 598 tokens of phonologically modal and checked vowels revealed that the proportion of tokens with pitch spikes on modal vowels was significantly higher than that on checked vowels, regardless of the lexical tone on the vowel ($\chi^2(1, N=88.273, p<0.001)$).

In one possible analysis, the spiking pattern in F0 is the surfacing of an intonational boundary tone, appearing here as a facet of list intonation. Glottalized vowels are often associated with an underlying or historical low tone (e.g., Gordon & Ladefoged, 2001); such a low tone may exist on MacZ checked vowels, blocking the posited boundary tone from surfacing. However, the F0 spike analyzed here appears as a rapid fluctuation in pitch rather than as a canonical boundary tone with a clear tonal target, weakening this analysis.

We argue that the data better support a second analysis, that the F0 spike is an F0 cue to contrastive phonation, supplementary to the phonation cue itself and distinct from the F0 cue to lexical tone. The glottalized portion of a checked vowel in MacZ occurs only at the end of the vowel, making the contrast difficult to perceive; therefore the need for an additional perceptual cue to phonation contrasts is not surprising. F0 contours tend to be licensed on longer vowels (Zhang, 2004), explaining why it is the modal vowels that have the F0 spike and not the checked vowels, which have a relatively shorter period of sonority.

This paper examines the complex laryngeal system of MacZ, in which a spike in F0 is significantly more likely to occur on phonologically modal than checked vowels. We argue that this spike is best analyzed as an additional cue to contrastive phonation, creating a system in which three different laryngeal cues are used to convey only two laryngeal contrasts.

Amelia Becker
Georgetown University

The phonological status of [mid-spread] and [aligned-thumb-configuration] in American Sign Language

Signed languages demonstrate a level of structure analogous to phonology in spoken languages (Stokoe 1960), and native signers display categorical feature perception in a similar way to native users of spoken languages (Best et al. 2010). However, American Sign Language (henceforth ASL) offers few minimal pairs to affirm the contrastiveness of a given feature. The present study capitalizes on a unique characteristic of the signed modality – the presence of two independent articulators – to investigate the phonological status of "mid" realizations of the [spread] and [thumb-configuration] features of ASL handshapes. The data indicate that [spread] is a binary feature, with [mid-spread] resulting from phonetic reduction. On the other hand, results favor an analysis of [thumb-configuration] (henceforth [t-c]) as a potentially ternary feature, with underlying specification for [opposed], [unopposed], and [aligned-t-c] values.

When movement, location, and orientation features of each hand differ in a two-handed sign, one hand (the nondominant hand, henceforth NDH) must act as the passive articulator or place of articulation for the other (the dominant hand, henceforth DH). Battison (1978) identified a limited set of NDH handshapes in this type of sign, which he dubbed "asymmetrical" signs. This set includes a handshape with all fingers fully extended and fully spread ([+spread] in the present study). Another is produced with the fingers extended and partially spread ([mid-spread]). Battison described the latter as 'distinct from fingerspelled "B"' (p. 52), the handshape in which all fingers are extended and touching along their edges ([–spread]). However, Battison did not indicate whether he considered the [mid-spread] variant a NDH allophone of 'fingerspelled "B"' or whether the two handshapes belong to separate phonemes. The NDH inventory also includes both [opposed] and [unopposed] thumb configurations, as well as handshapes which display an [aligned-t-c] variant in which the thumb and index finger align. But although [t-c] is the only feature distinguishing two of Battison's seven NDH handshapes, it is not clear whether this feature is contrastive in other parts of the lexicon, given the lack of minimal pairs as mentioned above.

Data analyzed come from publicly available videos of language use by Bobbi Cordano, a native ASL signer and president of Gallaudet University, a Deaf university in Washington, D.C. The DH and NDH of each asymmetrical two-handed sign occurring in these videos were coded for [+], [–], and [mid] realizations of [spread] and for [opposed], [unopposed], and [aligned] realizations of [t-c]. Independent variables were DH vs. NDH context, grammatical category, [spread] and [t-c] values of the preceding and following DH and NDH, sign (word), and whether the two handshapes are the same or different in citation form. Results from a multivariate regression conducted in Rbrul (Johnson 2009) require different accounts for the distribution of the two features. [mid-spread] occurs most frequently in contexts where we would expect phonetic reduction (the NDH context and function words). There is also evidence of regressive assimilation to [+spread] but not to [mid-spread]. These results are interpreted as evidence that [mid-spread] results from phonetic reduction and is not underlyingly specified. On the other hand, distribution of the three values of [t-c] suggest that [aligned] is at least sometimes the underlying specification for [t-c]. Thus [t-c] may be a ternary feature, with underlying specification for [aligned] in addition to [opposed] and [unopposed].

Metrical Incoherence: different metrical structure at different strata

Johanna Benz - Universität Leipzig - benz@studserv.uni-leipzig.de

Metrical Incoherence: In some languages, there is conflicting evidence for metrical structure. This can manifest itself in different ways: 1. the metrical structure as diagnosed through the stress pattern of the language is different from the metrical structure as diagnosed through other phonological properties such as segmental processes, or 2. the stress system itself has incoherent properties. In this talk, I show that "metrical incoherence"(Dresher & Lahiri 1991, Gordon 2016) follows from how metrical structures assigned at different strata interact in Stratal Optimality Theory. Metrical structure assigned at an earlier stratum can be overwritten or preserved by the re-ranked constraint system at a later stratum.

Data: An example of the latter type is Washo (Jacobsen 1964), where word stress (in verbs) behaves much like lexical stress: most verbal roots and some affixes (near future -áša? below, same is true for negative -é:s, interrogative -hé:š) bear stress independently of where in the word they occur, restricted only by a constraint against stress clashes, which is satisfied by de-stressing the first of two adjacent stressed syllables (1d). However, declaring the stress system "lexical" misses important generalizations as the location of stress on stem (roots and roots extended by reduplication) is actually predictable (Yu 2005).

(1) "lexical" stress at the word level:

a. l-[$_{\text{stem}}$éme?]-ši-áša?-i → léme?šiyáša?i "We are going to drink."
b. we-[$_{\text{stem}}$híwi]-áša?-i → wehíwiyáša?i "It's going to thunder."
c. l-[$_{\text{stem}}$éye?]-we?-giš-uwe?-áša?-i → léyewegišuwa?áša?i "I'm going to go far away."
d. ?-[$_{\text{stem}}$íšl]-áša?-i → ?išláša?i "He will give it [to the man]."

(2) predictable penultimate (ultimate if monosyllabic or ultimate contains a long vowel) stress at the stem level (see also examples above):

a. bókoŋ "to snore" b. bíŋil "to try" c. biŋíŋil "to try repeatedly"

Analysis: The Washo facts receive an analysis where stress is predictably assigned at the stem stratum (along the same lines as in Yu (2005)). At the word level, faithfulness constraints against deletion and addition of stress are promoted (but the constraint against deletion of stress remains dominated by *CLASH). Stress is thus "frozen" on the same syllable that it was assigned to at the stem stratum and interacts like lexical stress with the inherently stressed affixes.

Discussion: Metrical incoherence instantiates a controversial prediction of this framework: namely, that the phonology of a later stratum could be quite different from the phonology at an earlier one (McCarthy 2000). In Washo, stem-level stress is preserved at later strata. Jarawara (Kiparsky 2015, Dixon 2004) builds feet from left to right at the stem-level (recoverable from segmental processes), but right-to-left trochees at the word level. Jarawara is therefore an example for the non-preserving type, where the earlier metrical structure is nonetheless still visible in the output. Gordon (2016) analyzes several cases of metrical incoherence as a mismatch between word- and phrase-level metrical structure. I will argue that these are special cases of the more general possibility of a mismatch beween "early" and "late" metrical structure and can therefore be integrated into the proposed approach without problems. The departure from a strictly parallel approach to conflicting metrical structures makes the additional prediction that these conflicting structures can reasonably be assigned at different strata.

Constraints on doubling are amodal

Iris Berent[1], Outi Bat-El[2], Qatherine Andan[3], Diane Brentari[4], and Vered Vaknin-Nusbaum[5]

[1] Department of Psychology, Northeastern University, i.berent@neu,edu
[2] Department of Linguistics, Tel Aviv University, Tel-Aviv, Israel, obatel@post.tau.ac.il
[3] Department of Psychology, Northeastern University, kattywa@gmail.com
[4]Department of Linguistics, University of Chicago, USA, dbrentari@uchicago.edu
[5] School of Education, Western-Galilee College, Akko, Israel, vered.vaknin@gmail.com

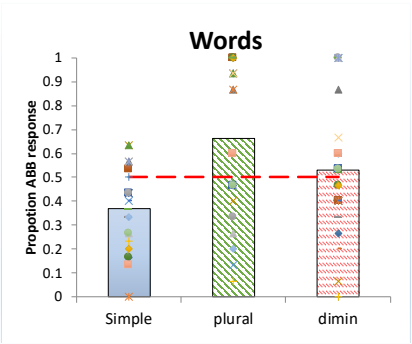
Our study seeks to dissociate the contribution of phonology from the phonetic system, asking whether some phonological constraints are independent of the phonetic substance. Our experimental results provide a positive answer to this question, showing that (i) a single linguistic stimulus with invariant phonetic properties can give rise to conflicting linguistic responses – aversion vs. preferences; and (ii) the acceptability of a linguistic form can remain invariant when its phonetic substance is radically altered – from speech to signs.

Our case study concerns the restrictions on doubling, generally ABB (e.g. *panana*). Doubling is amenable to two distinct parses, depending on the linguistic level of analysis. At the **phonological level**, doubling is parsed as identity, and adjacent identical elements within the same morpheme are *banned* by the OCP (McCarthy, 1981), so ABB<ABA. At the **morphological level**, doubling is parsed as reduplication, and since the base (i.e. AB) is identity-free, the OCP is vacuously respected, and the proximity of the identical elements is now ***required*** by ANCHORING, i.e. ABB>ABA (McCarthy & Prince 1995). Our experiments examined whether speakers productively project these restrictions on doubling across language modalities.

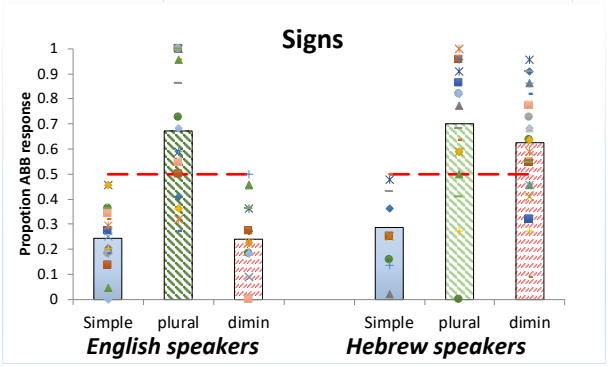
		Example	Structure	OCP	ANCHOR
Phonology	ABB	*panana*	$[p_1a_2n_3a_4n_5a_6]$	*	
	ABA	*panapa*	$[p_1a_2n_3a_4p_5a_6]$	√	
Morphology	ABB	*panana*	$[p_1a_2n_3a_4]\{n_{3c}a_{4c}\}$		√
	ABA	*panapa*	$[p_1a_2n_3a_4]\{p_{1c}a_{2c}\}$		*

c = copy/reduplicant; [] marks the base and {} the reduplicant

We first demonstrate that English speakers indeed shift their responses to novel English words (printed or spoken) depending on the linguistic level of analysis. In each trial, participants made a forced choice among a matched pair of tri-syllabic stimuli—ABB or ABA (e.g. *panana* vs. *panapa*). Results show that without of a morphological context (i.e. morphologically simple forms), adjacent identical syllables were systematically disliked (ABB<ABA). But once doubling was presented as a licit morphological operation of plurality, the doubling aversion shifted into a systematic preference (ABB>ABA). No such preference obtained for morphological diminutives.



Our subsequent experiments showed that English speakers with no command of a sign language spontaneously project these principles to novel ASL signs. As with novel spoken forms, ABB signs in bare phonological forms were systematically disliked. But when doubling was presented as a licit morphological operation of plurality, the doubling dislike shifted into a systematic preference (ABB>ABA).



Moreover, the projection of doubling constraints to speech and signs depended on the morphology of participants' spoken language. While English and Hebrew speakers each showed a reliable doubling preference when doubling indicated plurality (the unmarked semantics of reduplication), only Hebrew speakers projected a reduplicative parse to diminution (the marked semantics of reduplication), which is expressed by reduplication in Hebrew, but not English.

Together, these results suggest that the parsing of doubling in speech and signs is constrained by a single set of abstract linguistic principles. As such, these findings suggest that some phonological principles are amodal and abstract.

Unsupervised emergence of a five-vowel system in a Deep Belief Network

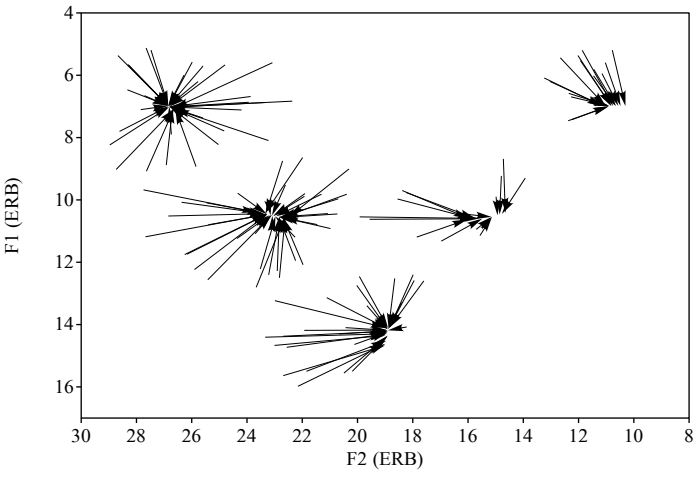
Paul Boersma, University of Amsterdam

We claim that when a large set of auditory representations of speech sounds are fed to a self-learning artificial neural network, discrete phonological categories will **emerge** in the network solely on the basis of the distributional properties of this set, i.e. without any supervision as to what the intended categories were. Our example here is that of a set of 30,000 vowels represented as excitation patterns of the basilar membrane, drawn from a Spanish-like inventory of five vowels with natural variation: the network will automatically come to understand that this language has five, rather than 30,000 vowel categories.

The simplest network that accomplishes this feat is a Deep Belief Network consisting of two stacked **Restricted Boltzmann Machines**. To model an incoming vowel sound, the first (input) layer contains 30 nodes that represent locations (i.e. spectral frequencies) along the basilar membrane and/or its representation in the auditory cortex. The second layer has 50 nodes, the third layer 20 nodes. The number of nodes is largely immaterial: qualitatively comparable results arise with networks that are 3 times smaller or 10 times bigger.

We **trained** this network by feeding it sounds drawn from a Spanish-like distribution of formant values (F1 and F2), where the regions around an F1 of 4 ERB with an F2 of 26 ERB (i.e. [i]), 8 with 23 ERB (i.e. [ę]), 12 with 20 ERB (i.e. [a]), 8 with 17 ERB (i.e. [ǫ]), and 8 with 23 ERB (i.e. [u]), were only slightly more common than sounds in other regions (a peak-to-valley ratio of only 1.5 in the pooled distribution). With this scheme we trained the two RBMs simultaneously 30,000 times with a learning rate of 0.001.

After training, we **tested** the network by applying 200 F1–F2 combinations randomly drawn from the auditorily possible space; these points are the starting points of the 200 arrows visible in the figure. We had each sound percolating up via the second layer to the third layer, and then reflecting back from the third via the second to the input layer. The resulting reflected activation pattern usually has peaks in several locations. When we take the two highest peaks and define the one with the lower frequency as F1 and the one with the higher frequency as F2, we obtain a "reflected" F1–F2 pair, and this pair is shown in the figure as the end point of the arrow.



The arrowheads turn out to cluster in five regions, which are (from left to right) near the vowel sounds [i], [ę], [a], [ǫ] and [u]. Apparently, the network "thinks" that the input consisted of only five different sounds (**prototypes** of the categories, so to say) rather than a randomly dispersed set of 200 different sounds. The cause is that in the third layer there are only five different possible activation patterns, which is precisely what categorization means (categorization being defined as the discretization of behaviour).

We conclude that a simple case of fivefold category emergence is correctly handled by a simple Deep Belief Network. This holds large **promise** for future phonological modelling, because these bidirectional networks are similar to ones that can replace older decision mechanisms such as bidirectional OT; it will be good to have a single type of network that can produce and comprehend speech, *and* create its own categories, just like our brain does.

Artificial grammar learning reveals differences in L1 categorical and gradient constraint effects

Justin T. Craft – University of Michigan

Phonological theories that assume a single generative mechanism (Prince & Smolensky 1993/2004) make a learning prediction that phonotactic knowledge drives alternation learning. Some psycholinguistic evidence that phonotactics and alternations are linked comes from artificial grammar learning (AGL) experiments with adults (Wilson 2003, Finley 2016). Pater and Tessier (2005) found that participants utilize categorical constraint knowledge and rely on their L1 phonotactics when learning novel alternations. This work builds on their result and investigates the contribution of variable phonological knowledge: that is, the extent to which a gradient phonotactic constraint that drives a variable alternation in a learner's native phonology improves their learning of a related, across-the-board generalization.

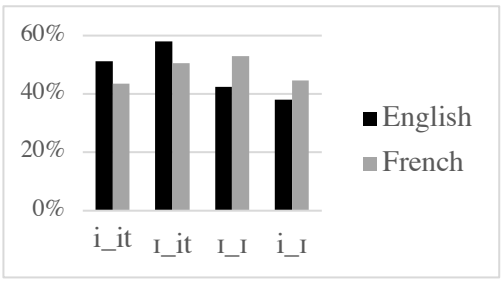
The study used an AGL experiment with speakers of Canadian French (CF) and American English (AE). In CF, high vowels have tense and lax allophones: tense [i, y, u] appear in open syllables (e.g. [vi] "life", [sa.ly] "hello") and lax [ɪ, ʏ, ʊ] appear in closed syllables (e.g. [vɪd] "empty", [e.lɪt] "elite"). However, word-final high lax vowels in closed syllables can optionally trigger laxing in preceding high vowels: e.g. [pu.tɪn] ~ [pʊ.tɪn] "poutine", [tˢy.mʊʃ] ~ [tˢʏ.mʊʃ] "fly-paper" (Dumas 1976, Walker 1984, Poliquin 2006). Thus, CF speakers must have some gradient wellformedness knowledge of sequences like [u…ɪ] and [y…ʊ]. In AE, no such optional harmony applies, so AE speakers should not have any such knowledge.

Participants in the AGL experiment were exposed to an invariant version of the variable CF harmony process: singular words ended in tense vowels (e.g. [si.pu] "rabbit), and plurals were marked with a [-t] suffix that triggered laxing in the final syllable and hence harmonic laxing in the initial syllable (e.g. [sɪ.pʊt]).

Singular Training:	Plural Training	Testing: Legal Singulars	Testing: Illegal Singulars	Testing: Legal Plurals	Testing: Illegal Plurals
[mu.gi] [ti.gi]	[mʊ.gɪt] [tɪ.gɪt]	[bu.ki]	*[bi.gʊ], *[sɪ.tʊ] *[fɪ.ti]	[zʊg.gɪt]	*[fu.tʊt],*[bi.kut] *[zɪ.dit]

Given their L1 experience, CF participants should be better at learning and generalizing harmony to novel items while rejecting non-harmonic novel items. Likewise, given the findings of Pater & Tessier (2005), participants should also reject test words that violate categorical constraints in their L1: schematically, *ɪ# in AE and *iC# in CF.

Participants in both language groups recognized familiar items and generalized to novel items in testing at near identical rates (CF: 85%, AE: 86% in familiar test items, CF & AE: 74% in novel test items) showing no advantage in learning for CF speakers. However, error trends do show effects of L1 phonological knowledge. Between language groups, test items that violate categorical L1 constraints (*ɪ# in AE, *iC# in CF) are accepted at lower rates by participants. CF participants reject final lax vowels less than AE participants (reflecting AE *ɪ#), while AE participants reject tense vowels in closed syllables less (reflecting CF *iC#). Combined, these results reaffirm that speakers use phonological knowledge in AGL experiments, while also suggesting that L1 gradient constraint knowledge doesn't appear to aid alternation learning in AGL experiments. Alternatively, L1 categorical constraint knowledge appears to aid in rejecting illegal test forms in an AGL experiment when participants don't receive positive evidence in exposure that conflicts with their categorical L1 constraint.



The English “Arab rule” without metrics

Quentin Dabouis[1], Jean-Michel Fournier[1], Guillaume Enguehard[2] & Nicola Lampitelli[1]
LLL UMR 7270 CRNS[1,2], U. Tours[2], U. Orléans[2]
1. firstname.lastname@univ-tours.fr 2. firstname.lastname@univ-orleans.fr

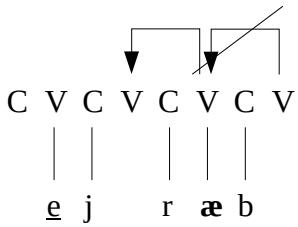
0. English vowel reduction can be blocked in some contexts (Halle & Keyser 1974, Burzio 1994, Hammond 2003, Pater 2000, SPE among many others). First, we focus on a specific case: when the unstressed vowel of a second final syllable is followed by a non-coronal coda obstruent, it is: **i.** reduced if the preceding syllable is light (e.g. [æɹəb]), or **ii.** not reduced if the preceding syllable is heavy (e.g. [eiɹæb]) (1). This phenomenon is generally called “Arab rule” (Hayes 1980; Pater, 1995, 2000; Ross 1972).

(1)

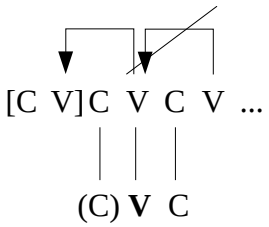
	_[-cor]	**_[+cor]**
L_	Reduction	Reduction
H_	*No reduction*	Reduction

1. The purpose of this talk is twofold: **i.** to evaluate the efficiency of the Arab rule; and **ii.** to propose an analysis without metrics consisting in the unification of English blocking contexts.
2. Our careful corpus-based scrutiny on 210 disyllabic words with trochaic stress taken from Wells (2008) with [-cor] final codas reveals that, in 84% of cases, no reduction occurs to the second syllable when the first is heavy, whereas reduction does occur in 75% of cases when the first syllable is light. In disyllabic words ending in [+cor] coda, in turn, reduction generally occurs, regardless of the weight of the first syllable (Burzio 2007, Ross 1972).
3. Assuming that lateral relations condition both inhibition and strengthening (Ségéral & Scheer 1999, Scheer 2000), we propose that these can interfere with English vowel reduction. The non-moraicity of coronal codas suggested by Hammond (1999) supposes that these are followed by a licenser in CVCV (i.e. they behave like onsets). Conversely, the moraicity of non-coronal codas supposes that these are followed by an unlicensing nucleus (i.e. they behave like codas).[1] In sum, reduction is blocked when the vowel is unlicensed and needs to license a heavy rhyme on its left (2). Interestingly, this hypothesis makes a clear prediction. Because they are preceded by an initial empty CV (Lowenstamm, 1999), vowels of unstressed closed initial syllables are found in the same lateral configuration (3). Thus they should not be reduced. This is what we observe when we compare [æ]*pteryges* and [ə]*peritive*.

(2)



(3)



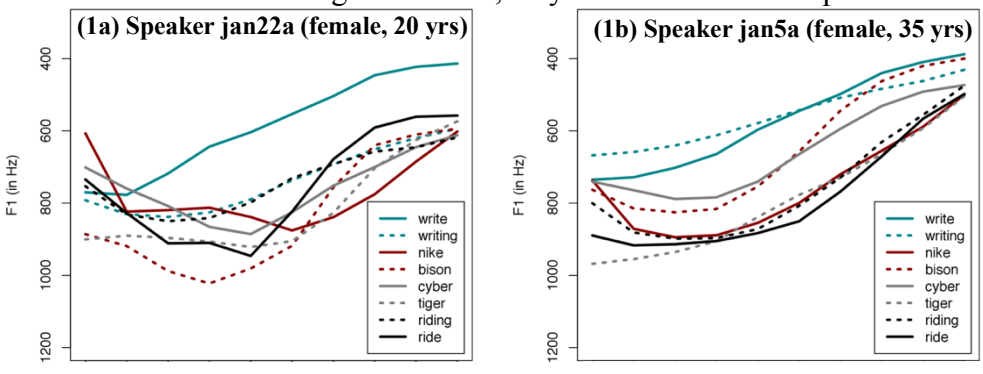
4. We extracted all the words in Jones (2006) which are marked as unstressed on their first syllable and stressed on the second syllable. Only monomorphemic words and words containing a bound root and a suffix were preserved for this study (974 words). Over these words, 744 items have an open initial syllable, whereas the remaining 230 items begin with a closed syllable. As expected, closed syllables tend to block reduction: this happens in 89% of cases (204 words). Open syllables, in turn, show solid tendency for reduction in 69% of cases (517 words). Our prediction is borne out.
5. Overall, our analysis is an attempt at representing the relation between stress and vowel reduction in English without the use of notions such as ‘foot’ or ‘mora’. Rather, we adopt two independently motivated notions: that is the relations of government and licensing. We claim that the distribution of vowel reduction depends on the interaction of these relations.

1. More specifically, we will argue that a non-coronal consonant behaves like a bipositional cluster embedding a non-final empty nucleus (hence unlicensing).

Individual Variation in an Incipient ay-raising Dialect: Unlocking the Mystery of Dialect B

Stuart Davis (Indiana University Bloomington), Kelly Berkson (Indiana University Bloomington)
davis@indiana.edu; kberkson@indiana.edu

In Joos's (1942) description of Canadian Raising, wherein /ay/ and /aw/ surface as [ʌy]/[ʌw] before voiceless consonants, he noted that Toronto area high school students exhibited two patterns of raising. Those he referred to as Group A (Dialect A) talkers showed what is generally considered to be a phonological pattern: the diphthong raised before underlyingly voiceless segments, regardless of surface voicing, such that /ay/ raised to [ʌy] before both the surface-voiceless [t] in *write* and the surface-voiced t-flap in *writing*. Those Joos referred to as Group B (Dialect B) talkers did not raise before t-flaps, thus producing *typewriter* as [tʌɪpɹ**aɪ**ɾɚ]. This pattern aligns with what would be expected of phonetic raising, as these talkers raised before the surface voiceless [p] in *type* but not before the surface-voiced t-flap in *writer*. Other attestations of phonetic raising have proven elusive: by the early 1970s only Dialect A talkers remained in Toronto (Chambers 1973), leading Kaye (1990) to observe that the phonetic Dialect B disappeared rapidly if it ever existed at all. Moreover, Fruehwald (2013, 2016) makes a strong claim based on the Philadelphia Neighborhood Corpus (PNC) that ay-raising is probably phonological from the very beginning of its inception. His investigation of the PNC revealed no evidence of purely phonetic raising in Philadelphia: as soon as diphthongs in items like *write* show raising, diphthongs before t-flaps in items like *writing* show raising as well. We have recently documented incipient phonetic raising in Fort Wayne (FW) in northeastern Indiana, however. Our data come from 27 participants (16 female; 19-78 yrs old) who hail from FW and were recorded producing a wordlist. Crucially, in addition to words like *write* and *writing*, our list contains two syllable monomorphemic forms like *Nike* and *bison,* where /ay/ precedes a voiceless consonant, and monomorphemic forms like *cyber* and *tiger*, where /ay/ precedes a voiced consonant. Previous research does not seem to detail words like *Nike* and *bison,* but we find that they provide crucial insight into the nature of incipient /ay/-raising and the mystery of Dialect B. Specifically, while our 27 talkers range from those who have no raising to the phonological raising described in previous research, we have also identified a previously undiscovered pattern: some speakers raise before the voiceless consonant in monosyllables like *write* but do not raise in any bisyllabic words—neither before voiceless consonants as in *bison,* nor before the t-flap in *writing*. Time normalized F1 trajectory of such a speaker is in (1a). More interesting is that we have some speakers who raise before voiceless consonants in monosyllables and before a t-flap like in *writing* but not before the voiceless consonant in bisyllabic monomorphs like *bison* and *Nike* (data in 1b). By looking at a range of speakers in an incipient ay-raising dialect we can see that, as hypothesized by Bermúdez-Otero (2017), incipient raising indeed affects monosyllables before bisyllables (consistent with Dialect B). Furthermore, the first bisyllables to be affected are those that are in a paradigm relation with a monosyllabic form that undergoes raising. This leads us to conclude that Dialect B is not really a dialect, but an incipient stage of Dialect A. That is, those in FW who display a Dialect B type pattern of raising will eventually come to have the phonological pattern. We hypothesize that Joos's Dialect B speakers may have retained Dialect B only if they moved to an area that lacked Canadian raising. Otherwise, they became Dialect A speakers.



(1) Time-normalized F1 (in Hz) of Diphthong in monosyllabic and bisyllabic forms

Two Phonologies

Noam Faust & Adèle Jatteau (Université Paris 8, CNRS SFL), Tobias Scheer (Université de Nice, CNRS BCL)

Claim. Phonological computation is held to be the set of operations that transforms lexical representations stored in long term memory and assembled by morpho-syntax into surface realizations that constitute the input to phonetic processing. Following work by Gouskova & Becker (2016) and Rasin (2016), we argue that this production scenario needs to be augmented by a different computational system that manages and creates lexical representations when speakers integrate new words in their lexicon (in L1 acquisition or at adult age). That is, lexical representations must somehow come into being by a process that transforms the continuous auditory signal into a discrete symbolic representation which obeys lexical constraints. This process is distinct from regular perception, which occurs on the fly in communication and contributes to morpheme recognition: lexicalization creates lexical items, while regular perception does not. We contend that regular perception phonology uses both lexicalization and production phonology.

We argue that lexicalization phonology and production phonology are distinct computational systems: they do not work on the same input (auditory signal upon lexicalization, symbolic vocabulary in production), they do not impose the same restrictions (to be illustrated below) and they perform (partially) different types of operations that do not occur in the other system (e.g. inventory-related adaptations upon lexicalization, association line-management and sandhi processes upon production).

Syllabification. Government Phonology (GP; Kaye et al. 1990) offers several arguments to the effect that syllable structure is fully recorded in the lexicon. Yet GP does not talk about the question of how syllable structure gets comes to be represented: it is not contained in the acoustic signal. Hence it is not the case that there is no syllabification algorithm in GP – rather, syllabification occurs upon lexicalization. That the two phonologies – one building syllable structure, the other using it – are separate may be illustrated by a case from Modern Hebrew where [e] syncopates unless the result would be a triconsonantal cluster: [kit**e**r, kitr-u] 'he/they ranted' [kint**e**r, kint**e**r-u] 'he/they taunted', and not *[ki**ntr**u], which would involve resyllabifying two separate consonants into a branching onset. This being said, denominal verbs in Modern Hebrew can be created by "squeezing" the consonants of the base into a two-vowel stem, e.g. [katalog] 'catalogue' becomes /kitleg/ 'he catalogued' upon nativization. Crucially, this word formation process *can* create the same clusters that the production grammar refuses to create from two originally separate consonants: [χantariʃ] 'charlatan' => /χi**ntr**eʃ/ 'he talked nonsense'. This makes sense if creating a new verb is a matter of lexicalization that obeys its own well-formedness conditions, whereas syncope is a matter of production phonology where (re)syllabification is not performed.

MSC. The lexicalization phonology is the locus of what was called Morpheme Structure Constraints (MSCs) in SPE, i.e. restrictions that are imposed on what is storable. Although MSCs have been rejected because of the 'Duplication Problem' (they duplicate active rules in the production grammar), they can be shown to be necessary in a number of cases. For example, Ancient Greek does not allow aspiration features to co-occur within a morpheme (Jatteau 2016). This generalization is however not surface-true: it is violated when independent constraints require a [spread glottis] feature in a given position, as in root-initial *r*: [r^{h}ut^{h}mos] 'rhythm'. We show that this problem can be solved if the co-occurrence constraint is part of the lexicalization grammar, rather than the production grammar.

ROTB. If, as we suggest, perceived inputs are restated upon lexicalization in terms of what a possible lexical entry is in the language, there are many configurations that never reach production phonology because they are filtered out upon lexicalization. This view therefore undermines Richness of the Base. We illustrate this point by reexamining McCarthy's (2005) analysis of final vowels in Arabic dialects, showing that the ban on final short vowels is more insightfully accounted for in lexicalization than in production.

Laryngeal sonority and timing

Chris Golston (California State University Fresno)
Wolfgang Kehrein (Rijksuniversiteit Groningen)

We present a survey of how obstruents and sonorants are aspirated and glottalized across over 70 languages. In general our study supports Howe & Pulleyblank's claim that 'the distribution of glottalisation appears to be governed by syllable structure' (2001:45) and expands the implications of this in two ways. First, we expand the claim to cover aspiration as well as glottalizaton, yielding a generalized account of laryngeal timing. Second, we drive the explanation deeper into syllable structure by linking it directly to sonority sequencing

Our proposal for sonority sequencing puts larygneals between obstruents and sonorants:

(1) stop < fricative < laryngeal < nasal < liquid < glide < hi V < mid V < low V

Given this sonority hierarchy, we find two common patterns, one rare pattern, and one missing pattern for laryngealized consonants. In the common *prosodic pattern*, sonority rises in the onset and falls in the rhyme: obstruents are post-aspirated and ejective in onsets but pre-aspirated and pre-glottalized in codas, while sonorants are pre-aspirated and pre-glottalized in onsets but post-aspirated and post-glottalized in codas:

(2) *Prosodic pattern* (36 lgs: Halh Mongolian, Irish, Tarascan, Icelandic, Tzotzil, Cua...)

Obstruents	tʰaʰt	t'aʔt
Sonorants	ʰnanʰ	ʔnanʔ

Intervocalic laryngeal timing mirrors onsets in some languages (tʰatʰaʰt) and codas in others (tʰaʰtaʰt), dividing the prosodic pattern into two subtypes, both well attested.

In the common *onset pattern* we find the laryngealization patterns for onsets (tʰ, t', ʰn, ʔn) generalized to coda position; obstruents are post-aspirated and ejective, sonorants are pre-aspirated and pre-glottalized, *in onsets as well as codas:*

(3) *Onset pattern* (20 lgs: Yokuts, Armenian, Kabardian, Georgian, Sm'algyax, Gitksan...)

Obstruents	tʰatʰ	t'at'
Sonorants	ʰnaʰn	ʔnaʔn

Very rare is the *coda pattern*, with ʰt, ʔt, nʰ, nʔ generalized to onset position; we find only at most three languages with this pattern, suggesting that coda patterns are relatively marked:

(4) *Coda pattern* (3 lgs: Nłeʔkepmxcin, Huautla Mazatec, Osage)

Obstruents	ʰtaʰt	ʔtaʔt
Sonorants	nʰanʰ	nʔanʔ

The logically possible *antiprosodic pattern* (onset-friendly tʰ, t', ʰn, ʔn in codas; coda-friendly ʰt, ʔt, nʰ, nʔ in onsets) is completely unattested as far as we can tell:

(5) *Antiprosodic pattern* (0 languages)

Obstruents	ʰtatʰ	ʔtat'
Sonorants	nʰaʰn	nʔaʔn

We end with *breathy-voiced stops* (nʱ, dʱ) and *voiced pre-glottalized plosives* (ʔd) in 20 languages, showing that voicing complicates our account of glottalization and aspiration.

There is no problem of /v/ in Russian phonology

Pavel Iosad

University of Edinburgh pavel.iosad@ed.ac.uk

The dual behaviour of /v/ has been a notorious crux in Russian phonology since at least Jakobson (1956). The basic problem is that /v/ fails to trigger voicing assimilation (1), like sonorants, but undergoes both assimilation to following obstruents (2) and final devoicing (3), like obstruents.

(1)	a.	[bʲitv̲ə]	*битва*	(2)	a.	[pʲɪv̲e͡ts]	*певец*	(3)	a.	[zov̲ə]	*зова*
		‘battle’				‘singer’				‘call-GEN.SG’	
	b.	[podv̲ʲik]	*подвиг*		b.	[pʲɪf̲t͡sa]	*певца*		b.	[zof̲]	*зов*
		‘feat’				‘id., GEN.SG’				‘call’	

The commonest solution in the literature is representational: [v] is treated as a sonorant, either an underlying /w/ (Lightner 1972, Hayes 1984, Kiparsky 1985) or some labial non-glide (Coats & Harshenin 1971, Padgett 2002). Most recently, Reiss (2017) analyses /v/ as /V/, underspecified for [±voice] – patterning with sonorants, but not a sonorant in featural terms – that is devoiced to [f]. He argues that this is an insurmountable challenge to the Contrastivist Hypothesis (Hall 2007), since [v] and [f] are minimally distinct in terms of voicing, but do not pattern phonologically like other similar pairs in Russian.

The argument rests on two premises: Russian /v/ lacks a voicing specification, and is thus unable to trigger assimilation (cf. Kiparsky 1985, Hall 2004), but becomes phonologically voiceless in the course of the derivation. In this paper I argue that the first premise is correct, but there is no evidence that the latter process is phonological; instead, there is every reason to treat *all* (de)voicing patterns affecting Russian /v/ as belonging to the phonetic component, just as is the case for sonorants.

Under this analysis, the apparent serial interaction of the obstruentization of /v/ and its devoicing follows from the feed-forward architecture of grammar, not from ordering within the phonology (for a related analysis, see Knyazev 2004, 2006). I argue that Russian /v/ is laryngeally underspecified not just in the input to phonology but also in its output; it is in no sense the voiced counterpart of /f/, which joins the better known [t͡s], [t͡ʃʲ], and [x] in lacking such a counterpart (cf. already Kiparsky 1985).

If the patterns of /v/ (de)voicing are phonetic, then a whole host of facts cease to be problematic for phonological analysis, including the famous variability in the behaviour of devoiced /v/ as an assimilation trigger ([jazf] ∼ [jasf] for /jazv/ ‘sore.GEN.PL’; Reformatskiĭ 1975); the behaviour of [v] and sonorants in voicing assimilation (Kulikov 2013); the fact that some (de)voicing patterns are specific to [v], such as the minority but robust pattern of *progressive* assimilation in [v#v] sequences (Vorontsova 2007); and the sensitivity of sonorant and /v/ (de)voicing to prosodic boundary strength.

The dissociation between laryngeal assimilation in obstruents and in /v/ is also expected to follow from the life cycle of phonological processes (Bermúdez-Otero 2015): historically, the former predates the latter by several centuries, and there is ample dialect evidence showing that the devoicing of /v/, even where it did happen, did not always result in [f], [x] being a frequent outcome (e. g. Kasatkin 2005, Galinskaya 2008). The proposed analysis is reminiscent of ‘rule scattering’ (Zsiga 2000, Bermúdez-Otero 2015), with both phonological and phonetic patterns of (de)voicing found in the same language; in fact, I argue that phonetic /v/ (de)voicing coexists with another phonetic pattern of obstruent devoicing and assimilation – the gradient congener of phonological assimilation rules arising via rule scattering.

Ultimately, many aspects of the behaviour of Russian [v] may have a phonetic rationale, at least historically (albeit possibly not synchronically, as argued by Bjorndahl 2015). However, in this paper I argue that the best analysis of the problem of /v/ is a substance-free one that does not encode these explanations in the phonological grammar, *contra* e. g. Padgett (2002), but also respects the privileged role of contrast in phonological representation, *contra* Reiss (2017).

Indexed Morphemes and Locality Conditions on Polish Yer Deletion

Gaja Jarosz, University of Massachusetts Amherst, jarosz@linguist.umass.edu

Traditional analyses treat Polish yers, alternating vowels ([bɛz] ~[bzɨ] 'lilac'), as exceptional segments that differ underlyingly from their non-alternating counterparts ([bɛz]~[bɛzɨ] 'meringue'; Rubach 1986, Szpyra 1992). Gouskova (2012) reanalyzes Russian yers relying on indexed constraints (Kraska-Szlenk 1995, Pater 2000) and the whole morpheme exception hypothesis, positing that exceptionality is a property of morphemes, not segments. Rubach (2013, 2016) argues that the whole-morpheme approach is untenable since Gouskova's analysis, which relies on an indexed context-free *MID constraint to trigger deletion in yer morphemes, fails to extend to Polish due to difficulties restricting deletion to observed contexts.

Contra Rubach, the present paper argues that a parallel, whole morpheme indexed constraint analysis is possible for Polish if yer morphemes undergo a deletion process driven by a context-sensitive markedness constraint *εCV (Rubach 2016) indexed to triggering morphemes AND the indexed constraint violations are evaluated locally. Morpheme-level exceptionality succeeds, and indeed is desirable for Polish, because the locus of alternation is entirely predictable (see Gouskova 2012 on Russian). Alternations are limited to the last vowel of the morpheme immediately preceding a V-initial triggering morpheme: yer vowels (underlined) occurring earlier in the word do not delete: [sfɛtɛ̲r+ɛ̲t͡ʂ+ɛ̲k] ~ [sfɛtɛ̲r+ɛ̲t͡ʂ+_kʲ+ɛm] 'sweater (double diminutive)' (k→t͡ʂ and k→kʲ palatalizations are not analyzed here). Triggering morphemes (/-ɛm$_L$/) are indexed to *εCV$_L$, which ranks above general MAX, conditioning deletion (1). Crucially, *εCV$_L$ violations (double underlined) are local, incurred only when the offending structure contains an exponent of the indexed morpheme (1b). Morphemes with non-alternating [ɛ] (/sɛtɛr$_L$/) are indexed to a high-ranked MAX$_L$, preventing their deletion (1c), even when violations of *εCV are at stake (2). Indexed context-sensitive *εCV$_L$ correctly predicts that alternating vowels do not delete before C-initial suffixes (3), even if these are indexed triggers.

Polish morpho-phonology provides unique opportunities for observing the interaction of indexed constraints across morpheme boundaries and reveals that the locality conditions on indexed markedness constraints require refinement beyond the containment conditions proposed by Pater (2010). The Polish facts require that indices on markedness constraints be anchored to an edge of the overlapping configuration. For *εCV$_L$ the right edge of the marked configuration must overlap with an exponent of the indexed morpheme (4): morphemes can trigger from the right, but deletion cannot be conditioned by a local triggering morpheme on the left (4a).

The paper will also show that the proposed approach extends to the challenging cases of yers that exceptionally delete ([vjatr] 'wind') or variably delete ([sarn]~[sarɛ̲n] 'roe deer') in simplex forms yet reliably appear in derived forms ([vjatɛ̲rɛ̲k], [sarɛ̲nɛ̲k]) (Szpyra 1992, Gussmann 2007), thereby providing a unified treatment of the three yer alternation patterns.

(1) /sfɛtɛr-ɛk-ɛm$_L$/	MAX$_L$	*εCV$_L$	MAX
☞ a. sfɛtɛrkʲɛm			*
b. sfɛtɛrɛ̲kʲɛ̲m		W*	L
c. sfɛtɛrɛkm	W*		*
(2) /sɛtɛr$_L$-ɛm$_L$/	**MAX$_L$**	***εCV$_L$**	**MAX**
☞ a. sɛtɛ̲rɛ̲m		*	
b. sɛtrɛm	W*	L	W*

(3) /t͡ʂukʲɛr-nik$_L$/	MAX$_L$	*εCV$_L$	MAX
☞ a. t͡ʂukʲɛrnik			
b. t͡ʂukrnik			W*
(4) /sɛtɛr$_L$-ɛk-ɛk-ɛm$_L$/	**MAX$_L$**	***εCV$_L$**	**MAX**
☞ a. sɛtɛrɛt͡ʂkʲɛm		(*)	*
b. sɛtɛrt͡ʂkʲɛm			**
c. sɛtɛrɛt͡ʂɛ̲k̲ʲɛ̲m		W*(*)	

Geminate prohibition across the phonological hierarchy

Gerrit Kentner, Max-Planck-Institute for Empirical Aesthetics, Frankfurt, Germany

The lexicon of German avoids geminates (e.g. Wiese 1996). In terms of autosegmental phonology, this may be represented as a prohibition of structures like (1a) and (1a') in which a single segment or two identical segments on the melodic tier are associated with two adjacent positions on the skeletal tier. In this paper, I present data to show that, in German, the ban on geminates is wider in scope than has hitherto been envisaged. Specifically, I show that not only geminate consonants but also sequences of identical syllables, feet, and p-words (prosodic geminates, as it were) are banned from entering the lexicon. Generally, adjacency of segmentally identical prosodic nodes ϕ as in (1b) and (1b') is illicit. The present data suggest any geminate ϕ-nodes that do show up to be generated post-lexically. Geminate ϕ-nodes (1b, 1b') violate the Ocp (e.g. McCarthy 1986) and are avoided in German by either A: phonological alteration of one of the twins thwarting identity, or B: epenthesis, i.e. interspersed material that thwarts adjacency.

(1) a. * t — x x a'. *t t — xx b. * ϕ — X_ϕ X_ϕ b'. * ϕ_i ϕ_i — $X_\phi X_\phi$

Evidence for A (phonological alteration - identity avoidance):
i. Syllable level: Nicknames may be formed by truncation to a light syllable that gets doubled (*Johannes* → [jo] → ['jo.jo]). Crucially, the syllables form a trochee and are thus not identical but differ in terms of stress (culminativity prevents level stress).
ii. Foot level: Hypocoristic rhyme (*Hansi* → *Hansipansi*, proper name) and ablaut reduplication (*Quatsch* → *Quitschquatsch*, 'nonsense') involve alteration of stem onset or vowel to achieve non-identity. Total reduplication is not viable (**Hansihansi, *Quatschquatsch*).
Evidence for B (epenthesis - adjacency avoidance):
iii. Segment level: collective -s suffix for proper names (*/Müller/+/s/* → *Müllers*) requires epenthetic [ən] with names ending in [s]: *Maas* → *Maasens* [maːsəns] ∼ *[maːsː])
iv. Word/Compound level: Recursive compounds (*Kind+es+kind* 'child of the child') necessarily involve linking elements (**Kindkind*).
v. Phrase level: Sequential constructions (*Tag für Tag*, 'day by day') involve semantically opaque (and hence: epenthetic) prepositions preventing adjacency of the twin nouns.
Examples i.-v. are clearly lexicalised or at least lexicalisable. Contrast this with examples (vi.-viii.) that do produce segmental or prosodic geminates:
vi. Non-lexicalised compounds: *Lack+kanne*, [lakːanə], 'jug of paint'. If such compounds become lexicalised, they tend to de-geminate (e.g. *Hand+tasche* [hantaʃə], 'purse').
vii. Contrastive focus reduplication (Finkbeiner 2014, Freywald 2015): *ReisReis* 'run-of-the-mill-variety rice'; ad-hoc construction, not lexicalisable; only valid as a referring expression in contexts where the reduplicated base is given or salient.
viii. Potentially unbounded iteration (*ach Gott, ach Gott, ach Gott*, 'oh god' × 3). Unbounded iteration is considered impossible within the lexicon.
Conclusion: Geminates in German are post-lexical in nature. The lexical ban on geminates holds for consonantal geminates, but also for geminate ϕ-nodes across the phonological hierarchy (syllables, feet, p-words, potentially phrases). Cases of underlying ϕ-node gemination within the lexicon are repaired and made adhere to the Ocp.

References: Finkbeiner (2014), *Word Structure* 7; Freywald (2015), *Studies in Language* 39; McCarthy (1986), *LI* 17.2; Wiese (1996), *The phonology of German*.

Base identity effect at the segmental and suprasegmental levels in nonstandard Korean

Ji Yea Kim (Stony Brook University; jiyea.kim@stonybrook.edu)

In order to conform to the legitimate syllable structure (C)(G)V(C) in Korean, input stem-final consonant clusters undergo simplification by deleting one of the two consonants: /(C_1)(G)V**(**$\underline{C_2}$**)(**$\underline{C_3}$**)**/ [(C_1)(G)V**(**$\underline{C_{2/3}}$**)**]. This occurs with no variation for nouns in isolation, as in (1). In contrast, variation occurs in inflection with a vowel-initial suffix, as in (2a-c).

(1) Isolation: /ta**lk**/ [ta**k**] 'chicken' (Note: no variation)

(2) Inflection: /ta**lk**-i/ a. [ta**l**.**k**i] 'chicken-NOM' (Standard with both consonants)

~ b. [ta.**k**i] 'chicken-NOM' (Nonstandard I with only one consonant)

~ c. [ta**k**.**s**i] 'chicken-NOM' (Nonstandard II with [s]-epenthesis)

For standard inflection, both consonants from input are preserved, as in (2a) [ta**l**.**k**i] 'chicken-NOM'. For Nonstandard Korean I, the consonant that remains in isolation also remains. For example, the isolation form [ta**k**] 'chicken' in (1) and the Nonstandard I form in [ta.**k**i] 'chicken- NOM' in (2b) share the same consonant [k] at the expense of the other one, /l/. This indicates that segment preservation or deletion in nonstandard forms, as in (2b-c) is determined by the consonant in isolation forms, as in (1). I adopt Kenstowicz's (1996) version of output-output correspondence constraint, BASE-IDENTITY to explain the fact that isolation forms are the base to which nonstandard inflected forms make reference to *at the segmental level*.

There is even striking variation by inserting non-etymological [s] in inflected forms, as in (2c) [ta**k**.**s**i] 'chicken-NOM' in Nonstandard Korean II. This phenomenon has been underestimated as a speech error (e.g., Jun & Lee 2007) presumably because [s] cannot find its origin in input, as shown in /talk/ 'chicken'. Yet, it is observed consistently in colloquial speech, not only for stem-final consonant clusters like the *lk* sequence shown above but also for stem-final simplex consonants, as in /pa**p**-i/ [pa**p**.**s**i] 'rice-NOM' (the example from Jun & Lee 2007).

I propose that the purpose of [s]-epenthesis in onset position of the second syllable is to align the coda in the isolation forms ta**k**]$_\sigma$ 'chicken' and pa**p**]$_\sigma$ 'rice' to the coda in the inflected forms ta**k**]$_\sigma$**s**i 'chicken-NOM' and pa**p**]$_\sigma$**s**i 'rice-NOM', respectively. In other words, the Base identity effect also works *at the suprasegmental level*, to be more specific at the syllable level. This requires the syllabic profile in isolation forms and inflected forms be identical. I adopt the constraint CORR-σ-ROLE (Aguero-Bautista 1998 in Kenstowicz 2005): "… [I]f x and y are corresponding segments then x and y have the same syllabic analysis (onset, nucleus, coda)." This is another kind of the BASE-IDENTITY constraint, which was originally proposed to explain the two allomorphic diminutive suffixes *-sit* and *-it* in Spanish from a syllabic perspective. The actual output of the diminutive of *amor* 'love' is [a.mo**r**.-si.t-o] to have the consequence that [r] is in coda for both the Base [a.mo**r**] and the diminutive. On the contrary, if phonological optimization were more important, *-it* would be chosen (i.e., *[a.mo.**r**-*i.t*-o]) since the stem ends in a consonant, and thus to conform to CV, which is less marked than CVC.

[s]-insertion in Nonstandard Korean II can also be accounted for by this effect under which the syllable structure of isolation forms (i.e., Base) is preserved in nonstandard inflected forms. This can be accounted for by the constraint ranking in which CORR-σ-ROLE dominates BASE-IDENTITY and DEP-C-IO, as in (3), which shows the selection of [ta**k**.**s**i] 'chicken-NOM'.

(3) /ta**lk**-i/ (Base: [ta**k**])	CORR-σ-ROLE	BASE-IDENTITY	DEP-C-IO
a. [ta**l**.**k**i]	*! ([k] is not in coda.)	* (No [l] in Base.)	
b. [ta.**k**i]	*! ([k] is not in coda.)		
☞ c. [ta**k**.**s**i]		* (No [s] in Base.)	* (No [s] in input.)

By means of inserting the non-etymological [s] in the second syllable at the expense of being faithful to input, [k] remains to be in coda position both in isolation [ta**k**] and in inflection [ta**k**.si] in Nonstandard Korean II. The interaction between the two versions of Base constraints, BASE-IDENTITY (the segmental level) and CORR-σ-ROLE (the suprasegmental level) contributes to a better understanding of nonstandard varieties, which are not entirely predictable from input.

Against a stem-allomorphy analysis of Amuzgo tonal inflection

Yuni Kim, University of Essex (y.kim@essex.ac.uk)

Many morphological categories in Amuzgo (Oto-Manguean: southern Mexico) are marked non-concatenatively by phonological mutations in stems. The lack of linearized surface morphs makes it difficult to tell whether morphologically complex words have constituents and subconstituents on a more abstract level, or whether it is even possible to distinguish operations on underlyingly unified roots and stems from large-scale suppletive allomorphy. In this paper, using a case study from Amuzgo, I develop a general approach for teasing morphological structure out of phonological stem alternations; the key lies in patterns of interaction between those alternations and their morphological context. Data come from an unpublished manuscript of verb conjugations by native speaker Fermín Tapia García, which was checked and reviewed with him and other speakers during fieldwork by the author in the community of San Pedro Amuzgos, Oaxaca.

I focus on tonal alternations in Amuzgo verbal paradigms and make two main claims. First, although inflectional tones generally overwrite lexical tones, I argue that they originate at a higher level of morphosyntactic structure and cannot be inherent to lexical entries of stem allomorphs. Evidence comes from the neutralization of inflection-class distinctions in causativization. In (1), although the lexical item belongs to a minor inflectional class that replaces the lexical tone (which here is H) with L in 1sg. and HM in 2sg., the causative forms revert to the general default tonal inflection pattern of HM in both 1sg. and 2sg.

(1)		1sg.	2sg.	3sg.
	'sleep', completive	tsɔ^{L}	tsuʔ^{HM}	tso^{H}
	'cause to sleep', compl.	si^{H}-ki^{H}-tsɔ^{HM}	si^{H}-ki^{H}-tsoʔ^{HM}	si^{H}-ki^{H}-tso^{H}

Our analysis of this pattern is that tonal inflection is crucially mediated by abstract inflection-class features on the stem. A structurally distinct AGR head hosts the inflectional tone. However, causative derivation introduces a Voice head that intervenes between the root and AGR, such that locality requirements for the visibility of the stem's inflection-class features to AGR are no longer met. The additional layer of structure causes the stem to be spelled out before the phonological material of the inflectional tone in AGR has been selected, so the stem's abstract inflection-class features are no longer accessible. A suppletive analysis where inflectional tones are integral to stem allomorphs has trouble accounting for this interaction between inflection class and causative derivation.

The second main claim is that lexical tones are present during derivations even where they are ultimately overwritten by inflectional tones. Again, evidence comes from the tonal patterns of causatives. The interaction in (1), where lexical inflection class is neutralized to the default inflection class, applies only where the underlying lexical tone is morphotactically ill-formed as an inflectional tone. Only 5 of the 8 contrastive Amuzgo tones are used in inflection, so this applies if the causative is built on a lexical item with one of the three inflectionally invalid tones (H, MM, MH). However, if the underlying stem tone is one of the other five (HM, HL, M, L, LL), most forms simply surface with the lexical tone (with a few systematic exceptions) and there is no alternation - no matter the inflection class of the stem. The crucial fact is that phonological information about the lexical tone must be visible to AGR - exactly what we predict if the stem is spelled out prior to selecting inflectional tone.

To summarize, in some contexts the realization of Amuzgo inflectional tones is defective due to locality or morphotactics, and the influence of the lexical tone can emerge. These patterns permit resolution of the perennial analytical ambiguity in stem alternations between operations and suppletion, revealing the complexity of the derivations involved.

Stem allomorphy in Uspanteko as an epiphenomenon of metrical affixation

Björn Köhnlein (koehnlein.3@osu.edu), Yuhong Zhu (zhu.1447@osu.edu)
The Ohio State University

The issue. We argue that a complex pattern of stem allomorphy in Uspanteko (Mayan) can be successfully analyzed within a morpheme-based model of morphology given two assumptions: i. underlying representations can contain metrical templates (e.g. Saba Kirchner 2013, Iosad 2016 for recent proposals); ii. pitch-accent contrasts in Uspanteko are a surface exponent of a difference between trochaic (falling tone) and iambic feet (level tone), as proposed in Authors (to appear). We claim that our analysis is more restrictive than an earlier account by Bennett & Henderson (2013; *henceforth* B&H), who (arbitrarily) divide relevant items into several nominal cophonologies. In analyzing non-concatenative exponence as an epiphenomenon of metrical affixation, our approach is in line with principles of *Generalized Non-Linear Affixation* (e.g. Bermúdez-Otero 2012, Trommer & Zimmermann 2014).

Data. In Uspanteko, certain possessive prefixes lead to variation in stress and pitch accent and can sometimes trigger vowel length alternations or consonant deletion in roots. Here, we focus on long vowels (VV) for purposes of exposition (we discuss all relevant data, which are from B&H, Can Pixabaj 2006). There are four distinct patterns for VV roots when affixed; examples in (1) show prefixation with /in-/ 'my' (before C) or /aw-/ 'your' (before V). Underlining indicates stress; accent marks indicate H of falling pitch accent:

(1) Stress and pitch accent under possessive affixation for VV roots
   a. Prefix introduces H, VV preserved, final stress – [ooj] ~ [aw-óoj] 'avocado'
   b. Prefix introduces H, VV shortens, penultimate stress – [teem] ~ [ín-tem] 'chair
   c. Prefix H blocked, VV preserved, final stress – [keem] ~ [in-keem] 'weaving'
   d. VV with H in isolation stays the same – [kúuk$^{?}$] ~ [in-kúuk$^{?}$] 'squirrel'

Cophonologies. B&H assume that possessive prefixes come with a lexical H (always realized on penultimate vocalic mora, attracting stress), and account for variation with four nominal cophonologies: one protecting H and vowel length, leading to VV with H (1a); one protecting H but prohibiting tone on final syllables, leading to shortening and H on penultimate syllable (1b); one protecting length and prohibiting H on final syllables, leading to a toneless VV (1c); one where root structure is fully preserved due to high-ranked output-output faithfulness (1d).

Our approach – representations. Assuming the foot inventory by Kager (1993), we adopt from Authors (to appear) that the language contrasts moraic trochees and (default) syllabic iambs (the general contrast between iambs and trochees is already motivated in B&H), and that all tones are intonational – realized as falling tone on moraic trochees, and as level tone on iambs. To account for the allomorphy patterns, we propose that possessive prefixes carry segmental information and a floating trochaic template, plus four underlying metrical specifications in VV roots: bimoraic vowel (1a); monomoraic vowel plus a floating mora OR non-moraic vowel plus two floating moras (1b); bimoraic vowel associated with an iambic template (1c); bimoraic vowel associated with a trochaic template (1d).

Our approach – grammar. There is maximally one foot, which is right-aligned (ALL-FT-R). While underlying root feet are always preserved upon affixation (1c, d), trochees introduced by possessive prefixes can violate certain restrictions that feet in simplex words have to respect (e.g. sonority-sensitive stress; [ín-tem] in (1b) would have to be [intem] as a simplex word). We account for this apparent paradox in Stratal OT. At the stem level, only words with lexically associated foot structure have feet (iff these feet respect positional restrictions, 'DEFAULT' (as a cover constraint) >> MAX-FT). Other words receive no footing (MAX-FT >> *STRESS >> GRWD = PRWD); floating moras remain floating (MAX-μ, DEP-LINK >> *FLOAT). At the word level, footed roots retain their feet under possessive prefixation – preserving associated feet is preferred over incorporation of the floating affix foot, which would violate additional DEP-LINK constraints (1c, d). Unspecified roots are assigned default feet as simplex words due to reranked GRWD = PRWD >> *STRESS (either iambic by default or based on other restrictions, such as sonority); yet they will receive a right-aligned trochaic foot from possessive prefixes – this can override certain default patterns (reranked MAX-FT >> 'DEFAULT'). Roots with bimoraic vowels (1a) have to preserve association lines between moras and segments (MAX-LINK) and get a right-aligned trochaic foot on the final heavy syllable, with the initial syllable unparsed (ALL-FT-R, MAX-LINK >> PARSE-σ). Words with floating moras (1b) have a shortened root vowel and stress on the prefix, parsing both syllables while maintaining a right-aligned foot (trochaic shortening). This satisfies ALL-FT-R, MAX-FT, PARSE-σ and MAX-LINK, while potentially violating 'DEFAULT', as in [ín-tem] (cf. sonority).

The Role of Tongue Root Advancement in Palatalization: Evidence from Polish

Steven M. Lulich & Malgorzata E. Cavar (*Indiana University)*
slulich@indiana.edu, mcavar@indiana.edu

The range of palatalization phenomena in Polish includes both diachronic and synchronic processes, including velar palatalization to post-alveolars (1st Velar Palatalization), coronal palatalization to pre-palatal sounds, and (allophonic) secondary palatalization (Surface Palatalization).

We used ultrasound to image tongue shapes during production of both phonemic and allophonic palatalized "soft" and unpalatalized "hard" consonants in Polish. Our research strategy initially was exploratory, in which we sought to discover a common articulatory pattern that distinguished "soft" and "hard" consonants. In all cases, we observed that tongue root activity was found to be a consistent articulatory correlate, with "soft" consonants produced with tongue root advancing, and "hard" consonants produced with tongue root retraction.

Anatomical constraints and prior electromyography (EMG) studies support this finding. While intrinsic tongue muscles and the anterior genioglossus have been found to contribute to the production of front vowels, including [i], the most consistent and effective muscular mechanism for producing [i] appears to be contraction of the posterior genioglossus, geniohyoid, and mylohyoid muscles, all of which advance the tongue root and "squeeze" the tongue body upward and forward by means of a muscular hydrostat mechanism (cf. Takano and Honda, 2007).

Tongue root advancement was observed in all phonetically "soft" Polish consonants, including phonemic prepalatals, but was absent in "hard" post-alveolars, as illustrated in Figure 1 which shows thresholded midsagittal ultrasound images of the initial consonant in the words "Ciska" and "Czyngiz" overlaid on each other.

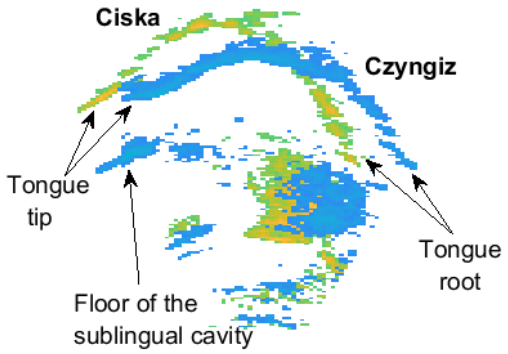


Figure 1. *Thresholded ultrasound images from the "soft" consonant at the beginning of the word "Ciska" (yellow) and the "hard" consonant at the beginning of "Czyngiz" (blue). The tongue root is advanced in the "soft" consonant and retracted in the "hard consonant".*

On the basis of anatomical constraints and EMG findings, together with the confirmatory ultrasound data from Polish, we propose that all synchronically active palatalization processes cross-linguistically involve tongue root advancement. In diachronic sound change, we propose that palatalized sounds may be reanalyzed and lexicalized by new generations of speakers, potentially using features (and muscular mechanisms) other than tongue root advancement (e.g. coronal place features) to distinguish them from other sounds in the language. This outlook can account for the range of (synchronic and diachronic) palatalization processes in Polish. We suspect it can also explain constraints against secondary palatalization of uvular and retroflex sounds, since (we hypothesize) both classes require tongue root retraction, directly contradicting the requirement of palatalization.

Trisyllabic hypocoristics in Spanish and layered feet

Violeta Martínez-Paricio and Francesc Torres-Tamarit
Universitat de València, SFL (CNRS/Université Paris 8)

Two main types of hypocoristic truncated forms (TFs) have been described for Spanish: those that preserve the initial portion of the source form (SF) (*Féde* ← *Federíco*; in all the examples an acute accent marks stress), and those that preserve the stressed syllable of the SF until the right edge of the word (*Mándo* ← *Armándo*) (Prieto 1992, Lipski 1995, Colina 1996, Piñeros 2000a,b, Grau Sempere 2006, 2013, Sanz Álvarez 2015, 2017). The two types of hypocoristic TFs are generally bisyllabic; more precisely, they correspond to a syllabic trochee. Monosyllabic hypocoristic TFs have also been reported to be possible in Spanish as long as they are bimoraic (*Crís* ← *Cristína*) (Grau Sempere 2013).

The goals of this paper are twofold. First, we provide a detailed description of a truncation process in Spanish that creates trisyllabic hypocoristics and has often gone undetected (although see Sanz Álvarez 2017). Second, we develop a constraint-based analysis of this truncation process by means of *internally layered ternary* (ILT) *feet* (Martínez-Paricio 2013, Martínez-Paricio & Kager 2015).

We will show that most hypocoristic trisyllabic TFs (TTFs) in Spanish conform to the general unmarked pattern of penultimate stress (amphibrach rhythm), whether they end in a vowel (*Estéfa* ← *Estefanía*, *Encárna* ← *Encarnación*) or a consonant (*Eméren* ← *Emerenciána*, *Estánis* ← *Estanisláo*). Among TTFs derived from simple names, two subgroups can be identified: those that preserve the left portion of the SF (like the previous examples), and those that preserve the stressed syllable of the SF (*Chabéla* ← *Isabél*, in which a gender desinence is epenthesized in order to comply with the trisyllabic template). The most productive TTFs derive from compound names (*Mariájo* ← *Maria José*, *Joséma* ← *Jose María*). Finally, there are a few TTFs that exhibit anapest rhythm (*Marijó*). We claim that the reason why this kind of TTF surfaces with final stress is related to the form of the SF. In TTFs with anapest rhythm, the SF is a compound name whose members are themselves bisyllabic truncated forms. For instance, the SF of an anapest TTF like *Marijó* is not the SF *María José*, but *Mari Jóse*, a truncate-based compound made up of two independent TFs, *Mári* (← *María*) and *Jóse* (← *José*) (cf. **Mariajó*).

In our analysis we assume, like in previous work on templatic truncation, that shortening is driven by faithfulness constraints targeting output-output correspondence relations between bases and truncated outputs, size restrictor constraints, and anchor constraints (Alber & Arndt-Lappe 2012). In TTFs the constraints that promote exhaustive parsing (Chain constraints in Martínez-Paricio & Kager 2015) outrank the constraint against truncation Max(SF-TF), and Max(SF-TF) dominates Foot-Binarity, which penalises ILT feet. Constraints on foot-type (Trochee), alignment constraints on the position of the adjoined syllable, and Head-Max (Piñeros 2000a,b), relativised to prosodic heads, are also necessary to derive all types of TTFs.

Emerenciána	Chain	Max(SF-TF)	Ft-Bin
a. ☞ *(E(méren))*		*****	*
b. *(Éme)*		******!**	
c. *Eme(ren(ciána))*	*!*		*

We will demonstrate that our analysis allows us to reconcile the general assumption that all hypocoristic TFs in Spanish correspond to the size of a foot, to be more precise, a maximal foot, while providing further support for the existence of a particular layered ternary structure in the domain of truncation. Although minimal recursive feet were originally proposed to account for ternary rhythm (Selkirk 1980, Prince 1980), it has not been until fairly recently that metrical studies have reintroduced ILT feet in prosodic representations in order to account for a wide range of segmental, tonal, and stress-related phenomena cross-linguistically. In this context, our main contribution is to demonstrate that there is also morphophonological evidence for this metrical configuration in Spanish from a truncation process of hypocoristic formation.

Locality, Transparency, and Uyghur backness harmony
Adam G. McCollum, UC San Diego, agmccoll@ucsd.edu

Transparency has proved a recalcitrant problem for theoretical models of vowel harmony. Some work has argued that true transparency does not exist, and that harmony is, by nature, local (Gafos 1999; Ní Chiosáin & Padgett 2001). In support of this claim, recent phonetic studies have shown that, in some languages, putatively transparent vowels actually exhibit harmonic alternations (Gick et al. 2006; Benus & Gafos 2007; Ritchart & Rose 2017). In Kinande and Moro, these alternations are categorical, but in Hungarian, the alternations are subphonemic. Analyses assuming strict locality cannot account for harmony patterns where transparent vowels do not undergo even low-level subphonemic alternations. Uyghur backness harmony is reported to be one such pattern. Uyghur [i] is reportedly transparent, failing to exhibit even low-level phonetic alternations based on backness context (Lindblad 1990; Hahn 1991; Vaux 2000). This paper presents results from experimental fieldwork showing that, in actuality, [i] is not transparent, but alternates for harmony like other vowels in the language.

Vaux (2000) argues that [i] is transparent for the following reasons: one, [i] does not have a [+back] counterpart, two, [i] generally triggers [+back] suffixes (1a,b), and three, medial [i] does not even undergo phonetic coarticulation in [+back] contexts. Underlying high vowels are transparent to harmony in (1e,f). High vowels may also arise due to raising (1g,h). The root-final vowels in (1c,d) are [-high] in final as well as closed syllables, but in medial open syllables, these vowels raise to [+high], (1g,h). Both types of high vowels, underlying and derived, are transparent to harmony.

(1)

a.	til-lar	‘tongue-PL’
b.	ʧiʃ-lar	‘tooth-PL’
c.	sællæ	‘turban’
d.	palta	‘axe’
e.	bæl-i̱-dæ	‘waist-PS3-LOC’
f.	tal-i̱-da	‘willow-PS3-LOC’
g.	sælli̱-lær	‘turban-PL’
h.	palti̱-lar	‘axe-PL’

Contrary to Vaux’s claim, we first demonstrate from fieldwork (9 speakers; over 6000 vowel tokens) that the Uyghur inventory does possess both /i/ and /ɨ/. The accusative suffix is invariantly produced as [-ni] (mean F2 = 2.23 z/ 2680 Hz) but the third-person possessive (PS3) and ablative (ABL) suffixes are invariantly produced as [-ɨ] and [-dɨn] (aggregate mean F2 = 0.86 z/ 2004 Hz). These invariant suffixes require underlying representations that include both /i/ and /ɨ/. Second, while the pronunciation of some lexemes varies between [i] and [ɨ], e.g. [ilim] ~ [ɨlɨm] ‘science,’ front vowel variants typically trigger [-back] suffixes, [ilim-lær] ‘science-PL’ but back vowel variants trigger [+back] suffixes, [ɨlɨm-lar] ‘science-PL.’

Third, medial high vowels do undergo alternations for [back]. For raised vowels (1g,h), there is a highly significant difference in normalized F2 based on [back] context (ΔF2 = 0.78 z/434 Hz, $p < .001$). For underlying high vowels, like those in PS3 and ABL, even though they do not exhibit categorical [i]~[ɨ] alternations, they do undergo subphonemic alternations (ΔF2 = 0.37 z/183 Hz, $p < .05$). Thus, raised vowels regularly alternate and underlying high vowels subphonemically alternate for [back] in Uyghur.

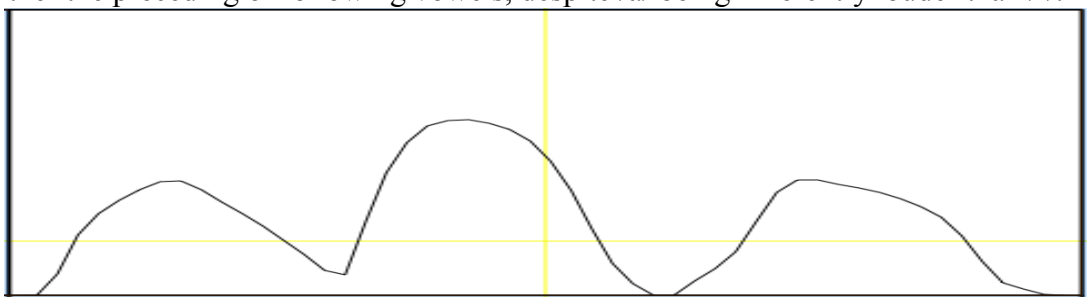
In sum, phonetic evidence suggests that harmony does not skip [i] in Uyghur. Further, harmony does not even skip consonants. Dorsal obstruents are known to alternate for backness, but this study found that the lateral also alternates, surfacing as [l] in [-back] contexts and [ɬ] in [+back] contexts (ΔF2 of = 1.60 z/ 785 Hz, $p < .001$). All results suggest that harmony is strictly local, as in neighboring Kazakh (Dzhunisbekov 1980). In turn, these results support the claim that vowel harmony is ontologically local.

LOUD, EVEN IAMBS: EVIDENCE AGAINST THE IAMBIC/TROCHAIC LAW

Zachary Metzler – CSU, Fresno *Trevor Driscoll – CSU, Fresno*
zmetzler@mail.fresnostate.edu *tdriscoll7@mail.fresnostate.edu*

The Iambic/Trochaic Law (ITL), first proposed as part of auditory perception (Bolton 1894, Woodrow 1951) and later as a principle governing feet (Hayes 1985), makes two claims: (i) stimuli differing in intensity are grouped trochaically, (ii) stimuli differing in length are grouped iambically. We argue that both claims are counterexemplified in Hidatsa (Siouan, North Dakota) and that these claims fail to predict quantity-insensitive iambic languages like Osage (Altshuler 2009).

We show that intensity peaks in Hidatsa align to quantity-sensitive iambs. This increase in intensity is such that it overrides the inherent sonority of the vowels. This counterexemplifies (i) because the intensity peaks are grouped iambically and not trochaically and is significant ($p<.001$) in a two-tailed t-test. *abica,* 'crane', exemplifies this as the /i/ is over 10 decibels louder than either the preceding or following vowels, despite /a/ being inherently louder than /i/.



ITL claim (ii) is undermined by intervocalic voicing in Hidatsa, which is gradient and determined by foot position. Foot-medial stops are more voiced than foot-initial stops and stops in unfooted syllables. Stops in the onsets of heavy syllables in LH sequences behave like foot-initial stops, suggesting that LH has a foot boundary L(H). (ii) requires that (LH) be a metrical constituent but the gradient intervocalic voicing data from Hidatsa show that (LH) is not a foot but a foot-and-a-half L(H). Without LH there are no uneven iambs, invalidating (ii). Altshuler (2005, 2009) has shown that Osage has quantity *insensitive* iambs, further demonstrating that iambs need not differ in length.

Following Kager (1993), we show that all types of iambic lengthening, a process traditionally attributed to the ITL, can be accomplished by the Stress-to-Weight Principle (Prince 1990) and a variety of faithfulness constraints. Our factorial typology shows that the possible constraint rankings that result in iambic lengthening outnumber those that prevent it, making the ITL an emergent tendency of the typology and not a constraint itself:

Rankings Resulting in Lengthening

V Lengthening: SWP, MAX, DEPμC > DEPμV (Hixkaryana, Derbyshire 1985)
Gemination: SWP, MAX, DEPμV > DEPμC (Southern Paiute, Harms 1966)
Deletion: SWP, DEPμC, DepμV > MAX (Hopi, Jeanne 1978)

Ranking Resulting in Even Iambs

Even Iambs: DEPμC, DEPμV, MAX > SWP (Asheninca Campa, Payne 1990)

Under this analysis, iambic lengthening is emergent; by removing the ITL from phonological theory and accounting for its effects with interaction of independently needed constraints, we can explain iambic lengthening while also capturing the relevant facts of languages like Hidatsa and Osage.

The life cycle of Mapudungun epenthetic vowels: Historical evidence for lexicalisation and morphologisation

Benjamin J. Molineaux – The University of Edinburgh

The earliest records for the Native American language Mapudungun (presumed-isolate, Chile/Argentina) date back to the early seventeenth century (Valdivia 1606, 1621). These documents present a system with abundant consonant clusters both within morphemes and across their boundaries, in a pattern that contrasts with all present-day varieties of the language. The author of these early works, the Jesuit Luís de Valdivia, explicitly rejects the possibility of a vowel breaking up such sequences. While this is consistent with his spelling of individual morphemes (1), his transcription of complex verbs evidences alternations indicative of incipient or sporadic epenthesis (2).

(1) a. ⟨plli⟩ ‘soul’
b. ⟨mamll⟩ ‘wood’

(2) a. ⟨kim–i–n⟩ know–EPENTH–1SG:IND
b. ⟨elu–n⟩ give–1SG:IND
c. ⟨elu–l–m–n⟩ give–SUBJ–2–PL

Varieties of Present-Day of Mapudungun (PDM) appear to no longer tolerate tautosyllabic consonant sequences, either in the onset or coda. In the same root-morphemes where Valdivia described clusters, PDM now has a vocalic element ([ɨ]) breaking up the series and creating a new syllable (3). Diachronically, therefore, this vowel can be characterised as epenthetic. However, by PDM these root-internal vowels no longer alternate with the original clusters (Echeverría 1964, Salas 1976, Sadowsky et al. 2013) and the newer vowels now interact with the stress assignment system (Molineaux 2014, 2017), leading us to believe they have been lexicalised. As for the cross-morpheme contexts, PDM appears to have regularised the 17th century epenthesis process, leaving no surface word-level clusters (4). Crucially, however, where the morphemes are truly agglutinative (i.e. when they represent a single meaning as in the ‘2’ and ‘pl’ morphemes in 4b), epenthesis appears to be a surface phenomenon, and does not interact with stress, while where morphemes are fusional, e.g. portmanteaus (notably, 4a), the vowel may receive stress, showing it to be part of a deeper level of representation for the morpheme.

(3) a. [ˈpɨ.ʎi] ‘soul’
b. [ma.ˈmɨʎ] ‘wood’

(4) a. [ki.ˈm–ɨn] know–1SG:IND
c. [e.ˈlu–n] give–1SG:IND
b. [e.ˈlu–l.–m–ɨ–n] give–SUBJ–2–EPENTH–PL

By mining a large selection of Mapudungun texts for the 17th to the 20th century (the core texts earmarked for the Corpus of Historical Mapudungun), in this talk I will reconstruct the successive synchronic stages of epenthesis for the 400-year history of the language. In a brief overview of the contact situation with Spanish and the timing of the changes, I will conclude that epenthesis-related processes must be considered endogenous to Mapudungun. This done, I will go on to show how epenthesis follows the well-documented life-cycle path of phonological processes (Bermúdez-Otero & Trousdale 2012, Ramsammy 2015): the rule is first seen to stabilise at morphological boundaries, going on to enter the stem domain, where it is quickly lexicalised. Perhaps more interestingly, among fusional suffixes, epenthesis becomes morphologised, creating a suppletive morphological patterns (cf. [-n]∼[-ɨn]) in place of the erstwhile purely phonological one (which allows for the interaction with stress). Throughout these processes, however, a post-lexical rule of epenthesis remains active in the agglutinating morphology. I conclude with a call for some refinement of the life-cycle model, in order to better predict the different patterns of morphologisation arising in fusional as opposed to agglutinating morphology, an aspect of the model which — to my knowledge — has not been addressed in the theoretical literature.

Scottish Gaelic svarabhakti: Not evidence for prosodic identity in copy epenthesis

Donald Alasdair Morrison (donald.morrison@manchester.ac.uk)
The University of Manchester

It has been claimed that copy vowels and their hosts stand in correspondence with one another (Kitto & de Lacy 1999), but this is said to predict unattested processes in which an epenthetic vowel seeks to match its host for prosodic properties (Kawahara 2007). Stanton & Zukoff (to appear, S&Z) claim that such processes *do* exist, using evidence from Scottish Gaelic (SG), Selayarese and Ho-Chunk. I show that their analysis of SG is incorrect, and offer an alternative analysis drawing on Köhnlein's (2016) proposals for Franconian tone-accent dialects.

In SG, an epenthetic copy vowel (*svarabhakti* vowel, SV) breaks up an underlying heterorganic cluster whose first member is a sonorant, as in (1). Words containing SVs are prosodically distinct (*tone 2*, rising) from those containing underlying vowels (UVs, *tone 1*, falling). The host vowel must be stressed (SG is mostly stress-initial) and cannot be long.

(1) i. /paɻ̪ʸk/ → [^{2}paɻ̪ʸ̲ak] 'bellows' (*cf.* /paɻ̪ʸak/ → [^{1}paɻ̪ʸak] 'skull')
ii. /l̪ʲuːɾpɔst/ → [l̪ʲuːɾpɔst] 'Leurbost (village)' *[l̪ʲuːɾu̲pɔst] *[l̪ʲuɾu̲pɔst] *[l̪ʲuːɾuː̲pɔst]

As part of this tonal contrast, SVs bear higher pitch and longer duration than UVs (Bosch & de Jong 1997), suggesting that they carry stress in addition to the host vowel. S&Z attribute this to a host-epenthetic (HE-)correspondence constraint HE-IDENT(stress). Moreover, they attribute the blocking of epenthesis after long vowels to a constraint HE-IDENT(length), working alongside constraints that prevent the shortening of underlying long vowels in initial syllables and prevent the occurrence of long vowels in non-initial syllables.

S&Z view svarabhakti in isolation. However, the *same* tonal contrast occurs elsewhere in SG, distinguishing diphthongs and long vowels (tone 2) from underlying hiatus sequences (tone 1), as in (2) (Ladefoged et al. 1998). Dialects vary in their realisation of the tonal contrast (pitch, glottalisation, or overlength), but each dialect realises the contrasts in (2) in the same manner as the contrast produced by svarabhakti (Ternes 2006). Since these examples do not involve copy epenthesis, HE-correspondence cannot be responsible for the tonal contrast in general.

(2) i. /tu͡an/ → [^{2}tuan] 'song' vs. /tu.an/ → [^{1}tuan] 'hook'
ii. /poː/ → [^{2}poː] 'cow' vs. /po.ə/ → [^{1}poː] 'reef'

In addition, S&Z's explanation of the blocking of epenthesis after long vowels hinges crucially on the assumption that long vowels are banned in non-initial syllables, even when stressed. This assumption is false: numerous items with exceptional non-initial stress show that length is licensed by stress, not by initial position, e.g. [pəˈn̪ʸtʰaːʰtə] 'potato', [tʲəˈmaːrʸst] 'Tuesday'.

Morphological evidence and speaker intuitions have led many authors to link the tonal contrast to syllable count: tone-2 words are monosyllabic and tone-1 words are disyllabic (e.g. Ladefoged et al. 1998, Iosad 2015). In the case of svarabhakti the epenthetic vowel does not project a new syllable, and the form therefore carries the rising tone of a long monosyllable. I derive this using Köhnlein's (2016) constraint HEADMATCH(Σ) (the head of a foot in the output must match that of its input correspondent) coupled with his proposal that the level at which the head occurs depends on the level at which branching occurs (i.e. the head of [$_{\Sigma}$ σ$_{\mu}$ σ$_{\mu}$] is the first syllable, and that of [$_{\Sigma}$ σ$_{\mu\mu}$] the first mora). If the input to svarabhakti is taken to be [$_{\Sigma}$ σ$_{\mu\mu}$], then highly ranked HEADMATCH(Σ) prevents epenthesis from bringing about resyllabification to [$_{\Sigma}$ σ$_{\mu}$ σ$_{\mu}$]. Under this analysis, the blocking of epenthesis after long vowels can be motivated by constraints against superheavy syllables and the shortening of underlying long vowels.

I also cast doubt upon S&Z's two other analyses. Their account of Selayarese is dependent on an unsafe assumption about the synchronic underlying representations of loanwords and their account of Ho-Chunk uses forms that contradict those attested in their sources. I conclude that processes in which an epenthetic vowel seeks to match its host for prosodic properties, such as stress or length, remain unattested in accordance with Kawahara (2007).

In Which Bracketing Paradoxes Fall Flat

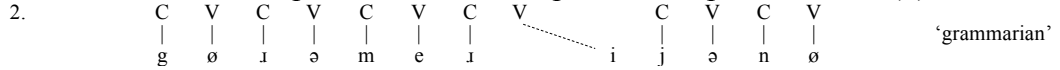
Heather Newell, UQAM

The Problem. Bracketing Paradoxes (BPs) are seen as a puzzle whose solution may give particular insight into generative structure building and its interpretation at the interfaces. This classic problem arises from mismatches like in (1). Many solutions to BPs have been proposed, but each

1. (a) [[transformational grammar]ian] **Syn/LF** (b) [transformational [grammarian]] **PF**

has drawbacks (Pesetsky 1977/1985, Allen 1978, Williams 1981, Selkirk 1982, Kiparky 1982, Sproat 1985/1988, Booij & Lieber 1993, Newell 2005/2008, etc.). I argue here that these drawbacks are concentrated around two theoretical propositions. First, that an affixes' phonological behaviour is mediated through morphological classification (as in Lexical Phonology (LP)) and, second, that hierarchical structure exists in the phonological representation. In this talk I demonstrate that eliminating lexical Levels and Prosodic Hierarchy(PH)-based structure dissolves the paradox. A CVCV linear analysis (Scheer 2004) of phonological outputs combined with cyclic interpretation of syntactic phases is shown to account for apparent mismatches. This solution gives particular insight into the generative process and its relation to the interfaces, and renders the grammar truly modular in the Fodorian sense. **A sketch of the solution.** Affixes in the phonological output of a derivation are not restricted to appearing in the position ascribed to them by the morpho-syntax, ex. infixation, liaison, cliticization (ex. Peperkamp 1997), morphological merger/lowering (Halle & Marantz 1993), and phonological merger (Newell & Piggott 2014). It is clear that *bloody* in *absobloodylutely* is not in a syntactic position intermediate to *abso* and *lutely*. Given this indisputable evidence, we must consider the possibility that the syntactic structure, and input to both the phonology and the semantics, is (1a), and that *-ian* is subject to one of the operations above, ensuring its phonological proximity to *grammar* despite its syntactic distance. This is exactly what has been independently proposed by Newell (2017). Newell shows that a better account of the 'Level 1/2' distinction in English is given if this difference is not morphological but phonological; so-called Level 1 affixes begin with a floating vowel and therefore link with an open vocalic skeletal position at spell-out, as in (2):

2.



'grammarian'

The derivation of *transformational grammarian* is effected in at least two steps. Presupposing cycles/phases and Late Insertion (as in Distributed Morphology), [[[transformational]$_a$ grammar√]∅]$_n$. undergoes Vocabulary Insertion, and PF outputs [*tɹænzfəɹmeʃənəl gɹæməɹ*]. The second cycle [[[transformational]$_a$ grammar√]∅]$_n$ ian]$_n$, after liaison in (2) induces re-syllabification and stressing, gives [*tɹænzfəɹmeʃənəl gɹəmeɹijən*]. It is irrelevant to the phonological representation if *transformational* has been interpreted as closer (e.g. in a cycle/phase) to *grammar* in the syntax/semantics. The 'phonological bracketing' in (1b) never exists. That this is not a notational variant of a PH/bracketing account will be demonstrated. This type of analysis will also be shown to account for *unhappier* and *particle verb* paradoxes, such as the Russian /pŏdŭ-žĭg-l-ŭ/ → [*podžëg*] 'set on fire.masc' (Pesetsky 1979). Such BPs, given independently motivated cyclic syntactic analyses (e.g. Ramchand & Svenonius 2002, Newell 2005), lead to strictly linear phonological representations where the prefixes/particles are not syllabified with their bases, while the suffixes are. **Dealing with allomorphy** What of *allomorphic* BPs like *Baroque flautist*? Here [[[Baroque]$_a$ flute√]∅]$_n$, outputs [*bəɹok flut*]. The addition of the suffix *-ist* cannot induce allomorphic selection of *flaut* post-hoc. Again, independent arguments from comparative allomorphy in Bobaljik & Wurmbrand (2013) demonstrate that a larger domain of allomorphic conditioning will be forced in just these cases and [[[Baroque]$_a$ flute√]∅]$_n$ must delay Spell-Out until after *-ist* is merged. The entire construction is interpreted together. BPs of this type are hence also illusory. **Import of this analysis.** Bracketing Paradoxes have been a problem only since the advent of LP and the PH. This analysis demonstrates that problems like BP can reveal the need to reexamine our theoretical tools, forcing a shift of theoretical paradigm. This in turn has an important impact on what constitutes an explanatory theory of phonology.

Tone features reconsidered: Proof from Limbum deverbal nouns

Jude Nformi, Universität Leipzig, awasom_jude.nformi@uni-leipzig.de

Introduction. With novel data from Limbum (Grassfields Bantu, Cameroon), I present an account of an interesting behaviour of tone in nominalised verbs. I show that the nominalizer in the language comprises a floating tonal circumfix (Ⓛ - Ⓛ) which triggers various lowering effects on the edges of verb roots. I assume the model of tonal representation proposed by Snider (1999) and provide an OT-analysis of the data.

Data. Verb roots in Limbum can be monosyllabic or disyllabic and have various tone patterns including high (H), low (L) for monosyllabic roots, and high high (HH), low mid (LM), low high (LH) for disyllabic roots. Nominalisation involves combining the circumfix and a verb root. The effect of this process is that the tone of the verb root lowers as shown in (1). The high and low tones of the first syllable become mid and extra low (LL) respectively while the high and mid of the second syllable both become low.

(1) *Deverbal nouns*

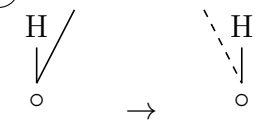
	Verb roots		Sg.	Pl.	
H	tá	'shoot'	r-tā	m-tā	'shot(s)'
L	vù	'come'	r-vù	-	'coming'
HH	yé'ní	'teach, learn'	r-yēʔnì	-	'lesson, way of teaching'
LM	bìsī	'answer'	r-bìsì	-	'answer'
LH	lèsí	'forget'	r-lèsì	-	'forgetfulness'

Analysis. Lowering of the tone of the first syllable results from association of the floating *l*-register of the prefixal part of the circumfix to the tonal root node it precedes and delinking its original register if it was *h* (Register lowering). The high tone with *h*-register surfaces with *l*. On the other hand, the suffixal Ⓛ overwrites the tonal feature of the second syllable, hence H and M change to L. However, the tone of the first syllable is not overwritten by the suffixal Ⓛ. I argue that the root-initial syllable is a prominent position whose segments are preserved by a positional faithfulness constraint which makes the insights of this alternation better expressed in OT.

I adopt a correspondence-theoretic version of OT and show that register lowering and tonal overwriting in deverbal nouns basically follow from the ranking of relevant constraints as shown in (2) and (3). In (2), *Float-(l) is ranked highest because the floating *l*-register has to be associated to a tonal root node. Max-(l) is also ranked higher than Max-(h) since *l*-register of the nominaliser is preferred over *h*.

(2) *Monosyllabic* H: *Float-(l) ≫ Max-(l) ≫ *hl ≫ *Float-(h) ≫ Max-(h)

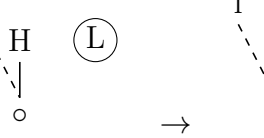
a. Ⓛ h → l



In (3), we consider only the effect of the suffixal Ⓛ and since this is a monosyllabic root, the positional faithfulness constraint which forbids deletion of the tone of the initial syllable is ranked highest. The correct output is faithful to the input, whereas the Ⓛ of the nominaliser is deleted since Max-(L) is ranked lower.

(3) *Monosyllabic* HⓁ: Max-σ_1(t) ≫ *hl ≫ *Contour≫ *Float-(t) ≫ Max-(l) ≫ Max-(h)

a. l Ⓛ → l



The analysis considers the idea of geometry of tone and tone features (particularly Snider1999) against one which considers only tonal primitives. Such a featural approach allows us to model the difference between the lowering effects triggered by the prefix (register lowering) and the suffixal boundary tone (tonal lowering). Contrary to Hyman (2010) and Clements et al (2010), tone features are still needed in analysing such tonal alternations.

The stray syllable in Dutch: leftwards or rightwards attachment?

Marc van Oostendorp
Meertens Instituut / Radboud Universiteit Nijmegen

Dutch is standardly assumed to have trochaic feet (Hulst1984, Kager1989, Gussenhoven2009), but in certain cases it shows a ternary pattern similar to e.g. English, such as in *fonologie* [fònoloɣí]. The third syllable of this word (which we call 'stray') has a different status than the second, 'weak', syllable. The question is what its position in the prosodic structure is. While most literature (Oostendorp1999, Gussenhoven2009) assumes that it is attached leftwards to *fono*, Kager and Martínez-Paricio2018 [KMP18] argue that it is instead rightwards attached to *gie*. This presentation offers a refutation of KMP18's claims and gives new arguments that the stray syllable is indeed leftwards attached. This obviously has implications for our theory of foot typology.

1. Arguments for rightwards attachment we have deduced from KMP are the following: **1.1. An asymmetry between weak syllables** has been observed many times in the literature; it concerns vowel reduction to schwa, which is optional. However, while *phonələgie* and *phonəlogie* are both possible, *phonolə̀gie* is not. In other words, the stray syllable only reduces if the weak syllable also does. This is taken to show (Kager1989, Booij1995, Oostendorp1995) that the stray syllable is in a stronger position. KMP18 attribute this to the fact that syllables at left edges are stronger, but they show no independent evidence that this is not just an edge effect, regardless of left/right position. **1.2. Licensing of** [h] **and** [ʔ]. KMP18 claim that [h] is optionally deleted in a weak syllable (*Johan*, [jóhɑn, jó(w)ɑn] but not in a stray syllable. They claim this is because foot-initial [h] is not deleted. Some of the examples they give (*Villahermosa* (place name), *protohistorisch* 'protohistoric' may be analysed as morphologically complex, with *h* appearing at the beginning of a word, so being initial in another way. We show data that in the other words they mention (*Tarahumara*) the [h] is deleted by Dutch speakers just like in the case of weak syllables. We show that something similar holds in our experiment for the purported licensing of [ʔ]: Dutch speakers have stray syllables behave more like weak syllables than KMP18 claim. We conclude that there are **no strong empirical arguments for rightwards attachment**.

2. A new argument against rightwards attachment. If stray syllables are indeed attached rightwards, one would expect them to behave similar to initial unstressed syllables, such as in *geniet* [ɣənit] 'enjoy'. This is indeed KMP18's claim for the [h] and [ʔ] facts, addressed in 1.2. They do not note, however, that all word-initial syllables with a schwa have one of the onsets ɣ, *b* or *r*. This is hardly a natural class in phonological terms, and no similar restriction holds for stray syllables. A possible explanation for this restriction is that *re-,be, ge* are the three possible prefixes with schwa in Dutch. We might surmise therefore that initial schwa syllables are only allowed if they can be analysed as prefixes, even if that is not their etymology. Under a rightwards attachment analysis, this is an unexpected restriction. The leftwards attachment analysis, inversely, would have a problem with freely occurring schwa syllables.

3. Typological implications. As noted, English has a ternary pattern much like Dutch; however, the arguments for rightward attachment in English seem much stronger. We argue that this can be learned by the learner because English has no restriction on 'morpheme-like' initial syllables.

Tense? (Re)lax! (A new formalisation for the tense/lax contrast)

Markus A. Pöchtrager (markus.poechtrager@univie.ac.at), University of Vienna

Problem. The two sets of English stressed vowels bear various names: tense/lax (focus on quality), long/short (quantity), free/checked (behaviour). Stressed checked vowels are disallowed finally (1a) and pre-hiatus (1b) as they need 'checking' by a following consonant. This explains their distribution but not why they need 'checking' in the first place (or why they have the phonetic characteristics they have). Similarly, Government Phonology equals tense with (melodically) headed and lax with unheaded (Kaye 2000) and requires branching nuclei to link to headed expressions, thus deriving long vowels to be tense and connecting quality to quantity. However, this does not capture or explain the distribution in (1) in a non-arbitrary fashion (without extra stipulation). That is, previous accounts capture different aspects of the tense/lax distinction, but never the full range. This abstract derives all properties from one single assumption.

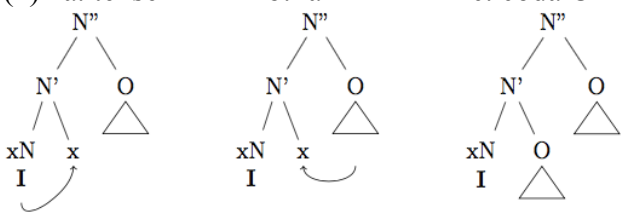
Proposal. Tense (2a) and lax (2b) vowels have the same basic structure, a nuclear head (xN) and a complement (x), but differ in who makes use of the complement: In a tense vowel, xN claims x by spreading its melody, while in a lax vowel the complement is not claimed by xN and therefore needs licensing by a following consonant (marked 'O').

Predictions. 1. The need of lax vowels to be 'checked' by a following consonant is no longer an extra stipulation, but follows from having an unused complement in need of licensing; (1) follows. **2.** Tense vowels take up more space (head & complement) than corresponding lax vowels (head only). Their greater duration ([biːt]/[bɪt] have vowel ratios of 3:2) follows, thus explaining the quantitative difference. **3.** The different quality can be pinned on the status of the nuclear head: laxness means there is no other point to take care of. **4.** Tense vowels require more room than lax ones. If a coda consonant (in the sense of GP) takes up the place of the nuclear complement (2c), only lax vowels are possible: [ˈɪmp], *[ˈiːmp]. (Alveolar clusters can exceed that limit, cf. Pöchtrager 2010.)

Extensions. 1. Québec French laxing ([vi̲de] 'to empty' but [vɪ̲d] 'empty') can be derived by one extra stipulation on constituency: A consonant in the *same syllable* will claim the complement x (cf. 2b), thus laxing the preceding vowel. (The restriction of laxing to high vowels can be derived from structure as well; cf. Pöchtrager in print.) **2.** The unstressed position in English is restricted to schwa and some tense vowels (*happy*, *into*). **a.** That the latter group be tense is unsurprising; final vowels are not followed by a consonant, so they must be tense, i.e. xN must take care of x. (At least in some varieties of English.) Tellingly, once this vowel finds itself followed by a consonant it becomes lax (*happily* vs. *happy*). **b.** It is tempting to treat schwa as tense (as argued by Booij 1995 for Dutch), thus uniting all vowels, but the lack of a parallel to *happy*/*happily* remains problematic. **3.** My proposal can be seen as a (possibly language-specific) extension of Kaye's (1990) (universal) Coda Licensing Principle, requiring a coda to be licensed by a following onset: Not only codas need such a license, but lax vowels do, too.

(1) stressed V:	tense	lax
a. finally	b[iː], z[uː]	*b[ɪ], *z[ʊ]
b. pre-hiatus	l[iː]o, th[iː]atre	*l[ɪ]o, *th[ɪ]atre

(2) a. tense b. lax c. coda C



Systematic leveling and what to make of it

Renate Raffelsiefen IDS Mannheim raffelsiefen@ids-mannheim.de

Leveling typically involves the replacement of various stem forms by the relevant "basic" form (Old Engl. *help-an, hælp, hulp-on, holp-en*, Modern Engl. *help, help-ed*) (cf. Kuryłowcz's 1949 2nd law). Compare the modeling of such change in SPE-type vs. Structuralist analyses:

SPE-type analyses. Guiding intuition: same underlying representation for "related" morphemes as long as surface variation can be derived by "independently motivated" (recurring) rules (Halle & Mohanan 1985 on English strong verbs). "Leveling" may indicate mere loss of diacritic marking of the underlying form (hence lead to a simplified lexicon) but could moreover involve loss of a rule (hence lead to a simplified grammar) (Bynon 1977).

Structuralist analyses. Guiding intuition: same representation for sounds (phonemes) as long as surface variation can be attributed to the segmental or prosodic context. Phonemic distinctness in related surface forms entails allomorphy, associated with distinct morphosyntactic markings such as {/hɛlp/$_{\text{Basic}}$, /hilp/$_{\text{PresSg:2,3}}$ /hælp/$_{\text{PastSg:1,3}}$ /hulp/$_{\text{PastPl;2,}}$ /holp/$_{\text{PastPart}}$}. "Leveling" indicates the loss of allomorphs, thereby simplifying the lexicon while also impoverishing it, as morphosyntactic information is no longer (redundantly) expressed through the stem form.

Explanations for leveling on either analyses invoke low token frequency. Yet there are significant phonological correlates, which may empirically decide among the two approaches. Consider the fate of the original class III verbs, defined by a stem-final consonant cluster, in English. Of the 23 surviving verbs involving a stem-final homorganic nasal-stop cluster or a single consonant (due to degemination or h-loss), 21 are still strong. Formerly weak verbs have switched into this class (*fling, string*). All remaining original class III verbs, whose stems end in other clusters, have become weak. This regularity indicates an active markedness constraint *+αF-αF (Consonant clusters must agree regarding place, manner). A possible role for this constraint in historical leveling is shown in (1), where inputs consist of (Structuralist-type) allomorphs encountered in acquisition and *+αF-αF is sandwiched between faithfulness constraints (MAX-IO$_D$ (The basic input form must have an output correspondent), DEP-IO (Output forms must have input correspondents)) and DISTINCT constraints, which link specific morphological differences to phonemically distinct stem forms (DISTINCT B ≠ P (past tense stems must differ from basic stems), DISTINCT B ≠ PL (plural stems must differ from basic stems)). The grammar in (1) models the transition state where allomorphs are still known but no longer used.

(1)	{/hɛlp/$_{\text{B}}$, /hælp/$_{\text{PastSg:1,3,}}$ /hulp/$_{\text{Pastpl;2,}}$ {/hilp/$_{\text{PresSg:2,3,}}$ /holp/$_{\text{PastPart}}$ }	DEP-IO	MAX-IO$_D$	*+αF-αF]	DISTINCT B ≠ P, B ≠ PL
	{/hɛlp/$_{\text{B,}}$ /he:lp/$_{\text{Past}}$ }	*			
	{/hilp/$_{\text{PresSg:2,3}}$ }		*		
	{/hɛlp/$_{\text{B,}}$ /hælp/$_{\text{PastSg:1,3,}}$ /hulp/$_{\text{Pastpl;2,}}$ }			***	
☞	{/hɛlp/$_{\text{B}}$}			*	*

SPE-type analyses famously aspire to accounting for the production of forms which have not been encountered but may fail to capture the regular abandoning of forms known to the speaker. Such analyses might explore linking the systematic leveling in question to the fragmentation of the class due to vowel changes before /ɹ/, which might favor rule loss, but reasonably large classes remained (see (2)). Indeed, several strong verbs persist in English despite showing isolated alternations (/ɪ/ : /ɛi/ *bid - bade*, /ɐ/ - /ɛi/ *come - came,* /ɑi/ - /u/ *fly - flew*).

(2) /ɛ/: *delve, bellow, yelp, help, melt, thresh*; /ɑ/: *bark, carve, fart, smart, starve*

Two additional cases of large-scale systematic leveling in the history of German to be modeled with reference to phonological markedness constraints will be presented: allomorphy in present tense paradigms and allomorphy in weak verbs involving "rückumlaut".

Phonetic lapse in American English *–ative* **Juliet Stanton, NYU (stanton@nyu.edu)**

In American (A.) English forms ending in *–ative*, whether or not *–at-* bears stress is influenced by the identity of the segment(s) preceding it (Nanni 1977): stress is more likely when *–at-* is preceded by an obstruent or cluster (*irri**g**ative, inte**gr**ative*) than when it is preceded by a vowel or sonorant (*palli**a**tive*, *specu**l**ative*). I provide new empirical support for Nanni's claim **(§i)** and argue that the attested pattern should be understood as an effect of gradiently evaluated *LAPSE: phonetically longer lapses are penalized more severely than shorter ones **(§ii)**. Results from a nonce word rating task support this claim **(§iii)**. The broader implication of these results is that the definition of constraints regulating the distribution of prominences (e.g. *LAPSE) must make reference to fine-grained durational information (see also Hayes 1984). Alternatives to the present proposal (e.g. Davis 1988's) will be discussed and shown to yield a worse fit to the corpus and behavioral data.

(§i) Corpus study. To verify that Nanni's generalization is correct, a corpus was built including all current *–ative* forms in the OED with a transcription and frequency information available. I focus on forms with trochee-final stems, where failure to stress *–at-* would result in a *LAPSE violation (e.g. *íntegr-ative*, n=332). The OED data support Nanni's (1977) generalization, though they also reveal variability and additional distinctions among consonant types: *–at-* is stressed most frequently after a cluster (CC), then an obstruent (O), then a sonorant (R), then a vowel (∅).

Preceding cons.	Stressed *–at-*	Stressless *–at-*	Rate of *–at-* stress
CC	27, e.g. *législàtive*	1, e.g. *ádequative*	96% (27/28)
O	91, e.g. *dépcrecàtive*	19, e.g. *dúbitative*	83% (91/110)
R	85, e.g. *mútilàtive*	65, e.g. *spéculative*	57% (85/150)
∅	21, e.g. *annúnciàtive*	23, e.g. *pálliative*	48% (21/44)

A logistic regression fit to the corpus data indicate that the identity of the pre *–at-* material plays a significant role in predicting whether or not it bears stress ($p < .001$), even when other potentially relevant factors (e.g. frequency of the *–ative* form, frequency of its morphological base, and relative frequency of the two; cf. Hay 2003; Collie 2007, 2008) are taken into account.

(§ii) Proposal. Why should the rate of *–at-* stress depend on preceding segmental material? I propose that the identity of these segments is relevant because *-at-* stressing is a lapse resolution strategy (*législative* violates *LAPSE, while *législàtive* satisfies it), and the identity of the pre-*at-* material can shorten or lengthen the duration of the lapsed string: all else equal, a string containing a CC is longer than one containing an O, which is longer than one containing an R, which is longer than one containing ∅. Under the further assumption that the longer the lapse, the more actively it's avoided, *legislative* (with CC) is more likely to bear *–at-* stress than *speculative* (R) because the lapse that would result in *legislative*, were *–at-* stressless, would be longer than that in *speculative*. For this proposal to be plausible, **(a)** the phonetic facts must be as this hypothesis assumes, and **(b)** speakers of A. English must prefer phonetically shorter lapses to longer lapses.

(§iii) Experiment. A nonce word rating task probed **(§iia)** and **(§iib)**. The stimuli included 80 stressless *-ative* forms, with a trochaic beginning (e.g. *sóbi-*) and one of 20 endings *(∅,* 4 R, 8 O, 7 CC; followed by *–ative*). One native A. English speaker recorded the stimuli. Their productions corroborate **(§iia)**: a change in the pre-*at-* segment(s) from ∅ to R to O to CC is correlated with an increased lapse duration ($p < .001$). These recordings were incorporated into a rating task, where participants (n=50) were presented with auditory and orthographic stimuli and asked to rate them on a scale from 1 (least natural) to 7 (most natural). Corroborating **(§iib)**, forms with longer lapses had lower ratings ($p < .001$). Together, these results indicate that the proposal regarding stress in *–ative* is plausible: the rate of *-at-* stress observed in the OED is positively correlated with the duration of a potential lapse, and A. English speakers disprefer long lapses relative to shorter ones.

The L-ephant in the room. Lateralisation in vocalised /l/

Patrycja Strycharczuk[1], Donald Derrick[2] & Jason Shaw[3]
University of Manchester (patrycja.strycharczuk@manchester.ac.uk)[1],
University of Canterbury[2], *Yale University*[3]

Allophonic processes affecting /l/ in English can be modelled in terms of positionally conditioned variants, ranging from relatively more consonantal (word-initial) to relatively more vocalic (word-final). This type of distributional pattern is typically the result of a diachronic positional weakening (lenition) process, but it is less clear *when* in the process of sound change the shift in manner happens. /l/-vocalisation is an interesting source of evidence in this context, because it involves a loss of not one, but two consonantal features: tongue tip raising and tongue lateralisation. If we see /l/-vocalisation as simply lenition of the tongue tip gesture, we may expect that the loss of lateralisation will be a later development in the change. In contrast to this prediction, our data show that decrease in lateralisation is a gradient and persistent feature of TT reduction in New Zealand English.

We present EMA data from 7 native speakers of NZE from the South Island, where /l/-vocalisation is variably found in final position, depending on dialect and speech style (Hay 2008). The speakers read test items including /l/ preceded by the FLEECE, KIT (which is mid and central in NZE) or THOUGHT vowel. The morpho-syntactic boundary following /l/ was systematically varied, similar to Sproat and Fujimura (1993). Each speaker read 20 repetitions, which yielded 300 tokens per speaker. For each speaker, five EMA sensors were placed on the tongue surface: three midsagittal sensors: Tongue Tip (TT), Tongue Body (TB) and Tongue Dorsum (TD), and two parasagittal sensors: right (TR) and left (TL). In addition, we placed sensors on the upper and lower lip, on the lower incisor, and on the nasal bridge.

Following Ying et al. (2017), we calculated the Tongue Lateralisation Index for the entire /Vl/ duration, quantified as the difference in height between the relatively more lowered parasagittal sensor (TR.z or TL.z), and the estimated height of the tongue blade in the midsagittal plane along the same horizontal location as TR and TL. We analysed this variable in normalised time, using General Additive Mixed Modelling (GAMM).

The GAMM results show that both the timing and the degree of lateralisation vary, depending on vowel and context. On average, lateralisation reaches its peak early in the vowel (ca. 35% into /Vl/), although it may be relatively delayed in contexts like *heal Mick*, i.e. in a context for darkening, when the preceding vowel is high and front. The maximum degree of lateralisation is greater for /ɔ:/ compared to /i:/, but within vowel, relatively lighter /l/s (e.g. word-initial) shows more lateralisation compared to darker ones (e.g. word-final).

We propose that the vowel effects we find are due to a link between lateralisation and dorsal retraction (Sproat and Fujimura 1993). While the prosodic effects seem to contradict this link (there is less lateralisation in word-final /l/), they can be explained as a gradual loss of lateralisation, conditioned by final /l/-vocalisation. This is further supported by results from mixed-effects regression modeling of peak TT magnitude, depending on peak lateralisation, vowel, context and context within speaker. The average magnitude of TT gesture decreases in word-final pre-consonantal /l/, and it is also highly variable in this context. Furthermore, lateralisation interacts with context: it is correlated with TT magnitude, particularly in the context for vocalisation (Vl#C).

Our data suggest that lateralisation begins to decrease as soon as there is reduction in TT contact. A possible interpretation of this correlation is that lateralisation is mechanically coupled with TT raising. This view, however, is challenged by the dynamic patterns in our data: lateralisation tends to reach its peak value early in V1, consistently preceding TT raising. Assuming the connection is not a mechanical one, /l/-vocalisation appears to track the relationship between multiple articulatory components. This supports an interpretation of vocalisation as a gradient, multi-dimensional shift in manner, rather than weakening *sensu stricto*.

The Tonal Patterns of Reduplication in Standard Chinese

Yanyan Sui Nankai University yanyansui@nankai.edu.cn

Issue: The reduplication in Standard Chinese (SC) exhibits three basic tonal patterns, represented by diminutive, intensifying and delimitative reduplications. In diminutive reduplication, the reduplicant is toneless, the Low tone in the base does not undergo tone sandhi, e.g., *lǎo lao* 'maternal grandma' 姥姥. In intensifying reduplication, the reduplicant has the same tone as the base, and tone sandhi applies regularly, e.g., *lán lǎn* 'very lazy' 懒懒. Whereas in delimitative reduplication, the reduplicant is toneless, but tone sandhi applies to the base, e.g., *zóu* (/*zǒu*/) *zou* 'to take a walk' 走走.

Background: Packard (1998) and Xu (2001) are representative endeavours to account for the tonal properties of reduplication from the perspective of Lexical Phonology and Morphology (Kiparsky 1982, Mohanan 1982, 1986). Xu (2001) orders the two phonological rules of tone sandhi and tone deletion differently depending on the level of word formation. Mandarin word formation processes are divided into two levels. In Level one, tone deletion applies before tone sandhi, hence blocks tone sandhi to occur in diminutive reduplication. Whereas in Level two, tone sandhi precedes tone deletion, therefore, in delimitative reduplication tone sandhi applies to the Low tone in the base before the conditioning Low tone in the reduplicant is deleted, which gives rise to the opacity of the application of tone sandhi in the base.

Xu's analysis cannot distinguish between delimitative and intensifying reduplications, since the latter does not undergo tone deletion. In addition, the purely lexical analysis is not sufficient to explain the incompatibility of delimitative reduplication and resultative verbs.

Proposal: Reduplication is an interface study of grammar. The distinct tonal patterns in reduplication are manifestations of the interaction between multiple modules of grammar.

Analysis: Semantically, (i) the syntactic distribution of intensifying reduplication overlaps that of the degree word *hěn* 'very' 很. Degree morphemes cannot co-occur with reduplicated adjectives, *hěn gāo* 'very-tall' 很高 versus ***hěn gāo gāo*** (Chao 1968, Lü et al. 1980, Zhang 2015). Moreover, neither *hěn* 'very' 很 nor intensifying reduplication can occur in comparative or superlative constructions (Chao 1968, Zhang 2015). (ii) Delimitative reduplication is sensitive to the aspectual structure of the base verb. Only verbs that lack an inherent result state may undergo delimitative reduplication, and delimitative reduplication is incompatible with progressive and durative aspects. Moreover, the base and the reduplicant can be interrupted by *yī* 'one' and the perfective aspect marker *-le*, which is inconsistent with the Lexical Integrity Hypothesis (Jackendoff 1972, Huang 1984, Selkirk 1986).

We adopt the syntactic analyses proposed by Zhang (2015) for intensifying reduplication and by Arcodia et al. (2014) and Basciano & Melloni (2017) for delimitative reduplication to represent the reduplicant and the base in different syntactic positions. In addition, extrasyntactic operations are necessary in order to explain the distinct tonal patterns in reduplication. In particular, diminutive reduplication is derivational affixation, intensifying reduplication is compounding, and delimitative reduplication is inflectional affixation. Affixation triggers tone deletion in the reduplicant. Meanwhile, the morphosyntactic processes are subject to phonological constraints.

Conclusion: Phonology interfaces with morphology in reduplication in a transparent way, faithfully reflecting the morphological differences in various types of reduplication by maintaining distinct phonological patterns in the reduplication output.

A Natural Turn of Evenks

Christian Uffmann, *HHU Düsseldorf*

Background: The classic SPE view that features are grounded in phonetics has recently come under attack, most notably by Mielke (2008), who argues that features only define phonological classhood, and that the interface to phonetics thus has to be sought elsewhere. Crucial to his argument is the existence of phonetically unnatural classes of sounds that are phonologically active. Particularly striking here are what Mielke calls 'crazy' classes of sounds, a notorious example of which is found in Evenki (Tungusic).

Data: In Evenki, suffix-initial *v, s, g* become homorganic nasals if preceded by a nasal (see examples in (1)). Mielke argues that, given the inventory in (2), these do not form a natural class of sounds that could be captured by a single phonetically grounded distinctive feature.

Proposal: This talk will argue that these sounds do indeed form a natural class once the contrastive function of features is also taken into account, allowing for underspecified representations. It argues that *v, s, g* (and *j*) form a class of underspecified continuants. The process of nasalisation is motivated by a constraint against nasal+continuant clusters. This requires, however, not to look at an isolated process but at the whole phonological system of Evenki and the constraints operating on it (including other processes and phonotactic restrictions) and also to look more closely at the phonetic realisation (and variability) of these sounds. We ultimately propose the revised inventory in (3).

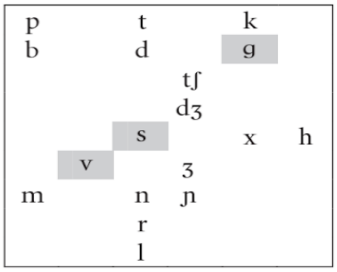
Analysis: We argue that *g* is indeed a continuant, and that there is independent evidence that it forms a natural class with *v, s, j*. Indeed, *g* is [ɣ] intervocalically and word-finally, which can be shown to be underlying (and [g] is derived). It shows similar contextual variation with *v*; both have sonorant realisations and harden in onsets. *v*, *g* are also exempt from an otherwise general ban against final voiced obstruents (Konstantinova 1964, Nedjalkov 1996). Moreover, in cluster phonotactics (Bojcova 1966) *v, g, s* don't behave like obstruents. Note the inclusion of *j* in this class although it does not trigger nasalisation. However, the resulting nasal [ɲ] is systematically banned from clusters. After nasals, suffix-initial *j* is deleted instead, i.e subject to the same phonotactic constraint, although a different repair is chosen.

Discussion: *v, s, g* behave as a class in different contexts, and they are phonetically not as distinct as a superficial analysis may suggest. We will analyse the Evenki consonant system in a version of the Parallel Structures model of Feature Geometry (Morén 2003, Iosad 2012) and Optimality Theory, arguing that a 'myopic' look at individual processes is insufficient to determine whether they are natural or unnatural. Instead, we call for a more holistic view of phonology that takes the notion of contrast in a system more seriously.

(1) Nasal assimilation in Evenki (examples from Konstantinova 1964, Boldyrev 2007):

bira-va	'river (acc.def.)'	*but*	laaŋ-me	'trap (acc.def.)'
ɟu-sun	'your (pl.) house'	*but*	oron-nun	'your (pl.) reindeer'
ile-git	'human (elative)'	*but*	kurim-ŋit	'wedding (elative)'

(2) Evenki consonants (Mielke 2008)



(3) Reanalysis

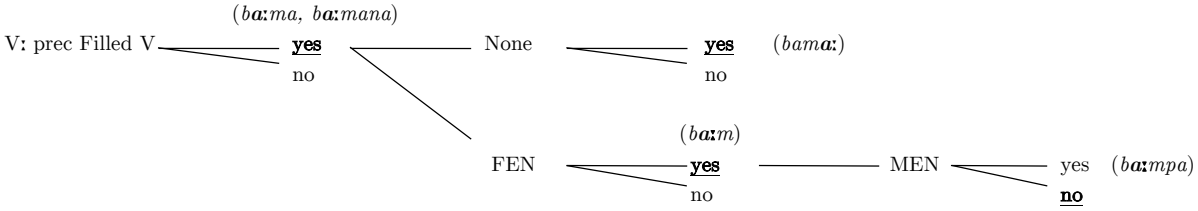
p	t	c	k	
b	d	ɟ		
m	n	ɲ	ŋ	
w~v	s	j	ɣ~g	h
	l			
	r			

Prevocalic Tenseness in English, Binarity and the Typology of Long Vowel Distributions

Shanti Ulfsbjorninn (CNRS Paris 8, UCL) & Katalin Balogné-Bérces (PPCU)

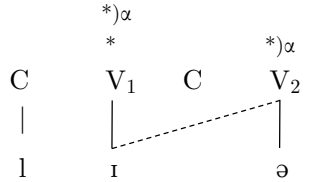
This presentation connects the process of Prevocalic Tenseness (PT) with Current Southern British English's place in the broader typology of long vowel (V:) distribution. The analysis of PT is couched in the framework of Strict CV, but the presentation is of broader interest to other frameworks because of (a) our proposed typology of V: distributions and (b) the novel mechanism by which this typological variation is formally accounted for: parameter hierarchies (Ulfsbjorninn 2017; Benz & Ulfsbjorninn 2018; of the same type as used for syntax Baker 2001; Biberauer et al. 2013; Biberauer & Roberts 2014; Sheehan 2014). Prevocalic Tenseness is an exceptionless static distribution which subsequently interacted with monophthongisation. In English, only 'tense' (long) monophthongs /iː, uː/ precede schwa. This reveals a contrast between diphthongs and V+schwa hiatuses: (a) [lɪə] → [lɪː] 'Lear/leer' vs. [liːə] 'Leah' & (b) [ʃʊə] → [ʃoː] 'sure' vs. [suːə] 'sewer'. *A priori*, Strict CV cannot distinguish diphthongs from hiatuses or VC sequences due to its recasting of constituency into flat dependency (Scheer 2013). However, this data demands an interpretation of this contrast. The key question is: why should monophthongisation affect *V+schwa* and not V:*+schwa*? The data suggests that only binary vocalic spreading is possible, but this doesn't follow from the general distributional restrictions on V:s. As we will demonstrate typologically, if a language allows V:s then it universally allows V:s preceding filled Vs (e.g. [b**aː**r**a**]) (cf. Yoshida 1993; Kaye 1995; Scheer 2004). In any other position, V: is marked and its distribution is parametrised according to three independent core environments: (a) Medial Empty Nucleus (MEN) [b**aː**mØpi], (b) Final Empty Nucleus (FEN) [b**aː**mØ], or (c) nothing [bam**aː**].

(1) Parameter hierarchy for long vowels (English settings shown in **bold underline**)

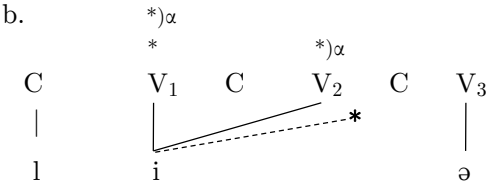


In English, a vowel may spread to any V position that is (a) licensed by a filled vowel, (b) in absolute word-final position, or (c) before FEN, but not before a MEN. This implies that there would be nothing improper about having ternary monophthongisation of hiatus sequences. One way to restrict this sequence is to impose a binary limit on spreading. The most economical way is to have this limit piggy-back on a pre-existing representational condition. We propose the (Strict CV) mechanism for quantity: *Incorporation* (Ulfsbjorninn 2014) (a) Filled V_1 = V_1* (* is a grid mark) (b) Filled V_1 prec Empty V_2 = V_1**). In English there are only **two** degrees of quantity: Heavy (VC, VV) > Light (V), despite there also being 'superheavy' rimes (VVC) (Harris 1994). No phonological behaviour identifies VVCs as phonologically heavier than heavy rimes. That is to say, there is no third weight category. *Incorporation* in English is binary. Having established that, English PT results from assuming that *vowels can only spread into incorporated positions* (also required for Palestinian (Faust & Ulfsbjorninn to appear)). Accordingly, diphthongs are incorporation domains and correspondingly have permitted their V_2 to be subject to spreading: [lɪː] 'leer' in (2a), while the V_3 of hiatus sequences has fallen outside of the domain of incorporation: [liːə] 'Leah' in (2b).

(2) a.



b.



Phonological domain paradoxes in Indonesian: A stratal analysis

Joanna Zaleska (joanna.zaleska@uni-leipzig.de), University of Leipzig

In Standard Indonesian (SI; Lapoliwa 1981), suffixes seem 'closer' than prefixes to lexical roots for some phonological processes but for others, this relation is reversed. I argue that unlike the well-known phonology-morphology/semantic bracketing paradoxes (Cohn 1989; Cohn & McCarthy 1994), this type of mismatch is not amenable to a fully parallel analysis. I propose an account couched in Stratal Optimality Theory (Kiparsky 2000, 2015; Bermúdez-Otero 2011, 2012) in which both prosodic and cyclic-stratal domains limit segmental processes, providing a unified account for both types of data while maintaining the *Indirect Reference Hypothesis*.

In SI, some phonological processes take as their domain the lexical root plus suffix but fail to apply across the prefix-root boundary. These include (i) intervocalic glide insertion, which applies within morphemes and across root-sufix boundaries, (1a) but not across prefix-root boundaries, where a glottal stop is inserted (Cohn 1989: 192); and (ii) stress placement, which falls on the penultimate syllable from the right edge of a suffixed word, (2a), unless the penultimate syllable is a prefix, in which case the root is stressed, (2b; Lapoliwa 1981: 32–33,128).

(1) a. /diam/ [ˈdi**j**am] 'quiet' b. /di+ambil/ [di**ʔ**ambil] 'taken'
/hari+an/ [haˈri**j**an] 'daily' /di+aʤari/ [di**ʔ**aˈʤari] 'taught'

(2) a. /bodoh/ ['bodoh] 'stupid' b. /di+tik/ [di'tik] 'typed'
/kə+bodoh+an/ [kəbo'dohan] 'stupidity'

Other processes, such as nasal place assimilation, take as their domain the prefix plus lexical root, (3a), but fail to apply across the root-suffix boundary, (3b; Lapoliwa 1981: 106–107).

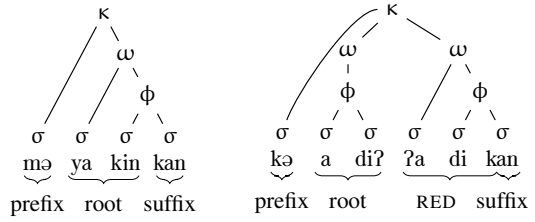
(3) a. /mə**ŋ**+ʤə**mp**ut/ [mə**ɲ**ʤə**mp**ʊt] 'to fetch'

b. /məŋ+yaki**n**+**k**an/ [məyaki**nk**an] 'to convince'

Furthermore, nasal substitution (fusion of a nasal with a voiceless stop) applies at the prefix-root boundary, but not between prefixes, the root-suffix boundary or root-reduplicant boundary.

My analysis adopts the prosodic structure of Indonesian words proposed by Cohn (1989), where the left edge of the lexical root coincides with the left edge of the prosodic word (ω), with prefixes adjoined to the clitic phrase (κ) and suffixes incorporated into the leftmost ω, (4). However, in contrast to Cohn, I assume that prosodic structure is built incrementally, together with morphological structure. Finally, I combine Pater's (1999) and (2001) analyses of nasal substitution, viewing it as the cumulative effect of *NC̥ and CRISPEDGE (CE; Itô & Mester 1999). The analysis proceeds as follows.

(4) *Simple* *Reduplicated*



ROOT LEVEL: A ω (dominating a right-aligned foot) is built over the entire lexical root, due the ALIGN(RT,L,ω,L) and ALIGN(RT,R,ω,R) constraints (Trommer 2011: 64).

STEM LEVEL: Prefixes are added. They are adjoined directly to the κ-node, due to a high-ranked faithfulness constraint, FAITH(ω↔[•) protecting the left edge of a prosodic word. A SHARE(PLACE)$_{NC}$ constraint triggers nasal place assimilation. Across prefix-root boundaries, this incurs a violation of CE, whose cumulative interaction with *NC̥ causes nasal substitution when the lexical root begins with a voiceless segment.

WORD LEVEL: The reduplicative morpheme and suffixes are added. With nasal substitution having applied at the previous stratum, its overapplication in reduplication forms (e.g. /mə**ŋ**+karaŋ+karaŋ/ → [mə**ŋ**araŋ **ŋ**araŋ] 'to make up') follows automatically. With the right-edge equivalent of FTH(ω↔[•) low-ranked, the prosodic word can be extended rightwards to include suffixes. The position of the foot is readjusted, resulting in penultimate primary stress. SHR(PL)$_{NC}$ is demoted, which correctly predicts the lack of nasal assimilation or nasal substitution across root-reduplicant and root-suffix boundaries (an improvement over Pater 2001, where an *NC̥ repair is predicted in, e.g. /tər+poto**ŋ**+**p**otoŋ/ [tərpoto**ŋ** **p**otɔŋ] 'to be cut into pieces'). Glide insertion repairs ONSET violations within ωs but not across prefix-ω boundaries due to CE (ʔ-insertion applies at the SENTENCE LEVEL; Cohn & McCarthy 1994).

Loanword specific prosody as minimal constraint re-ranking

Draga Zec, Cornell University
dz17@cornell.edu

In this paper we propose an analysis of loanword patterning in Standard Serbian characterized by an idiosyncratic distribution of pitch accents that departs from the native phonological system, yet is in no obvious way related to any of the donor languages.

Loanword classes that we focus on here emerge within the prosodic system of Standard Serbian, characterized by H(igh) tone and stress (Browne&McCawley 1965, Lehiste&Ivić 1986, Inkelas&Zec 1988, Smiljanić 2002). H is lexically governed and can occur on any syllable in a lexical form, while the occurrence of stress is predictable from the locus of H. Crucially, H and stress co-occur when H is on the initial syllable (1a), and occupy contiguous syllables in all other cases (1b). (Stress is designated by a vertical bar, and H tone by an *H* subscript on the TBU.)

(1)a. 'va$_H$tra ‘fire’, 'ja$_H$goda ‘strawberry’, 'pra$_H$vedan ‘just’, 'o$_H$morina ‘heat’

b. 'voda$_H$ ‘water’, ra'mena$_H$ ‘shoulders’, 'mara$_H$ma ‘scarf’, ru'kavi$_H$ca ‘glove’

We note two loanword specific prosodic classes: LClass A (2), in which H and stress invariably co-occur on the same syllable, and LClass B (3), in which stress falls on the syllable immediately preceding the H toned one only when that syllable is word initial (3a), otherwise, stress co-occurs with H (3b):

(2) LClass A: fre'kve$_H$ntan ‘frequent’, ade'kva$_H$tan ‘adequate’, ambu'la$_H$nta ‘clinic’

(3) LClass B: a. 'stude$_H$nt ‘student’, 'promo$_H$cija ‘promotion’, 'dikta$_H$tor ‘dictator’

b. asi'ste$_H$nt ‘assistant’, inves'ti$_H$cija ‘investment’, provo'ka$_H$tor ‘provocateur’

In the proposed OT analysis (following Zec&Zsiga 2017), the standard pattern is prosodically circumscribed by three undominated constraints, which insure the faithfulness of lexical H (4), the trochaic foot shape (5), and the inclusion of lexical H in the head foot (6):

(4) IDENTHIGH Correspondent tones must be identical. (5) FOOTFORM: TROCHEE (syllabic)

(6) HDPROSWD/H: The foot that corresponds to the head of the prosodic word contains H.

Among the dominated constraints, (7) and (8) regulate the locus of H within the foot. Co-occurrence of H and stress is penalized by (7), and their separation is penalized by (8). Constraint (9), here non-gradient (Kager 2005), captures the unmarkedness of word initial stress.

(7) *HD/H Foot head may not be associated with H.

(8) *NONHD/H Foot non-head may not be associated with H.

(9) ALIGNPRWD/LEFT Align the left edge of a prosodic word with the left edge of a foot.

With the ranking in (10), *NONHD/H is violated in forms with non-initial lexical H (1b), and *HD/H is violated in forms with initial H (1a) (in order to avoid violating one of the undominated constraints). ALIGNPRWD/LEFT, violated in forms with non-initial stress, does not affect the overall outcome.

(10) HDPROWD/H, IDENT-H, TROCHEE >> [*HD/H >> *NONHD/H >> ALIGNPRWD/LEFT]

Significantly, the two loanword patterns emerge from a factorial typology of the dominated (boxed) constraints in (10), which yields six rankings, and three co-phonologies, as in (11).

(11) Three co-phonologies: (i) = Standard Serbian; (ii) = LClass A; (iii) = LClass B

(i) *HD/H>>*NONHD/H>>ALIGNPRWD/LEFT; *HD/H>>ALIGNPRWD/LEFT>>*NONHD/H; ALIGNPRWD/LEFT >> *HD/H >> *NONHD/H

(ii) *NONHD/H >>*HD/H >>ALIGNPRWD/LEFT; *NONHD/H>>ALIGNPRWD/LEFT>>*HD/H

(iii) ALIGNPRWD/LEFT >> *NONHD/H >> *HD/H

While in both loanword classes *NONHD/H outranks *HD/H, imposing the co-occurrence of H and stress, the ranking of ALIGNPRWD/LEFT in LClass B further occasions their separation.

To conclude, the two loanword patterns presented here both depart from the standard system, but do so by virtue of exploiting system internal potentials for minimal constraint re-rankings.

On the Acquisition of European Portuguese Liquid Consonants by Chinese Learners

Chao Zhou[1], *Maria João Freitas*[1] *& Adelina Castelo*[2,1]

[1]University of Lisbon, Centre of Linguistics / [2]Macao Polytechnic Institute

zhouchao@campus.ul.pt, joaofreitas@letras.ulisboa.pt & adelina.castelo@ipm.edu.mo

The acquisition of non-native liquid consonants has been a topic under discussion in L2 speech research (Aoyama et al., 2004; Brown, 1998; Face, 2006, Colantoni & Steele, 2007, among many others). Despite the references showing the difficulties exhibited by Chinese learners acquiring these segments in European Portuguese (EP) (Batalha, 1995; Espadinha & Silva, 2009; Martins, 2008; Nunes, 2015; Oliveira, 2016), as far as we know, no previous work has systematically analyzed the L2 acquisition of EP liquids.

According to Mateus et al. (2016), EP shows four liquids, /l/ (phonetically realized as [l] in onset singletons and clusters, as [ɬ] in codas), /ʎ/ (singletons), /ɾ/ (singletons, onset clusters or codas), and /ʀ/ (singletons, mostly produced as fricatives [ʁ], [χ] and [x]; Rennicke & Martins, 2013; Rodrigues, 2015). Meanwhile, Mandarin Chinese (MC) only exhibits /l/ (singletons) and /ɻ/ (singletons and codas) (Duanmu, 2005; Lin, 2007) in its segmental inventory.

This study examined the production of EP liquids by fourteen B1 level MC speakers through a picture naming task eliciting the target segments in all possible syllable and word-level positions; phonetic transcriptions were performed by 3 researchers and acoustic analysis was undertaken to assist the transcription of non-native productions.

The results, discussed in the light of the relationship between segmental and prosodic levels (Nespor & Vogel, 2007), show that, in the interphonology of these learners: /l/ is stable in singletons (100% target-like) due to the positive transfer from MC. However, it is very often vocalized in codas (only 16.7% target-like production, [ɬ]), which might be attributed to a phonetically based tendency (Borowsky, 2001; Graham, 2017; Recasens, 1996). The high accuracy (97% target-like) of /l/ in onset clusters, an absent structure in the L1, can be the result of the heterosyllabic nature of EP obstruent-liquid sequences (Veloso, 2006) or of the association of two segments to a single skeletal position, which was also argued as an intermediate stage in EP L1 acquisition (Freitas, 2003). /ʎ/ is still under acquisition (52.4% target-like), and is produced as a L1 category [lʲ], due to the acoustic and the articulatory similarity between [ʎ] and [lʲ]. As for /ɾ/, it is not acquired in onsets (39% target-like in singletons, 51.2% in clusters), because the participants fail to notice the difference between /ɾ/ and /l/; the fact that the feature [±lateral], which serves to distinguish /ɾ/ from /l/ in EP (Mateus & Andrade, 2000), is redundant in CM may account for this failure. Nevertheless, /ɾ/ is accurately produced in 69% of the cases in coda. We argue that the relatively high accuracy is driven by the input's phonetic properties, namely the consistent production of target coda /ɾ/ by native EP speakers, as opposed to onset /ɾ/ (Zhou et al., submitted). This input consistency in coda may thus contribute to an early categorization of /ɾ/ in this syllable position; /ʀ/ is already acquired (81% target-like), and this may be due to the fact that MC learners are sensitive to its fricative nature and thus realize it as [x], which is available in MC's inventory. Our results demonstrate that not all L2 segments are equally difficult for non-native learners and that it is crucial to adopt a phonetically based phonological approach to understand the acquisition of L2 phonological categories.

The Gradience of Ghosts: An Account of Unstable Segments

Eva Zimmermann, University of British Columbia
Eva.Zimmermann@uni-leipzig.de

Main Claim Ghost segments are best analysed as weakly active elements. This account predicts that 1) both phonological and lexical factors can contribute to the realization of a ghost element and 2) that ghost segments only gradiently contribute to markedness if they surface.

Ghost segments Ghost segments alternate with zero and only surface if their realization either solves a markedness problem or does not create a new markedness problem (Archangeli, 2011). An example for the former type can be found in *Catalan* (Bonet et al., 2007) where for masculine nouns, an /u/ is realized to avoid a sibilant cluster (vs. regular epenthetic /ə/). In addition, an arbitrary class of masculine nouns always surface with this additional /u/, independently of any markedness. The masculine suffix can hence be analysed as a ghost segment /u/ that only surfaces if it avoids a marked structure or receives lexical support from certain nouns.

An example for the second type of ghost segments is found in *Ahousaht* (Kim, 2003*a*,*b*) where certain suffixes begin with consonants that only surface post-vocalically (1). The non-realization of the unstable consonants thus avoids a marked structure: a coda for (C)V-suffixes (1-a: */tɬ'isqumɬ/) and a complex coda for (C)CV-suffixes (1-b: */k^{w}iskɬaː/). Both structures are possible outside the context of ghost consonants in Ahousaht.

(1)	V__	C__
a. /–(q)umɬ/ 'round'	ʔatɬa–qumɬ	tɬ'is–umɬ
b./–(k)ɬaː/ 'to be called'	ʔu–kɬaː	k^{w}is–ɬaː

Analysis Under the assumption of Gradient Symbolic Representations, phonological elements can have different degrees of presence in underlying representations, expressed as numerical activities (Smolensky and Goldrick, 2016; Rosen, 2016). Deletion of a weakly active element hence does not violate MAX to the same degree as deletion of a fully active element does. Together with the assumption of Harmonic Grammar (Legendre et al., 1990), gradient activity predicts the typology of unstable segments. The /–u/ in *Catalan* is taken to be weakly active and hence only realized if it reduces markedness violations or receives additional lexical activity. The latter is taken to be another weakly active /u/ in the representation of those nouns that always surface with /u/. These two weak elements can then coalesce in order to pass the realization threshold. The weak consonants in *Ahousaht*, on the other hand, are only realized if they do not cause further markedness violations. Since MAX is only violated by -0.5 if a weakly active segment remains unrealized, this deletion is the preferred option to avoid a coda (cf. (2)) or coda cluster. Under the new assumption that elements can retain their weak activity in the output, a ghost segment only violates markedness constraints gradiently (-0.5x*COD in (3)). The asymmetry that ghost segments are avoided if they would 'push' a base segment into the coda (2) but are realized if they end up as coda themselves (3) hence straightforwardly falls out.

(2) */–(C)V/: Coda avoided*

tɬ$_1$i$_1$s$_1$–q$_{0.5}$u$_1$m$_1$ɬ$_1$	MAX 20	*COD 14	
a. tɬ$_1$i$_1$s$_1$.q$_{0.5}$u$_1$m$_1$ɬ$_1$		-2	-28
☞ b. tɬ$_1$i$_1$.s$_1$u$_1$m$_1$ɬ$_1$	-0.5	-1	-24

(3) */–(C)CV/: Coda tolerated*

ʔ$_1$u$_1$–k$_{0.5}$ɬ$_1$aː$_1$	MAX 20	*COD 14	
☞ a. ʔ$_1$u$_1$k$_{0.5}$.ɬ$_1$aː$_1$		-0.5	-7
b. ʔ$_1$u$_1$.ɬ$_1$aː$_1$	-0.5		-10

Alternative accounts Both the interaction of phonological and lexical support for ghost segments (=Catalan) and the gradient markedness of ghost segments (=Ahousaht) cannot be analysed under the assumption that unstable segments are phonologically defective and lack, for example, a segmental root node (Archangeli, 1983, 1991; Hyman, 1985; Szypra, 1992; Zoll, 1998, 2001) or that there are listed allomorphs for those morphemes (Bonet et al., 2007). In Ahousaht, the constraint preferring non-realization of the unstable segment (e.g. DEPROOTNODE under a defectivity account or PRIORITY under an allomorphy account) must be ranked/weighted above NOCODA for (1-a) but below NOCODA for (1-b) – a ranking/weighting paradox emerges.

Poster papers

k͡t and g͡d in English: Evidence for Coronal-Velar Stops

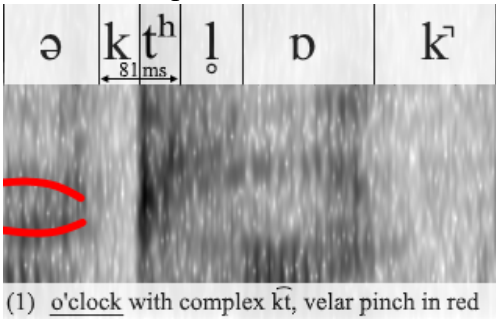
Samuel Andersson, samuel.j.andersson@gmail.com, Yale University

Introduction I aim to show that there is phonological and acoustic evidence for doubly-articulated coronal-velar stops k͡t, g͡d as allophones of /k, g/ in some British Englishes. This type of double articulation was previously attested only in clicks (Ladefoged and Maddieson 1996). Within Evolutionary Phonology (Blevins 2004, 2006, et seqq.), I suggest that coronal-velars arose from misperception (CHANGE) and reanalysis (CHOICE) of other realizations of /kl, gl/ clusters, such as [kl, gl] and, importantly, [tl, dl] (Blevins and Grawunder 2009, henceforth BG). Strikingly, one also finds /kl/ realized as [ᵏǁʰl]. A voiceless aspirated lateral click is formed due to overlap between coronal and velar movements for [k͡tl] (cf. Fuchs, Koenig, and Winkler 2007). The implications for phonological typology are discussed.

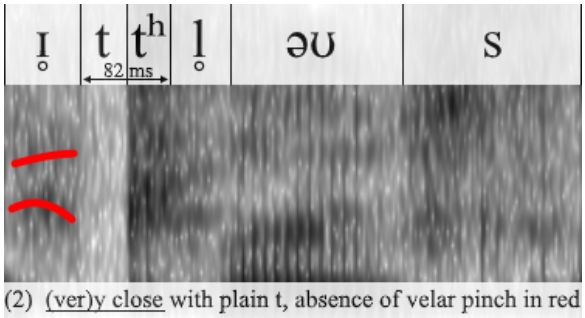
Data BG show that the pronunciations [tl, dl] for [kl, gl] used to be widespread in the UK and the US, and list perceptual and articulatory factors favoring coronals in this environment. Both sets of variants are attested in a corpus of 2017 recordings of BBC sports commentators from England, Scotland, Northern Ireland, and Ireland.[1] A pool of variation including velar and coronal tokens has led to the innovation of a third variant: some tokens with coronal release have a preceding velar constriction. (1) shows [ək͡tlɒk] *o'clock*, with a characteristic 'velar pinch' on the [ə] (cf. (2)). Phonologically, /n/ can assimilate to [ŋ] before coronal-velars: [faɪŋ k͡tlɒθs] *fine cloths*. Preliminary analysis suggests that the duration of these consonants is comparable to that found for plain stops (see (1-2)), and they only show a single release burst (see (1)), supporting an interpretation with complex segments k͡t and g͡d.

Clicks Overlapping coronal and velar gestures at word boundaries are known to give rise to weak clicks in several languages (see Fuchs et al. 2007 and references therein). In the present dataset, the clicks resulting from such overlap are very salient acoustically. I attribute this to the high degree of overlap between coronal and velar gestures in k͡t, as compared to the overlap in the sequences like …k#t… studied by Fuchs et al. (2007). There is no need, then, for a phonological process turning /k/ into [ᵏǁʰ]. Acoustically salient clicks are otherwise never used linguistically "in any ordinary languages outside of Africa" (Ladefoged and Maddieson 1996: 246), and virtually nothing is known about their origins (Blevins 2004: 194-197). Although the English [ᵏǁʰ] has not been phonologized, the data show the necessary preconditions for a regular sound change creating clicks from non-clicks.

Conclusions The work reported here argues for the existence of k͡t and g͡d in varieties of English. The phonetic implementation of these stops sometimes involves acoustically salient clicks, which are also vanishingly rare crosslinguistically. Without these varieties of English, we would have no evidence for (pulmonic egressive) coronal-velars as a possible segment type, and no evidence for non-clicks becoming clicks as a possible alternation. This case illustrates a more general point: the absence of a property in the languages currently known to linguists need not imply that this property should be ruled out by Universal Grammar, nor that theories which predict it to exist must be restricted for reasons of overgeneration.



(1) o'clock with complex k͡t, velar pinch in red



(2) (ver)y close with plain t, absence of velar pinch in red

1 Diagnostic criteria for coronals were taken from BG, and include spectral properties of the release burst, and auditory impression. In addition to this, formant transitions on the preceding vowel were used.

Patterns of *s*-retraction in Manchester English: Investigating categoricity with ultrasound

George Bailey & Stephen Nichols, University of Manchester
{george.bailey, stephen.nichols} @ manchester.ac.uk

This investigation of Manchester English (McrE) uses ultrasound tongue imaging to examine the articulation of *s*-retraction in /stɹ/ and /stj/ clusters. Our results reveal inter-speaker variation with respect to whether retraction in these environments is gradient or categorical in nature.

S-retraction is comparatively under-studied in British English and work has relied solely on acoustic data (e.g. Bass 2009, Sollgan 2013). Ultrasound enables us to ascertain a better articulatory picture; this is especially important given that the same acoustic signal can be achieved through different articulatory means (e.g. Mielke et al. 2017 on covert articulation of /ɹ/).

In contrast, it is relatively well-studied in American English (AmE; e.g. Durian 2007, Gylfadottir 2015, Wilbanks 2017), where it has been argued that retraction is triggered non-locally by /ɹ/ (Shapiro 1995). These studies have also principally been based on acoustic data, with the notable exception of ultrasound studies by Mielke et al. (2010) and Baker et al. (2011).

However, our results suggest that, in McrE, /ɹ/ is not the direct cause of retraction, nor is it the only indirect source due to comparable behaviour in /stj/, a cluster notably absent in these contexts in AmE. Although we find inter-speaker variation with respect to the gradience or categoricity of retraction, /stɹ/ and /stj/ appear to pattern together.

In this study, articulatory data were collected using ultrasound tongue imaging alongside audio recordings. Five repetitions of each target word were elicited in a carrier sentence. The stimuli were all monosyllabic with target segments in word-initial position and were balanced for the following vowel (/i: u: ɒ/), with the exception of /stj/, which only occurs before /u:/ and for which two target words were disyllabic (*student, stupid*). Distractor items began with /s/, /ʃ/, /st/, /tʃ/, /tj/, /tɹ/ and /ɹ/. The /s/- and /ʃ/-initial words were used to gauge the degree of retraction in target clusters.

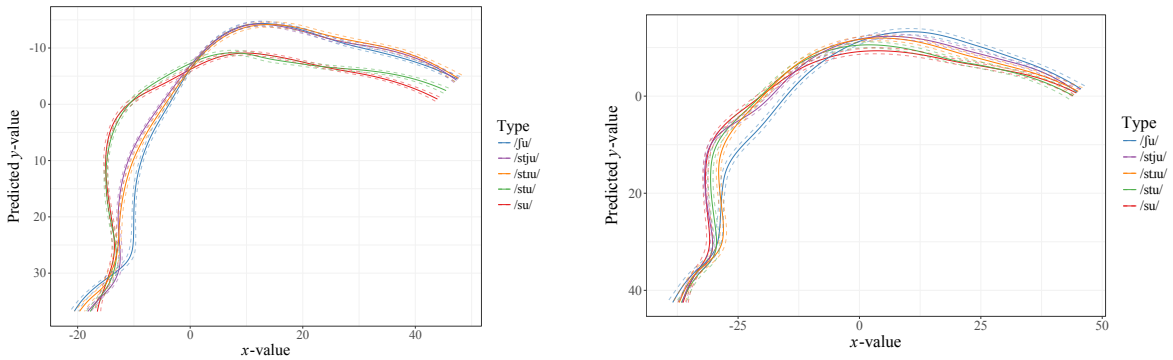


Figure 1: SS-ANOVAs for M01 (left) and F01 (right)

Results from 6 subjects (2M, 4F; aged 18–26; mean age 22) reveal inter-speaker variation; speakers fall into two broad groups, as illustrated by the SS-ANOVA curves in Figure 1. Some speakers exhibit categorical retraction in /stɹ/ and /stj/ contexts in addition to gradient retraction in /st/, while others exhibit only gradient retraction in /stɹ/ and /stj/ and no retraction in /st/. In the latter pattern, retraction is actually more advanced in /stj/ than /stɹ/, which we suggest stems from the coalescence of underlying /tj/ and the categorical nature of the palatalisation to [tʃ].

The fact that all speakers, whether gradient or categorical, produce retraction for /stɹ/ and /stj/ shows that the explanation for *s*-retraction in AmE is not applicable to McrE. Rather than /ɹ/ being the direct trigger (see Baker et al. 2011), we instead suggest that both /ɹ/ and /j/ trigger affrication of the preceding /t/, which in turn causes retraction of /s/.

Future work will also examine word-internal /stɹ/ and /stj/ clusters as well as the effects of word and morpheme boundaries and other factors such as speech rate.

Bidirectional learning explains tone typology

Jeroen Breteler & Paul Boersma × *University of Amsterdam* × *j.m.w.breteler@uva.nl*

Introduction In many tone languages, tone spreads or shifts. We collectively refer to this as "tonal reassociation" (TR). Previous work by the first author developed a constraint-based analytical framework for TR patterns. The analyses use foot structure; feet act as tone licensors, causing tone to reassociate to footed positions (Kang 1997). The framework successfully accounted for attested TR patterns, but also generated some types of unattested patterns. Here, we continue this research by involving learnability simulations.

Studying the learnability of TR is a worthwhile technical challenge, and one that has not been the subject of any previous work. TR patterns can be highly complex (Jardine 2016); surface forms often differ starkly from their corresponding lexical forms, and neutralization is common. In addition, in our foot–tone framework, learners have to deal with structural ambiguity both in terms of feet and autosegmental structure. A second motivation in this study relates to TR typology. If attested TR patterns are favored in learning over unattested patterns, then the overgeneration of the foot–tone framework can be explained away by learnability (Boersma 2003; Staubs 2014; Stanton 2016).

Methods We have used the online, error-driven Gradual Learning Algorithm (GLA, Boersma & Hayes 2001). We ran 100 learning trials for each of 11 patterns (5 attested, 6 unattested). We kept much of the representational structure *hidden*; virtual learners were presented with adult example pairs of a "meaning" form containing only some morphological information, and an impoverished surface phonological form. Learners had to decide themselves about all surface and lexical structure for both tones and feet (Apoussidou 2007).

Findings TR patterns are learnable: an average of 78% of virtual learners converged successfully for the attested patterns. The learnability results also fit with typology: the average convergence rate for unattested patterns was only 23%. Interestingly, the learning success and the typological fit depend crucially on our use of two underexplored choices in online, error-driven learning simulations: *bidirectional error detection* and *harmonic bounding avoidance*.

Bidirectionality In previous literature, the learner typically only updates its grammar when it has found an error in its production-direction behavior. In our approach, errors from the *comprehension* direction are also used for learning (Boersma 2011). This *bidirectionality* of error detection is crucial; using only production errors, the success rate for attested patterns falls from an average 78% to 38%, while unattested patterns don't have a major change in average rates, meaning that the overall typological fit of the results is also weakened. We also tested learning using only comprehension errors (Hamann et al. 2009). This resulted in a 0% success rate for all patterns. This shows that there is added value in considering errors in both directions in tandem, and that bidirectionality is key to learning success and typological explanation.

Harmonic bounding Another crucial choice is that we did not include production-direction harmonically bounded candidates in GEN. We term this "harmonic bounding avoidance". Simulations with a GEN that does include all candidates show a dramatic 62% pt drop in average success rate for the attested patterns, and a 12% pt drop for unattested ones.

Conclusion We have shown that foot-based analyses of a class of complex tone patterns are learnable, even when lexical and surface phonological structure are hidden. In addition, we have enhanced the typological account of the foot-based framework by showing that similar analyses for a class of representable but unattested tone patterns are not learnable. Methodologically, our results have revealed the importance of bidirectional error detection and harmonic bounding avoidance.

Sound change as a function of experimental setting: methodological and theoretical issues

Karolina Broś, University of Warsaw
k.bros@uw.edu.pl

According to the lifecycle of phonological processes (Bermúdez-Otero & Trousdale 2012), phonological innovations go through a series of stages, from spontaneous phonetic changes, through cognitively controlled processes to full-fledged phonological rules applied in specified domains. This can be observed synchronically in cross-dialectal variation. Also, some speakers may present more advanced changes compared to other speakers of the same variety. In this study, however, I analyse different stages of ongoing language change presented by **the same speakers** that do not happen at random, but rather as a function of the modality they use. This is of importance as variable realisations of the same sounds by the same speakers governed by circumstances show sound change in progress and inform about the current/established outputs vs. the outputs the dialect is transitioning to. Moreover, the circumstances in which variation is observed give us insight into an issue that has been largely neglected in phonological investigations: the way our data gathering methodology affects our observations and analyses.

The data are based on the speech of 6 native speakers of Canarian Spanish whose spontaneous productions were recorded during interview-based fieldwork. A few months later, the same speakers took part in a controlled experiment consisting of a repetition and a reading task. Not surprisingly, speakers present a more radical version of consonant weakening in spontaneous productions, yet the differences are not random but structured in accordance with the well-known lenition patterns, and systematic between the two modalities. First, when repeating sentences, speakers produce coda *s* weakening to [h] inside words and across word boundaries before vowels and voiceless, but not voiced, consonants. *S* is deleted before voiced consonants. In spontaneous speech, *s* is elided before all consonants and pauses. Two other processes are involved. Unlike in other varieties, approximantisation of voiced stops only takes place after vowels and not after continuant consonants in phrase phonology in Canarian. Even more surprisingly, in the controlled setting, /b d g/ do not become [β ð ɣ] when preceded by an *s*-final word even though the *s* is deleted. In spontaneous speech, approximantisation **does** apply in the same context. Thus, deletion acts as a blocker of the change in controlled speech, but not in unconstrained productions. At the same time, advanced degrees of approximantisation are not suppressed in other contexts so the blocking is not a result of more careful pronunciation in general. Rather, it is a domain-specific effect that affects word edges in phrase-level phonology. The third process, postvocalic voicing, fails to apply in spontaneous speech when the *s* of the preceding word is deleted, which is an exact parallel of what we observe with approximantisation in controlled speech. All the above observations enable us to draw a cycle of events which supports Bermúdez' lifecycle hypothesis, esp. phonologisation effects.

The analysis of the dialect needs to include the (systematic) variation across modalities, opaque weakening across word boundaries (before vowels) and the curious blocking behaviour of deleted segments. The latter problem requires turbidity (Goldrick 1998) in conjunction with a stratal approach. The proposed Stratal OT account is based on a coda condition against *s* restricted by ONSET (no deletion before vowels), with debuccalisation at the word level and deletion allowed at the phrase level. The restriction on the deletion patterns is governed by a high-ranked CC AGREEMENT constraint for voicing, which accounts for the discrepancies between segments preceding [p t k] and [b d g]. This restriction competes with a different constraint ranking that promotes deletion everywhere but before vowels (demotion of MAXSEG), as well as the extension of the context of approximantisation beyond post-vocalic position. The blocking effect on both [β ð ɣ] formation and [p t k] voicing results from the pronunciation vs. projection relations between inputs and outputs governed by RECIPROCITY constraints. The intra-speaker variation is understood as a competition between different co-phonologies (with partially unranked constraints) reflecting sound change in progress.

MFM abstract – Productivity of Minor Syllables in Burmese

Dan Cameron Bugdorf
Cornell University, dcb275@cornell.edu

Burmese is often described as sesquisyllabic, but in some respects, it doesn't fit the profile. Sesquisyllabic languages have distinct major and minor syllables, where the latter have restricted phonological forms and must occur attached to the left of a major syllable, forming a distinctive word shape. Minor syllables in Burmese are toneless and restricted to the form /Cə/, such as in /tʰə.mí:N/ "rice." However, words frequently contain multiple adjacent minor syllables (/ɟə.tə.na:/ "treasure," /tʰə.mə+ɟe:/ "rice water"), and major syllables can be reduced to minor ones in certain contexts, including in compounding as above. Previous accounts (notably Green 2002) have concluded that whether and how compounds reduce must be lexically specified, but I make the claim that reduction is productive, prosodically motivated, and partially predictable.

I depart from previous analyses in positing a three-way weight distinction in syllables, where high and level tone syllables are bimoraic, creaky and checked tone are monomoraic, and minor syllables are nonmoraic, which I justify with a consideration of vocalic material and duration in native speaker pronunciations. I find that compounds of some shapes (e.g. μμ+μ) are very likely to reduce, while other shapes (μ+μμ, μ+μ) don't, and posit that Burmese uses iambic feet to which minor syllables contribute sub-mora weight. Using Optimality Theory as a formal framework, an analysis is given in which conflict between faithfulness (non-reduction) and a preference for exactly one well-formed foot per (minimal) prosodic word characterizes the distribution of reduction in compounds.

		Reduced	Unreduced	
(1)	(a) ŋá:+ʔu̯ →	(ŋə.ʔu̯)	*(ŋá:).ʔu̯	fish+egg = fish spawn
	(b) ŋá:+tɕaʊʔ →	(ŋə.tɕaʊʔ)	*(ŋá:).tɕaʊʔ	fish+dry = dried fish
	(c) nwá:+mą̰ →	(nə.mą̰)	*(nwá:).mą̰	cow+F = female cow
	(d) tɕɛʔ+ʔu̯ →	*(tɕə.ʔu̯)	(tɕɛʔ.ʔu̯)	chicken+egg = chicken egg
	(e) tɕɛʔ+θá: →	*(tɕə.θá:)	(tɕɛʔ.θá:)	chicken+meat = chicken

In (1a-c), the unreduced form of the input, which can't be well footed, is ungrammatical; in (1d-e), the unreduced form makes a well-formed iambic foot, and reduction is ungrammatical.

In addition, morphological structure and part of speech also influence reduction, with reduction very common in noun compounds but not in verbs. Alternations like the following, however, show that morphology, like lexical specification, is not a sufficient explanation:

(2)	(a) wó:N.kwɛ́:+ə.mą̰ →	(wó:ŋ).(kwɛ́:).(ə.mą̰)	cousin+older.sister
	(b) wó:N.kwɛ́:+ɲi:.mą̰ →	(wó:ŋ).(wə.ɲi:).mą̰	cousin+younger.sister

Other patterns of reduction and their interaction with syllable structure are also examined, including a very common reduction whereby minor syllables collapse into onset clusters for the following major syllable. Overall, though roots may be lexically specified as containing a minor syllable in the first place (like /tʰə.mí:N/ "rice"), much of the syllable structure of Burmese can be modeled and predicted with productive constraints.

What's wrong with being a rhotic?

Alex Chabot
Université Côte d'Azur
alexander.chabot@etu.unice.fr

This talk explores the phonological unity of the class of segments known as rhotics. Cross-linguistically as much as in individual languages this is a set of segments which function as a phonological class but don't share any clear phonetic qualities (Lindau 1985; Ladefoged & Maddieson 1996; Hall 1997; Walsh Dickey 1997; Scobbie 2006; Wiese 2011). Indeed, the class of rhotics exhibits extraordinary phonetic variability, encompassing a wide range of articulatory diverse sounds. The literature has documented (at least) the following phonetic realizations of rhotics cross-linguistically: [ʋ ɻ̊ r ɾ̊ ɾ ʃ ʒ ɻ̝ ɹ̝ ɽ̊ ʂ ʐ ɻ̊˔ ɻ˔ x ɣ ɯ̟ ʁ̞ ʁ χ ʁ h ɦ]. Variation within a single language can also be extensive. Brazilian Portuguese is an example of such a language showing a particularly intricate pattern of rhotic allophone variation with a relatively large number of phonetically disparate allophones, including [ɾ h ɦ χ ɣ ɻ] (Cristófaro Silva 1998), with most dialects showing variation between three of these items.

This makes determining a phonetic correlate difficult. For that reason, conversely, identifying a segment as a rhotic in an unknown language is not a trivial matter: in absence of reliable phonetic evidence the analyst must fall back on the behavior of segments in distribution and processing. In language with branching onsets for instance, rhotics are identified by their ability to constitute the second element of a branching onset. Hence in Polish [ʃ] in [pʃɛd] 'before' is a rhotic: this is supported by its diachronic identity and synchronic alternations. That is, often only a phonological analysis can reveal rhoticness; phonetic criteria are insufficient.

The talk identifies two properties that characterize rhotics cross-lingustically and are independent of phonetics. One is procedural stability: rhotics that are implicated in phonological processes can vary in a phonetically arbitrary manner without perturbing the process itself. The other is diachronic stability: the phonetics of rhotics can vary in diachronic evolution without provoking a realignment in the phonology.

A particularly telling process from Norwegian illustrates the fact that the phonetic realization of rhotics does not matter and has no bearing on their phonological identity or behavior. In standard Norwegian, [ɾ] causes a following obstruent to be realized as a retroflex: /bɑːɾ/ 'bare' +/-t/ NEUT → [bɑːʈ] (Stausland Johnsen 2012). However, in the Frogner dialect of Norwegian, the realization of the rhotic is [ʁ], which nevertheless causes the same retroflexion of following consonants: /fɑːʁ/ 'father' + /-s/ NEUT → [fɑːʂ] (Stausland Johnsen 2012) – there is no source of retroflexion on the surface, and L1 learners never hear a retroflex r. They infer from the fact that [ʁ] causes retroflexion that this uvular articulation is in fact a dental retroflex, phonologically speaking.

If the phonetic realization of rhotics is unpredictable and divorced from their phonological identity, it is hard to see how their relationship could be considered natural. That is, the behavior of rhotics shows that languages are happy to instantiate an arbitrary phonetics-phonology relationship. If this is true for rhotics, then it may be true for all of phonology. Hence rhotics provide support for the view of substance free phonology (Hale & Reiss 2008; Blaho 2008; Iosad 2012) whereby phonological objects are devoid of any reference to phonetic categories.

The arbitrary relationship between phonological items and their phonetic realization can be understood by an interface setup that relates the output of phonological computation, i.e. on the grounds of listed correspondences (such as r ↔ [ʃ] in the Polish example). The two terms of a lexical entry are by nature arbitrary, as in the case of the interface between syntax and phonology where the output of morpho-syntactic computation is converted into a phonological string through a lexical access called vocabulary insertion (e.g. past tense ↔ -ed).

Phonological impacts on phonetic variation: vowel harmony and V-to-V coarticulation

Jenna Conklin & Olga Dmitrieva
jconkli@purdue.edu, odmitrie@purdue.edu
Purdue University

When phonetic and phonological processes compete for the use of phonetic cues, phonetic variation can be suppressed, as has been shown for nasalization in French (Cohn, 1990) and stop consonant voicing, pitch, and tone in Cantonese (Francis, Ciocca, Wong, & Chan, 2006). It has been argued that phonetic variation is suppressed in order to preserve phonological contrast. For example, by reducing coarticulatory nasality in vowels, French maintains contrast between oral and nasal vowel phonemes (Cohn, 2007). The present study is concerned with the interaction between phonological vowel harmony and its gradient phonetic counterpart, vowel-to-vowel coarticulation, within a single language. While examination of coarticulation between harmonized vowels is impossible, some languages with vowel harmony have a well-established set of exceptional, disharmonic words. Such disharmonic words provide insight into the workings of coarticulation in harmonizing languages when harmony itself is not in force. On the one hand, disharmonic words might be expected to exhibit strong coarticulation in the same direction as vowel harmony, such that over time, vowel harmony would apply to these words as to the rest of the lexicon. On the other hand, disharmonic words may resist coarticulation in the direction parallel to harmony in order to maintain a phonological contrast between harmonic and disharmonic words in the language, even if the possibility of actual lexical confusion is low.

Beddor & Yavuz (1995) examined coarticulation in disharmonic words in Turkish and found that coarticulation on the harmonizing feature [back] proceeded primarily in the direction opposite that of vowel harmony in Turkish. This finding is compatible with the idea that the pressure to maintain phonological contrast between harmonic and disharmonic words in Turkish leads to suppression of phonetic variation. The present study builds on this result by investigating vowel-to-vowel coarticulation in Tatar, a Turkic language with left-to-right backness harmony and an established lexical sub-stratum of dishamonic words. Twenty native speakers of Tatar completed a sentence reading task with carefully chosen target words designed to detect coarticulation, and average differences between neutral and coarticulated stimuli were analyzed. Pilot results from one speaker demonstrate exclusively right-to-left backness coarticulation in disharmonic words, in contrast to the left-to-right harmony in harmonic items. These findings reflect Beddor & Yavuz's (1995) Turkish results and further support the hypothesis that coarticulation in the direction parallel to vowel harmony is suppressed in harmonizing languages.

A possible confounding factor, however, can explain both the Turkish and the Tatar results: stress. It has been suggested that stressed vowels are more resistant to coarticulation than unstressed ones (Majors, 2006). Word-final stressed vowels, like those found in Tatar and Turkish, may therefore trigger coarticulation in the leftward direction while inhibiting its rightward spread, especially if disyllabic stimuli are examined. In order to further examine the role of stress in vowel coarticulation, an acoustic investigation of coarticulation was conducted in Spanish, where stress can appear in a number of positions within the word. Non-word data were collected from 20 native speakers of Spanish and examined for right-to-left and left-to-right coarticulation in three combinations of stressed and unstressed vowels. The Spanish results confirmed that stressed vowels underwent less coarticulation than unstressed ones and provide partial support to the hypothesis that Turkish and Tatar coarticulation is due to the location of stress and not to the presence of phonological vowel harmony.

On diphthong formation and stress assignment

Thaïs CRISTÓFARO SILVA (UFMG, CNPq, FAPEMIG)
thaiscristofarosilva@ufmg.br

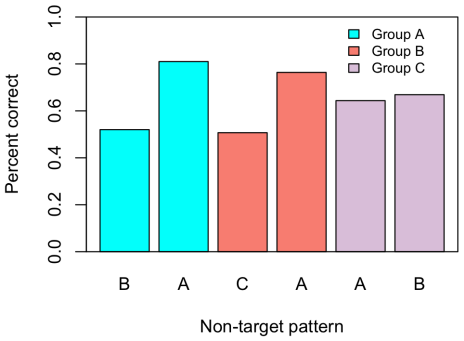
This paper discusses cases where high vowels may occur as glides when adjacent to another vowel in order to address the nature of stress assignment in Brazilian Portuguese (BP). In several Romance languages high vowels may be manifested as glides when adjacent to another vowel (MAROTTA 1993; VAN DER VEER 2006; MIRA MATEUS & PARDAL 2000). Stress has a close relationship to diphthong formation. In languages like Portuguese or Spanish primary stress can be final, penultimate or antepenultimate - *sábia* [ˈsabia] 'wise(fem)'; *sabia* [saˈbia] '(s/he) knew'; *sabiá* [sabiˈa] 'a type of bird' -, but stress cannot fall on the fourth-to-last vowel: *[ˈsaciada]. Penultimate stress is the most common pattern in BP. Any account to predict stress assignment has to assume that either antepenultimate stress or final stress is an ad hoc pattern (BISOL 2013, LEE 1997). It is assumed that stress assignment has access to syllable structure, but not to segmental material. In this paper we will examine diphthong formation and suggest that segmental material provides important information for stress assignment in BP. We will consider cases where high vowels are adjacent to each other and diphthongs may be formed. An interesting question to be posited when the adjacent vowels are both high vowels is: which one of the high vowels will be manifested as a glide and why it is so? Let us first consider cases which involve two adjacent high vowels where one of the vowels receive primary stress. When the sequence of vowels is (back+front) either a diphthong *ruiva* [ˈhujva] 'red haired' or a hiathus *ruído* [huˈidu] 'noise' may occur. When the sequence of vowels is (front+back) only a hiathus occurs *ciúme* [siˈumi] 'jealousy'. In fact, [íw] diphthongs are not allowed in BP unless word-finally in verbal morphology, as in *viu* [ˈviw] '(s/he) saw' or as cases of lateral vocalization *mil* /mil/ > [ˈmiw] 'thousand' or *silva* /silva/ > [ˈsiwva] 'Silva' (surname). Intervocalic glides may occur only with a palatal glide [j] and receive penultimate stress, as in *saia* [ˈsaja] 'skirt', although in loans a finally stressed vowel may be preceded by a palatal glide: *maiô* [majˈo] 'swimming costume'. Another restriction on intervocalic glides is segmental: no sequence of only high vowels such as *[ˈuju] or *[ujˈu] occurs whereas non-high vowels do: *meio* [ˈmeju] 'half' or *maiô* [majˈo] 'swimming costume'. In the cases we have just considered one of the adjacent high vowels were either stressed or occurred as an intervocalic palatal glide. Let us now consider a case with four adjacent high vowels. In the word *Tujutí* [tujuˈti] 'a school of samba' stress is final. Stress could not be penultimate, *[tujˈuti], as [ujˈu] is not allowed in BP. Antepenultimate stress would not be allowed as an [iw] diphthong would occur: *[tuˈiwti]. When we consider a word which presents five adjacent high vowels as *Tuiuiú* [tujujˈu] 'a kind of bird' stress is final. Stress could not be penultimate as [iw] diphthongs do no occur in BP: *[tujuˈiw]. Antepenultimate stress would present an *[ˈuju] sequence which is not allowed in BP: *[tujˈuju]. The data we presented suggest that adjacent high vowels interact with stress assignment on diphthong formation. Diphthongs formed by (back+front) high vowels are favoured whereas (front+back) high vowels diphthongs are restricted to verbs or cases of lateral vocalization. In a sequence of more than two high vowels segmental restrictions play an important role in defining stress assignment. This result suggests that segmental material provides important information for stress assignment in BP.

Markedness and the learning of non-native stress patterns: a language game

Megan J. Crowhurst, University of Texas at Austin, *mcrowhurst@austin.utexas.edu*
Laura R. Faircloth, University of Texas at Austin, *laura.faircloth1693@gmail.com*

A decades-long research programme in metrical phonology has delivered a well-articulated typology of stress patterns occurring in the world's languages and has informed theories of metrical markedness (e.g. Hayes 1980, 1995; Prince 1983; Halle & Vergnaud 1987; Kager 1992, 1993, *et seq*). Yet, in spite of this solid foundation, remarkably little research has studied the relationship between markedness and the learning of stress patterns. Some research has explored the markedness/learnability connection computationally (e.g. Stanton 2016). However, studies with human learners are scarce. In two recent studies, Carpenter (2010, 2016) demonstrated that adult native speakers of French and English were able to learn a natural (quality- or quantity-sensitive) stress pattern significantly better than an unnatural and highly unlikely stress pattern. However, *little to no research has investigated differences in how adults learn patterns which we believe to differ in markedness, but which are attested, familiar patterns in the stress typology*.

As a first step in addressing this gap, we conducted an experiment to explore English-speaking adults' ability to distinguish and learn patterns differing in the presence and location of a stress lapse. Five and seven syllable "words" were constructed for three target patterns. All stimuli had iterative stress with initial main stress. In pattern A, secondary stress fell on all odd syllables including the final (e.g. *bádegèdabègadà*). In pattern B the ultima was unstressed creating a final stress lapse (e.g. *bádegèdabègada*), and in pattern C, a stress lapse occurred after the initial syllable (e.g. *bádegedàbegàda*). The physical correlates of stress were higher pitch (primary vs nonprimary stress), duration and intensity. We take B to be least marked in this set. Pattern A, in which final stress implies a degenerate foot, *(báde)(gèda)(bèga)(dà)*, is marked relative to B if a degenerate foot is less harmonic than a non-exhaustive parse (as in B). We assume that pattern C is marked relative to B as final lapses are relatively common and initial lapses are not (on inspection of, e.g. Halle & Vergnaud 1987, Hayes 1995). Participants were assigned to one of three conditions with the hidden goal of learning one of the three target patterns, A, B or C. They heard 32 pairs of nonce words differing only in stress pattern. One in each pair matched the target pattern and the other, a non-target pattern. For example, group A subjects were tested on counterbalanced pairs with the structure AB, BA, AC, CA. Participants were told that they were learning words in a new language and that on each trial, they would hear a correct and an incorrect pronunciation of the same word. They were to indicate which they thought was the correct pronunciation. As subjects were learning "from scratch", there were no practice trials and subjects were instructed to pick either choice on the first turn. Subjects received visual "hit vs. miss" feedback after every trial to help them. The statistical analysis measures increases in accuracy over time for individual subjects and differences in accuracy across subjects in the A, B and C target learning conditions.



As the study is not yet complete, we must defer a report of statistical outcomes. The early results (figure to right) suggest that group A (cyan) and B (salmon) subjects perform with high accuracy against the initial lapse pattern C, but at near chance levels against the other left-to-right iterative pattern. Group C subjects (lilac) distinguish pattern C from A and B, but choose C as correct less often against A and B, as compared with the group A and B subjects' accuracy against pattern C. These early results suggest that patterns A and B both seemed natural and were learned with comparable ease, even though phonologists might classify A as more marked. Although the initial stress lapse in C was highly distinct (as confirmed by subject feedback), subjects were less willing to accept C as the correct pattern. A full report of results and interpretations will be made at the conference.

Strength of morphophonological generalizations: consonant mutations in Polish

Bartłomiej Czaplicki, University of Warsaw, bczaplicki@uw.edu.pl

I provide evidence supporting construction-based sublexicons (Anttila 2002, Inkelas 2014) and morphophonological schemas extracted from them (Bybee 2001, Becker & Gouskova 2016). In contrast to SPE-style rules, schemas exhibit various strength depending on the frequency of use and on their confidence scores (calculated on the basis of the number of words in which they apply and the number of words in which they are applicable – hits/scope, Albright & Hayes 2002), they refer to arbitrary and morpheme-specific classes of segments (Gussmann 2007, Mielke 2008) and their impact is continuously mediated by paradigm uniformity pressures (Steriade 1999). Supporting material comes from selective elimination of consonant mutations in Polish. Two patterns from Polish are analyzed: a low-frequency pattern – agent nouns in *-ista* and a high-frequency pattern – diminutives in *-ek* (1 ÷ 11; calculations of frequency based on dictionary and corpus searches).

-ista [s z n]	teni[s] 'tennis' pla[n] 'plan'	teni[ɕ-ist-a] 'tennis-player' pla[ɲ-ist-a] 'planner'			**mutations**
-ista [t d r]	fle[t] 'flute' balla[d]-a 'ballad'	fle[tɕ-ist-a] 'flautist' balla[dʑ-ist-a] 'ballad writer'	Bonapar[t]-e propagan[d]-a 'propaganda'	bonapar[t-ist-a] 'supporter of B.' propagan[d-ist-a] ~ propagan[dʑ-ist-a] 'propagandist'	**mutations/ no mutations/ variation**
-ek [k g x]	kro[k] 'step'	kro[tʂ-ɛk]			**mutations**

The distinct behavior of words in *-ek* and *-ista* finds an explanation in their different type frequencies: the pattern with a lower frequency is less stable. The different behavior of base-final [s z n] and [t d r] within the *-ista* pattern is dependent on paradigm uniformity effects, manifested as the featural similarity of mutated consonants to their base correspondents, [±strident]. In addition, whether a particular derivative in [t d r] shows mutations, no mutations or variation depends on its token frequency, $U = 356.00$, $z = -2.308$, $p < .05$.

As part of an experiment probing native speaker intuition, 61 subjects were asked to form nonce words in *-ista*. Their responses were compared to the data drawn from a dictionary. The table below provides the percentages of words with mutations for [t d r] and [s z n] in the dictionary and in the experiment. All the analyzed base-final consonants show a reduction in the number of mutations in the experimental results, compared with the dictionary. These findings point to the continuous impact of paradigm uniformity (base-derivative correspondence).

% of words with mutations	t	d	r	s	z	n
dictionary	38	46	35	100	100	100
experiment	9	7	16	59	46	95

In the formalization of the analysis, schemas, which are ranked based on the frequency of the morphological pattern they encode, are interspersed with paradigm uniformity constraints ($\text{IDENT}_{[\text{feature}]\text{O-O}}$). In this way, the stability of a pattern goes hand in hand with its frequency: *-ek* vs. *-ista*. The greater stability of some particular words (maintenance of mutations) than comparable others is promoted by their high token frequency and the constraint USELISTED, which enforces the use of stored representations, as opposed to their generation from component elements (Zuraw 2000).

Prosodic boundaries in Vietnamese continuous and discontinuous noun phrases

Sarah Duong Phu, Goethe University of Frankfurt, sarahduongphu@outlook.com

Since Vietnamese is an isolating language, word order plays an important role in identifying the function of a particular word. Yet, in some contexts SVO word order may be flexible especially in the case of special information structural settings. Discontinuous noun phrases constitute a specific case of word order change in Vietnamese. In (1) the head noun *cam* 'orange' is separated from the numeral classifier complex: the fronted noun takes the role of a contrastive topic and the numeral classifier complex is the focus. This word order is contrasted to the canonical word order in (2) where the noun *cam* 'orange' appears after the classifier. This sentence does not require a special information structural setting, but is uttered in a context of all-sentence focus.

(1) Cam tôi mua hai trái.
orange I buy two CLF
'I buy two oranges.'

(2) Tôi mua hai trái cam.
I buy two CLF orange
'I buy two oranges.'

I have conducted a read-speech experiment with 6 female speakers from the Southern dialect[1] in order to find out whether there are prosodic or intonational effects in a comparison between continuous (unmarked word order) and discontinuous noun phrases (marked word order) in Vietnamese. Adding together mean durations of 5 classifiers (with 5 different tones)[2] in continuous and discontinuous context, it turns out that the classifiers are significantly longer ($p<0{,}001$, ANOVA calculation) in the case of discontinuous noun phrases (see figure 1) and that the rising tone (*sắc*) is clearly articulated as rising. In the case of continuous noun phrases the duration of the classifier is significantly shorter ($p<0{,}001$, ANOVA calculation) and a classifier with rising tone may lose its rising property.

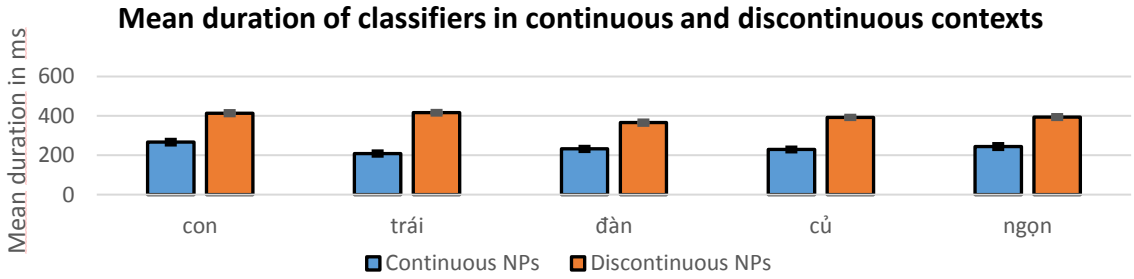


Figure 1

I assume that in Vietnamese there is generally a correspondence between syntactic and prosodic structure as in Selkirk (2011) and Féry (2017). This means that for example the DP *hai trái cam* 'two oranges' (two CLF orange) is matched by a prosodic phrase, thus (hai trái cam)$_\Phi$. However, when the noun *cam* 'orange' is separated from the numeral classifier complex the noun and the classifier form a prosodic phrase on their own: (hai trái)$_\Phi$. It can thus be concluded that intonation effects in Vietnamese are not only present in expressing sentence modality and in changing the role of function words (Do et al. 1998 and Ha and Grice 2010), but they also play a role word order change, as in discontinuous nominal phrases.

[1] An experiment with speakers of the Northern dialect was constructed earlier. The results were similar to the current experiment (see Duong Phu 2016).

[2] For four classifiers (con, trái, củ, ngọn) there were 60 target words in discontinuous and 30 target words in continuous context. As for one of the classifiers (đàn), there were 35 discontinuous and 18 continuous target words.

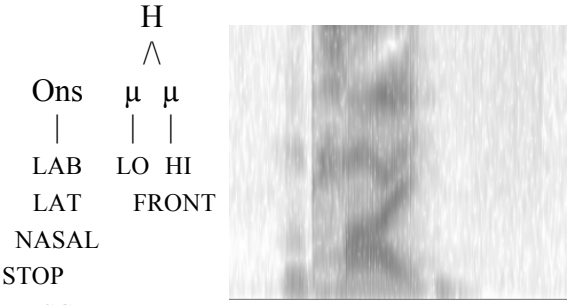
Chao's dilemma: segmentation is indeterminate

Sean Fulop & Chris Golston
California State University Fresno

Chao argued against the 'assumption that given the sounds of one language, there will be one and only one way of reducing them to a system of phonemes which represent the sound system' (1934, 38). Reducing the phonology of Cantonese or English to a unique set of phonemes, he showed, is not possible; at best, one can argue for a better or worse set of phonemes for a given language. We show here that this is true of the phonetic concept *phone* and its phonological counterpart *segment* as well, and argue that the problem is endemic to *any* attempt at segmenting speech into letter-sized units. Despite vast progress in the speech sciences over the past 80 years, the fundamental problem of segmentation remains, casting terrible doubts on typological claims based on segments (Ladefoged & Maddieson 1996; Maddieson 2014abc; etc.)

We show that the indeterminacy problem is greatly diminished, perhaps solved, by doing away with segmental, letter-sized units, leaving only sub– and suprasegmental units. The subsegmental units are *distinctive features* (Jakobson, Fant & Halle 1952), the suprasegmentals are onsets and moras (Hyman 1985). We need units (features) and minimal organization (onsets, moras), but segments make the organizational problem intractable.

We focus on White Hmong (Heimbach 1966, Ratliff 1992), which starkly illustrates the indeterminacy of segments: *depending on analysis*, Hmong has 70 segments (57 Cs, 13 Vs), or 25 (17 Cs, 8 Vs), or some number in between: aspirates can reasonably be treated as simple (p^h) or complex (ph), as can prenasalised stops (^{m}b, mb), diphthongs (a͡u, au), and complex tones (RISING, LH). Despite the major segmental indeterminacy, there are *exactly* 57 distinct onsets and 91 distinct rhymes in the language. Since aspirated onsets don't combine with breathy rhymes, there are *exactly* 4836 syllables in Hmong, all featurally distinct using LAB, COR, DOR, POST, DIST, STOP, NAS, CONT, STRID, LAT, SG, CG, HI, LOW, FRONT, ROUND, H, M, L. For instance,



[mpłáí] 'ring'

All of the features have articulatory and acoustic correlates that render them observable and quantifiable. Bundling them into onsets and moras doesn't suffer from indeterminacy either, so it appears that omitting segments from phonology solves Chao's dilemma while maintaining a discrete phonetics and phonology. Phonological organization in syllables is minimal (Ons, μ) and phonological atoms are too (features, gestures, elements, as the case may be).

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Deriving three surface VOT categories from a two-way phonological contrast in Tibetan

Christopher Geissler
Yale University

In Central Tibetan (henceforth, "Tibetan"), words carry high or low register tone, and word-initial stops can be aspirated or unaspirated and sometimes voiced, but aspiration is longer in words with high tone than words with low tone, and voicing occurs for some but not all unaspirated stops with low-tone. Descriptions vary as to whether to treat the stops as two (Dawson 1980) or three (Denwood 1999, Tournadre and Dorje 2003) phonological categories. While voice onset time (VOT) is an important cue to phonological contrast and exhibits language-specific variation (Cho and Ladefoged 1999), three positive VOT categories is not attested in other languages.

We present phonetic data showing that there is a three-way contrast in positive VOT but argue that this three-way contrast in the phonetics can be derived from a simpler distinction in the phonology. Specifically, we draw on the uneven distribution of VOT and tone categories (see chart) to derive the third surface phonetic VOT category, the contrast between "Middle VOT" and "Long VOT," from the effect of tone on relative timing of the laryngeal and supra-laryngeal gestures of stop consonants.

	Short VOT	Middle VOT	Long VOT
High Tone	[tá.mak] 'cavalry'	N/A	[t^{h}á.mak] 'cigarette'
Low Tone	[tòm] ~ [dòm] 'spider'	[t^{h}òm] 'bear'	N/A

Recent phonetic work on Mandarin (Gao 2008) and Thai (Karlin 2014 et seq) has argued that tone affects the relative timing of word-initial consonants and vowels, in that the presence of a specified tonal gesture conditions a reduction in the temporal overlap of consonant and vowel gestures. These studies did not bear on the laryngeal component (only voiced segments were studied), but it follows that less overlap between a stop closure and the following vowel gesture could 'expose' more of a glottal opening gesture, resulting in longer VOT in this environment than in the absence of a specified tonal gesture.

This paper uses the tonal effect on C-V timing to explain the Tibetan facts as follows: treating the high tone as carrying a high tonal gesture and the low tone as lacking such specification, the presence of the high tone reduces overlap between the consonantal closure and the vowel, lengthening aspiration for aspirated stops. Unaspirated stops, which have a release burst but no aspiration, remain unaffected by the presence/absence of tone and retain a similar VOT in either tonal context. Thus, the Tibetan distribution is analyzed on the phonological level as a straightforward interaction between presence/absence of high tone and presence/absence of a glottal opening gesture, analogous to the feature [SPREAD GLOTTIS]. This analysis resolves a three-way surface phonetic categories into a two-way phonological contrast, with the additional phonetic distinction in VOT resulting from the effect of tone on the timing of the consonant and vowel.

Sonority and the typology of Turkic onset obstruentisation

Deepthi Gopal, University of Cambridge / University of Manchester
dg537@cam.ac.uk

In many of the Kipchak and all of the Siberian Turkic languages[1], sonorant-initial suffixes are obstruentised if preceded by a high-sonority coda—Kazakh [alma.lar] 'apples', but [kitap.tar] 'books'. Individual cases show variability in 'cut-off point' for obstruentisation, and in the behaviour of segments with identical manner and differing place specification; partial sample in table 1 below.

Language	Onset	Preceding coda: vowel	glide	r	l	n, m, ŋ	voiced obst.	voiceless obst[2].	Source
Bashkir	l	baqsa.lar garden-PL	taw.ðar mountain-PL	jər.ðar place-PL	kyl.dær lake-PL	urman.dar forest-PL	kolxoz.dar kolkhoz-PL	kitap.tar book-PL	Poppe 1964
	n	baqsa.nɨ garden-ACC	taw.ðɨ mountain-ACC	jər.ðɨ place-ACC	kyl.də lake-ACC	urman.dɨ forest-ACC	kolxoz.do kolkhoz-ACC	kitap.tɨ book-ACC	
	m			al.ɨr.mɨn take-COND-1SG	al.mam take-NEG				
Kazakh	l	alma.lar apple-PL	taw.lar mountain-PL	kijar.lar cucumber-PL	køl.dar lake-PL	adam.dar man-PL	qɯz.dar girl-PL	qus.tar bird-PL	Mukhamedova 2015
	n	alma.nɯ apple-ACC	taw.dɯ mountain-ACC	kijar.dɯ cucumber-ACC	køl.di lake-ACC	kelin.di bride-ACC	qɯz.dɯ girl-ACC	qus.tɯ bird-ACC	
	m	alma.ma apple-INT	taw.ma mountain-INT	kijar.ma cucumber-INT	køl.me lake-INT	ʒaŋ.ba sleeve-INT	qɯz.ba girl-INT	qus.pa bird-INT	Gouskova 2004
Khakas	l	pu.lar this-PL	toj.lar wedding-PL	pyyr.ler wolf-PL		ton.nar fur coat-PL	taɣ.lar mountain-PL	aɣas.tar tree-PL	Anderson 1998
	n	ʃkola.nɨ school-ACC	toj.nɨ wedding-ACC	taɣ-lar.nɨ mountain-PL-ACC		ton.nɨ fur coat-ACC	taɣ.nɨ mountain-ACC	inek.ti cow-ACC	
Tuvan	l	bala.lar child-PL		dækter.ler notebook-PL	ool.dar boy-PL	**kyn.ner** sun-PL		at.tar horse-PL	Mawkanuli 2004
	n	bala.nɨ child-ACC		dækter.ni notebook-ACC	ool.dɨ boy-ACC	**kyn.ni** sun-ACC		at.tɨ horse-ACC	
	m	kumda.ma angry-NEG		dur.min stay-1SG	gel.be come-NEG		gag.ba put-NEG	bil-bes.ben know-NEG-1SG	

Table 1: Summary of selected Turkic desonorisation patterns, for 4 of 14 languages considered.

All attested patterns show *continuity* with respect to the assumed position of the triggering coda on the sonority scale: if coda *A* triggers desonorisation in onset *B*, then *B* will desonorise after all equal or lower-sonority codas. This is not reversible; onsets of seemingly identical sonority behave independently. Partial accounts of these data appear previously in the literature on sonority-driven alternations (Davis 1998; Gouskova 2004), but absent the /n/-/m/ asymmetries in table 1. **In this work,** I will argue that existing approaches cannot capture *place*-dependent non-uniformity across onset segments with identical manner. I make the following propositions in this analysis: first, that (contra e.g. De Lacy 2002, 2006; Gouskova 2004) it is possible to permit featural markedness scales and structural elements such as sonority to interact, and consequently, featural markedness scales and 'combined' scales corresponding to coda-onset sequences; second, that the scale of prominence for *onsets* alone undergoes a re-ordering that accounts for the anomalous patterns in onset desonorisation. I consider additionally questions of the origin and phonologisation of these alternations; sonority-driven obstruentisation a fairly narrow areal and genetic distribution within the larger family, but points to more widely-inherited patterns of phonetic implementation across Turkic that lead to differently-triggered obstruentisations in more distantly-related languages.

[1] Altai (Dyrenkova 1940; Kotvič 1962; Schönig 1998), Bashkir (Poppe 1964), Chulym (Li et al. 2008; Schönig 1998), Chuvash (Krueger 1961), Dolgan (Stapert 2013), Kazakh (Davis 1998; Gouskova 2004; Mukhamedova 2015), Khakas (Anderson 1998), Kyrgyz (Gouskova 2004; Herbert & Poppe 1963), Noghay (Csató & Karakoç 1998; Karakoç 2013), Sakha ('Yakut') (Krueger 1962; Odden 2005), Shor (Schönig 1998; Chispyakov 1992), Tuvan (Mawkanuli 2004; Anderson & Harrison 1999; Harrison 2000), and (Western) Yugur (Roos 2000).

Features, UG, and 'Sensorimotor' Experiments on Infant Speech Perception

Mark Hale & Madelyn Kissock, Concordia University, Montréal

The trend in infant and adult speech perception studies has been moving steadily away from narrow (auditory-related-only) perception bases toward more integrated perception-production-sensorimotor (PPS) bases for perception (Werker & Gervain 2013). From the standpoint of theoretical linguistics, this entails a reduction in the primacy of (abstract, phonological) features in favor of a less well-defined and more general cognitive/production approach. In this paper, we examine a selection of recent experimental results, using Bruderer, Danielson, Kandhadai, & Werker (2015) as the focal point (henceforth BDKW) from the PPS theory side.

BDKW (2015) propose that articulation plays a critical role in the perception of speech sounds for 6 month olds, including for sounds not found in the environment language. Their infant subjects, when prevented from using the relevant articulators, showed significant impairment of contrast perception as compared to performance when the articulators were unimpeded. These findings were considered strong support for existing 'motor' theories of adult speech perception behavior (including audio-visual effects and sensorimotor effects), particularly as any experiential component could be ruled out. Such results may challenge the positing of substance-free UG features (à la Hale & Reiss 2007).

Considering various aspects of BDKW (2015) and related experiments (e.g. Ito *et al.* 2009; Sams *et al.* 2005; d'Ausilio *et al.* 2009 *inter alia*), we argue that the role of audio-visual/motor/sensorimotor in speech perception is peripheral, and never causal, and that innate features are both necessary and sufficient for perceiving contrasts in language. Specifically, we make the following points:

- that infants studied at the earliest ages do not have the requisite motor skills but still perform successfully on contrasts;
- that categorial contrasts (VOT), speaker independent token perception, and multiple possible articulatory sources for single sounds remain unexplained under a production-influenced theory;
- that the loss of discrimination based on experience with environment language (10-12 months, Werker & Tees 1984) cannot be attributed to loss of motor skills, with the conclusion that featural representations are critical (Hale & Kissock 1997, 2007) — any claim that the relevant motor skills are lost at this point falls apart in face of bilingual L2 acquisition;
- that there is a mistaken interpretation of causality in those experiments showing that listeners activate articulatory muscles upon hearing tokens;
- that there is a mistaken attribution of behavior to the linguistic system rather than to any of the multiplicity of additional cognitive systems involved in analysis of experimental input;
- that the fact that damage to the motor system does not impair speech perception (refs. in Hickok 2012) conflicts with the claimed results;
- and that the notion of *improvement* in perception (BDKW and Werker & Gervain 2013) highlights some additional problems with such experiments concerning 'average' behavior (i.e., *performance*) rather than individual knowledge states (i.e., *competence*) — for any single subject, perceptual *capacity* is either present or absent, not scalar (and thus not subject to 'improvement').

In summary, we note that traditional experiments such as those favored by psychologists have a very different goal than subject-based data collection in linguistics. The former seek to describe the 'average', or 'majority' behavior of a selected population. However, following the generative tradition of Chomsky and Halle (1968) and Chomsky (1957), our own (linguistic) interests lie in answering the question 'What is a possible human language?' or, more specifically, 'what sorts of representations and computations are possible in a human linguistic system?'. We maintain that the crucial question for linguistics is not 'how much/many' but 'whether'.

Laryngeal features of voiced-aspirated stops: Empirical evidence from Bangla

Md Jahurul Islam
Georgetown University; mi302@georgetown.edu

The Laryngeal Realism (LR) framework (Iverson & Salmons 1995, Honeybone 2005, Beckman et al. 2013) argues for multiple *specified* features in voiced-aspirated stops, aka breathy-voiced stops, in four-way stop systems, found in many Indic languages. While predictions of the LR framework have been tested on two- and three-way stop systems, there has been very little work on four-way contrast systems. Specifically, there is a general lack of empirical evidence for the claim that voiced-aspirated stops involve two different specified features, [voice] and [spread glottis] ([sg]). This study presents empirical evidence from Bangla and argues that 1) the predictions of the LR framework work variably for the voiced-aspirated stops; [sg] is found to be a stronger candidate to be a specified feature than [voice], and 2) the notion of breathy voicing may not be a completely redundant feature of the breathy-voiced stops, as claimed in earlier literature (e.g., Mikuteit & Reetz 2007).

In the LR framework, stop contrast systems are captured with different combinations of the privative features [voice] and [sg]. In a two-way system, one category is *specified* for either [sg] (in aspirating languages) or [voice] (in true-voice languages) while the other category remains unspecified ([∅]). In a three-way contrast, as in Thai, the three categories are specified for [sg], [voice] and [∅], respectively. LR predicts that the fourth category is, however, specified for multiple features: both [voice] and [sg]. The effect of speech rate on the length of the acoustic cues of the specified features has recently been proposed and used to test laryngeal features empirically (e.g., Beckman et al., 2013; Beckman et al., 2013; Schwarz 2017). The basic assumption is that acoustic cues of the specified features are longer in slower speech than fast speech. This 'diagnostic technique' has been successfully used for 2-way (e.g., English, Russian, Swedish) and 3-way (e.g., Thai) stop contrasts.

The current study extends the use of the technique to a 4-way contrast system, in Bangla, especially to investigate what the tool would predict for the voiced-aspirated stops which is specified for two features. Ten native Bangla speakers produced 16 stop sounds (4 places x 4 manners) in word-initial position at faster and slower speech rates; the total number of tokens were (16 stops x 3 repetitions x 2 speech rates x 10 speakers) 960. The duration of 'lag-time' (the cue for [sg]) and prevoicing (the cue for [voice]) were compared between the two speech rates to investigate the impact of speech rate on the cues of the specified features.

Results revealed that slower speech increased lag-time, the cue for [sg], in both voiceless-aspirated and breathy-voiced stops. This effect provides support of [sg]'s being a *specified* feature. Mixed-effects models confirm that slower speech significantly lengthens lag-time. On the other hand, the duration of the prevoicing was not affected by speech rate; this was true for both plain- and breathy-voiced stops (mixed-effects models also did not produce statistically significant difference). Out of the eight voiced stops, only [g], [d̪], and [d̪ʰ] had longer closure voicing in slower speech. This tendency contradicts the prediction of LR that [voice] is a *specified* feature in breathy-voiced stops. Also, the absolute duration of true breathy-voicing, when present, in the voiced-aspirated stops increased in slower speech. (It must be noted that about 40% of the voiced-aspirates did not have a breathy-voiced interval at all.)

The results are interesting at least in two ways. First, the general prediction of LR that [voice] is a *specified* in the 'voiced' stops is contradicted, even though the [voice] feature in Russian stops were tested successfully (Beckman et al. 2013). Rather, the results align with the proposal of Schwartz et al. (2017) that [voice] could be a less important/redundant cue for stops. Second, there have been claims that the instance of 'breathy-voicing' during in voiced-aspirated stops is an optional/secondary cue (Mikuteit and Reetz 2007); data here indicates that speakers had active targets for breathy-voicing indicated by their longer intervals in slower speech. More research might reveal if these tendencies are affected by the trade-off relations of different cues.

Precedence is pathological: Majority Rule in Harmonic Serialism

Andrew Lamont - University of Massachusetts Amherst

This paper argues that constraints defined in terms of precedence relations make pathological predictions, focusing on Majority Rule assimilation as a case study.

Majority Rule (MR) is a pathological agreement pattern predicted in parallel Optimality Theory (OT) (Prince & Smolensky, 1993/2004), where assimilation is controlled by the largest class in the input (Lombardi, 1999; Baković, 2000). MR occurs with the standard markedness constraints AGREE and CC-IDENT which penalize the co-occurrence of segments that disagree in some feature. Tableau (1) gives an example of MR in sibilant harmony. Candidates (1c) and (1d) satisfy the markedness constraints CORR(SIB), which requires sibilants to correspond, and CC-IDENT(ANT), which requires correspondents to agree in anteriority. IDENT prefers (1d) over (1c) because it targets the fewest segments for assimilation.

(1)

/ʃ...ʃ...ʃ...s...s/	CORR(SIB)	CC-IDENT(ANT)	IDENT
a. ʃ...ʃ...ʃ...s...s	W 6		L
b. $ʃ_i$...$ʃ_i$...$ʃ_i$...s_i...s_i		W 6	L
c. s_i...s_i...s_i...s_i...s_i			W 3
→ d. $ʃ_i$...$ʃ_i$...$ʃ_i$...$ʃ_i$...$ʃ_i$			2

In OT, MR arises from differences in the number of times candidates violate a given faithfulness constraint. These differences do not arise in Harmonic Serialism (HS) (Prince & Smolensky, 1993/2004; McCarthy, 2000), because GEN is limited to producing candidates that differ from the input via the application of at most one unfaithful operation. Therefore, one might expect that HS cannot derive MR, for the same reason that it avoids other pathologies like Sour Grapes (McCarthy, 2010). This paper shows that this is not the case.

Tableaux (2-3) show how HS derives the same MR sibilant harmony pattern as tableau (1). At each step, the unfaithful candidates (c) and (d) tie on IDENT, each targeting one segment for assimilation. Crucially, however, these candidates differ in their violations of CC-IDENT(ANT), which assigns violations for every pair of corresponding segments that disagree in anteriority (Rose & Walker, 2004; Hansson, 2010; Bennett, 2015).

(2)

Step 1: /ʃ...ʃ...ʃ...s...s/	CORR(SIB)	CC-IDENT(ANT)	IDENT
a. ʃ...ʃ...ʃ...s...s	W 6		L
b. $ʃ_i$...$ʃ_i$...$ʃ_i$...s_i...s_i		W 6	L
c. $ʃ_i$...$ʃ_i$...s_i...s_i...s_i		W 6	1
→ d. $ʃ_i$...$ʃ_i$...$ʃ_i$...$ʃ_i$...s_i		4	1

(3)

Step 2: ʃ...ʃ...ʃ...ʃ...s	CORR(SIB)	CC-IDENT(ANT)	IDENT
a. ʃ...ʃ...ʃ...ʃ...s	W 4		L
b. $ʃ_i$...$ʃ_i$...$ʃ_i$...$ʃ_i$...s_i		W 4	L
c. $ʃ_i$...$ʃ_i$...$ʃ_i$...s_i...s_i		W 6	1
→ d. $ʃ_i$...$ʃ_i$...$ʃ_i$...$ʃ_i$...$ʃ_i$			1

This reveals that MR is not a pathology associated with GEN, which can be avoided in HS, but rather a pathology associated with CON, specifically with CC-IDENT. The potential loci of violation for CC-IDENT of a candidate like $A_x \dots B_x \dots C_x \dots D_x$ are {*AB*, *AC*, *AD*, *BC*, *BD*, *CD*}. Hansson (2007) terms this *global* evaluation, and contrasts it with *local* evaluation, which limits potential loci to the uninterrupted pairs {*AB*, *BC*, *CD*}. Global evaluation is necessary to derive MR. This paper proves that at each step of an HS derivation, targeting a member of the minority class optimally satisfies CC-IDENT when evaluated globally. Local evaluation does not produce MR because assimilation results in ties between unfaithful candidates on CC-IDENT that are broken by other constraints.

This paper characterizes global and local evaluation of CC-IDENT in terms of Formal Language Theory, showing that global evaluation is equivalent to a Strictly Piecewise (SP) constraint defined over precedence relations (Heinz, 2007, 2010; Rogers et al., 2010). Other SP constraints, such as generalized alignment (Eisner, 1997, 2000), are also known to produce pathologies, and we hypothesize more generally that CON does not include SP constraints.

An Artificial Language Learning experiment finds no bias against word-final devoicing

Julian Kirkeby Lysvik (University of Oslo) - j.k.lysvik@iln.uio.no

Summary: This talk outlines an ALL experiment designed to test for *substantive bias* (Moreton, 2006) in phonology. Previous studies (see summary in Moreton & Pater, 2011) have not shown effects of such biases in forced-choice tasks. In my experiment, no bias against word-final voiced obstruents was found. However, a channel bias against intervocalic voiceless obstruents was found in the production task for plurals, which is able to account for the markedness of a synchronic process of final voicing.

Experiment: Two groups of Norwegian native participants (n = 36) were exposed to one of two artificial languages. Either: final obstruent devoicing (FOD) or final obstruent voicing (FOV). Norwegian has both voiceless and voiced final obstruents, but no FOV or FOD rules. There is no structural difference between these two rules, so there should be no complexity effects. FOV, however, is both typologically nonexistent (Kiparsky, 2006) and harder to produce (Yu, 2013). The experiment has three phases: Learning, Forced-Choice and Production. During Learning participants were exposed to auditory/visual stimuli of singular and plural forms. Plural forms were constructed on the form /$C_1VC_1VC_2$-u/ and singulars: /$C_1VC_1VC_3$/. C_3 was always voiced in FOV language, and voiceless in FOD. C_2 could be either voiced or voiceless in both languages (12.5% of tokens were voiced in FOV, and vice versa), to avoid a rule interpretation of C → [-voice]/V_V. The auditory stimuli were created using MBROLA speech synthesis software. The duration of voiced segments was shorter than the duration of voiceless segments to simulate natural voicing (Westbury & Keating, 1975). In the Production Phase participants heard a plural form (4/5 times) and a singular form (1/5 times). They were then asked to produce the singular and plural, respectively. For the Forced-Choice Phase participants heard two tokens, one corresponding to the language and one incorrect token. They were then asked to choose the token correctly corresponding to the language by pressing a button, and the RT for the press was measured.

Results/discussion: The results show no significant difference between the singulars for languages in either Forced-Choice or Production (figures 7 and 8, mixed logit model tests: Pr(>|z|) = 0.21, z-value = 1.253 for FC, and Pr(>|z|) = 0.895, z-value = 0.132 for Production), consistent with a lack of substantive effects as in previous studies. However, the figures show that in production of plurals, participants in the FOV language produced voiced obstruents when the target was voiceless to a larger degree than FOD participants produced voiceless segments when the target was voiced (Mixed logit, Pr (>|z|) > 0.01, z = -3.471). The consequence of this is that participants in FOD produce the alternating form *rusu**b**u* ↔ *rusu**p***, a typical devoicing process, as expected. However FOV participants produce *rusu**b**u* ↔ *rusu**b***, rather than the alternating *rusu**p**u* ↔ *rusu**b*.** Importantly, in the forced-choice task participants chose alternating and non-alternating forms equally frequently. I argue that a production channel bias against intervocalic voiceless obstruents can account for this.

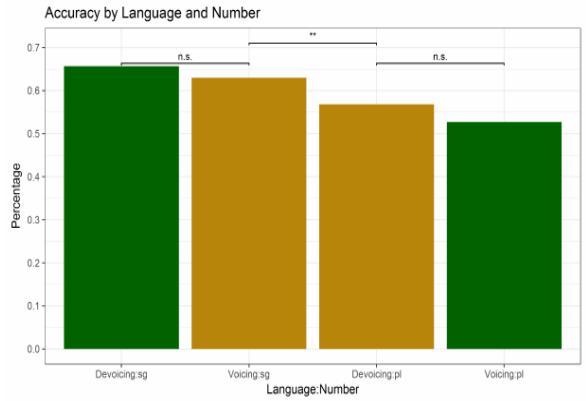


Figure 7: Forced-choice task results: The bars show at which percentage participants chose voiceless obstruents (green) or voiced obstruents (gold).

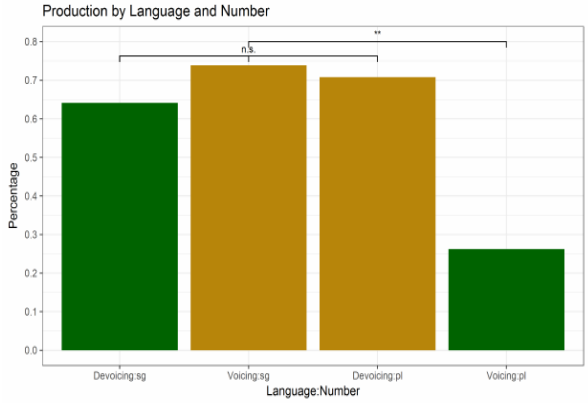


Figure 8: Production task results: The bars show at which percentage participants produced voiceless obstruents (green) or voiced obstruents (gold).

A REANALYSIS OF CROSS-FEATURAL POLARITY AS OCP-DRIVEN INSERTION

Savio Megolhuto Meyase
University of Leipzig, Germany
savio.meyase@uni-leipzig.de

Main Claim: Tones in Tenyidie (Angami) employ a so far unattested type of polarity, a cross-featural polarity. In this talk, I argue that the cross-featural polarity in tone can be reanalysed as an OCP-driven epenthesis in a stratal model.

Data: Tenyidie has four level tones – Extra High, High, Mid, and Low (Blankenship et al, 1992; Meyase, 2014). There are three classes of suffixes: first, those that simply surface consistently with one of the four tones in all contexts; second, those where the suffix always show up with either Extra High or High; and third, those where the suffix always show up as Mid or Low. The second and third classes show the natural division of the four tones into the two higher and the two lower tones and this follows the assumption of tonal features as in (1).

(1) Featural representation of Tenyidie tones following Yip (1980).

Register	+Upper		–Upper	
Pitch/Tone	+high	–high	+high	–high
Tone in Tenyidie	Extra High /e̋/	High /é/	Mid /ē/	Low /è/

The second class of suffixes has the pattern in (2), exemplified with the perfect suffix /-te/.

(2) vő [+Upper, +high] tḗ [+Upper, +high] "to go" + PRF
sá [+Upper, −high] té [+Upper, −high] "to repeat" + PRF
prū [−Upper, +high] tḗ [+Upper, +high] "to jump" + PRF
lè [−Upper, −high] té [+Upper, −high] "to go down" + PRF

Here the suffix is Extra High when it follows a [+high] stem and High when follows a [–high] stem. This alternation is predictable under the assumption that these suffixes are underspecified for only [+Upper] and assimilate in [±high] to the preceding tone.

But in the third class, while [–Upper] is specified for the suffix, the alternation of [±high] in the suffix is seen as a phenomenon of cross-featural polarity where the [±high] value is the polar opposite of the [±Upper] in the stem, as in (3).

(3) vő [+*Upper*, +high] liè [−Upper, −*high*] "to go" + IMP
sá [+*Upper*, −high] liè [−Upper, −*high*] "to repeat" + IMP
prū [−*Upper*, +high] liē [−Upper, +*high*] "to jump" + IMP
lè [−*Upper*, +high] liē [−Upper, +*high*] "to go down" + IMP

Proposal: In this talk, I propose a reanalysis for this apparent polarity pattern that does not rely on a powerful mechanism like alpha-rules (Gregersen, 1974), following de Lacy (2012). The polarity in (3) follows as OCP-driven epenthesis under the assumption that tones can be associated on a tier other than the one they originated on, in order to avoid another costly repair. Instead of the aforementioned features we simply use H and L and repeat them in the two tiers to represent the tones. Suffixes are still taken to be underspecified; in (4), for L on the register tier. Epenthesis of H takes place to counter the L-L OCP in the first stratum (assuming strata, Bermudez-Otero (2007)). This H then moves to the next tier in the next stratum. Here OCP does not apply, and the suffix gets a full-tone status. Underspecified suffixes in non-OCP environment simply get a default L on the tonal tier to fully specify the tone.

(4) (Low + suffix)

.	+	.	→	.	.	→	.	.
L		L		L	*H* L		L	L
L				L			L	H
(underlying form)				(OCP; *H* insertion; stratum I)			(association of floating tone; stratum II)	

Although the H-tone hence originated on the register tier, it is associated on the tonal/pitch tier to fully specify the underspecified suffixes.

A diachronic analysis of sibilants in early French phonology in a split-margin approach

Francisco Antonio Montaño, Lehman College (CUNY), francisco.montano@lehman.cuny.edu

Sibilants enjoy a unique status with respect to other obstruents throughout the history of French, as evidenced by their ability to surface in phonotactic environments where other obstruents cannot. Particularly in the earliest stages of French, spanning from Late Latin through the Gallo-Romance period (1st-10th centuries) and well into the late Old French period (11th-13th centuries), /s/ is distinctive from other obstruents in that it may form a word-initial cluster with another obstruent (e.g. Latin ***s**ponsa* 'spouse.FEM'), later undergoing postlexical prothesis (***s**ponsa* > ***es**puse* 'spouse.FEM') (Pope 1952; Rohlfs 1970; Rickard 1989) when not preceded by a vowel-final word, and that it persists in coda position as a member of a syllable-contact cluster well beyond other obstruents, which delete in this position during the Gallo-Romance period (cf. *ru**p**ta* > *rute* 'route' vs. *fe**s**ta* > *fe**s**te* 'celebration', *ho**s**pitale(m)* > *o**s**tel*) (Pope 1952; Jacobs 1995; Gess 1998, 1999, and later work). The patterning of /s/ in Late Latin and Gallo-Romance provides rich insights into the sonority-based licensing of consonant clusters as well as the melodic properties of harmonic syllables and phonological words in these early stages of French phonology, as word-initial and word-internal clusters containing /s/ become progressively more restricted to heterosyllabic surface positions (i.e. syllable-contact clusters).

During the Old French period /s/ ceases to surface as a licit word-internal syllable coda (Gess 1998, 1999, and later work), as it undergoes deletion accompanied by compensatory lengthening of the preceding vowel (*feste* [fɛs.tə] > *fe:te* [fɛ:.tə]) (Gess 1998). The deletion phenomenon occurs in stages, conditioned by the sonority of the following onset segment (Montaño 2017). In close chronological proximity to coda /s/ deletion, the prothetic vowel of words containing an etymological word-initial /s/ + obstruent cluster becomes a fixed element of surface forms (e.g. /spusə/ → [es.pu.zə] ~ [spu.zə] > /spusə/ → [es.pu.zə]) (Pope 1952), pointing to one of two possible conclusions: that prothesis shifted from the postlexical to the lexical phonology (input form /spusə/ → [es.pu.zə]), or that the prothetic vowel had been re-analyzed as part of the input form during acquisition via lexicon optimization (input form /espusə/ → [es.pu.zə]). Interestingly, the inability of /s/ to occupy a word-internal coda position (i.e. as the first member of a syllable-contact cluster) interferes with prothesis in that simply epenthesizing a word-initial vowel no longer yields a harmonic output form once Old French coda /s/ deletion is underway, since such an output would also violate a critical constraint against /s/-initial syllable-contact clusters (e.g. /spusə/ 'spouse.FEM' → *[spu.zə], *[es.pu.zə]). Unsurprisingly, /s/ does delete in this position (/spusə/ → [e.pu.zə]), but critically no compensatory lengthening accompanies deletion as in word-internal contexts (Pope 1952). This particular distinction, corroborated by the lack of long vowel or diphthongs in modern varieties of French (e.g. Québec French) that in fact preserve long vowels in erstwhile compensatory lengthening contexts (Walker 1984; Picard 2004; Gess 2008; Côté 2012), lends strong support to my claim that prothesis remained an active phenomenon in the lexical phonology throughout the Old French period. Moreover, Old French prothesis, once coda /s/ deletion took hold, underwent a fundamental transformation on a phenomenological level. It in fact represents a case of non-surface-apparent opacity (McCarthy 1999) in that the prothetic vowel surfaces in output forms in which the conditioning environment of word-initial [s] + obstruent clusters is absent. My analysis shows how well-established phonological constraints succeed in characterizing both the Old French synchronic reality of the opaque prothesis phenomenon and coda /s/ deletion as well as the diachronic developments leading up to it within a single, unified evolving phonological system.

In my optimality-theoretic analysis, I formalize the interrelated nature as well as the predictably ordered chronology of these changes in consonant cluster licensing by use of the Split Margin Approach to the Syllable (Baertsch 2002; Baertsch & Davis 2003; and later work). I demonstrate how the rich network of implicational structural relationships among syllable and word-level constraints on margin segments, as they interact with faithfulness constraints, elegantly captures how the phenomena of prothesis and coda /s/ preservation and deletion evolve over the course of Late Latin through Old French, as well as how the two phenomena intersect in critical ways. Baertsch and Davis' split margin approach proves particularly adept for analyses such as this, not only due to the high granularity of the split-margin family of markedness constraints, but especially by virtue of its insightful structural link between M_2 consonants, i.e., the second member of an onset cluster and a singleton coda consonant. By capitalizing on the analytical breadth of this approach in the parallel evaluation of diverse sonority contours and its applicability to clusters in both the syllable domain (onset clusters) and the phonological word (syllable-contact clusters), I offer a comprehensive and informative schematization of the clustering possibilities of /s/ in early French phonology and how this system evolves over time.

You have a neat theory, then [l] turns up

Filiz Mutlu, McGill University, filizmutlu@yandex.com,

[l] can pattern with approximants (R) or stops. Korean [l] alternates with an approximant [ɾ] and [l] occurs in _#, a position restricted to stops (1a). In Yaka [l] alternates with a stop, [d]: [l]+[a, o, u] but [d]+[i, j] (1b). In Luganda [l, r] alternate, similar to Yaka in the V(owel) context: #[l], [a, o, u]+[l] but [i, e]+[r] (1c) (Myers 2015 and works cited therein). (1) is a puzzle for any theory aiming to capture the link between manner and sonority/complexity (see Selkirk 1983, Harris 1994), *and* between the V context and laterality. In this paper I will show how Spatial Phonology (SP) straightforwardly accounts for the puzzling facts of Luganda and Yaka, and the seemingly contradictory behaviour of [l].

1. a) Korean (cf. Sohn 1994): [sal] 'flesh', [paɾam] 'wind', [paŋ] 'room', [kyːʑin] 'ghost', [nat] 'face', [cip] 'straw', [pak] 'outside', *s, h, ɾ, tʃ#	**b)** Yaka (Hyman & Inkelas 2012): dila 'cry', dja 'eat', lela 'rock (baby), lala 'get lost', lula 'blame, scold', lola 'punish'	**c)** Luganda (Halle & Clements 1983): luula 'sit', kola 'do', wulira 'hear', eddwaliro 'hospital', buulira 'tell'

Background: SP adopts the position that language is an algorithm to asymmetrically build a three-dimensional cognitive space (cf. Arsenijevic 2008, Di Sciullo 2005, van der Hulst 2015, Kayne 1994). All primitives (or *elements* in Government Phonology (Kaye et. al. 1985)) are coordinates in this space (0/1). By asymmetry, no non-zero coordinates can be the same on a plane. In (1), I will deduce all and only the possible place and manner properties: The elements I, A, U; no constriction, friction, stopness. The exact mapping of (1) to elements is motivated on phonological and phonetic grounds in Author (in press).

2) a) I b) A c) U d) b+c e) project f) friction g) stopness i) f+g

(2a) is the point (0, 0, 0), or the *head.* It can be combined with a *dependent*. (2b) shows a dependent removed from the head along one dimension, (1, 0, 0), or the *comp(lement)*. (2c) has a dependent removed along two dimensions (-1, 1, 0), or the *spec(ifier)*. In syntax, these relations can exist within a compound or a phrase. In phonology, the internal structure of the head maps to place properties (2a-c). There must be exactly three basic 'place' elements I (2a), A (2b), U (2c). Dependencies in the phrase map to kinds of constriction: no constriction (2e), friction (2f), stopness (2g) (cf. Steriade 1993, Pöchtrager 2006, Schwartz 2015). (2e) shows a dependent removed along three dimensions, (0, 0, 1), or an *adjunction point*, where in a phrase adjuncts sit. Formally, *projection* is gaining an adjunction point, or the potential to have adjuncts. Stopness and U contain the same dependency, spec-head (A and friction have comp). (2g) is a stop without oral release (N), (2i) is catch+release (T).

Analysis: i: [l] has a complex compound head A+U (2d) (cf. Pöchtrager 2001, Balcı 2006), [r, d] have A (2b) (Broadbent 1993). (By asymmetry, either the head can be complex (2d), or the phrase (2i), but not both, hence there is no (non-contour) lateral T *(2d+2i)). On a scale of dimensional complexity, I, A, U exist in that order. In Luganda (1c), V+R can have *only* two adjacent objects from that scale: I, A or A, U, not both. A is monogamous, if you will. Since [l] has A+U, it cannot have a neighbour with I (front V). Yaka (1b) [l]+V must share *at least* one element (A, U). [l] patterns with [r] (1a, c) since they have the same projection (2e). [l] patterns with stops (1a, b) since it has the same dependency as stopness *within its head* (2c, 2g). (Time permitting: Though [w] has U, glides are different from liquids in that glides sit in a functional projection between consonants and vowels, see Author (2017), Liu (2014).)

Element suppression: dependents are the first to go

Kuniya Nasukawa and Phillip Backley (Tohoku Gakuin University, Japan)

This paper describes segmental weakening in the model of melodic structure known as Precedence-free Phonology (AUTHOR A 2014, 2016, 2017). It describes how weakening operates on structures, and shows how the outcome of weakening reveals details about the internal representation of consonants and vowels. In this sense, phonological evidence (from weakening effects) provides support for phonological structures (melodic expressions).

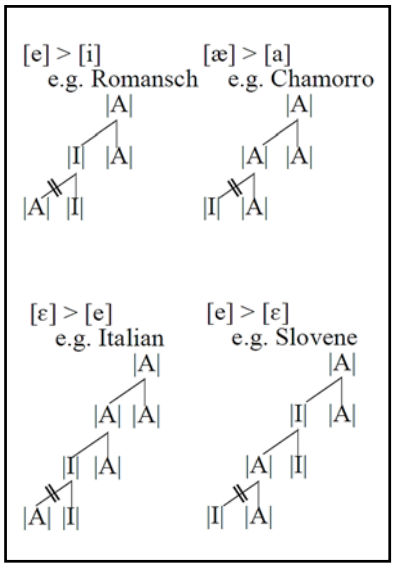
It is proposed that all cases of weakening follow a single general principle in which dependent structure – specifically, the most deeply embedded unit(s) in a melodic expression – is suppressed. Since segmental weakening is thought to operate blindly and uniformly on any target structure, the phonetic and phonological properties of a reduced sound are determined largely by the structural properties of the original target expression. So, typological differences in vowel/consonant reduction among dialects/languages are attributed to differences in the way segments are represented in a particular system, and not to the weakening mechanism itself.

Precedence-free Phonology (PfP) uses the six elements |A I U H L ʔ| of Element Theory (Harris & Lindsey 1995, 2000; AUTHOR B 2011), but departs from standard versions of element-based phonology by requiring *all* element concatenation to be based on head-dependent relations: the complexity of a melodic expression increases by concatenating additional elements via the recursive use of head-dependent relations between elements (AUTHOR A 2016, 2017). This produces melodic expressions with 'vertical' structures built from a network of asymmetric relations. These PfP structures correspond to prosodic domains of varying sizes from a single nucleus, through syllable- and foot-sized units, to entire prosodic words. As the name 'Precedence-free' suggests, the linear ordering of segments in a melodic representation is not overtly expressed in terms of precedence relations; instead, it falls out from the way that element expressions are hierarchically organized and phonetically interpreted.

In vowel structures, one element (usually |A|) acts as a head, providing an essential structural base but contributing little in terms of melodic information. (By itself, a bare head |A| is pronounced as a schwa-like default vowel – the realization of an unmodulated baseline carrier signal.) By contrast, dependent elements are structurally unimportant but they are key to contributing contrastive melodic properties (AUTHOR B & AUTHOR A 2015, AUTHOR B 2017): a single level of dependency/embedding produces the 'corner' vowels [a i u], while additional layers allow for further contrasts to be expressed. Vowel reduction targets the most deeply embedded elements in an expression, leaving behind a weak vowel comprising either a single dependent element (giving [a]/[i]/[u] in centrifugal systems, e.g. Chamorro) or a bare V-head element (giving [ə]/[ɨ] in centripetal systems, e.g. English).

In consonant structures, a laryngeal element (|H| or |ʔ|) acts as a head, this C-head being a dependent of the vowel structure which licenses it (together they form a unified CV unit). As in vowels, the C-head supports dependent elements that provide contrastive information. And again, segmental weakening (consonant lenition) targets the lowest elements in the hierarchical structure. Depending on the specific properties of the original structure, this could leave behind a glottal [ʔ] or [h], a fricative (i.e. a spirantised stop), or an approximant such as [w], [ɣ] or [ɾ].

By assuming that processes such as segmental weakening are formally simple and blind in terms of the way they apply to target structures, the burden of explanation is placed on representations. In PfP these are sufficiently rich in melodic information to express the range of weakening effects observed cross-linguistically.



Velar softening without precedence relations

Hitomi Onuma (Iwate Medical University) and Kuniya Nasukawa (Tohoku Gakuin University)

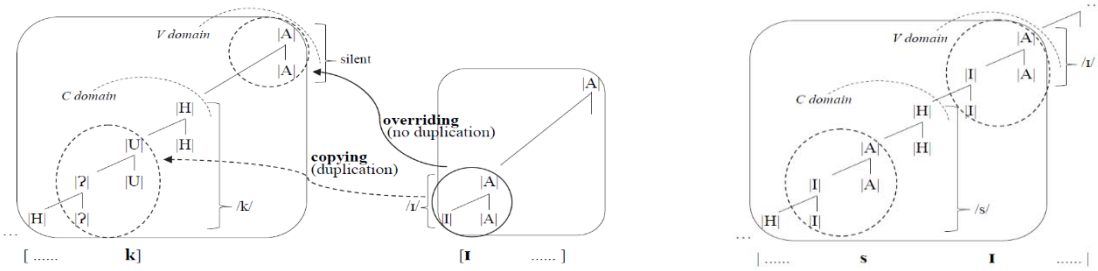
This paper presents an account of velar softening – the well-documented set of alternations between the velar stops /k g/ and the coronal consonants /s ʤ/ – using the Precedence-free Phonology approach (AUTHOR B 2015, 2016). According to this approach, phonological representations refer only to elements, which are employed recursively throughout a structure in such a way that excludes all precedence relations between units.

Velar softening takes place only when the target stops /k g/ are followed by a front vowel /ɪ, i, aɪ, e/ in one of the participating suffixes. It is generally thought to result from the Root-level suffixation of morphemes such as *-ity*, *-ism* and *-ise/ize*, it is assumed to take place in the Root-level morphology (Harris 1994). In utterances, these suffixes are realised as -[ə]*ty*, -[ə]*zm* and -[aɪ]*se*/[aɪ]*ze*. However, as the spelling suggests, they were presumably pronounced -[ɪ]*ty*, -[ɪ]*zm* and -[ɪ]*se*/[ɪ]*ze* at some earlier stage in the history of English. Even if the pattern is viewed as a synchronic process, there seems to be a consensus that /ɪ/ is the lexical form of the initial segment of the suffixes. Thus, the /k/-/s/ alternation may be described by the rewrite rule /k/ → /s/ / ___/ɪ/ (Chomsky & Halle 1968, Halle & Mohanan 1986, Halle 2005).

Since velar stops /k g/ do not alternate with /s ʤ/ when the stops are preceded by high front vowels (e.g. /pɪk/ 'pick' → */pɪs/, /pɪg/ 'pick' → */pɪʤ/), any analysis must regard the precedence relation between /k g/ and front vowels as a key factor in triggering the process. Analysing velar softening is clearly a challenge for Precedence-free Phonology, which excludes from phonological representation all properties associated with precedence relations.

In this paper, we analyse English velar softening as a Root-level morphological operation (Harris 1994) without referring to precedence relations. Within the framework of Precedence-free Phonology we propose that the process in question may be viewed as an agreement effect involving the |A|-headed [|A||I|] set: in velar softening, the elements which are flanked by the highest and lowest elements in the C domain of the base are overridden by the |A|-headed [|A||I|] set in the lowest part of the suffix according to ALT NONHI-NONLOWV$_{SUFF}$ WITH HIV$_{BAS}$ in (1c).

(1) a. Velar softening: the /k/~/s/ alternation → b. The structure of /sɪ/



c. ALT NONHI-NONLOWV$_{SUFF}$ WITH HIV$_{BAS}$
Replace an expression which is neither highest nor lowest in the consonantal domain of the base with the copied lowest vocalic domain of the suffix.

Since the highest element in the C domain of the base in (1a) is the first token of |H| and the lowest element in the C domain is the second token of |H|, these must be preserved and parsed in accordance with (1c). On the other hand, the elements in between (i.e. the |U|-headed [|ʔ||U|] set) must be replaced by the structure of the suffix-lowest /ɪ/ (i.e. the |A|-headed [|I||A|] set). The motivation for this type of alternation is, we suggest, to produce a tighter concatenation akin to a non-analytic form; the effect is something similar to dovetailing. In addition, we assume that the motivation for leaving intact the highest and lowest elements of the C domain of the base may be attributed to their linguistically significant roles: the head (i.e. the first token of |H| in (1a)) is structurally important (obligatory) while the dependent (i.e. the second token of |H| in (1a)) is rich in terms of contrastive information (AUTHOR B 2015, 2016). That is, the elements occupying the outermost (i.e. top and bottom) positions in a domain are resistant to phonological alternation. The other type of velar softening which involves the alternation /g/~/ʤ/ is also analysed in the same manner.

In addition, velar palatalization proceeds along the same lines. The only difference between the two processes is that velar palatalization shows an agreement effect involving the set of [[|A||I|]$_A$|I|]$_A$.

Perceptual Assimilation and Orthographic Effects in L2 Allophonic Acquisition

Alexandra Pfiffner, Georgetown University (amp343@georgetown.edu)

The Perceptual Assimilation Model (PAM; Best et al., 2001; Tyler et al., 2014) predicts a hierarchy of discrimination ease for non-native phonemes based on how similar the new phones are to native phonemes. For example, if the two L2 phonemes map onto two L1 phonemes, then it will be easy to discriminate between the two L2 phones. If two L2 phonemes map onto the same L1 phoneme, then it will be more difficult to discriminate between them. No predictions are made, however, for L2 allophonic variants. This study investigates the discrimination and subsequent acquisition of allophonic variants with regards to two main factors: similarity to L1 phoneme categories and orthography.

Using an artificial language learning paradigm, participants were exposed to one of three allophonic variations (hereby "languages") paired with one of three orthographic types. Following PAM's discrimination criteria, the variations included phones that assimilate to two native phoneme categories (TC), phones that assimilate to one native phoneme category, but one is a better fit (category goodness, or CG), and phones that assimilate to the same category and are equally good exemplars of that L1 phoneme (SC). PAM predicts an ease of discrimination hierarchy of TC>CG>SC, and thus it was hypothesized that participants would follow this discrimination ease hierarchy with the allophonic variants, subsequently acquiring TC best, followed by CG, and then SC. Orthographic conditions included no orthography, transparent orthography (each allophone had a separate symbol), and opaque orthography (both allophones shared a symbol). It was predicted that transparent orthography would improve learning, as different symbols explicitly draw attention to the different allophones, whereas opaque orthography would hinder learning by masking the allophones behind one symbol.

Materials (examples in Table 1) consisted of CVCVC words recorded by a Russian speaker.

Language	Allophone	Distribution	Transparent orth.	Opaque orth.
TC	[r]	word-initial; word-medial	**r**obes	**.ɫ**obes
	[ɬ]	word-medial; word-final	nipu**l**	nipu**.ɫ**
CG	[lʲ]	word-initial; word-medial	**ll**obes	**l**obes
	[ɬ]	word-medial; word-final	nipu**l**	nipu**l**
SC	V:	before nasals	p**ii**mul	p**i**mul
	V	elsewhere	b**a**los	b**a**los

Two hundred English L1 participants learned vocabulary words in a "Martian" language and then tested their memories. Participants underwent a training phase, where they were familiarized with the language's phonotactic pattern by hearing 50 randomized words repeated four times. Participants in opaque and transparent orthographic conditions were also given the spelling of each word. After the training phase, participants entered a testing phase with 10 repeated training words, 10 phonotactically-conforming new words, and 10 non-phonotactically-conforming new words. Participants were asked if they had previously heard the word or not, with no pictures nor orthography given. If participants learned the allophonic variation, then they should "false alarm" and say that they previously heard the phonotactically-conforming new words. This procedure followed a phonotactic learning paradigm that has been used with success (Bernard 2015; Steele et al., 2015; Denby et al., 2018).

Results demonstrated that TC and CG languages were equally acquired, while SC was not acquired. Additionally, the simple presence of orthography improved learning, but there were no significant differences between transparent and opaque orthographic types. These results suggest that L2 allophonic discrimination is not the same as L2 phonemic discrimination, and that any type of orthography may aid allophonic acquisition over having no orthography.

Why high vowels are not always high vowels

Marie-Luise Popp, Leipzig University, marie_luise.popp@uni-leipzig.de

Chain Shifts are phonological processes where an input /A/ surfaces as [B] while /B/ becomes [C]. Widespread examples of chain shifts are partial height harmonies where low vowels become mid vowels and mid vowels become high vowels in the same environment (Parkinson 1996; Moreton 2010). However, low vowels do not become high vowels, as exemplified by Lena Spanish in (1) where the high vowel in the affix *-u* triggers raising of the stem vowel.

(1) Lena Spanish (Hualde 1989; Parkinson 1996)

a → e	gat-a	get-u	'cat'		e → i	nen-a	nin-u	'child'
a → e	sant-a	sent-u	'saint'		e → i	bwen-a	bwin-u	'good'

Chain shifts are problematic for Optimality Theory (Prince & Smolensky 1993) as they result in a ranking paradox. The constraint triggering the vowel change must outrank the faithfulness constraint preserving the mid vowel to trigger a shift from /e/ to [i], however, the faithfulness constraint preserving a mid vowel resulting from a low vowel apparently needs to outrank the constraint triggering the vowel change to prevent /a/ from shifting to [i]. Moreover, McCarthy (1993) and Kirchner (1996) have argued that rule ordering is not an appropriate solution to chain shifts since they clearly exhibit two different instances of a single raising process. In this paper, I will show that the opacity problems posed by *Chain Shifts* can easily be analysed within *Containment Theory* (Prince & Smolensky 1993; Trommer 2011; Trommer & Zimmermann 2014; van Oostendorp 2003, 2007) . In contrast to previous approaches to Chain Shifts (Kirchner 1996; Łubowicz 2012), my analysis does not require powerful mechanisms but makes reference to constraints that base on compelling phonological, phonetic and typological evidence.

In Containment Theory, deletion of phonological elements is impossible. Rather, phonological features can be inaccessible to phonetics but remain in the phonological structure. Thus, an underlying segment has a different featural specification than a derived segment. I make use of the consequence that an underlying vowel /e/ has different features than a vowel [e] that is derived by vowel raising. While an underlying /e/ is specified as [-high, -low], a derived [e] is necessarily specified as [-high, -low, +low] since the [+low] feature of the underlying /a/ remains phonologically accessible. I suggest that this is what prevents derived /e/ vowels from changing into [i]. This can be obtained by a markedness constraint sensitive to all features in the candidate against the combinations of features [+low,+high] within a segment. Crucially, this constraint is not stipulative but builds on a strong phonological basis. The tableau in (2) shows how this can be modelled in OT. Raising is driven by two harmony constraints, crucially ranked higher than the respective faithfulness constraints. However, the constraint *[+low,+high]$_{I}$ rules out [i] as it penalizes a combination of a +low and +high feature on a single vowel and exactly such a combination arises if an underlyingly low vowel is raised to a high vowel.

(2) Abstract chain shift: /a/ → [e] Phonetically invisible features: feature

/a/ [+low,-high]	*[+low,+high]$_{I}$	HARMONY$_{highP}$	HARMONY$_{lowP}$	FAITH$_{highI}$	FAITH$_{lowI}$
a. a [+low,-high]		*!	*		
b. ☞ e [+low , -high, -low]			*		*
c. i [+low , -high, -low, +high]	*!			*	*

I will show that all types of Chain Shifts can easily be analysed within Containment Theory by means of a number of independently motivated constraints which makes powerful and potentially overgeneralizing mechanisms like Constraint Conjunction superfluous.

Phonology produces Morphology. How to define the Righthand Head Rule (RHR) in morphologically complex word as an effect of Phonology

Michela Russo (University of Lyon 3 / UMR 7023 SFL CNRS, Paris 8)
mrusso@univ-paris8.fr

We question here the modalities of the relationship between an abstract structure required, where the functional or categorial heads connect with their dependent, as well as its phonological realization. In the *Righthand Head Rule* (RHR), Williams states (1991, 248): "In morphology, we define the head of a morphologically complex word to be the righthand member of that word". We propose to see in the typical configuration, where the heads (of any nature, categorical and functional) are made final, the effect of the syllabification, universally retrograde. If this proposal is right, we do not need to state the morphological principle of the head finality. The primacy of structural heads (below any linear reading) ensures their final realization, ordered, from more embedded to more peripherical. If the syllabification can ensure a realization of the successive linear morphological elements, it can also be used to determine their co-realization, a form of merger, to the extent that the content of phonic morphemes determines an interpretation of the structural dependency in this sense. The segregation of consonants and vowels naturally lends itself to the co-realisation in the syllabification (rather than the consecutive realization) of the morphemes hierarchically associated (such as the temporal-aspectual head and the verbal root in the Semitic languages).

In the Italo-Romance domain and in Metaphony, the number and gender can be performed as a final segment, the current situation. However, they can also be realized parasitically on the tonic vowel, which is a description of the opaque metaphonic status of Southern Italian Modern dialects. The internal morphology of Southern Italian dialects is not the effect of a phonic segregation that would require using the material of a morpheme structurally neighbour to syllabify the content of a morpheme. We can, however, see in it a kind of ionization phonological effect that an elements phonological approach allows to formalise. It is known that the incompleteness of the ions determines their propensity to combine. We have argued strongly that the responsible for the Italo-Romance Metaphony has to be an element, and specifically not one or the ones that we are waiting for... the element A (the one that defines the low and mid vowels) is the active element in the Metaphony (see Russo 2007), i.e. a morpheme A singular and feminine, instead of the morphemes, the elements high (I, U) plural and masculine. A morphological mark reduced to an element is ready optionally, instead of an interpretation as a segment, to an interpretation by combination with other vocalic material.

The Italian heteroclite paradigms type masculine singular *il dito* 'the finger' and the feminine plural *le dita* 'the fingers' correspond to the dialectal, with the exception of the metaphony, *furno* M.S. the *oven* / *forna* F.PL. *the ovens*. The analysis is facilitated here if the Element A represents a morpheme of plural, functionally higher than the proper gender of the form, which also imposes a parasite gender, in this particular case the feminine gender: [**PL**-A [**F**-A **m**-∅-**N**

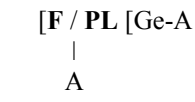


Fig. 1 *heteroclite paradigms* (*il dito /le dita*)

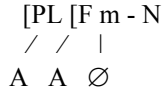


Fig. 2 *furno / forna – metaphonic type*

See already in the Medieval Southern forms (HistTroya 78) the feminine plural affix -*a* in *quella mura* with heteroclite agreement of the (plural) verb and adjectives:

quell**a** mur**a** **foro** fabricat**eAGR.PL.** e coperta de marmore ben laborat**e**, e *pent**e***
These walls were built and covered of marbles well worked and painted

Or the Italian Southern Latin forms: - ad agr**a** pum**a** 'apples' - as Modern Italian *le dita* F.PL. 'the fingers'. As the derivational suffixes, which determine regularly the category of the resulting word, are logically recognized as structural heads of the complex form, the functional categories of the grammar (gender, number in particular) can be considered to be structural heads. This leads to a unified theory of (affixational) morphology, in which derivational affixes and inflectional affixes do not need to be separated in the rules of formation and in which Phonology builds Morphology.

Characterizing Contrasts: Features vs. Acoustic Distance

Chelsea Sanker, *Brown University* (chelsea_sanker@brown.edu)

Are distinctive features *per se* reflected in perception? Some work has found evidence for abstract features not attributable to acoustic similarity, in consonantal contrasts (Studdert-Kennedy, Shankweiler, & Pisoni 1972). However, while consonants exhibit consistent categorical discrimination, vowels can have more continuous patterns (e.g. Fry et al. 1962; Pisoni 1973), and do not exhibit the same effects of having shared features (Blumstein 1974).

I present a perceptual discrimination study examining whether contrasts are better captured by abstract features or phonetic similarity. The results support a featural characterization of consonants, but are more consistent with an acoustic characterization of vowels.

48 native English speakers heard pairs of English words and decided whether they were the same or not. Half of the pairs were phonologically distinct; half were the same. Within a block, phonological contrasts were consistently in the same position of the word: onsets (e.g. *fan-pan*), nuclei (e.g. *look-lock*), or codas (e.g. *fun-sun*). Each listener completed one block of each contrast type. The study was split into two conditions: (1) maximizing trials for each word pair (mean = 21.6), with fewer pairs; (2) maximizing number of pairs, with fewer trials for each (mean = 8.0). Pairs differing in number of segments were excluded from analysis.

For consonant contrasts, the phonological distance between paired items, measured in number of features, was negatively correlated with response time; listeners made faster decisions when the two items differed in more features. Condition 1: in Coda blocks, $r(62) = -0.27$, $p = 0.025$ and in Onset blocks, $r(68) = -0.23$, $p = 0.049$. Condition 2: in Coda blocks, $r(353) = -0.18$, $p < 0.001$, and in Onset blocks, $r(326) = -0.14$, $p = 0.01$.

Items differing by more consonant features more accurately distinguished, though the correlation between featural distance and accuracy was only significant in the condition with more pairs: in Onset blocks, $r(326) = 0.22$, $p < 0.001$, and in Coda blocks, $r(353) = 0.095$, $p = 0.073$. The effects varied by feature; e.g. [+continuant] was more distinctive than [+voice].

Table 1: Correlations of acoustic and featural distance with RT and accuracy: Nuclei

Condition 1 (n = 73) Correlations

	RT	accuracy
F1-F2 Euclid. Dist.	-0.20·	0.34***
Features	-0.14	0.12

Condition 2 (n = 358) Correlations

	RT	accuracy
F1-F2 Euclid. Dist.	-0.15***	0.23***
Features	-0.083	0.093

For vowel contrasts, acoustic distance was a stronger predictor than featural distance; both response time and accuracy were significantly correlated with Euclidean distance between the F1 and F2 values of the paired items. The correlations with featural distance had a weak trend in the expected direction, which is predicted by the acoustic grounding of features.

Despite the correlation between acoustic distance and accuracy, responses were generally categorical; 'same' responses for phonologically distinct pairs (6.2% and 4.2%, in each condition) were infrequent relative to responses for phonologically matching pairs (93.7% and 89.3%).

For consonantal contrasts, response time and accuracy were both correlated with featural distance between paired items. However, neither response time nor accuracy was significantly correlated with featural distance between paired items with a vowel contrast; rather, they were correlated with acoustic distance. These patterns suggest different encoding of vowel and consonant contrasts, as well as demonstrating limitations of equating different features.

Perspectives on final laryngeal neutralization – new evidence from Polish

Geoff Schwartz, Ewelina Wojtkowiak & Daria Arndt: UAM Poznań

Since it was first reported for final obstruent devoicing, incomplete neutralization has been a controversial phenomenon. Some (e.g. Port 1996) have suggested that incomplete neutralization poses a challenge to the fundaments of phonology, and perhaps for this reason many (e.g. Manaster-Ramer 1996) have dismissed the findings, citing methodological issues such as the influence of orthography. Röttger et al. (2014) address such methodological concerns in their study, and still find solid evidence for contrast maintenance in German. This study aims to reproduce the Röttger et al. methodology to assess claims of neutralization in Polish, both in production and perception.

For production, we use a singular formation task based on aural input of nonce words, minimizing possible effects of orthographic bias. Participants heard a carrier sentence containing a nonce word with contrasting obstruents before the plural ending (i/ɨ), and their task was to produce the singular version with a zero ending in a different carrier:

- Aural Stimulus: *Szeby~Szeby* /ʂɛbi~ʂɛpɨ/ *można znaleźć w Warszawie* ('you can find _____ in Warsaw')
- Participants' productions: *A w Poznaniu jest tylko jeden szeb~szep* ('But in Poznań there is only one _____')

We recorded 24 nonce pairs (48 words) from 15 speakers, for a total of 720 items. Linear mixed-effects regression models were run with 4 different acoustic measures (Vowel Duration, Closure Duration, Closure Voicing Duration, Burst Duration) as dependent variables, Underlying Voicing as an independent variable, and Speaker and Item as random factors. Significant effects of Underlying Voicing were found in the expected direction for Vowel Duration (mean difference of 6.6 ms), Closure Duration (7.2 ms), and Closure Voicing (2.1 ms). Individual results revealed that Vowel Duration, Closure Duration, and Closure Voicing were neutralized for 4, 5, and 7 speakers, respectively, and that 3 speakers showed neutralization in all acoustic measures.

Recordings from the production study were used in a perception experiment employing a forced choice plural formation task in which listeners were asked to choose which of the two words displayed on the screen was the plural form of the word that they heard. Stimuli were chosen such that the acoustic contrasts between the voiced/voiceless productions was representative of those observed in the production study. The experiment contained 112 trials (56 voiced/voiceless pairs). Forty-six L1 Polish listeners took part in the experiment yielding a total of 5152 tokens for analysis. The overall accuracy rate was 78.8%, suggesting that listeners were quite adept at hearing the difference between voiceless and 'devoiced' items. In addition, underlying voiceless items were identified with greater accuracy (89%) than underlying voiced items (68%). A mixed effects logistic regression analysis found a significant effect of Vowel Duration on accuracy (Reference Value: Correct, B=-0.021, Std.Error=0.003, t=-6.44, p<.001), but no effects for Closure Duration, Closure Voicing, or Burst Duration. The negative coefficient for the effect of Vowel Duration indicates that shorter vowels contributed to more accurate responses. An additional perception experiment is in preparation in which the stimuli will be manipulated to equalize the above-mentioned acoustic measures.

Our results suggest that incomplete neutralization is alive and well in Polish, but how may it be incorporated into a phonological analysis (cf. van Oostendorp 2008)? We argue that the issue of neutralization is a relic of the 'segment', and that a structural approach to laryngeal phonology (Schwartz 2017) offers an insightful explanation of how group-based incomplete neutralization effects may co-exist with intra-speaker neutralization.

AMPLITUDE AS A MEASURE OF STRESS PLACEMENT IN CROW

John Simonian; California State University, Fresno; john@mail.fresnostate.edu

Phonetic correlates of stress are listed as length, intensity, and pitch (Gordon 2011). Crow is a language where length is contrastive and where pitch is predictable with a series of rules (Graczyk 2007: 15; 20-21). By process of elimination, the feature that must be the indicator of stress is intensity.

To establish what a high intensity peak is, monosyllabic words in isolation are the benchmark. Crow is a language that is iambic and quantity sensitive (Golston & Riad 2017). All monosyllabic Crow words are bimoraic such as *búa* 'fish' or *bíi* 'snow' (Simonian 2017). The average intensity of 10 measured monosyllabic words is 82.79 dB.

When comparing words comprised of two heavy syllables, their mean intensities are similar. Across 60 words the average intensity of the first syllable is 77.95 dB and the average of the second is 76.55, effectively identical. However, these numbers mask the fact that there are two sub-classes of HH words. The division that creates two classes of HH words is the placement of the "accent" marker which is displayed in Crow orthography as <´>. This marker is thought to be a marker of high tone (Graczyk 2007). A word accented on the first syllable, for instance, *déeshe* [deː.ʒæː] 'tongue' has an intensity for the first syllable of 82.00 dB with the second having an intensity of 72.14 dB. A word accented on the second syllable *chiaxxó* [ʧiːʰx.xɔː] 'five' has an intensity for the first syllable of 71.42 dB with the second having an intensity of 81.68 dB. The placement of this "accent" marker is the determining factor in which of these two syllables is louder, or in other words, stressed.

I propose that the loudest syllable is routinely predicted by the orthographically-marked high tone, *regardless of what should be the loudest syllable based on iambic footing*. Evidence for this claim comes from LH and HL words where the light syllable is louder than the heavy syllable if and only if it has the lexical accent mark. Additional evidence is that out of 433 words, 359 words had the loudest syllable and the marked accent coincide, regardless of things like the sonority differences between different types of vowels. With evidence that amplitude and pitch co-occur, Crow's system of stress is changed from what Golston & Riad have proposed. Instead of amplitude being stable and predictable, it is clear that pitch and amplitude co-occur in a majority of words.

Golston & Riad 2017. 'Pitch accent in Crow and Osage'. mfm. **Gordon** 2011. 'Stress: Phonotactic and Phonetic Evidence'. UCSB. **Graczyk** 2007. *A Grammar of Crow*. Nebraska. **Simonian** 2017. 'Minimal Word and Affix Length in Crow and Hidatsa'. Siouan/Caddoan Languages Conference, Missouri.

There is Faith and Faith: Prosodic contrast in Serbo-Croatian and Slovenian verb derivation

Marko Simonovic, Univerza v Novi Gorici, Universiteit Utrecht

I discuss productive verb derivation patterns with special attention for allowed preservation of prosodic contrast. A preliminary study yielded two sets of extremely productive verb derivational patterns, which allow very different amount of prosodic contrast. Specific Serbo-Croatian and Slovenian suffixes will be analysed and compared. In this abstract we illustrate the main generalisations using Serbo-Croatian examples.

On the one hand, suffixes *-ova-* and *-a-* which have been used for denominal verbs and are currently mostly employed for the integration of English verbs allow the preservation of prosodic patterns, even some which are not attested elsewhere in the verbal system. For instance, S-C verbs generally follow the pattern where the stem-final syllable has a high tone in the infinitive form. However, denominal verbs such as *u$_{н}$žin-a-ti* 'to snack', based on the noun *u$_{н}$žina* 'snack', form an exception. Similarly, non-initial high tones have to spread to the left in native verbs, forming rising accents (*če$_{н}$k-a-ti* derives *do$_{н}$-če$_{н}$k-a-ti* and not **do-če$_{н}$k-a-ti*), but loanwords allow patterns like *rikve$_{н}$st-a-ti *ri$_{н}$kve$_{н}$st-a-ti* ' to request' based on the English verb.

On the other hand, suffixes *-i:va-*, *-a:va-* and *-V:.a-* which are involved in co-called secondary imperfectivisation (derivation of an imperfective verb from a verb which was made perfective by prefixation) all have predictable prosodic patterns, thereby allowing no prosodic contrast, as can be seen from the same pattern in the rightmost column below. This pattern is analysable in terms of the prosodic dominance of the suffix, but it is also worth considering an option in which the surfacing pattern is post-lexical (see Simonović & Arsenijević 2014, for a similar account).

Original IMP	Prefixed PERF	Secondary IMP
pi:$_{н}$s-a$_{н}$-ti 'to write'	pre-pi:$_{н}$s-a$_{н}$-ti 'to copy'	pre-pis-i:$_{н}$v-a$_{н}$-ti 'to copy repeatedly'
če$_{н}$k-a-ti 'to wait'	do$_{н}$-če$_{н}$k-a-ti 'to meet'	do-ček-i:$_{н}$v-a$_{н}$-ti 'to meet repeatedly'

Finally, I observe that the two kinds of derivational patterns seem to be strictly separated in the dynamics of verb aspect encoding in the lexicon, so that hardly any denominal and borrowed verbs ever derive secondary imprefectives.

I discuss two possible approaches to accounting for the observed grouping and separation of the productive derivational patterns. On the one hand, the two kinds of derivation involve radically different syntactic structures, so I test an account couched in Distributed Morphology (Halle & Maranz 1994, Mavrin 2003), which allows syntax to impose or delete prosody of the stem. On the other hand, representational phonological approaches will be tested, which involve the well-known mechanisms of OO-FAITH (Benua 1997) and Lexical Conservatism (Steriade 1997). I conclude that while phonological approaches seem to be suited to account for the exceptional preservation of contrast, a more syntactic approach is required to account for the loss of contrast in secondary imperfectives.

Approximant Reduction in Colloquial Icelandic

Brynhildur Stefánsdóttir Cornell University *bs724@cornell.edu*

Cited pronunciations often do not reflect actual speech. This is the case in Icelandic, even though it is thought to be a conservative language. In colloquial speech there are interesting changes happening, for example with regards to approximants (traditionally symbolized [v], [ð], [j] and [ɣ]). Approximants frequently weaken, or fully delete in colloquial speech (Árnason 2011, Helgason 1993), e.g *maður* 'man' [ma:.ðʏr̥] →[ma:.uʏ̯] or [ma:r̥]. This can lead to further reduction, e.g. *náttúrulega* 'naturally' [nauhturʏlɛɣa] → [nauhtl̥a]. Deletion happens within a prosodic word, e.g. *þú veist* 'you know' [θu.veist] → [θu.eist]/[θust].

Some of these pronunciations have resulted in new written variants, mainly used in informal writing. This is similar to contracted forms in English where some, e.g. *you'll* for *you will,* are more acceptable than others, e.g. *prolly* for *probably.* For example, *ætlarðu* 'are you going to' is commonly written *ætlaru*. The former was used 16 times on *Twitter* in January 2018 while the contracted form appeared 26 times. Some of these written variants have a restricted usage, e.g when *þú veist* 'you know' is not used in its lexical meaning but rather as a discourse marker or a hedging word it is sometimes written *þúst*. This contracted form was used 25 on *Twitter* in January 2018 compared to 38 instances of the full written form. Importantly, there are no examples of *þúst* when the phrase retains its lexical meaning but 112 examples of the full written form.

This paper reports the results of a study on approximant reduction in colloquial Icelandic and how it affects the pronunciation of a word. For an actual representation of colloquial speech, I used data from an Icelandic podcast, where a male and a female speaker discuss Icelandic films as well as various random topics. I fully transcribed a half hour of speech, containing almost 800 examples of approximant reduction each. This kind of data has never been used before for Icelandic. The advantage is that this is a fully casual and informal conversation between speakers that are not trying to realize expected pronunciations in accordance to prescriptive rules. This is apparent e.g. from their usage of English slang and high frequency of discourse fillers and hedging words. Furthermore, *Twitter* was used to gather data on the two participants usage of new written variants.

In the data, an approximant is rarely fully pronounced; intervocalically it is always deleted, e.g. *mögulega* 'possibly' [mœ:ɣʏlɛɣa] (2 examples) is pronounced [mœ:ʏlɛa] and [mœ:lɛa]. Only [v] and [j] can appear word initially and there they are not deleted, e.g. *vera* 'to be' is pronounced [vɛ(:)ra] or [vra]. An approximant is more likely to be deleted when it appears in high frequency forms. For example, *eitthvað* 'something' (168 examples) and *svona* 'thus' (120 examples), while formally pronounced [eittkʰvaθ] and [svɔ:na] respectively, the most common pronunciation is [eihkʰa] and [sɔ:na]/[sɔnna]. Another clear example is the phrase *þú veist* 'you know' [θuveist]. There are 180 examples in the data where it is used as a discourse marker or a hedging word. When used as such it is more susceptible to lenition. The pronunciation is on a continuum, ranging from [θuest to [θs], with [θʏst]/[θust] being the most frequent.

The results of this study show that the most significant factors for extreme weakening and deletion are frequency and grammatical function. When a phrase has lost its lexical function, it is more likely to be reduced. This does not reflect a fully automatic process from the standard form but is rather the result of contributions from both reduction and lexicalization. Data from *Twitter* supports this, both speakers use *þú veist* when using the phrase in its original lexical function. However, the only time the phrase appears as a discourse marker, the female speaker uses the contracted form *þú veist.* In sum, even in Icelandic, thought to be to be conservative, there are clear signs of reduction with a range of variation in colloquial speech.

Prosodic Faithfulness and (no) noun classes in Afar

Jelena Stojković, *University of Leipzig*, jelena.stojkovic@uni-leipzig.de

Introduction. Afar (Cushitic) nouns can be feminine or masculine: feminine end in a stressed vowel, and masculine can end in an unstressed vowel or in a consonant (1). The phonological shape of the noun interacts with stress-reassignment when the particular suffix is attached (2).

(1) *Case marking*

	ACC	NOM	GEN	gloss
I	calé	calé	calé-C	'mountain'
II	gíta	gití	gití	'road'
III	alíl	alíl	alíl	'heart'

(2) *Particular*

	ACC	particular	gloss
I	dummú	dummuytá	'vixen'
II	dúmmu	dummúyta	'tomcat'
III	xatúk	xatúkta	'star'

Previous approaches. Ulfsbjorninn 2016 has proposed that Afar has no noun classes, rather that the apparent suppletive allomorphy is phonologically conditioned, but this proposal holds only if nouns are marked for stress and syllabified in the input. In that sense the account based on noun classes (Bliese 1981) is advantageous, but it fails in other cases. My proposal builds on Ulfsbjorninn's idea and shows that apparent noun classes are derived via suffixation on different strata. Accentual properties of nouns with and without the particular follow from a high-ranked demand for faithfulness to the input foot size.

Analysis. Assuming that Afar has an accentual system with the H tone on the Stress Head, I claim that Afar nouns are subject to Prosodic Faithfulness (Itô et al. 1995): size of the foot is immutable in terms of the number of moras. Feminine is thus derived via affixation of a foot (as in Greek, cf. van Oostendorp 2012) associated with a H tone.

(3) IDENT-ϕ: Substrings of the input dominated by feet correspond to substrings of the output dominated by feet.

(4) *'younger brother'*

/macanda/	Align-R	WSP	NonFin	Dep-H	Dep-ϕ
a. (mácan)da	*!	*		*	*
☞ b. ma(cánda)				*	*
c. macan(dá)		*!	*	*	*

(5) *'younger sister'*

/macanda/ + ϕ–σ–H–μ	Ident-ϕ	Align-R	WSP	NonFin	Dep-ϕ
a. (mácan)da	*!	*	*		
b. ma(cánda)	*!				
☞ c. macan(dá)			*	*	

It is crucial that this constraint 'sees' only the prosodic structure, but cannot refer to elements below the mora. At the stem stratum, accent is re-assigned when the particular suffix (underlyingly specified with a H tone) is attached. Since this construction has two H tones, the left one is deleted due to right-directed OCP-R (cover constraint for OCP » ALIGN-R).

(6) *Feminine noun + particular*

H H / dum(mu) + yta	Ident-ϕ	Head=H	OCP-R	*Deass-T	Max-H
a. dum(muy)ta	*!		*!	*	*
b. dummuy(ta)			*!	**	*
☞ c. dummuy(ta)				*	*

(7) *Masculine noun + particular*

H H / (dum)mu + yta	Ident-ϕ	Head=H	OCP-R	AlignϕR	*Deass-T	Max-H
a. (dum)muyta			*!	**	*	*
b. dum(muy)ta			*!	*	**	*
☞ c. dum(muy)ta				*	**	*

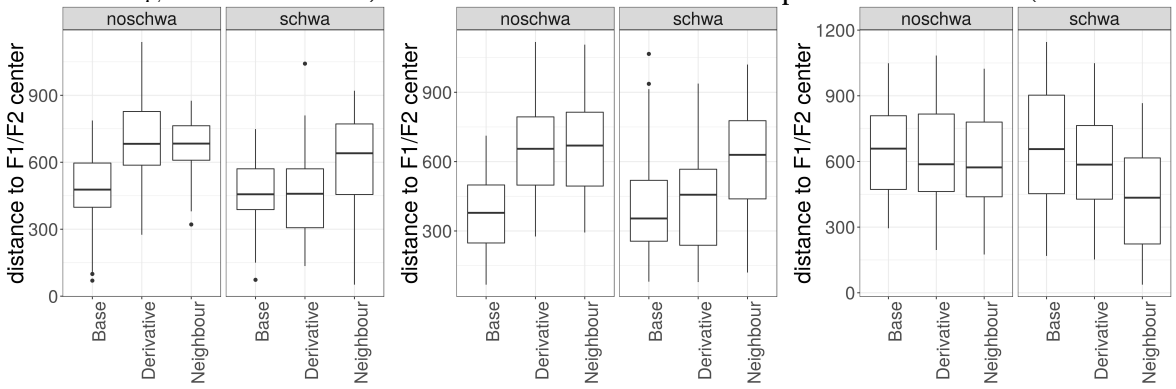
Prosodic Faithfulness has been implied in different domains: apart from FTBIN and FOOTFORM (Prince & Smolensky 1993), constraints sensitive to foot size have been employed for reduplication (Steriade 1988, McCarthy & Prince 1995), truncation (Piñeros 2000, 2014, Sanz Álvarez 2015), blends (Ahn 2014, Trommer & Zimmermann 2010), language games (Itô et al. 1995). This account joins them in advocating for mechanisms in the grammar that can only see up to a certain point in the structure, but not further than that.

Phonologically-conditioned cyclicity in Standard French • Benjamin Storme (CNRS)

1. Introduction. The phonology of derivatives can be regular (i.e. it obeys the language's phonotactics) or cyclic (i.e. the derivative bears resemblance to its base beyond what is predicted by the language's phonotactics). This paper documents a pattern of phonologically-conditioned cyclicity in Standard French (SF), where the realization of a mid vowel as tense or lax in the final syllable of a derivative's stem (e.g. *ê* in *fêt-ard* 'partier') is cyclic when a schwa can or must occur between the stem and the suffix (e.g. *coqu-(e)-let* 'hen-DIM') but regular otherwise (e.g. *fêt-(*e)-ard* 'partier'). This puzzling pattern is discussed in light of the debates on the 'French foot' (Selkirk 1978 a.o.).

2. Method. Ten SF speakers (age: 21-30; seven female speakers) were recorded uttering 42 triplets consisting of a derivative (e.g. *fêt-ard* 'partier'), its base (e.g. *fête* 'party') and a word which is morphologically simple and phonologically similar to the derivative (e.g. *feta* 'feta cheese'). This word provides the phonotactic baseline for the derivative. The derivatives contained (i) vowel- and glide-initial suffixes (before which no schwa can occur, due to a ban on ə-vowel and ə-glide sequences in SF) and (ii) obstruent- and liquid-initial suffixes (before which a schwa can or must occur). The words were embedded in a carrier sentence and presented to the participants in pseudo-randomized order (with three repetitions). The distance to the F1/F2 space's center was used as a measure of vowel quality: lax mid vowels [ɛ, ɔ] are more central than tense mid vowels [e, o].

3. Preliminary results. The data from three speakers have been completely analyzed so far. The figures below show how mid vowels are realized as a function of the word type (base, derivative, the derivative's phonological neighbour), the stem-suffix boundary (schwa available vs. unavailable) and the identity of the mid vowel in the base as established by pronunciation dictionaries ([ɛ, ɔ, o]). The results show that, when a schwa can or must occur at the stem-suffix boundary (the right panels in Fig. (a-c)), the derivative patterns with the base (i.e. cyclically) ; otherwise (the left panels in Fig. (a-c)), it patterns with its phonological neighbour (i.e. regularly). Three linear mixed-effects models were fit to the data: a fully phonotactic model (Derivative=Neighbour), a fully cyclic model (Derivative=Base), and a partially cyclic model (Derivative=Base if schwa can intervene between the stem and the suffix; Derivative=Neighbour otherwise). The third model was found to provide the best fit (lowest AIC).



(a) Base with [ɛ] (b) Base with [ɔ] (c) Base with [o]

4. Discussion and conclusion. The preliminary results of this study add to the body of evidence suggesting that preschwa syllables have a special status in French. Durand (1976) and Selkirk (1978) hypothesize that these syllables are prosodically prominent: this prosodic prominence could explain the cyclic effect (see Kenstowicz 1996). However, because optional noninitial schwas (e.g. the medial *e* in *coqu-e-let*) are very rarely pronounced in conversational SF, the cyclic pattern may also be directly conditioned on the nature of the segment following the stem in the derivative synchronically (nonschwa vowel or glide vs. obstruent, liquid or obligatory schwa), without reference to the distribution of optional schwas and their potential prosodic effects.

Gradient interaction of nasality and rounding
A corpus study of Hungarian

Ildikó Emese Szabó
ildi.szabo@nyu.edu

Introduction: Törkenczy (2006) observes that coda mC clusters in Hungarian are almost exceptionlessly preceded by [+round] vowels: words like /tømb/ *tömb* 'block', /tsomb/ *comb* 'thigh', and /tsim.bi/ *cimbi* 'buddy' are well-attested, but words like */tsimb/ *cimb* are extremely infrequent. In this paper I confirm Törkenczy's observation, and show that it is part of a larger gradient restriction: labial /mC/ is more likely to be preceded by [+round] vowels, and dental /nC/s are more likely to be preceded by [-round] vowels. I present corpus evidence for this distribution, and argue that its motivation is perceptual: [±round] contrasts are less perceptible adjacent to nasal codas.

Corpus study: The type frequency data in this paper comes from a corpus based on the Szótár AdatBázis 1.0 (Szilágyi N., 2014), which contains 71,133 unique stems of Hungarian. After the elimination of compounds, the corpus used in this study contains 21,787 stems. Table 1 shows the type frequencies of rounded and unrounded vowels in VNC sequences relative to other VCCs. Rounded vowels are significantly overattested before labial VNC clusters (χ^2-test with Yates' correction: χ^2=33.97, p=0.0001), while they are underattested before dental NCs (χ^2=29.34, p=0.0001). At the same time, other NC clusters pattern in-between, though there is little data on ɱ{f,v} and ɲ{c,ɟ} strings. Note that the nasal here is always a coda, due to rules of Hungarian syllabification, but the cluster might be split accross a syllable boundary—e.g. in /tsim.bi/ *cimbi* 'buddy'.

	m{p,b}	ɱ{f,v}	n{t,d}	ɲ{c,ɟ}	ŋ{k,g}	other CCs
Rounded	167	13	233	25 (35)	180	3071
Unrounded	181	27	729	40 (65)	409	6282
Ratio	0.92	0.48	0.31	0.63 (0.54)	0.44	0.49

Table 1: Type frequencies of CCs in V_ environment

As partially anticipated by Törkenczy, this pattern holds also in the more specific word-final environment (VNC#): in 15/16 Vm{p,b}# forms, but only 36/193 Vn{t,d}# forms, the vowel is [+round] (cf. 288/735 for all CCs). Outside of the coda context, we find evidence for only part of the restriction: rounded vowels are slightly overattested before prevocalic (onset) /m/, but vowels preceding onset /n/ do not pattern differently from vowels preceding other consonants.

Analysis: I claim that the prenasal suppression of the [±round] contrast is a result of anticipatory nasalization from coda Ns obscuring the cuing of roundedness in vowels. There is evidence for nasalization obscuring cues of roundedness—lowering F2 as well as dampening and raising F3 (Maeda, 1993)—and coda Ns typically induce more nasal coarticulation than onsets. Neutralization of [±round] contrasts preceding coda nasals is also attested (e.g. French: Fourgeron & Smith, 1993). Hungarian has substantial $\overleftarrow{\tilde{V}N}$ coarticulation from coda nasals—VnC alternates with $\tilde{V}$C (Siptár & Törkenczy, 2000)—which might make a roundedness distinctions harder to perceive prenasally and could lead to gradient partial neutralization. This can be analyzed in a Dispersion theoretic framework (Flemming 2004) as an interaction of constraints promoting nasal coarticulation and constraints enforcing distinctiveness thresholds for rounding contrasts (MinDist).

The overattested ngrams (V_{UR}n and V_Rm) suggest an enhancement effect. Since V_R and /m/ share a labial gesture, together they can cue the VN string as a whole better than e.g. /V_{UR}m/ could. It is predicted that since /ŋ/ does not participate in this pattern, it must have a smaller effect on preceding vowels than /m/ and /n/ do, which is yet to be verified experimentally.

OCP Effects in Turkish Partial Reduplication: Locality and Feature Specificity

Kevin Tang (Zhejiang University; linguist@kevintang.org) &
Faruk Akkus (University of Pennsylvania; akkusf@sas.upenn.edu)

This paper investigates the *partial (emphatic) reduplication* in Turkish, used with modifiers (adverbs and adjectives), which gives the modifier the meaning of 'fullness' (Demircan 1987).

Base	Gloss	Reduplication	Gloss	Base	Gloss	Reduplication	Gloss
dingin	'serene'	*di**p**-dingin*	'very bald'	*ma:vi*	'blue'	*ma**s**-ma:vi*	'fully blue'
beyaz	'white'	*be**m**-beyaz*	'very white'	*temiz*	'clean'	*te**r**-temiz*	'completely clean'

The reduplicant, realized as a prefix, has the form $(C_1)VC_2$. C_2 of the reduplicant prefix ends in one of the four *linking consonants* (LC): *-p, -m, -s, -r* (Lewis 1967). Previous studies on the topic approach the issue from different angles with different OCP constraints (Hatiboğlu 1973, Demircan 1987, Dobrovolsky 1987, Taneri 1990, Wedel 1999, Kelepir 2000, Yu 1999, Sofu 2005, Sofu & Altan 2008). Many relied solely on intuitions, examined a small number of items, used a forced-choice task and not a rating task. This study undertakes a comprehensive data collection and analysis of the positional and feature specificity of the OCP effects.

Method: 162 real words were selected from these studies to cover a broad range of previously commonly tested items. To enable within participant comparisons, each participant was tested on both a rating task and a forced-choice task (4-AFC). Only the rating task is reported here because it was rarely used in previous studies. Participants were asked to rate a naturalness scale of 1-7 of each of the 4 reduplicated forms per item as well as to pick one option out of the 4 reduplicated forms. Each item was tested by $\approx$ 40 participants.

Discussion: Previous studies converge on the view that the dissimilation in reduplication stems from some kind of OCP, yet questions regarding the nature of the OCP or the extent of its effect have not been explained thoroughly and remain largely at the observational level. Most of the studies reduce the OCP effect to anti-faithfulness constraints between segments, explained at the level of natural classes, e.g. Demircan (1987), Yu (1999), Kelepir (2000). Moreover, the OCP between the reduplicant and the base is assumed to extend to C_2 of the base, and no further (Demircan 1987, Kelepir 2000, Sofu 2005). However, minimal pairs showing that the effect extends to C_3 can be found. For instance, ***b**eyaz* 'white' and ***b**ayat* 'stale' have identical consonants except for C_3 ([z] vs. [t]), but the LC [s] is only dispreferred with *beyaz* (Rating: 3.6/7), while it is the most preferred LC with *bayat* (Rating: 5.95/7).

Results: Focusing on consonant-initial words, the trial-level rating data were analysed using mixed-effect regression modelling (*lme4* in *R* (R Core Team 2017)). Following Graff & Jaeger (2009), to examine the **positional and feature specificity** of the OCP effects, each phonological feature was specified as an independent predictor for each consonant (IndFeat). Other predictors were included such as total identity of consonants (LC = C_{1-4}) (Iden), sum of the matched features (SumFeat), and ease of articulatory (betwee LC and C_1). *Random* effects of items, their LC, and participants were included. The best model based on AIC/BIC was found to be **Iden + IndFeat** which includes both OCP predictors of total identity as well as individual features **across all consonants** (not only C_1 and C_2). In addition, the OCP effect decreases from left to right (Zymet 2014) and the OCP effect is **stronger for codas** than onsets.

Conclusion: This paper presents a comprehensive analysis of Turkish Particial Reduplication. We highlight that the OCP constraints are more graded than they have been previously proposed. Our findings support previous work on the formulations of OCP constraints that treat individual features as free parameters in the similarity computation. The surprising finding with regard to locality is that not only the OCP effect extends all the way from C_1 to C_4, but it is a function of both the proximity from LC and the position in syllable structures.

Opaque Multiple-Source Suppletion in Eslarn Infinitives

Jochen Trommer University of Leipzig jtrommer@uni-leipzig.de

Summary: In this paper, I provide new empirical evidence for phonological optimization in suppletive allomorph selection (Kager 1996, Bonet et al. 2007, Wolf 2015). The alternation between -ɐ and *-n* in Eslarn ([isliŋ]) Bavarian (Bachmann 2000) is triggered by two disjoint phonological contexts and can therefore not be captured through selection by a unitary subcategorization frame (Bye 2006, Paster 2006, 2009, 2015). I provide an analysis in Containment Theory which also captures the phonological opacity in the pattern emerging from nasal-stop coalescence. **Data:** The infinitive suffix is *-n* after non-nasal consonants undergoing place assimilation (1-a,d) and coalescence with singleton stops (1-c), but -ɐ after nasal-final roots (1-b). This suppletion pattern is mirrored in vowel-final roots (restricted in Eslarn to diphthongs and long [a]), where final low vowel triggers *-n* (1-f), and high vowels -ɐ (1-e):

(1)	**1sg**	**Infin.**			**1sg**	**Infin.**	
	laf	laf-m̩	‘run’		ʃɛl	ʃɛl-n	‘ring’
a. **Fricatives**	les	les-n̩	‘read’	d. **Liquids**	hul	hul-n	‘get’
	sɔ͡ʊx	sɔ͡ʊx-ŋ̩	‘quest’		be.tl̩^{ɣ}	be.tl̩^{ɣ}-n	‘beg’
	ʀam	ʀam-ɐ	‘vacate’		ba͡ʊ	ba͡ʊ-ɐ	‘build’
b. **Nasals**	ʀɛn	ʀɛn-ɐ	‘run’	e. **Non-low Vowels**	ʃʀa͡ɪ	ʃʀa͡ɪ-ɐ	‘yell’
	sɪŋ	sɪŋ-ɐ	‘sing’		lɔ͡ʊ	lɔ͡ʊ-ɐ	‘let’
	lep	lem	‘live’		ma:	ma:-n	‘mow’
c. **Stops**	ret	ren	‘talk’	f. **Low Vowels**	fɔ͡ɐ	fɔ͡ɐ-n	‘drive’
	lek	leŋ	‘put’		fɾ͡ɐ	fɾ͡ɐ-n	‘lead’

Crucially, neither the distribution of -ɐ (after high vowels and nasal consonants) nor *-n* (low vowels and non-nasal consonants) can be captured as a natural class, and hence as a unitary subcategorization frame, but the pattern is in crucial respects phonologically optimizing, avoiding two marked configurations that are illicit in Eslarn inside of phonological words, adjacent nasals (as in hypothetical [*ʀam-n]) and low-vowel sequences (as in *[ma:-ɐ]). **Analysis:** The pattern can be exhaustively captured by phonologically choosing between the listed allomorphs through the ranking {*NN, *$V_{+low}V_{+low}$, $\textsc{Share}_{Place}$ TN } ≫ *$\sigma_{3\mu}$ ≫ *V̆, where the constraint against unstressed vowels *V̆ leads to preference for syllabic nasal consonants as in [laf-m̩], overwritten in the relevant contexts by the ban on two adjacent nasals (*NN) and by *$\sigma_{3\mu}$ (‘Avoid trimoraic syllables’) for non-low vowels ([lɔ͡ʊ]$_\sigma$[ɐ]$_\sigma$ ≻ *[lɔ$_\mu$ʊ$_\mu$n$_\mu$]$_\sigma$), whereas the latter is outranked by *$V_{+low}V_{+low}$ for low-vowel stems. **Opacity:** -ɐ/-n͡ allomorphy involves two cases of surface opacity problematic for an analysis in Standard Correspondence Theory (CT). *First,* since in CT coalescence is true segment fusion as in /$l_1e_2p_3$-n_4/ → [$l_1e_2m_{3,4}$], it should also be available for nasal-final stems (/$ʀ_1a_2m_3$-n_4/ → *[$ʀ_1a_2m_{3,4}$]) and preferred since coalescence of two nasals leads to less violations of Ident constraints than nasal+stop coalescence. *Second,* stems which end in a high vowel and a stop (e.g. [ʃʀa͡ɪp] ‘write’) exhibit the nasal, not the vocalic allomorph ([ʃʀa͡ɪm], not *[ʃʀa͡ɪpɐ]). Both patterns fall out naturally in Autosegmental Containment Theory (Zimmermann and Trommer 2014), where underlying phonological material cannot be deleted but only marked as phonetically invisible, and coalescence boils down to non-realization of one of the involved segments accompanied by spreading (Zaleska 2018, in this case independently motivated place spreading to nasals). If now both *NN and *$V_{+low}V_{+low}$ are interpreted as generalized markedness constraints evaluating phonetically visible and invisible segments on a par, a form such as *[ʀa(ⓜ-m)$_{Lab}$] (with spread Labial, and stem-*m* made floating/invisible) still violates *NN and loses against [ʀam-ɐ], whereas [ʃʀa͡ɪ(ⓟ-m)$_{Lab}$] wins over *[ʃʀa͡ɪ.pɐ] because it additionally satisfies undominated $\textsc{Share}_{Place}$ TN (‘An obstruent should share Place with a following nasal’) even though it violates lower-ranked ∗$\sigma_{3\mu}$.

Maintenance of voicing and aspiration contrasts in Nepali stops

Rachel Vogel | Cornell University | rcv44@cornell.edu

This paper investigates the four-way contrast in aspiration and voicing of Nepali oral stops (i.e., [-voice, -asp], [+voice, -asp], [-voice, +asp], [+voice, +asp]). While this type of stop system is rare cross-linguistically, it is well attested in the Indo-Aryan family, as well as in unrelated languages in South Asia (Maddieson 1984, Ladefoged & Maddieson 1996). In many languages, however, it is observed that elements of the contrast are lost, usually with voiced aspirated stops (Dutta 2007, Kanwal & Ritchart 2015). In Nepali, specifically, it has been suggested that voiced aspirated stops undergo deaspiration in non-initial positions (Bandhu et. al. 1971, Acharya 2001, Schwartz, Sonderegger, & Goad 2017); however, this has never been systematically tested, and the observations differ across studies. The present investigation provides a systematic analysis of the four-way stop contrast, based on the durations of the closure and release portions of each stop type in word-initial and intervocalic positions, and demonstrates that at least for the variety of Nepali tested here, the contrast remains robust in both positions.

Based on previous observations regarding Nepali (Pokharel 1985), I formulated and tested the following hypotheses; any hypothesis not supported suggests neutralization of a contrast.

(1) Hypothesis 1: The total duration of aspirated stops in both initial and intervocalic positions will be longer than the duration of their unaspirated counterparts.

(2) Hypothesis 2: Aspirated stops, but not unaspirated stops, in both initial and intervocalic positions will exhibit substantial release portions following the closure.

(3) Hypothesis 3: The closure periods of phonemically voiced stops in both initial and intervocalic positions will be shorter than those of their voiceless counterparts.

The corpus, recorded and analyzed using Praat, consists of 120 stops with the four aspiration/ voice combinations, in initial and medial positions in real Nepali words, produced in a carrier phrase (4) by a 19-year-old speaker (F) from Kathmandu, currently studying in the United States.

(4) Nepali Carrier Phrase: *məlai ___ pʰeri bʰanus* 'please say ___ to me again.'

Figure 1 shows the mean duration of each consonant type (B = voiced, P = voiceless; h = aspiration), in each position (1 = initial position, 2 = intervocalic). The lower portion of each column is the closure duration; the upper portion is the release, identified as the time between the release burst and onset of the following vowel. As seen, while all types of stops are longer in initial position, in both positions they exhibit the same basic patterns. That is, aspirated stops are longer overall and have longer release portions than unaspirated ones, thus confirming Hypotheses 1 and 2. Voiceless stops have longer closures than voiced ones, confirming Hypothesis 3. We can thus conclude that there is no evidence for loss of any elements of the four-way stop contrast in the present variety of Nepali.

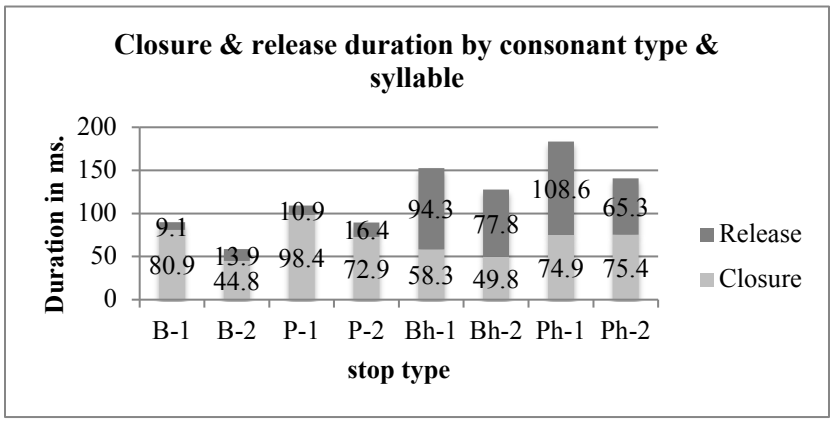


Figure 1. Summary of results

Continuancy in nasal place assimilation

Veno Volenec (University of Zagreb)
vvolenec@ffzg.hr

Introduction. This paper reports previously unrecognized patterns from Croatian in which nasal place assimilation is coupled with assimilation of continuancy. We show that a formal rule-based analysis which treats segments as unstructured sets of features elegantly captures all relevant phonological generalizations without overgenerating. These patterns are problematic for OT approaches to place assimilation (e.g., Jun 2004 ('classic' OT), McCarthy 2008 (harmonic serialism)) because of the phonetically arbitrary nature of nasal assimilation in Croatian.

The Data. In Croatian, phonemic nasals behave differently with respect to place assimilation: /n/ assimilates to bilabials, labiodentals, and velars; /m/ only to labiodentals; and /ɲ/ does not assimilate. Examples: /jedanput/ → [jeda**m**put] 'once', /on ʋidi/ → [o**ŋ**ʋidi] 'he sees', /banka/ → [ba**ŋ**ka] 'bank', /tramʋaj/ → [tra**ɱ**ʋaj] 'tram'. Crucially, /n/ changes to a velar nasal *stop* before non-continuants /k/ and /g/, but into a velar nasal *continuant* before continuant /x/; also, /m/ changes to a nasal continuant [ɱ] before continuants /ʋ/ and /f/. Preliminary electropalatographic recordings (averaged across two speakers at the frame showing maximal tongue-palate contact) indicate complete closure in realization of the nasal stop in [baŋka] 'bank' (*Fig. 1*) and non-complete obstruction in realization of the nasal continuant in [iŋxibirati] 'inhibit' (*Fig. 2*). Thus in specific cases Croatian nasals assimilate in continuancy as well as in place. These data are challenging both in terms of phonological computation (rules vs. constraints) and phonological representations (segments as unstructured sets of features vs. feature geometry).

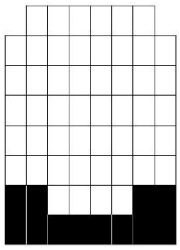


Figure 1.

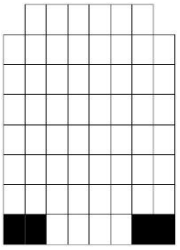


Figure 2.

Analyses. The simplest way of accounting for Croatian nasal assimilation patterns is with the following phonological rules:

(1) /+COR, +NAS/ → [–COR, αANT, βBACK, γCONT] / __ [–COR, αANT, βBACK, γCONT]

(2) /+LAB, +NAS, –CONT/ → [+CONT] / __ [+LAB, +CONT]

Rule (1) models place assimilation of /n/ before bilabial, labiodental, and velar segments, depending on the values of variables. Under this analysis [ɱ] is predicted to be a continuant, in contrast to more traditional interpretations of [ɱ] as a nasal stop (e.g., Laver 1994: 215). This is in line with Ladefoged's & Maddieson's (1996: 18) careful consideration: "We do not know if a true occlusive could be made with [a labiodental] gesture, when we take into account the gaps that often occur between the incisors." Rule (1) explicitly accounts for the fact that /n/ assimilates differently before non-continuant velars than before a continuant velar. Rule (2) models place assimilation of /m/ before labiodentals /ʋ/ and /f/. The feature [±CONTINUANT] is crucial for correctly stating both rules: It is the only feature which discriminates between labial and labiodental classes while still including both sonorant [ʋ] and non-sonorant [f]. Neither rule predicts unattested patterns: /m/ does not assimilate to velars, /ɲ/ does not assimilate at all. While an OT-HS analysis (McCarthy 2008) gives correct predictions in some simple cases (e.g., /banka/ → [baŋ.ka]), it cannot be brought to account for continuancy assimilation, and it predicts unattested output forms (e.g., /iznimka/ → *[iz.niŋ.ka] 'exception'). The main reason for this inadequacy is its reliance on CODACOND, defined by the [PLACE] node which does not include [±CONT]. Ideas on how to obviate this difficulty, pursuing possibilities explored by Padgett (1994) and/or positing a feature [LABIODENTAL], are presented and compared to the rule-based analysis.

Implications. Supported by phonetic data, this paper reports a previously unrecognized case of place and continuancy coupling in assimilation of nasals. A simple rule-based analysis ((1), (2)) explicitly captures all relevant generalizations: (i) Croatian underlying nasals behave differently with respect to assimilation (e.g., /n/ assimilates, while /ɲ/ does not); (ii) nasal place assimilation can be coupled with continuancy assimilation (e.g., [ŋ] in [baŋka] is [–CONT], [ŋ] in [iŋxibirati] is [+CONT]); (iii) a single natural class, velar obstruents, leads to two different outputs of place assimilation. We also show that due to the phonetically arbitrary nature of this phonological alternation, OT analyses undergenerate in some cases (e.g., in assimilation of /n/) and overgenerate in others (e.g., in assimilation of /m/).

Elements on the Licensor Tier for the Prosodic-Domain Head

Yuko Yoshida (Doshisha University)

This presentation provides a unified representational explanation of two seemingly unconnected points of dialectal variation observed between Standard and Kansai Japanese (SJ & KJ respectively): (a) the phonetic interpretation of an |U| element with a nasal sound preceding it and (b) whether a position filled with |U| can be accented. My proposal highlights the property of headedness as the key that unifies these phenomena.

This talk broadly couched in Government Phonology and Element Theory (Kaye et al. 1985, 1990; Charette 1991), elucidates the phonological role that elements can play when situated on what I call the Licensor Tier. My account is a novel tier-based representation of headedness (for overview see Ulfsbjorninn (to appear)). It explains how headship in Japanese pitch-accent varieties has an effect on segmental interpretation.

Since Y.Yoshida (1995), it has been assumed that, in Japanese, the head position of a word domain in a pitch-accent language is phonetically interpreted as a high pitch, unlike in stress languages, in which headship is manifested by strength. Only those nuclei which are projected to the Licensor Tier are the candidates for the headship of the prosodic domain. Thus a pitch accent never falls on a position which is licensed at the skeletal level (a.k.a. a dependent) e.g. the empty position involved in the representation of a geminate (ONO where N= ϕ) or the licensed position of a branching nucleus. In a similar vein, the skeletal position of /N/ never takes the role of prosodic head in SJ. Consequently, an epenthetic vowel /u/, headless |U|, never bears an accent in SJ (cf. Y.Yoshida 2003). As we will see, this has repercussions for the segmental interpretation. It constitutes another instance of the Labial-Velar correspondence that is attested in many other languages. According to the labial-velar hypothesis, these two classes of sounds are characterised by the same resonance/place element |U|, which is headed for labials and headless for velars (Backley & Nasukawa 2009, extended in Ulfsbjorninn to appear).

In SJ, the phonological element |U| is a non-headed expression, which phonetically manifests as [ɯ], a velar approximant without labial quality. On the other hand, KJ has a headed expression of the |U| element manifesting as [u]. In KJ, the vowel /u/ is pronounced with significant lip rounding [u], unlike its SJ counterparts [ɯ] (Sugito 1996). Correspondingly, the F2 of [u] in KJ is lower than SJ counterpart.

Another contrasting phonetic quality of /N/, the so-called 'syllabic nasal' of SJ and KJ, comes from the status of an element |U|. This follows the analysis of Y.Yoshida (1995): in SJ, scarcely distributed /nu/ (/n/ followed by a velar approximant), takes the headed expression |U| ([u]), which is typically accented, whereas non-headed |U| in the same composition, phonetically manifests [ũ̠] (a nasal velar approximant) and is never accented.

In KJ, and unlike SJ, |U| can project to the Licensing Tier, where (in addition to being interpreted as headed with full rounding) they can even serve as heads of the prosodic domain. This means that accents may fall on to those nuclei, including the second member of apparent monophthongs, *ʧuu'ka* 'Chinese', and an epenthetic /u/, *soNbu'rero* (sombrero), which attests the implication of the headedness of |U| in KJ.

A confirming piece of evidence comes from the mysterious behaviour of /N/ in KJ, which is capable of carrying a word accent: *kiN'ki* 'kinki region' and *oN'bu* 'piggyback'. Homorganicity of N with its following onset is equally observed in SJ and KJ, however, the manifestation comes from different instances of licensing: in SJ it is induced by nasals filling the onsets involved, whereas in KJ the headed |U| in the representation of /N/ attracts the nasality from the neighbouring onset for place of articulation. In the Kyoto Dialect, *uma* 'horse' in SJ is pronounced as *N'ma*, which sounds exotic to SJ ears with its a) word-initial /N/ and b) accented /N/. The nasality is copied from the following onset, even without any underlying nasality for the initial onset.

How many R's are there in "Arabic"?

Islam Youssef <islam.youssef@usn.no>
University of South-Eastern Norway

Despite the great variability in the sounds corresponding to the letter <r> across and within languages, the literature has systematically treated them as a single phonological class of rhotics (Wiese 2001, 2011). Rhotics are nonetheless far from unified under one set of features; they have been characterized via the manner features [approximant], [stop], [fricative], or just [rhotic], and with the place features [coronal], [dorsal], or 'underspecified' (Ladefoged and Maddieson 1996, Hall 1997). Arabic rhotics can be narrowed down to the alveolar tap/trill category – for the vast majority of dialects (Anani 1985, Watson 2002). Researchers have noted variation both across and within dialects, one that is especially related to emphatic vs. non-emphatic variants of the rhotic (e.g. Shaheen 1979, Younes 1994). However, questions remain as to whether the variation should be categorized as phonetic or as phonological; whether that categorization holds for all dialects; and if not, what evidence can be provided for the potential representational dissimilarities.

In this paper, I will compare and contrast the phonological behavior of rhotics in two Arabic dialects, namely Cairene and Baghdadi, in an attempt to answer these important questions. I show that in Cairene there are two rhotic phonemes, one plain and the other emphatic, which exist in a multiplex of contrastive and complementary distributions (see also Schulte 1985). In Baghdadi, however, there is only one plain rhotic phoneme that is subject to allophonic variation. Evidence for the distinction comes from phonological processes that involve /R/ in both varieties or in only one of the varieties. Examples of the former type include the total assimilation of the definite article /l/ to consonants that exhibit some form of 'coronality' (see Watson 2002: 217 and references therein), and across-the-board assimilation of the sonorants /n, l/ to a following /R/. Two examples of the latter type are highlighted. First is the behavior of /R/ as a long distance trigger of emphasis (pharyngealization) spread in Cairene, but not in Baghdadi. Only in Cairene do emphatic and plain /R/'s contrast, although the emphatic phoneme undergoes de-emphasis (to a plain /R/) when adjacent to tautosyllabic high front vowels (Broselow 1976, Woidich 1980). Corresponding behavior in Baghdadi is shown to be allophonic. Another process, attested only in Baghdadi, is the labialization of certain vowels (a change from /i/ to /u/) when flanked between a labial consonant and a back, emphatic or non-emphatic, consonant, where /R/ patterns with velar/uvular (back non-emphatic) consonants.

My conclusion is that although the R's in the two dialects appear to be phonetically similar, they are not phonologically so. Not only do we see a phonemic R split in Cairene and not in Baghdadi, but also neither of the Cairene /R/ phonemes is featurally identical to the Baghdadi /R/. Assuming Modified Contrastive Specification (Dresher et al. 1994, Hall 2007, Dresher 2009, *inter alia*), the distinct phonological behavior of these three /R/ phonemes should correlate with representational differences. There is evidence that all three have a consonantal place [coronal] feature as well as sonorant-like properties, indicated by a combination consonantal [open] and vocalic [close] features (following Morén 2003, 2006). The Cairene emphatic /R/ is characterized by a secondary vocalic [dorsal] feature, and the Baghdadi /R/ by an additional consonantal [dorsal] feature. Given that /R/ is phonetically both elusive and varied (Wiese 2011), these representations should not be viewed as articulatorily implausible. The representations demonstrate how the phonological behavior of segments can influence inventory structure and featural makeup, with the implication that distinctive features are not as rigid as most models of feature geometry propose. This also calls attention to the division of labor between phonetics and phonology, without disregarding the interface.

Special session

SPE at 50: what remains?

In memoriam Morris Halle

The Sound Pattern of English appeared in 1968, fifty years ago. The book laid out a comprehensive theory of phonology, formulating and developing hypotheses in most areas of the discipline, including phonological representations, phonological derivations, the relationship between phonology and other components of grammar, phonological acquisition, phonological typology, and phonological change. Many of the ideas proposed or elaborated in *SPE* went on to become everyday tools of the trade for phonologists: a widely used theory of segmental features, rewrite rules, extrinsic rule ordering, morpheme structure constraints, boundary symbols, the transformational cycle, markedness statements, the evaluation measure, etc. It is thus not surprising that, since its publication, *SPE* has repeatedly provided a reference point for phonological argumentation, with phonologists often presenting they work either as a direct continuation, a partial reformation, or a direct rejection of the *SPE* programme.

At the distance of half a century, this special session is intended to offer a chance to reflect on how the field now views *SPE*: what remains? Is the abstractness possible in *SPE*'s derivations a good thing? Are multi-stage derivations necessary? Are multiple levels? Should we retain or return to the phonological rule? (And if so, then what *are* rules and how are they constrained?) Or have phonological targets and effects been rightly and irrevocably separated? Are the analyses proposed in *SPE* learnable? Have models proposed since *SPE* improved in terms of learnability? Where should we stand in terms of representations: return to the simple binary features of *SPE*, or retain the enriched representations that emerged in late twentieth century phonology, or do something else entirely? Where does markedness now stand? *SPE* covered a lot of ground: are there ideas that have fallen from view that should be reintroduced into phonology? The invited participants in this session will address some of these and other related questions.

This session has been cast in a sad light, given the news of Morris Halle's death on 2nd April 2018. The session is now dedicated to his memory and will feature some commemoration of his overall contribution to phonology.

Invited speakers (in order of speaking)

- David Odden (Ohio State University)
- Silke Hamann (University of Amsterdam)
- Anne-Michelle Tessier (University of Michigan and Simon Fraser University)

Invited discussant

- Joan Mascaro (Universitat Autonoma de Barcelona)

The phonetics-phonology interface and the role of orthography in SPE and beyond

Silke Hamann (University of Amsterdam)

In this talk, I will discuss Chomsky & Halle's (1968) conception of phonetic implementation and how their focus on the production process had a lasting influence on the field of phonology. I will furthermore deal with the question how a generative phonologist can decide whether a process is phonological or phonetic and why this question should matter.

In the last part of the talk, I will re-evaluate Chomsky & Halle's ideas on the role of orthography for phonology, and discuss potential experimental evidence for an influence of orthographical knowledge on phonological representations.

Formal and Metatheoretical Contributions of SPE to Phonological Theory

David Odden (Ohio State University)

In this presentation, I review some of the contributions to phonology in *The Sound Pattern of English*, the foundational work in generative phonology published 50 years ago. *SPE*'s contributions fall into two areas. The easiest to identify are various technical claims about the language faculty, such as the formal theory of rules, principles of ordering, or the nature of the representations that rules act on. *SPE* is also a vehicle for conveying a methodology of phonology, a metatheory of what linguistics is about, and how we should construct theories. It is in shaping metatheory that *SPE* had its longest-lasting effect.

One very prominent driving force behind *SPE*'s theory and analysis is "capturing generalizations", an elusive notion. This desideratum leads to a complex formal system of rule-formulation where certain partial similarities in rules are factored out and multiple rules can be condensed into one. This condensing of rules feeds into a second desideratum, that of maximally compressing the rules and representations in a grammar, driven by the "evaluation metric", and determines the exact grammar to be acquired for a language. A third feature of SPE theorizing is that it makes free use of the notion of Universal Grammar, whereby any aspect of a language that could be attributed to UG is to be removed from the grammar, thus incurring no acquisitional cost.

While most of the technical devices that were specific to *SPE* were abandoned relatively early in the development of phonology, certain ideas proved more resilient, especially those ideas that pertain to encoding speaker intuitions into a grammar. The specific machinery of Morpheme Structure Rules and Markedness / Linking fell into disuse, but the underlying ideas of stating well-formedness constraints as part of a grammar, and of letting automatic substantive principles guide the derivation persisted up to the present.

The legacy of SPE and theories of phonological learning, 50 years later

Anne-Michelle Tessier (University of Michigan and Simon Fraser University)

My talk will deal with a series of fundamental questions about how generative phonological grammars are learned. In each case, I will raise a question that remains central to theory construction and evaluation in the phonological learning literature; I will remind myself and possibly others of how *SPE* framed, approached or avoided the question; then I will sketch to varying degrees of detail how the question and its *SPE* treatment have addressed in subsequent literature.

The questions I intend to raise are as follows:

1) How do learners compile their data for phonological learning? How do they relate what they perceive to a possible mental representation for phonological analysis? What are the theoretical consequences of the sequential, non-instantaneous nature of learning?
2) How do learners choose between grammar hypotheses to account for observed data? How do they calculate the relative value or explanatory adequacy of one hypothesis compared to another? What assumptions about the building blocks of phonological theory determine the winners in such calculations?
3) What are the learners' assumptions about underlying representations? What is the role of morpheme structure rules, constraints or filters? How do the choices the learner makes when storing underlying forms interact with their current grammatical hypotheses?
4) What is the role and nature of exceptions in relation to the phonological generalizations of a language? How do learners identify exceptions and how do they bear on the grammar?

In the spirit and the words of *SPE*, I will try to focus on the ways in which both the questions and their answers are 'empirical' and 'interesting' – that is, what types of evidence can choose between answers, and how they might get us closer to real and/or satisfying generalizations about linguistic knowledge. In a similar spirit, I will aim to end with more questions and fewer answers than I started with.