

**Alatawalah Arabic Phonological and Morphophonological Stress: A Stratal OT Account**

Alatawalah Arabic (AA) is a moraic trochaic language spoken in southwestern Saudi Arabia. AA stress is assigned to words phonologically. But when words are morphologically complex (multimorphemic), morphology usually affects stress assignment based on the type of affix joining the word. Thus, AA has both a phonological stress system and a morphophonological stress system.

The phonological stress system assigns stress based on syllable heaviness and rightmostness of stress as in /mal.ʕa.bəh/ ‘a male dance’ and /ʃa.ʕa.rəh/ ‘tree’. The morphophonological stress system assigns stress based on what function or role the stress-affecting affixes implement: they either stress the rightmost trochee or repel stress, for instance, /mal.ʕa.b-əh/ ‘field-his’ and /ʃa.ʕa.rə.t-ɛ:n/ ‘tree-du.’. In the former example, the heavy syllable (a trochee) does not attract stress (though it should) because of the rightmostness-triggering suffix /əh/ ‘his’. In the latter example, the word-final heavy syllable does not receive stress because the dual suffix repels it even though (phonologically) the ultimate heavy syllable should receive stress.

The affixes that trigger rightmost stress are verb subject suffixes, verb object suffixes, noun possessive suffixes, the definite article prefix and the nominalizing prefix /mən/. The affixes that repel stress are the dual suffix, locative suffixes and quantifier suffixes. Interestingly though, the rightmostness-triggering definite article prefix interact with the stress-repelling dual suffix (when both exist) resulting in blocking of the application of the dual suffix stress repel; hence, stress lands on the stress-repelling dual suffix as in /ʔal.-ba:.'b-ɛ:n/ ‘the-door-du.’. This said, the morphologically induced stress assignment causes minimal pairs that vary only in stress placement. Table 1 shows minimal pair examples.

Table 1 Stress Minimal Pairs

Phonological Stress	Morphologically Induced Stress
/ħa.'ga:hə.gəh/ ‘birds’	/ħa.ga:.'hə.gəh/ ‘his birds’
/'mal.ʕa.bəh/ ‘a male dance’	/mal.'ʕa.bəh/ ‘his field’
/'gasʏ.ga.sʏəh/ ‘cutting’	/gasʏ.'ga.sʏəh/ ‘he cut it’
/'mar.da.rəh/ ‘a beating-up’	/mar.'da.rəh/ ‘he beat him’
/'xan.tʕa.ləh/ ‘a knock-over’	/xan.'tʕa.ləh/ ‘he knocked him over’

Stratal Optimality Theory (Kiparsky, 2000, 2003) analyzes AA stress using universal constraints. It does not use language-particular or indexation constraints as classical OT (Prince & Smolensky, 1993) will do when analyzing AA stress.

The phonological stress can be accounted for using the constraint ranking FTBIN >> WSP >> RIGHTMOST. See (Prince, 1990) for WSP, (Prince, 1983) for RIGHTMOST and (Prince, 1980) for FTBIN. WSP ensures that stress falls on a heavy syllable when there is one and RIGHTMOST ensures that the rightmost heavy syllable or trochee get stress. FTBIN guarantees feet are bimoraic. See Tableaux 1 and 2 below.

Tableau 1

mal.ʕa.bəh ‘a male dance’	FTBIN	WSP	RIGHTMOST
✓ <sup>μμ</sup> mal. <sup>μ</sup> ʕa. <sup>μ</sup> bəh			*
<sup>μμ</sup> mal. <sup>μ</sup> ʕa.bəh		*!	

Tableau 2

ʃa.ʕa.rəh ‘tree’	FTBIN	WSP	RIGHTMOST
✓ <sup>μ</sup> ʃa. <sup>μ</sup> ʕa. <sup>μ</sup> rəh		*	
<sup>μ</sup> ʃa. <sup>μ</sup> ʕa.rəh		*	*!

For the morphophonological stress, the ranking (FTBIN >> WSP >> RIGHTMOST) cannot get the right stress in words that trigger rightmostness. However, words that have stress-repelling suffixes get the right stress with that constraint ranking on the condition that a new constraint (STRESSSTEM) is introduced

which forces stress fall on the word stem even if a degenerate foot is the result (see Burzio, 2002 for STRESSSTEM). Hence, the ranking STRESSSTEM >> FTBIN >> WSP >> RIGHTMOST accounts for most of the phonological stress words and the stress of words with stress-repelling suffixes. The introduction of STRESSSTEM presents an issue to words that do not stress the stem (namely nouns with the concatenative plural suffixes) but these will be treated like words that trigger rightmost stress since their stress is on the rightmost trochee. See Tableaux 3 and 4 below for the stem-level constraints deriving the right stress.

Tableau 3 (stem level)

dam-ε:n 'blood-du.'	STRESS STEM	FTBIN	WSP	RIGHT MOST
✓ <sup>μ</sup> <sup>μμ</sup> 'da.mε:n		*	*	*
<sup>μ</sup> <sup>μμ</sup> da.'mε:n	*!			

Tableau 4 (stem level)

ħu.bε:n 'lizard'	STRESS STEM	FTBIN	WSP	RIGHT MOST
<sup>μ</sup> <sup>μμ</sup> 'ħu.bε:n		*!	*	*
✓ <sup>μ</sup> <sup>μμ</sup> ħu.'bε:n				

The stem-level constrain ranking (STRESSSTEM >> FTBIN >> WSP >> RIGHTMOST) has to be scrambled to get the word-level constraint ranking that must account for the forceful rightmostness of stress placement. The word-level constraint ranking must account for both words with affixes that trigger rightmost stress and nouns ending with the (stressed) concatenative plural suffixes. Swapping WSP and RIGHTMOST secures stressing the rightmost trochee but STRESSSTEM has to be ranked below RIGHTMOST so stress can fall out of the stem boundary. The word-level constraint ranking is as follows: FTBIN >> RIGHTMOST >> WSP, STRESSSTEM. This constraint ranking explains the rest of AA words stress that is not explained by the stem level phonology. See Tableau 5 and 6 below for examples.

Tableau 5 (word level)

?al-dam-ε:n 'the-blood-du.'	FTBIN	RIGHT MOST	WSP	STRESS STEM
✓ <sup>μμ</sup> <sup>μ</sup> <sup>μμ</sup> '?ad. da.'mε:n				*
<sup>μμ</sup> <sup>μ</sup> <sup>μμ</sup> '?ad.da.mε:n		*!*		*

Tableau 6 (word level)

mal.ʕab-əħ 'field-his'	FTBIN	RIGHT MOST	WSP	STRESS STEM
<sup>μμ</sup> <sup>μ</sup> <sup>μ</sup> 'mal.ʕa.bəħ		*!		
✓ <sup>μμ</sup> <sup>μ</sup> <sup>μ</sup> mal.'ʕa.bəħ			*	

Stratal OT accounts for AA lexical stress by having the same constraints do so in two levels with slightly different sequence. The stem-level constraints explain stress of all AA stems, stems with non-stress-affecting affixes and stems with stress-repelling suffixes. The word-level constraints explain the rest of words (all affixed). Also, stratal OT captures elegantly the blocking of the dual suffix stress repel as in /?al.-ba:.'b-ε:n/ 'the-door.du.': the dual suffix repels stress due to high-ranked STRESSSTEM at the stem level but then when STRESSSTEM is low-ranked in the word level it bears stress (compare Tableau 3 to 5).

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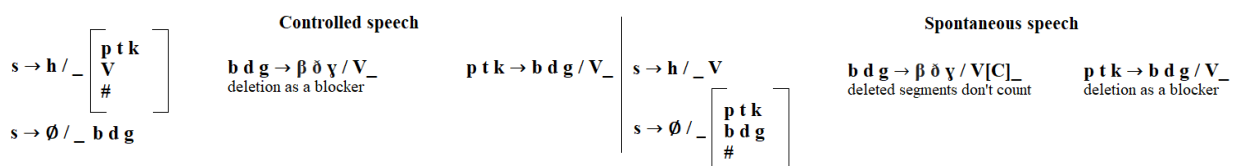
## Modelling variation in sound change: social setting as a determinant of process application

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Sound change is usually characterised by a set of phonetic and phonological processes observable diachronically or synchronically, by comparing different generations of speakers. It can also be studied based on cross-dialectal variation caused by social, political and/or geographical factors and serve as a point of departure for determining the trajectories of change affecting a particular group of sounds (Escure 1977, Kiparsky 1988, Labov 1994). In the case of sound change in progress observable in apparent time across different speakers of the same language, differing advancement stages of phonetic and phonological phenomena can be encountered simultaneously. Thanks to the legacy of William Labov (1972, 1990 *et seq.*) and others involved in studying the sociolinguistic aspects of speech, we are also aware of the influence of external factors on even a single grammar of a given language/dialect user. As duly noted by Coetzee (2009, 2016), Coetzee & Pater (2011) and others, instead of being neglected by phonologists, such variation should be incorporated into the theory of grammar. In previous works, it has been shown that speech rate, register, perception and lexical frequency contribute to grammatical structure alongside purely grammatical factors and can be successfully included in a formal representation of a language without losing major categoricity restrictions pertaining to phonology (e.g. Boersma & Hayes 2001, Anttila 2002, Coetzee & Kawahara 2013). The aim of this study is to contribute to this debate in both empirical and formal terms. To this end, 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 speech ‘modality’ they use. More specifically, speaker productions are not so much dependent on the speech rate or general ‘register’, but on the experimental (or social) setting. In a more controlled situational context in which speakers were asked to read or repeat sets of sentences, their productions show more moderate consonant weakening than in spontaneous speech induced by the experimenter during semi-structured interviews. Given the well-known disadvantages of controlled study design, such a result is predictable, yet the point does not lie in the variability itself but in the very specific domain of application effects. The observed differences are structured in accordance with the well-known lenition patterns and are systematic between the two speech modalities.

The data are based on the speech of 6 native speakers of Canarian Spanish recorded during fieldwork (5-10 minutes per conversation), and a few months later during a controlled experiment (129 sentences). The generalisations, summarised in Fig. 1 below, are as follows. First, when repeating/reading 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. Spirantisation of voiced stops takes place after vowels in phrase phonology, but in the controlled setting, /b d g/ do not become [β ð γ] when preceded by an *s*-final word even though the *s* is deleted. In spontaneous speech, spirantisation **does** apply in the same context. Thus, deletion selectively acts as a blocker of the change in more controlled speech, but not in unconstrained productions. At the same time, advanced degrees of spirantisation are not suppressed in any manner 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 spirantisation in more controlled speech. All of the above observations enable us to draw a cycle of events which supports the lifecycle of phonological processes hypothesis, especially the phonologisation and the domain narrowing effects (Bermúdez-Otero & Trousdale 2012).

Fig. 1. Generalisations



The analysis of the dialect needs to include the (systematic) variation across settings (modalities), opaque weakening across word boundaries (before vowels) and the curious blocking behaviour of

deleted segments. The latter problem requires turbidity (Goldrick 1998), i.e. the assumption that deleted segments are left unparsed/unpronounced but structurally present until the end of phonology. The selective blocking effects should be analysed as domain of application effects. More specifically, the domain of application is extended in more advanced stages of sound change: voiced stops turn into approximants either only after vowels or regardless of the preceding segment. In formal terms, this is expressed as a competition between general and positional markedness constraints banning [b d g] and V\_[b d g], respectively. A parallel pair of constraints governs /p t k/ voicing, the latter process being a step less advanced across modalities. The proposed Harmonic Grammar account is based on a coda condition against *s* restricted by ONSET (no deletion before vowels). 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 weighting that promotes deletion everywhere but before vowels (demotion of MAXSEG). The analysis is equally successful in Stratal OT but noisy HG is chosen as the preferred framework given its implications for synchronic variation. As argued by Coetzee (2016), the inclusion of noise to the weighted constraints model allows us to account for the fact that several grammar-external factors may govern actual productions across contexts. When the data (presented in the comparative HG tableau in Fig. 2) are fed into the Gradual Learning Algorithm with a noise component in Praat (Boersma & Weenink 2018) together with the percentages of occurrence of each process (an estimated 55% of spirantisation after deleted *s* and 50% of pre-*ptk s* deletion across modalities), a very close approximation of the actual speech patterns is produced, with competing outputs' H scores close enough to 'flip' the result in subsequent evaluations. Given the proximity of crucial constraint weights (here: Ident(cont) and \*bdg oscillating around 90 in each evaluation, with the starting constraint weight of 100 in the GLA), output distributions follow the pattern of process application. In terms of language change, this shows how more conservative realisations compete with phonetic innovations and how this is learned based on variable input data. The model is suitable for observing sound change in progress and for the formalisation of empirical findings concerning the transition of current/established outputs to new target structures. The present study contributes to the development of Coetzee's framework by adding the social setting as a factor determining the rates of application of several consonant weakening processes.

Fig. 2. HG comparison of voicing and spirantisation with and without deletion. All options are attested with various distributions, with the exception of the loser in 3. HG weighting permutations allow for switching between the attested outputs. The margin of separation between the winner and loser is in each case 1.0.

	<i>Weights</i>	4.0	3.0	3.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0
Input	winner ~ loser	*V_ ptk	Max	*s]Coda	Agr-CC	*V_ bdg	Ident cont	*h	Ident voice	Ident Place	*bdg	*ptk
1. panes de	pane(s) de ~ pane(s) De						+1.0				-1.0	
2. panes kon	paneh kon ~ pane(s) kon		+1.0					-1.0		-1.0		
3. sena de	sena De ~ sena de					+1.0	-1.0				+1.0	
4. sena kon	sena gon ~ sena kon	+1.0				-1.0			-1.0		-1.0	+1.0

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## The Underlying Representation of Syllables

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**Introduction.** While the existence of syllables is uncontroversial for most phonologists, most of them also assume that this organization is not stored in lexical entries; syllables are supposed to result from the operation (via rules or constraints) of a syllabification process on unsyllabified underlying strings of segments. Reasons to omit syllable structure from underlying representations may vary, but one of the most important probably is its phonological predictability: minimal pairs distinguished only by syllabification are alleged to be very rare, and syllabicity alternations usually can be viewed as the result of derived syllabification (e.g. Blevins 1995: 221), and given a string of segments in a word, usually the location of the syllable boundaries can be derived from them and is therefore not distinctive (Goldsmith 2011: 168).

**Hypothesis.** Nevertheless, some authors have proposed that syllabification is underlying. Various types of evidence support this claim: for instance, minimality requirements on lexical roots that can only be stated as requirements on certain syllable types, the existence of reduplicative morphemes consisting underlyingly solely of a syllable template, malapropisms and tips of the tongue suggesting that speakers store lexical entries as sequences of syllables rather than as mere strings of segments (see Golston 1996, Golston & van der Hulst 1999). Furthermore, contrastive syllabification may be less uncommon than often assumed, and sometimes the most convincing solution to account for some phonological contrasts (an idea already explored by some structural linguists – see e.g. Hjelmlev 1938). Finally, the argument that syllable structure is predictable from the linear order of segments can be reversed; if syllable structure is assumed to be underlying, then the linear order of segments can be derived from it (through universal – such as the sonority scale – and/or language specific constraints governing segment linearization). I will therefore assume that segments are affiliated to syllabic constituents already underlyingly. Under this assumption, within syllables onsets linearly precede nuclei and nuclei linearly precede codas, but within these constituents segments are unordered; that is, in a word like *trunk* the onset and the coda are the unordered sets  $\{/t/, /r/\}$  and  $\{/n/, /k/\}$  respectively, which are linearized as [tr] and [ŋk].

**Goals and data.** In this paper I will explore two consequences of the hypothesis of underlying syllable structure: if syllables are underlying, 1) contrastive syllabification should indeed exist (which I will try to show with data from the distribution of rhotics in Spanish), and 2) as mentioned above, the assumption of linear order in underlying representations can be abandoned; I will discuss how the alternative assumption of underlyingly unordered segments within syllabic constituents may provide a straightforward account for some cases of metathesis.

**Spanish rhotics.** Phonetically, Spanish has two rhotics, i.e. the alveolar trill [r] and the alveolar flap [ɾ] (see e.g. Hualde 2004). Phonologically, their status is debated; while they are for the most part in complementary distribution (only [r] appears word-initially and after a heterosyllabic consonant; only [ɾ] appears after a homosyllabic consonant and in coda position), they can contrast in intervocalic position: e.g. *perro* ‘dog’ [ˈpeɾo] vs. *pero* ‘but’ [ˈpeɾo]. One-phoneme analyses usually assume an otherwise unspecified rhotic and interpret minimal pairs as a singleton versus geminate contrast (/peRRo/ vs. /peRo/); however, Spanish has no other geminate consonants, and this analysis would imply that Spanish has word-initial geminates, which are typologically uncommon. On the other hand, two-phoneme analyses have to explain why the two rhotics are in near-complementary distribution. However, if syllabification is contrastive, we can assume a single rhotic phoneme which has two different allophones depending on its position within the syllable; since only [r] is found in unambiguous onset positions and only [ɾ] is found in unambiguous coda positions, pairs as [ˈpeɾo] and [ˈpeɾo] can be analysed as a contrast in the position of the syllable boundary, i.e. /pe.ro/ vs. /per.o/.

**Metathesis.** Metathesis is notoriously difficult to formalize. If a formalism simply allows inversion of segment order, it predicts not only attested cases of metathesis, but also unattested processes such as  $C_1C_2C_3C_4 \rightarrow C_4C_3C_2C_1$  and the like to be possible (Hume 2001). However, if syllable structure is underlying and segments are unordered within the syllabic constituents, some cases of intra-syllabic metathesis directly follow. For example, in Faroese (Rischel 1972) /k/ metathesizes with an adjacent /s/ if the fricative is followed by another stop consonant: [fɛsk] ‘fresh.FEM.SG’, but [fɛkst]

'fresh.NEUT.SG'. Assuming the coda is the unordered set {/s/, /k/, /t/} and knowing that \*[skt], \*[CCK] and \*[CCs] are not licit linearizations of Faroese codas, the linear order [kst] is an automatic consequence.

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## Same intonational categories, different phonetic indices

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Most linguists in the first half of the 20th century saw phonological categories as abstract entities characterised by invariant phonetic realisation [1]. The emergence of spectrographic techniques has however shown for the segmental domain that phonological categories are highly variable in their phonetic realisation, both across speakers [2] and across contexts [3]. Autosegmental-Metrical approaches to intonation have also claimed invariance in relation to tonal targets [4:186]. However, as shown by research on reduced speech [5], understanding variability as a blessing (rather than as a scourge) [6] has already illuminated some of the relationships between phonetic substance and phonological form at the word level. We suggest that variability might also lead to novel insights into categoriality in intonational phonology.

We cast our discussion of variability and constancy in intonation in terms of a distributional approach to phonological categories [7,8,9]. In such an approach, phonological categories map communicative functions onto a multidimensional phonetic space. Phonological categories are thus represented by realisational clusters in this phonetic space. Crucially, the contrast between phonological units is not determined by specific single values in a given dimension, but rather by the separation of realisational clusters in the multidimensional phonetic space. The strongest prediction generated by this hypothesis is that, for a given contrast, the realisations of speaker A can be effectively separated in a phonetic space with dimensions  $x$  and  $y$ , while productions from speaker B will be impossible to tease apart in this same space, but effectively separated in a space with two other phonetic dimensions  $j$  and  $k$ . This amounts to saying that speakers can have their individual way of filling a given phonological contrast with phonetic substance.

To test this, we investigate speaker-specific realisations of intonational contrasts with a production experiment using read speech in Egyptian Arabic [10], a language whose intonational phonology is relatively underdescribed. The corpus features data from 18 speakers producing 3 repetitions of 6 sentences with target words in 5 different pragmatic contexts (1620 items in total). Utterances were manually segmented at the syllable level;  $f_0$  contours were hand-corrected [11]; turning points were located automatically and verified manually. The phonetic indices extracted were on the one hand the duration of the syllable and of the target word, and on the other hand the scaling and alignment (relative to the end of the stressed syllable) of the three turning points (L1, H and L2) for the rise-fall contour on the target word.

Results reveal that the different pragmatic contexts indeed surface as speaker-specific clusters in the multidimensional phonetic space. Such effects are pervasive in our dataset, and are quantified using linear mixed effect models, which predict the effect of focus type on the various phonetic cues, and are fitted separately for each speaker. In Figure 1 we exemplify this with data from two speakers on the contrast between Broad and Narrow focus contexts, which confirm our strongest predictions. The figure shows that speakers use different phonetic indices to substantiate the contrast between the two contexts. Whereas the two categories are effectively separated in the phonetic space  $H$  alignment  $\sim$  Word duration for speaker M02 (panel a) but not for speaker F05 (panel b), the converse is true for the phonetic space  $L2$  alignment  $\sim$   $H$  scaling, where categories are separated for speaker F05 (panel c) but not for speaker M02 (panel d; see caption for further details).

Our findings thus support a model of phonological categoriality in intonation which builds on three pillars: communicative function (pragmatics), individual-specific phonetic behaviour, and flexibility of category networks. Such a model holds promise for a renewed understanding of several aspects of the production, perception and representation of variability and categoriality in intonation. This can have a great impact on accounts of the stratification of the repertoire, the intelligibility of accented speech, and of sound change.

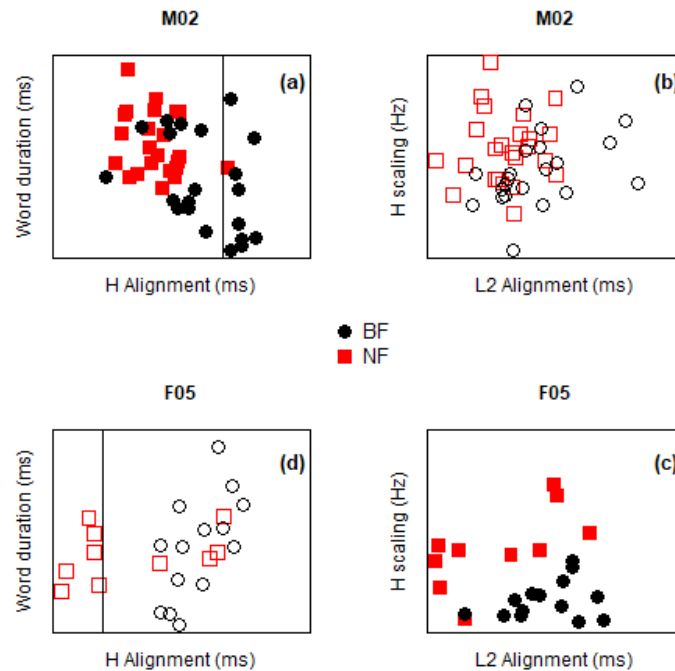


Figure 1. Utterances produced in Broad Focus (black dots) and Narrow Focus (red squares) by speakers M02 (top) and F05 (bottom). Results are displayed for two phonetic spaces: phonetic cues H alignment ~ Word duration (left column); L2 alignment ~ H scaling (right column). Symbols are filled when linear mixed effects modelling show an effect of focus type on both cues, and empty when there is no effect on either cue. For speaker M02, the two contexts are separated in the first space (panel a) but not in the second (panel b). For F05, the two contexts are not separated in the first space (panel d), but are in the second (panel c).

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## Towards a footless approach of English Vowel Reduction

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**0.** English vowel reduction can be blocked in some contexts (Halle & Keyser 1974, Burzio 1994, Hammond 2003, Pater 2000, SPE among many others). 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. [æɪəb]), or **ii.** not reduced if the preceding syllable is heavy (e.g. [eɪɪəb]) (1). This phenomenon is generally called “Arab Rule” (Hayes 1980; Pater, 1995, 2000; Ross 1972).

(1)

	_ <b>[-cor]</b>	_ <b>[+cor]</b>
<b>L</b> _	Reduction	Reduction
<b>H</b> _	<i>No reduction</i>	Reduction

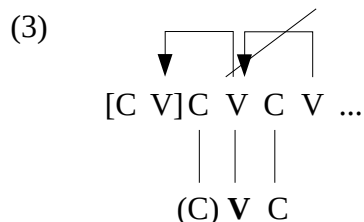
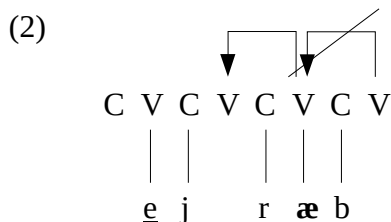
**1.** The purpose of this talk is twofold: **i.** to evaluate the efficiency of the Arab rule; and **ii.** to propose an analysis without metrics consisting in the unification of English blocking contexts. For this, we combine deductive and inductive methods. The fundamentals of both approaches are rigorously respected. First, hypotheses are derived from an independent axiomatic basis. Second, generalizations are raised from an independent corpus analysis. Finally, we confront the results of deductions with the results of inductions. By setting apart these two sides of scientific research, we prevent circularity inherent to new theoretical concepts or data.

**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). The effects of token frequency (taken from SUBTLEX-UK, see Heuven *et al* 2014) were also tested in a binary logistic regression alongside the weight of the first syllable. Both parameters turned out to be significant predictors of vowel reduction in the second syllable. However, light-initial and heavy-initial words did not behave uniformly: the former show a robust frequency effect consistent with previous research (the higher the frequency, the greater chances of reduction; Fidelholtz 1975) whereas the latter seems to be insensitive to frequency.

**3.** Assuming that lateral relations condition both inhibition and strengthening (Ségéral & Scheer 2001, 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).<sup>1</sup> In sum, reduction is blocked when the vowel is unlicensed and needs to license a headless nucleus 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.

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



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). Once again, frequency effects were tested for in binary logistic regression alongside the effects of syllable structure. Both frequency and syllable structure turn out to be significant predictors of vowel reduction. Our prediction is therefore 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.

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## Nasalization and drawl in Central Yiddish

Guillaume Enguehard (Université d'Orléans, CNRS LLL), Noam Faust (Université Paris 8, CNRS SFL)

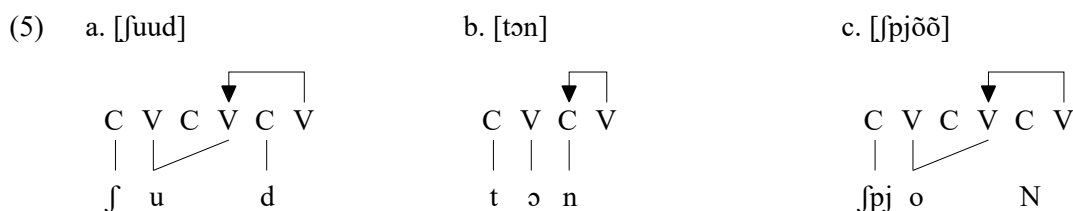
Strict CV phonology (Lowenstamm 1996, Scheer 2004) is a theory of autosegmental representations in which the skeletal tier is a strict repetition of CV units. In this theory, segment strength depends on a lateral relation called “licensing”, which emanates from an occupied V onto a preceding position (Ségéral & Scheer 1999). One example of strength effect is vowel length: **i.** if a V position is occupied, it licenses the preceding vowel to be long (1a); but **ii.** if a V position is empty, it does not license the preceding vowel to be long (1b).



In this talk, we examine the notion of licensing through its application to two phenomena from Central Yiddish (CY): *drawl* and *nasalization*. The data, elicited by us from a speaker of the Plotsk dialect, are presented in (2-4). *Drawl* is the insertion of epenthetic [ə] in a prepausal /CVVC/ syllable (2a). There is no drawl if the vowel is short (2b) or in an open syllable (2c).<sup>1</sup> *Nasalization* occurs in word-final position with the elision of final /n/ (3a). Neither this elision nor nasalization occurs after short vowels (3b). Interestingly, if a vowel becomes final by being nasalized, it *does* undergo drawl (4), unlike the vowels in (2c).

<p>(2) a. <u>#</u> <u>##</u>          fuud      fuuəd      ‘shame’          looz      looəz      ‘louse’          b. nol      nol      ‘zero’          ləz      ləz      ‘let’          c. bluu      bluu      ‘blue’          froo      froo      ‘lady’</p>	<p>(3) a. <u>#</u> <u>V</u>          bāā      baan-ən      ‘train’          ʃpjōō      ʃpjooon-ən      ‘spy’          b. man      man-ən      ‘husband’          tən      tən-ən      ‘ton’          (4) <u>#</u> <u>##</u>          tsūū      tsūūə      ‘tooth’</p>
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We aim to show how licensing accounts for the distribution of both nasalization and drawl. If vocalic length has to be licensed in CY (1), it must be assumed that the vowels in (2a,c) are also licensed. Yet there is no following vowel to license them. Kaye (1990) proposed that final empty nuclei (FEN) can: **i.** be licensed; and **ii.** license another position (5a). Importantly, this strengthening effect of the FEN does not target only vowels. In (5b), licensing does not need to target a preceding nucleus, because the vowel is short. Thus, it can target the final consonant, which as a result is in a strong position. In (5c), in contrast, the FEN needs to license the preceding nucleus. Consequently, it cannot target the final C position, which is therefore weak. The weak position, we submit, cannot host the nasal. The nasal will be realized as the nasalization of the preceding vowel. If so, /n/-deletion in word-final position is conditioned by licensing (for a similar claim about Catalan, see Faust & Torres-Tamarit 2017).



<sup>1</sup> Note that all final vowels are long.



## The Semitic Imperfective

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The verbal system of Semitic languages comprises two main forms, the Perfective and the Imperfective. In the Perfective, subject agreement markers are suffixed to the stem, e.g. Moroccan Arabic *kṭibṭi* 'you<sub>f.sg.</sub> wrote' (*kṭib-ṭi*). In the Imperfective, on the other hand, subject agreement markers 'split' and appear on both sides of the stem, i.e. as prefixes and suffixes. A clear case (not all cases are as clear) is the Imperfective corresponding to *kṭibṭi*, namely *tḳiṭbi* 'you<sub>f.sg.</sub> write' in which the affixal material of *kṭib-ṭi* appears to have been split into a prefix *t-* and a suffix *-i* (*t-ḳiṭb-i*). In (1), we illustrate a similar and genetically related but more complex system, the full paradigms of Measure I Perfective and Imperfective conjugations in Classical Arabic. The facts of Classical Arabic will be at the center of the discussion.

(1)

		Perfective	Imperfective
Singular	1c	katabtu	ʔaktubu
	2m	katabta	<i>taktubu</i>
	2f	katabti	taktubīna
	3m	kataba	yaktubu
	3f	kabat	<i>taktubu</i>
Plural	1c	katabnā	naktubu
	2m	kababtum	taktubūna
	2f	kababtunna	taktubna
	3m	kababū	yaktubūna
	3f	kababna	yaktubna

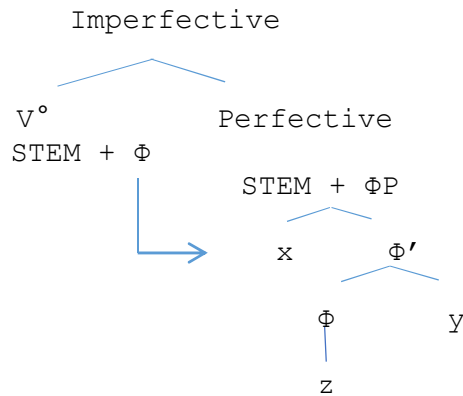
Numerous attempts have been made at connecting this differential distribution of affixal material to the respective syntactic derivations of the Perfective and the Imperfective : the Imperfective raises up to the head of Agr<sup>o</sup> while the Perfective moves *via* Agr<sup>o</sup> all the way up to Tense (Ouhalla 1991, Benmamoun 1992, Lumsden & Halefom 2003). Another family of efforts is represented in Halle (2000), cf. Lowenstamm (2011) for discussion.

To the best of our knowledge, all accounts fail to give a satisfying account of the syncretism involved in the Imperfective (*italics* in (1)), viz. the phonetic identity of 2<sup>nd</sup> masculine singular *taktubu* and 3<sup>rd</sup> feminine singular, also *taktubu*. It is obvious that prefix *t-* in both 2<sup>nd</sup> singular forms (and 2<sup>nd</sup> plural as well !) marks 2<sup>nd</sup> person, whereas prefix *t-* in 3<sup>rd</sup> feminine singular marks gender. In consequence, most if not all proposals have to recognize two different *t*'s, one marking 2<sup>nd</sup> person, the other marking feminine *in the context of 3rd person singular* (note that the two plural 3<sup>rd</sup> persons display identical prefixes).

We intend to turn the problem on its head, take phonetic identity as non-accidental and propose a specific derivational scheme, one such that the apparent syncretism just demonstrated will simply vanish.

We will propose that the Imperfective is nothing but an empty verbal shell, directly derived from the Perfective. *Qua verb*, it must be able to undergo and manifest subject agreement. For that purpose, it probes into its c-commanding domain and directly picks the highest  $\Phi$ -feature it finds there, that is in the Perfective's own  $\Phi$ -endowment, as shown in (2) where {x,y,z} stand for Person, Gender and Number.

(2)



The result is an entirely makeshift inflectional paradigm for the Imperfective, as we will show.

We predict a measure of variability where 3<sup>rd</sup> persons plural are concerned: while identical prefixes are possible for 3<sup>rd</sup> persons plural as in Classical Arabic, nothing forces that state of affairs. An alternative is to enforce a gender distinction in that particular section of the paradigm and we show in (3) how Hebrew – *because, unlike Classical Arabic, it has identical 3<sup>rd</sup> plural forms in the Perfective* – indeed implements that scheme.

(3)

Plural	Perfective	Imperfective
3m	šamru	yišmēru
3f	šamru	tišmorna

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### Three new reasons to root for the Semitic root

Noam Faust (Université Paris 8, CNRS SFL)

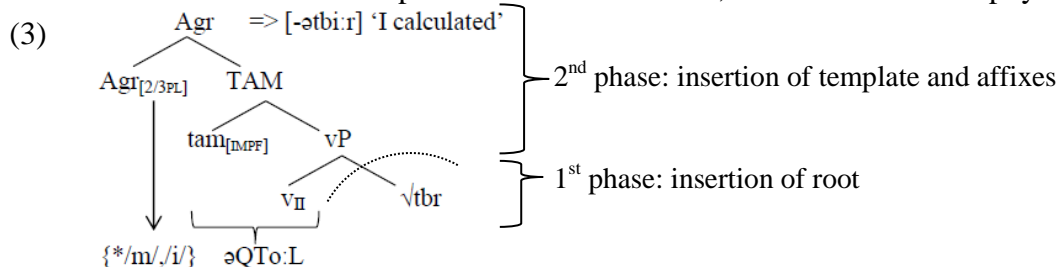
Data like (1) (form Modern Hebrew, MH) underlie a tradition of considering that in Semitic languages, verbs are decomposable into a discontinuous, mostly consonantal root (in this case the sequence <χʕʃ,v>) and a “template” (QiTuL, QaTaL, QiTel etc.). This idea has nevertheless been repeatedly challenged by several linguists, most notably Outi Bat-El, who claimed that the consonants of the root are at best a residue, not a morpheme in their own right. For Bat-El (1994, 2003), templates *are* morphemes, but they are imposed on full stems: [heχʃiv] is derived from *the stem* /χʕʃav/ by imposing <he-,i> on it and letting phonology do the work of syncope and melodic overwriting. If a form is not derived, this implies according to Bat-El that it is stored with its vowels: [χiʃev], for instance, can be a stem, and there is no sense in which it is complex. Thus, only stems, never “roots”, are stored in Semitic.

(1)	χiʃuv	‘calculation’	(2)	‘straighten’	‘break’
	χʕʃav	‘think’	MSG	-əru:kəz	-ətbo:r
	χiʃev	‘calculate’	MPL	-əɾəkz-ə <b>m</b>	-ətbi:r
	heχʃiv	‘consider’	FPL	-əɾəkz-ə <b>n</b>	-əto:r-ə <b>n</b>

Since Bat El’s (1994), quite a lot has been written in defense of and against the root as a cognitively real object, mostly dealing with Arabic and Hebrew. In this talk, I present three new arguments in favor of roots, from two other Semitic languages.

In the South Arabian Semitic language Mehri (Rubin 2010), there is allomorphy in the marking of 2/3MPL subject agreement on verbs in the imperfective aspect (2). The exponent used is either [ə**m**] or the replacement of a stem vowel by [i], the latter being used for bases with a round vowel between the 2<sup>nd</sup> and 3<sup>rd</sup> consonants. This selection, I submit, is motivated by an OCP-based incompatibility of the allomorph /-ə**m**/ with such bases: like the round vowel of the base, the consonant /m/ also contains the element |U| of Element theory. Crucially, however, /-ə**m**/ is not incompatible with any final consonant in the stem, including [m], e.g. [yəhənsə**m**-ə**m**] ‘they breathe’. Thus, despite what the linear order of sounds suggests, /-ə**m**/ is “closer” to the vowel than to the consonant between it and that vowel. Therefore, there is a need to separate the consonants of the base from its vowels *in the morphological structure*, placing the consonants further away from the suffix than the vowel.

The morpho-syntactic analysis in (3) is proposed following Arad’s (2005) DM construal of templates as realizing category heads. In the first phase, the root is inserted. In the second, both the template and the agreement affixes are. At this point, the root has not yet been associated to the template – this is the job of phonology – and so affix and stem vowel are adjacent. The analysis is supported by the compatibility of the suffix /-ə**n**/ with both stems: it does not raise the OCP-problem that /-ə**m**/ raises, and thus no allomorphy is attested.



The analysis in (3) is incompatible with Bat-El’s view of the base as a non-decomposable, linear sequence.

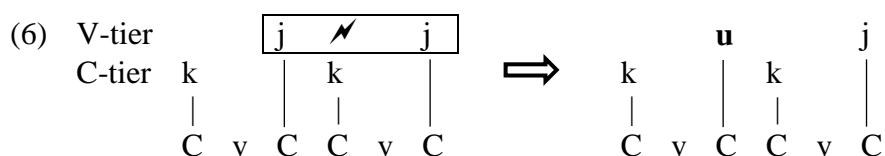
Working on MH, Bat El showed that nothing predicts the distribution of the would-be roots among the different verbal forms in (1). If the matching of root and template is an arbitrary fact, it must be memorized anyway, and there is no reason for storing roots separately. However, as I show next, this is not the case for all Semitic languages. In the

Christian Neo-Aramaic dialect of Urmi (4; Khan 2016), there are clearly two types of verbs (at least), trilaterals (S1) and quadrilaterals (S2), with different vocalic patterns (i.e different templates). But in the *Jewish* dialect of the same city (5; Khan 2008), the vocalic patterns of both types of verbs (and of all other verbs in the language) can be claimed to be identical: they are the discontinuous <a,ə>, <ə>, <u>, and <a,u,e>, with an additional initial epenthetic [ə] for quadrilaterals inserted when necessary. In other words, speakers of at least one Semitic language – Jewish Urmi Neo-Aramaic – only have to store purely consonant sets, since there is only one realization of the verbal category. Roots can exist as a cognitive category.

(4)	S1	S2	S2-4j	S2redup	S2redup-4j	(5)	S1	S2
-PST	patəx	madməx	ʃarʃə	barbər	kokə	-PST	qatəl	manxəp
+PST	ptix-	mudməx-	ʃurʃə	burbər-	kukə	+PST	qtəl-	mənxəp-
IMP	ptux	madməx	ʃarʃə	barbər	kokə	IMP	qtul	mənxup
INF	ptaxa	madmuxə	ʃarʃujə	barburə	kokujə	INF	qatole	manxope
	‘open’	‘sleep(tr)’	‘tire’	‘roar’	‘croak’		‘kill’	‘shame’

Time permitting, a short OT analysis will illustrate show how the placement of vowels between consonants in the Jewish dialect is possible. I will further show that with little further abstraction, the same analysis can be proposed for the Christian dialect (and possibly for MH), following Goldenberg (1994).

The third and last argument concerns the S2-4j and S2redup(icated) verbs in (4). Verbs like ‘tire’ are analyzed as based on quadriradical roots (hence their appearance in S2), whose final consonant is /j/, although this consonant surfaces only in the INF form. Khan singles out verbs like ‘croak’ as exceptional – they are the only verbs to contain [o] as the first vowel. But Khan does not explain why, curiously, all of these verbs are also 4j. I propose that like S2redup verbs like [barbər] ‘roar’, they are built with reduplicated biradicals /Cj/ roots: for ‘croak’, the reduplicated biradical is /kj/. As shown in (6), when the root is reduplicated, the two elements /j/ end up unseparated on the vocalic tier, violating the OCP. As a repair, the first /j/ is converted into the other high vowel /u/. /kajəj/ is then realized [kokə]. For a verb like [barbər] ‘roar’, all the elements of the root are consonantal, so no OCP violation arises.



The analysis in (6), if it is correct, is yet another nail in the coffin of the no-root view. If the decomposition of /kokə/ into /k,j,k,j/ + /a,ə/ were not real, and only the stem /kajəj/ was, the /ə/ would serve as contour on the V-tier, and no OCP violation would be expected. I conclude that the decomposition of items into root and pattern in Semitic is real.

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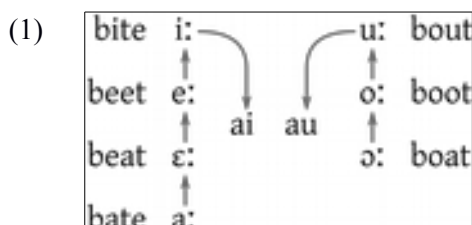


## Modélisation des chaînes de traction dans la *théorie des domaines piliers*

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Cette présentation vise à donner une modélisation des chaînes de traction diachroniques à travers une nouvelle théorie : *la théorie des domaines piliers*. Campbell (2013 : 40) donne la définition suivante d'un changement en chaîne : « Sometimes several sound changes seem to be interrelated [...]. These changes do not happen in isolation from one another, but appear to be connected, dependent upon one another in some way. Such interconnected changes are called *chain shifts*. ». Un exemple connu de changement en chaîne est le *Grand Changement Vocalique Anglais*. (1) rappelle les différentes étapes de celui-ci.



Selon la typologie de Martinet (1970 : 48-62) deux configurations sont possibles : soit les changements en chaîne – celui des voyelles d'avant et celui des voyelles d'arrière – ont débuté avec le rehaussement des voyelles basses et alors ce sont des chaînes de propulsion ; soit les changements en chaîne ont été amorcés par la diphtongaison des voyelles hautes et alors ce sont des chaînes de traction.

Les changements en chaîne se distinguent des autres processus phonologiques connus par ce caractère d'interdépendance entre les stades. Il y a véritablement une force systémique qui met en action tout le processus. De par leur complexité dans leur structure et leur fonctionnement, les changements en chaîne représentent un défi pour les théories phonologiques. En effet, ni les théories dérivationnelles orientées vers l'input ni la théorie de l'optimalité de Prince & Smolensky (1993, 2002) ne sont en mesure de les modéliser.

Ce défi des changements en chaîne et plus généralement celui de l'opacité – notion liée aux changements en chaîne – a conduit certains à proposer divers amendements à la théorie de l'optimalité. Parmi ceux-ci, Łubowicz (2003, 2012), avec sa *théorie de préservation du contraste*, avance la seule proposition permettant de rendre compte de la pression systémique des changements en chaîne. À travers l'utilisation de *scénarios* au lieu de candidats individuels, de *contraintes de préservation du contraste* et de la notion de *transformation du contraste*, Łubowicz met en avant une force motrice des changements en chaîne qui est de maintenir les niveaux de contraste d'un système donné.

Toutefois, la *théorie de préservation du contraste* ne modélise que des chaînes de propulsion. Elle ne modélise pas les chaînes de traction. Une question se pose alors : est-ce que les chaînes de traction existent ? Selon la typologie de Martinet, l'existence de ces dernières est bien possible. Dans une partie de ma thèse de doctorat, l'existence des chaînes de traction a pu être prouvée à travers plusieurs exemples vérifiés de chaînes de traction diachroniques.

Fort de l'existence des chaînes de traction, nous nous sommes alors demandés quelle force est à l'œuvre dans le déroulement de cette catégorie de changements en chaîne. Comme toutes les chaînes de traction mises en avant dans la thèse étaient des chaînes de traction vocaliques, nous avons alors observé les grandes tendances observées au sein des systèmes vocaliques afin de dégager une piste vers cette force de traction. En combinant ces observations avec les travaux de De Boer (2001) sur la naissance et l'évolution des systèmes vocaliques, nous sommes parvenus à construire une nouvelle théorie permettant de formaliser les chaînes de traction : la *théorie des domaines piliers*.

Pour résumer le fonctionnement de cette théorie en quelques mots, nous dirons que pour qu'un système vocalique soit stable, certains de ces secteurs doivent être occupés. Ces secteurs clés dans notre théorie sont désignés comme des *domaines piliers*. Nous distinguons deux principales catégories de domaines piliers : les *domaines piliers porteurs* (I A U) et les *domaines piliers de soutien* (E O). L'organisation des domaines piliers est régie par deux principes : 1/ Principe de maintien d'occupation des domaines piliers, et 2/ Principe de maintien des niveaux de contraste des domaines piliers. Ces principes sont obligatoires pour les domaines piliers porteurs et facultatifs pour les domaines piliers de soutien.

Le système vocalique donné doit donc contenir certaines voyelles précises afin d'être stable. Le premier stade d'une chaîne de traction va venir vider – ou déséquilibrer – un des domaines piliers du système et cela va provoquer d'autres changements afin que le système redevienne stable. Cette stabilité retrouvée

provoque l'interruption de la chaîne de traction. A travers la *théorie des domaines piliers*, nous tentons de phonologiser les travaux de De Boer. Cette théorie est à ce jour la seule permettant de formaliser les chaînes de traction. Elle met en avant la force motrice systémique au cœur des chaînes de traction. Elle apporte aussi une explication sur l'interruption de celles-ci.

Une première illustration de la *théorie des domaines piliers* peut être donnée avec le changement en chaîne vocalique en attique-ionien (Samuels, 2006) repris en (2).

- (2) Soit le système pré-changement /ɔ:, o:, u:/,  
 Domaine pilier porteur U = /u:/  
 Domaine pilier de soutien O = /ɔ:, o:/  
 Chaîne de traction: /u:/ → [y:] > /o:/ → [u:]  
 => Système post-changement obtenu : [ɔ:, u:, y:]  
 Domaine pilier porteur U = [u:]  
 Domaine pilier de soutien O = [ɔ:]

Ce scénario met en scène le domaine pilier porteur U. Il contient /u:/. Le premier stade de la chaîne de traction vide le domaine pilier porteur U de par la transformation /u:/ → [y:]. Le fait qu'un domaine pilier porteur se retrouve vide va produire une force de traction – de par la violation du principe de maintien d'occupation obligatoire pour les domaines piliers porteurs – qui va attirer une voyelle environnante, en l'occurrence /o:/. Le second stade de la chaîne de traction /o:/ → [u:] permet de remplir de nouveau le domaine pilier porteur U. Le domaine pilier porteur U est de nouveau rempli. Le principe de maintien d'occupation est respecté. Le domaine pilier de soutien O perd certes un niveau de contraste, mais cela n'a pas de conséquence étant donné que le principe de maintien des niveaux de contraste est facultatif pour les domaines piliers de soutien. Les principes sont respectés, la chaîne de traction prend fin.

Dans la formalisation avancée ensuite, la *théorie des domaines piliers* se forment autour de l'évaluation de scénarios. L'utilisation de contraintes permettent de transposer dans la formalisation théorique les deux principes gouvernant les domaines piliers.

Après présentation de la formalisation, quelques études de cas seront avancées pour tester la validité de cette théorie. Accessoirement, ces études de cas apporteront un soutien supplémentaire au fait que les données historiques sont légitimes pour tester des théories phonologiques modernes. La présentation se termina par la mention de quelques pistes de recherche impliquant la formalisation de la théorie en elle-même ainsi que la typologie des changements en chaîne.

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## Revisiting laryngeal features with a dynamic approach

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This paper questions the phonological analyses of laryngeal features at the segmental and suprasegmental levels. We address the limits of a static and synchronic analysis of phonological features. We instead propose a dynamic approach taking into account positional variation and diachronic evolution. Empirical data come from Tokyo Japanese. Acoustic investigations were conducted on a total of 2664 utterances produced by 9 female speakers aged 20 to 27.

### 1. [voice]: when phonetic evidence contradicts phonological arguments

In languages with a two-way laryngeal contrast based on VOT as a main cue for plosives, [voice] is employed as a distinctive feature in a classic approach (hereafter Approach A) (Keating, 1984). This embraces at least two types of languages: (1) “aspiration”, realized mainly as a long-lag vs. short-lag or negative VOT contrast, such as English or German; (2) “true voicing”, realized mainly as a short-lag vs. negative VOT contrast, such as French and Italian. In this approach, the different realizations are viewed as language-specific phonetic implementations of the same phonological [voice] contrast.

Another approach (hereafter Approach B) consists in using different and privative phonological features, [spread glottis] vs.  $\emptyset$  for (1), and  $\emptyset$  vs. [voice] for (2) (Iverson & Salmons, 1995).  $\emptyset$  represents the short-lag plosive series in both types, which is underspecified (or unmarked).

Phonetic and phonological criteria have been put forward to determine whether a language belongs to type (1) or (2). One of the phonetic criteria is passive vs. active voicing (Beckman et al., 2013). If one plosive series is consistently and robustly voiced in all contexts, as in French, the active feature is [voice]. If, for example, one plosive series is usually voiceless in utterance-initial position, but (variably) voiced in utterance-medial position, this voicing is considered as “passive voicing”. This is the case in English and German, hence [spread glottis] is proposed to be an active feature.

Japanese has long been analyzed as a type (2) language. The most widely accepted phonological argument is the active use of [voice] in different phonological rules involved in compounding, or *Rendaku* (Itô and Mester, 1986). Phonetically, it has been assumed by many that Japanese has a short-lag vs. negative VOT contrast (e.g., Iverson & Salmons, 1995).

Our study revisited VOTs of the two plosive series in Tokyo Japanese, referred to as voiced and voiceless plosives. The target plosives were elicited in three prosodic positions: utterance-initial (UI), utterance-medial & word-initial (UM), and word-medial (WM), and in two pitch-accent contexts: L and H. We found that voiceless plosives have medium-lag VOTs in UI and UM (mean at 36, 33, 55 ms for labial, dental, velar plosives, respectively), in line with Riney et al., (2007), but short-lag VOTs in WM (14, 15, 22 ms). We also found that voiced plosives are almost always voiced in WM, less often voiced in UM, and very often (67%) devoiced in UI. This result corroborates Takada and collaborators’ (2015) cross-generational study on word-initial voiced stops in Japanese, suggesting a trend towards devoicing these stops. Meanwhile, in UI, VOTs overlap between the two series, but remain significantly different. Therefore, in modern Tokyo Japanese, unlike a “true voicing” language, word-initial voiceless plosives are moderately aspirated, and voiced plosives are not robustly voiced in utterance-initial position. Their voicing in word-medial position may be considered as *passive voicing*. This phonetic evidence contradicts the phonological arguments in favor of a [voice] analysis.

### 2. F0 perturbation

Onset-induced F0 perturbation is attested in many languages. It is viewed in Approach A as part of a [voice] feature, including both type (1) and (2) languages, in that F0 at the vowel onset is lowered by /b,d,g/ compared to /p,t,k/ (Kingston & Diehl, 1994). Approach B considers that [spread glottis] raises F0 and [voice] lowers F0 (Iverson & Salmons, 1995), leading to the same relative F0 difference.

F0 perturbation is also reported briefly in Japanese in word-initial position (Shimizu, 1996). This study revisits F0 perturbation by illustrating F0 curves in the prosodic positions mentioned above. In UI (Fig. 1, left two panels) and UM (same pattern), F0 is remarkably higher after voiceless than voiced plosives, whether the latter are phonetically voiced or not, and this effect lasts till the final part of the moraic vowel following the onset. However, WM (Fig. 1, right two panels) plosives have much less effect on the following F0. The position-dependent F0 perturbation pattern in Tokyo Japanese suggests that F0 perturbation is neither a purely automatic effect of the phonetic voicing, (otherwise, it would disappear with a “devoiced” stop), nor phonologically involved in [voice] or [spread glottis] feature, (otherwise, we would expect similar F0 perturbation effect across all positions).

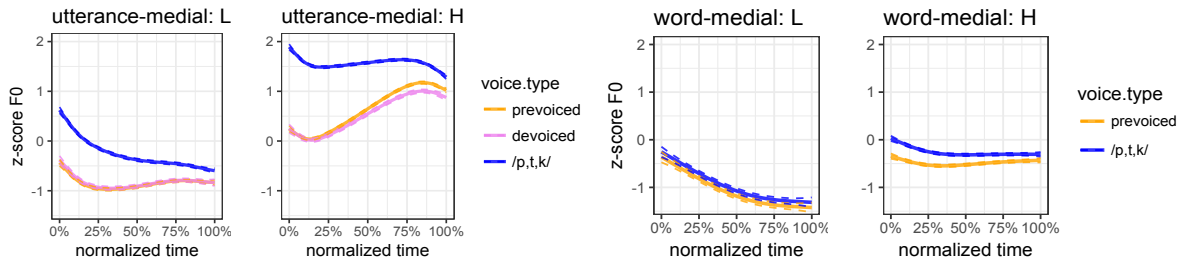


Fig. 1: Normalized F0 curves using z-score transformation after /p,t,k/, prevoiced /b,d,g/, and devoiced /b,d,g/, in UI and WM, in two pitch-accent contexts (L and H), computed by SS-ANOVA.

### 3. Proposal: a dynamic approach

#### 3.1. Positional variation

Modern Tokyo Japanese exhibits a differential use of cues to distinguish its two plosive series, depending on the prosodic positions: F0 (with overlapping short- vs. medium- lag VOTs) in word-, especially utterance-initial position, and short-lag vs. negative VOTs in word-medial position. We question the use of [voice] as a phonological feature, which does not account for the utterance/word-initial realization. We may of course propose a phonological rule which aspirates /p,t,k/ and devoices /b,d,g/ while lowering the following F0 in word-initial position. But, what prevents an analysis in the other way around: voicing of an L syllable in word-medial position? As a comparison, the three plosive series in Seoul Korean are all voiceless in word-initial position. One of them have lower F0 on the following vowel in word-initial position, and are voiced in word-medial position. Contrary to Japanese, in Seoul Korean, [voice] has been long avoided as a phonological feature, while word-medial voicing is considered as a phonological rule or a phonetic effect.

In Tokyo Japanese, F0 and VOT cues do not have a classic trading relation or perceptual equivalence because their use is first conditioned by position. But at the current stage, the differential use of these two cues mapped in different prosodic positions points to a same phonological category.

#### 3.2. Diachronic evolution

While this proposal sounds similar to the [voice/L] feature proposed by Bradshaw (1999), our proposal is more dynamic in terms of diachronic evolution. We believe that multiple cues of one phonological categories are not bound to be tied together forever. The diachronic evolution from [voice] to L has taken place in Vietnamese, Thai and many Chinese languages. In these languages, when the evolution has been completed, L is completely dissociated from [voice].

From a diachronic point of view, in utterance-initial position, the devoicing of voiced plosives, the aspiration of voiceless plosives, and the remarkable F0 difference might suggest that Tokyo Japanese is undergoing one of the following sound changes: (a) Germanic shift:  $p > p^h > f$ ; (b) tonogenesis (if “pitch-accent” is not considered as tone), as proposed for Seoul Korean (e.g., Silva, 2006). During the transitional stage of a sound change, phonological categories are, we believe, characterized by a bundle of cues (Mazaudon, 2012), difficult to sort out using a purely static and synchronic approach.

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## **/u/-fronting in English: how phonetically accurate should phonological labels be?**

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The diachronic process of /u/-fronting has been well-reported in Englishes worldwide, particularly in UK dialects (e.g. [1-3]). Phonetic studies generally quantify /u/-fronting with acoustic data referring to the second formant (F2), which is known to be an acoustic correlate of tongue position. /u/-fronting is thus defined as a process in which the historically high back rounded vowel is articulated at the front of the mouth, resulting in higher F2 values. However, other articulatory configurations may give way to increases in F2. A reduction in lip rounding could possibly produce a similar acoustic output without necessarily requiring a fronting of the tongue. If, however, the tongue is positioned more front than back and is accompanied by lip rounding, we would expect /u/ to resemble a high front rounded vowel, such as French /y/. We test this hypothesis using production data from five British English speakers and perception data from 12 French listeners. Assuming that French /y/ and /u/ are prototypical front and back vowels, asking French listeners to classify English /u/ as either /y/ or /u/ should indicate where the English vowel stands in terms of backness. If /u/-fronting is present and French listeners perceive /y/ rather than /u/, we may question the appropriateness of the label /u/ as a phonological category of English. We conclude by asking more generally how phonetically accurate phonological labels should be and whether diachronic phonetic change requires phonological formalisation.

Acoustic and articulatory data were recorded using a microphone and ultrasound tongue imaging for five native speakers of British English (A-E), including four women and one man who were 26, 50, 26, 26 and 26 years of age, respectively. One speaker (E) uses Standard Southern British English (SSBE) while the others come from northern England. Minimal pairs of /hVd/ words where V was /i, u, ə/ were recorded three times in isolation per speaker. One ultrasound image representing the maximum point of the tongue was selected for each vowel per speaker. To calculate the degree of /u/ fronting, we followed the method adopted by Scobbie et al. [4] whereby the vowel space is defined on the highest front and the highest back vowel in the system, namely /i/ and /ɔ/. X-coordinates were extracted for the highest point of each of the three vowels. Raw coordinate values were z-scored for each speaker.

The audio signals for the vowels /i, u, ə/ were segmented, labelled and extracted. Formant values were extracted at the mid-point of each vowel. F2 values were scaled using z-score normalization as in articulatory data. In both acoustics and articulation, a positive z-score was considered to represent a front vowel, while a negative score represents a back vowel.

12 native speakers of French participated in a forced-choice identification task. They listened to English productions of vowels /i/ and /u/ five times (5 speakers x 2 vowels x 5 repetitions = 60 tokens). The duration and intensity of the productions of /i/ and /u/ were normalized across speakers. French listeners were asked to select the vowel they heard from “i” (/i/), “ou” (/u/) and “u” (/y/). Interestingly, participants reported post-test that they thought they had listened to English people speaking in French.

FIGURE 1 depicts the z-scores for tongue position and F2 for the three vowels /i, ə, u/ in A-E. A positive z-score represents a front vowel, while a negative score represents a back vowel. For /i/ and /ɔ/, the z-score for tongue position and F2 correlate. We conclude that /i/ is anterior and /ɔ/ is posterior in

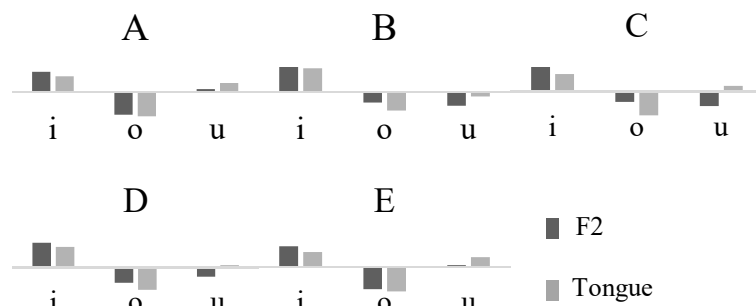


FIGURE 1: Tongue position & F2 z-scores in English speakers

both acoustic and articulatory terms in all speakers. However, we observe differences with regards to /u/. A and E have positive z-scores for both the tongue and F2, leading us to conclude that their /u/ is indeed front. /u/ is more front in articulatory terms than in acoustics, which may be a consequence of the presence of lip rounding. If rounding is present, French listeners may perceive /y/ for these two speakers, although the tongue is not as front for /u/ as it is for /i/. B's /u/ is closer to /o/ than /i/ in F2 and tongue position and is therefore back. We expect French listeners to therefore perceive /u/ in speaker B. We observe a mismatch in the acoustic and articulatory results for C and D's /u/. Their F2 values may be too low to resemble those of

a French /y/ but too high to resemble /u/. This discrepancy observed between acoustic and articulatory data in C & D leads us to stress the importance of articulatory data when addressing vocalic variation. Other researchers have also highlighted the deficiencies of a purely acoustic approach [4,5].

Our data does not present evidence to suggest /u/-fronting is a consequence of lip unrounding. If this were the case, we would expect to see a posterior tongue position with high corresponding F2 values. /u/-fronting, if it happens, seems to correspond with an articulation in the front of the mouth (at least for the five speakers presented here), coinciding with the results of other articulatory studies on SSBE [3,5].

To evaluate French perception data, the most common response for each stimulus was selected per listener. Unsurprisingly, /i/ was systematically perceived as /i/. However, variation was observed in the responses for /u/. Based on our production data, B's /u/ was deemed back and was indeed classed as /u/ by all listeners. C's /u/ was also perceived as /u/ by all listeners even though her tongue was closer to /i/ than /ɔ/. However, her z-score for F2 was even lower than that of C. A and D's /u/ was perceived as /u/ in 8 and 7 listeners respectively, otherwise it was classed as /y/. The majority of French listeners (N=8) perceived /y/ for speaker E's /u/, coinciding with our articulatory analysis. She is the only SSBE speaker we analysed and although we cannot base dialectal patterns on one speaker alone, other studies have observed more fronting in southern varieties of English than northern ones [1,5]. No speaker's /u/ was consistently perceived as /y/ by the French listeners. It would therefore be wrong to conclude that the phonetic realisation of /u/ is [y]. However, French listeners did not systematically perceive /u/ in four speakers. English /u/ therefore seems to lie somewhere between French /u/ and /y/.

An automatic classifier was trained in order to model the decision process whereby French listeners used tongue position and F2 frequency to classify the vowels as /i,y,u/. The resulting decision tree achieved 87.5% accuracy and showed that a first split involving F2 values separated all occurrences of /i/ from the other two classes. Then again F2 served as the most relevant criterion to firmly classify some stimuli as /u/. The final node relied on tongue position to classify vowels as /y/ (front) or /u/ (back).

Another classifier was trained to automatically learn the categories front and back. For the training phase, tongue position and F2 were used to predict class membership: /i/, representing the front category, and /ɔ/, the back category. Then /u/ tokens were submitted to the trained model. As it turned out, all of them were classified as front. In other words, if tongue position and F2 are the sole determinants of frontness, and if English /i/ and /ɔ/ faithfully represent the endpoints of the front-back phonetic continuum, English /u/ is phonetically more front than back.

Our perception and production data provide evidence to suggest that English /u/ is phonetically more front than back. However, French listeners do not systematically perceive /y/, which leads us to believe that English /u/ lies between French /y/ and /u/ and is perhaps a central vowel. The phonological label /u/ therefore does not reflect the phonetic reality. In traditional featural representations, fronting is formalised as [+back] → [-back] [6]. This rule cannot account for the fact that /u/ is currently undergoing fronting but the other [+high] [+back] vowel /ɔ/ is not. We propose to reanalyse English /u/ as a central vowel with the features [-front] [-back], distinguishing it from /ɔ/. /u/-fronting could then be formalised as [-front] → [+front]. A label change is therefore perhaps necessary, and we propose the central vowel /u/ as a potential alternative. The next step will be to consider the phonological consequences of such a change, going beyond fronting. A label change would not only have theoretical implications but also practical ones in various domains, such as teaching English to speakers of other languages. Finally, there is undoubtedly an important sociolinguistic dimension here. Diachronic phonetic change affects social groups at different speeds. How can we formalise these changes in phonological terms? Binary featural representations may not be the answer.

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## Syllable Contact in French Reduplication

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When partial reduplication occurs in French hypocorisms and onomatopoeic words, the phonological shape of the reduplicant in each of the phenomena becomes similar (Morin 1972). As a rule, the productive reduplicated form consists of a CV syllable when the stem has a CV(C) syllable structure, as typically in [1] *Bernard* /bɛʁnaʁ/ → *Nanard* [na.naʁ] (Plénat 1987) or *Bébert* [be.bɛʁ] (Morin 1972) and [2] *enfan* /ɑ̃fɑ̃/ → *fanfan* [fɑ̃.fɑ̃] (Walker 2001) and *Abel* /abɛl/ → *Bébel* [be.bɛl] (Morin 1972). Few past studies address markedness constraints which motivate partial reduplication in French within Optimality Theory (Prince & Smolensky 1993/2004), so the target phenomena are studied by analyzing a database, mostly culled from Morin (1972), Plénat (1987), and Walker (2001), and investigating whether the cross-linguistic schema [IO-Faithfulness » Markedness » BR-Faithfulness] (McCarthy & Prince 1994) makes sense in accounting for French partial reduplicative words.

This study indicates that first and foremost, French partial reduplication exhibits a high degree of phonological self-similarity among the two halves of the reduplicative words. The directionality of reduplication in French is from the right half of the reduplicative word to the left half (Morin 1972). In other words, a C(G)V syllable of the stem is copied word-internally. The postvocalic consonant of the stem then undergoes truncation, if any (Morin 1972) (see examples in [1]). The left half of the reduplicative word must begin with the consonant onset (Morin 1972) (see examples in [2]).

This sound pattern may well be considered what is known as “aggressive reduplication” (Zuraw 2002: 396) because a French partial reduplicant is derived from the stem regardless of morpho-syntactic or semantic considerations. If this line of reasoning is true, then the general description of the target reduplication would be that a CV-syllable of the ultimate syllable is reduplicated only when the self-similarity of the CV structure manifests word-internally. To actualize this generalization, REDUP (Zuraw 2002) would be one of the markedness constraints. This constraint requires a word to “contain some substrings that are coupled” (Zuraw 2002: 405). Additionally, SYLLCON (Rose 2000) and NO-CODA (McCarthy 2008) need to be active markedness constraints, helping the reduplicated output obtain a CV syllable with a falling sonority at the syllable boundary with the stem. SYLLCON requires that “the first segment of the onset of a syllable must be lower in sonority than the last segment in the immediately preceding syllable” (Rose 2000: 401). This study adopts the sonority hierarchy for French: vowels > glides > liquids > nasals > fricatives > stops (where “>” reads “as greater than” in terms of sonority) (Féry 2001). NO-CODA requires the syllable to contain no coda consonant (McCarthy 2008). As for the faithfulness constraint, we would suggest that MAX-KK is dominated by markedness constraints. MAX-KK refers to the faithfulness requirement that “if a word contains two



substrings  $S_1$  and  $S_2$  that are coupled, then every segment in  $S_1$  must have a correspondent in  $S_2$  and vice versa” (Zuraw 2002: 404). Accordingly, we suggest that a constraint ranking  $\llbracket \text{REDUP, SYLLCON, NO-CODA} \gg \text{MAX-KK} \rrbracket$  suffices to account for the representative examples in [1].

Following Zuraw (2002), a subscripted Greek letter indicates coupled substrings flanked by square brackets in Tableau 1. For hypocorisms in examples [1], the candidate in (a) outperforms other candidates except the candidate in (c), meeting the requirements of the superordinate constraints. The [na] in (a) is copied partially from the second syllable of the stem /nar/, resulting in the substrings of [na] and [nar] (Plénat 1987). The candidate in (c) proves itself as optimal as the grammatical output (a), partially copying the first syllable of the stem /ber/ (Morin 1972). The substrings of [be] and [ber] retain the similarity in their CV-syllable structure. French has the activity of SYLLCON check against the grammaticality of candidates in (b) and (e), but allows for the emergence of the unmarked outputs in (a) and (c) as variation. As shown by constraint interactions in Tableau 1, if the IO-Faithfulness constraint is ranked highest, the correct outputs would not be derived and the cross-linguistic schema would need to be modified for French.

Tableau 1

Input /bernar/	REDUP	SYLLCON	NO-CODA	MAX-KK
a. $\llbracket \text{na} \rrbracket_\alpha \llbracket \text{nar} \rrbracket_\alpha$				*
b. $\llbracket \text{ar} \rrbracket_\alpha \llbracket \text{ar} \rrbracket_\alpha$		*!	*!	
c. $\llbracket \text{be} \rrbracket_\alpha \llbracket \text{ber} \rrbracket_\alpha$				*
d. $\llbracket \text{ber} \rrbracket_\alpha \llbracket \text{ber} \rrbracket_\alpha$			*!	
e. $\llbracket \text{be} \rrbracket_\alpha \llbracket \text{er} \rrbracket_\alpha$		*!		**
f. ber.nar	*!		**!	

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## Formalising Headedness-Driven Phonotactics: English, French, Tarifit and Tashlhiyt Berber

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This presentation combines *Melody-to-Structure Licensing Constraints* (MSLCs) (Ulfsbjorninn & Lahrouchi 2016) with the hypothesis of *asymmetric headedness* proposed in (Ulfsbjorninn to appear). The goal is to improve the formalisation of phonotactics and especially those related to headedness.

Szigetvári (2017) effectively proposes that the phonological grammar of English contains a restriction on the branching of the element  $|\underline{H}|$ . This limits obstruent clusters by forcing them to contain at most a single fortis consonant. However, clusters such as /sf, ks, ps/ ([sfɪə] ‘sphere’, [fɒks] ‘fox’, [æps] ‘apse’) and /ft/ (before stressed syllables) seem to disprove the claim: [fɪft<sup>h</sup>i:n] ‘fifteen’. Although the /t/ in these /ft/ clusters is phonetically a little reduced in its aspiration, it is by no means categorically/fully lenis: \*[fɪfti:n] “fifteen”, and neither does the /f/ become lenis: \*[frvt<sup>h</sup>i:n] “fifteen”.

Continuing in the same spirit as Szigetvári (2017), but with a different hypothesis, we propose that aspirates and strident fricatives form a natural class defined by headed  $|\underline{H}|$ . We propose an MSLC, shown in (1), that bans headed  $|\underline{H}|$  from bipositional structures, effectively stopping headed  $|\underline{H}|$  from branching.

(1) MSLC on  $|\underline{H}|$  (English)

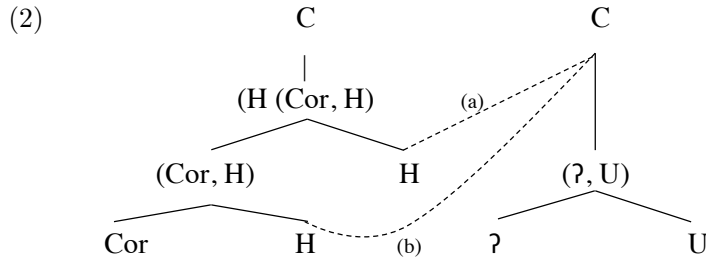
$|\underline{H}|$  cannot be contained by a bipositional structure

Note: Aspirates and strident fricatives (s, z, ʃ, ʒ) contain headed  $|\underline{H}|$

Non-aspirates and non-strident fricatives (f, v, θ, ð) contain unheaded  $|\underline{H}|$ .

The condition in (1) immediately excludes strident fricatives from preceding or following aspirate stops. The condition in (1) also eliminates the very well-known restriction on s + aspirate: [p<sup>h</sup>leɪs] ‘place’ vs. /mis- + p<sup>h</sup>leɪs/ → [mispleɪs] \*misp<sup>h</sup>leɪs ‘misplace’. And it also excludes the far less well-known English ban on adjacent strident consonants: [sti:m] ‘steam’ vs. \*[stʃi:m]. The exceptions to adjacent stridents are either the class of recent derived /t + u/ sequences: [stjʊ:] or [stʃʊ:] or [tʃʊ:] ‘stew’, or consciously known to be loanwords: [masʒid] ‘mosque’ (something which we suspect could be experimentally confirmed). Crucially the MSLC restriction in (1) does not exclude non-strident fricative + aspirate sequences: fi[f<sup>h</sup>t<sup>h</sup>i:n] ‘fifteen’, [sfɪə] ‘sphere’, [fɒks] ‘fox’, [æps] ‘apse’. In order to work, our account relies on the *phonological* distinction between the natural class of strident vs. non-strident fricatives. This distinction that we recruit for our phonotactic (the MSLC in (1)) is independently supported in English from the well-known patterns of past-tense and plural allomorphy: /kat + z/ → kats ‘cats’ & /plʌf + z/ → [plʌfs] ‘bluffs’ vs. /wɒtʃ + z/ → [wɒtʃɪz] ‘watches’ & /ho:s + z/ → [ho:ɪz] ‘horses’.

The MSLC in (1) is a grammatical condition on representations. However, we notice that the typical Element Theory representation of headedness is highly arbitrary. It is typically given either as a diacritic convention ‘underlining’ (Charette & Göksel 1996; Backley 2011), or as a template with a stipulative head-position (Kaye 2001; Faust 2017). In place of this, Ulfsbjorninn (to appear) proposes *asymmetric headedness*. In this model, a headed phonological expression also necessarily includes the unheaded version of headed element (cf. Breit 2013). The innovation is to define headedness as any element that asymmetrically c-commands another instance of itself: (H (H, ?, U)). This allows a headed structure to be linked in one of two ways, either at the level of headedness (see 2a) or at the level of the dependent (see 2b). The MSLC in (1) works by banning the kind of linking shown as (2a) for the element  $|\underline{H}|$ .



Phonotactic restrictions based on headedness can be expressed by branching at either (2a) or (2b). We will show that this kind of analysis insightfully models dialectal/diachronic shifts in headedness. We will present three case studies. First, there is the palatalization/assibilation of coronals before front vowels in Parisian French. Where this process is less advanced we see  $t, d \rightarrow [tʃ, dʒ] / \_y$  yielding: [dʒyʁ] ‘hard’, [tʃy] ‘tu’ (cf. [mjyʁ] ‘wall’), the consonant is affected but not the vowel. However, where the process is more advanced (more contexts) we see the palatalization/assibilation being accompanied by high vowel laxing: [maʁdʒi] ‘Tuesday’ and [etʃydʒã] ‘student’. This strongly suggests that the linking between C and V is proceeding in the fashion show in (2): first linking to the dependent then to the head - in effect - switching headedness without a switching operation. Second, there is Tarifit Berber, where /l/ if geminated or contained within an L.Cor cluster, surfaces as [ɕ] or [tʃ] (e.g. illa > [iɕa] ‘it exists’, tamddakk<sup>w</sup>lt > [tamddakk<sup>w</sup>ɕt] ‘girlfriend’). Assuming that /l/ contains the element [l] (Lahrouchi 2017) as do the coronal stops, we propose there is an MSLC which bans multiple instances of the headless element [l] in adjacent C-positions (in addition to the independent hardening). We propose that Tarifit fuses the two dependent element [l]s into a single headed [l̥] expression, which branches across the two positions. Third is an MSLC condition on headedness involving the labial-velar hypothesis (Bacley & Nasukawa 2009). In Tashlhiyt, where possible, the headless [U] of dorsals and uvulars is promoted to headed [U̥]; leading to their labialization. As shown in (3), labialization is blocked for labials. We propose this is due to the feature being redundant on a labial expression.

### (3) Aorist / Preterite

- |    |     |                     |         |     |                     |           |     |                     |          |
|----|-----|---------------------|---------|-----|---------------------|-----------|-----|---------------------|----------|
| a. | knu | i-k <sup>w</sup> na | ‘lean’  | gru | i-g <sup>w</sup> ra | ‘pick up’ | xlu | i-x <sup>w</sup> la | ‘go mad’ |
| b. | bnu | i-bna               | ‘build’ | ftu | i-fta               | ‘go away’ |     |                     |          |

The same language also presents a phonotactic restricting words to a maximum of one headed [U̥] in C per domain. We take this to be the syntagmatic instantiation of the paradigmatic MSLC against having multiple headed [U̥]. This process leads to the labial dissimilation in reciprocal forms (Lahrouchi 2018). As we see here, the reciprocal prefix dissimilates into [n] when attached to stems containing a labial consonant: hada > [m-ħidi] ‘be close to each other’ & ħsad > [m-ħisid] ‘envy each other’ vs. fhm > [n-fihim] ‘understand each other’ & gabl > [n-gibil] ‘face each other’.

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## Consonant-tone interactions: Shanghainese vs. Wuyi Wu

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This paper presents a lesser known case of consonant-tone interactions found in tone sandhi from two Chinese Wu dialects: Shanghainese and Wuyi (spoken in Zhejiang province), where the former exhibits a one-directional consonant-induced tone change whereas the latter shows a bi-directional interaction, with the reverse type of tone-induced consonant change being much rarer in Chinese and other tonal languages.

Shanghainese Wu has five tones which are split into high (yin) and low (yang) tonal registers. Tonal pitch level is represented by numbers 1-5, from 1 being the lowest to 5 the highest. Entering tones (underlined) are syllables that end with a glottal stop (e.g. [paʔ<sup>53</sup>] ‘eight’ in Shanghainese), whereas normal contour tones appear in non-glottal ending syllables. Wuyi has eight tones and follows a similar register split as Shanghainese.

### (1). Shanghainese tones (Zhu 2006)

Tones	Non-entering tones		Entering tone
Registers			
Yin (high register)	T1: 52	T2: 34	T4: <u>44</u>
Yang (low register)	T3: 14		T5: <u>24</u>

### (2). Wuyi tones (Fu, 1984)

Tones	Non-entering tones			Entering tone
Registers				
Yin (Low)	T1: 24	T3: 55	T5: 53	T7: <u>5</u>
Yang (High)	T2: 213	T4: 13	T6: 31	T8: <u>12</u>

In monosyllabic words, the laryngeal features of onsets in Shanghainese and Wuyi determine the tone register of the syllables. A low-register is always conditioned by voiced and breathy onsets (‘depressors’) and a high-register is always conditioned by voiceless and aspirated onsets (‘non-depressors’). Approximants that have a clear (or glottalised for Wuyi) voice appear in a high-register but they go

(3). Shanghainese:				Wuyi:			
Depressors		Non-depressors		Depressors		Non-depressors	
[bu <sup>14</sup> ]	‘old woman’	[pɔ <sup>34</sup> ]	‘baby’	[doŋ <sup>213</sup> ]	agree	[ʔmuo <sup>24</sup> ]	work
[və <sup>14</sup> ]	‘not’	[fu <sup>52</sup> ]	‘pay’	[zæʔ <sup>212</sup> ]	mature	[suo <sup>24</sup> ]	mountain
[dzɿo <sup>14</sup> ]	‘car’	[teieʔ <sup>44</sup> ]	‘foot’	[zyaŋ <sup>213</sup> ]	cabinet	[teiau <sup>2</sup> ]	leg
[l_aʔ <sup>24</sup> ]	‘spicy’	[t <sup>h</sup> oŋ <sup>52</sup> ]	‘get through’	[l_oʔ <sup>212</sup> ]	continue	[ʔlɿ <sup>24</sup> ]	knife
[m_o <sup>14</sup> ]	‘fur’	[la <sup>52</sup> ]	‘pull’	[m_uo <sup>213</sup> ]	sharpen	[ʔmuo <sup>24</sup> ]	work
		[mɔ <sup>52</sup> ]	‘cat’				

with a low-register when they become breathy voiced.

(Shanghainese: my recordings of a female Shanghainese speaker; Wuyi: Fu 1984)

In multi-syllable compound words, tone sandhi applies in both Wu dialects, which changes registers (and tones) from low to high (or vice versa) and causes mismatches between laryngeal features of the onset and the tonal register of the following vowel. Thus, it is expected that if a syllable with a voiced depressor in a multi-syllable word is changed into a high register tone due to tone sandhi, then register tone-induced depressor devoicing should occur. However, data for the two dialects show that depressors behave differently: Shanghainese depressors become opaque and inert to the change of tonal registers whereas Wuyi depressors are always sensitive to tonal changes and devoice or glottalise to non-depressor counterparts in high-register environments. Relevant data on depressors are given in (4a-b) and (5a-c). The same pattern is also found in non-depressors of the two dialects in (4c) and (5d-e). This means that Wuyi always maintains the systematic matching between laryngeal features of consonants and registers either before or after tone sandhi. Shanghainese has an asymmetric consonant-tone interaction where tones can be changed by consonants but consonants are insensitive to tones.

(4). Shanghainese bi-syllable tone sandhi: depressors being opaque to register changing (a-b)

*high + low* → *high + high register*:

- a. 44/34+14 → 33+44 [kuoʔ<sup>44</sup>] [dəʊ<sup>14</sup>] → [kuoʔ<sup>33</sup>dəʊ<sup>44</sup>] “bone”  
b. 34+14 → 33+44 [pɔ<sup>34</sup>] [dɔ<sup>14</sup>] → [pɔ<sup>33</sup>dɔ<sup>44</sup>] “report”

*low + high* → *low + low register*:

- c. 14 + 52 → 11 + 44 [zo<sup>14</sup>] [pe<sup>52</sup>] → [zo<sup>11</sup>pe<sup>44</sup>] “tea cup”

(5). Wuyi bi-syllable tone sandhi: depressors devices to non-depressors (a-c)

*low + low* → *high + low register*:

- a. 213+213 → 55+213 [dze<sup>213</sup>] [n̩.ɿ<sup>213</sup>] → [tɕie<sup>55</sup> n̩.ɿ<sup>213</sup>] “facing”

*high + low* → *high + high register*:

- b. 24+31 → 24+53 [sa<sup>24</sup>] [vuo<sup>31</sup>] → [sa<sup>24</sup>fuo<sup>53</sup>] “uncooked”  
c. 24+213 → 24+53 [foŋ<sup>24</sup>] [l̩.iɑŋ<sup>213</sup>] → [foŋ<sup>24</sup>ʎiɑŋ<sup>53</sup>] “cool”

*high + high* → *low + high register*:

- d. 55+24 → 11+24 [huo<sup>55</sup>] [te<sup>h</sup>ia<sup>24</sup>] → [fuo<sup>11</sup>te<sup>h</sup>ia<sup>24</sup>] “train”  
e. 55+5 → 11+5 [ka<sup>55</sup>] [ka<sup>ʔ</sup>5] → [ga<sup>11</sup>ka<sup>ʔ</sup>5] “reform”

The data above raise two interesting questions: (1) consonant-induced tone changes are more likely to happen in Chinese Wu dialects than tone-induced consonant changes. Indeed from the Wu dialects I studied (Shanghainese, Suzhou, Wuyi) and also studies on consonant-tone interactions other than Chinese (Tang 2008; Lee 2008; Maddieson 1974, 76, 78), more cases of consonant-induced tonal changes are reported (such as depressors, blocking of H/L tone spreading, tonogenesis etc.) than tone-induced consonant changes. (2). How to account for different consonant behaviours of Shanghainese and Wuyi in tone sandhi?

I attempt to answer the first question under Bao (1990, 1999)’s tone models, particularly his analysis of “segmentalisation of tones”, where tone nodes above the segmental plane have to be segmentalised down to the same segmental plane with consonants, so that tone-induced consonant changes could occur. I further argue that this downward-projection of the complete tone node is more demanding than the simple L-element projecting upward onto the tonal plane, where consonant-induced tone changes are implemented. This explains the asymmetry between consonant-induced tone vs. tone-induced consonant changes cross-linguistically. As for the difference between Shanghainese and Wuyi, my answer is that synchronically, dialects that retain more of the features of Middle Chinese (less simplified dialects) are more likely to exhibit diverse consonant-tone interactions. Wuyi can be considered as a more archaic form than Shanghainese especially in tones, which could explain why Wuyi has bidirectional consonant-tone interactions whereas only one-direction interaction is kept in Shanghainese. This pattern is also proved by Mandarin, which is an even more simplified Chinese dialect than Shanghainese and thus does not have any consonant-tone interactions at all.

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

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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. /pa<sup>h</sup>ʲk/ → [²pa<sup>h</sup>ʲak] 'bellows' (cf. /pa<sup>h</sup>ʲak/ → [¹pa<sup>h</sup>ʲak] 'skull')  
ii. /ʲu:rpɔst/ → [ʲu:rpɔst] 'Leurbost (village)' \* [ʲu:rupɔst] \* [ʲurupɔst] \* [ʲu:ru:pɔst]

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. /tuan̄/ → [²tuan] 'song' vs. /tu.an/ → [¹tuan] 'hook'  
ii. /po:/ → [²po:] 'cow' vs. /po.ə/ → [¹po:] '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. [pə'p̄<sup>h</sup>ʲa:<sup>h</sup>tə] 'potato', [tʰə'ma:r<sup>h</sup>st] '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( $\Sigma$ ) (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 [ $\Sigma$   $\sigma_{\mu}$   $\sigma_{\mu}$ ] is the first syllable, and that of [ $\Sigma$   $\sigma_{\mu\mu}$ ] the first mora). If the input to svarabhakti is taken to be [ $\Sigma$   $\sigma_{\mu\mu}$ ], then highly ranked HEADMATCH( $\Sigma$ ) prevents epenthesis from bringing about resyllabification to [ $\Sigma$   $\sigma_{\mu}$   $\sigma_{\mu}$ ]. 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).

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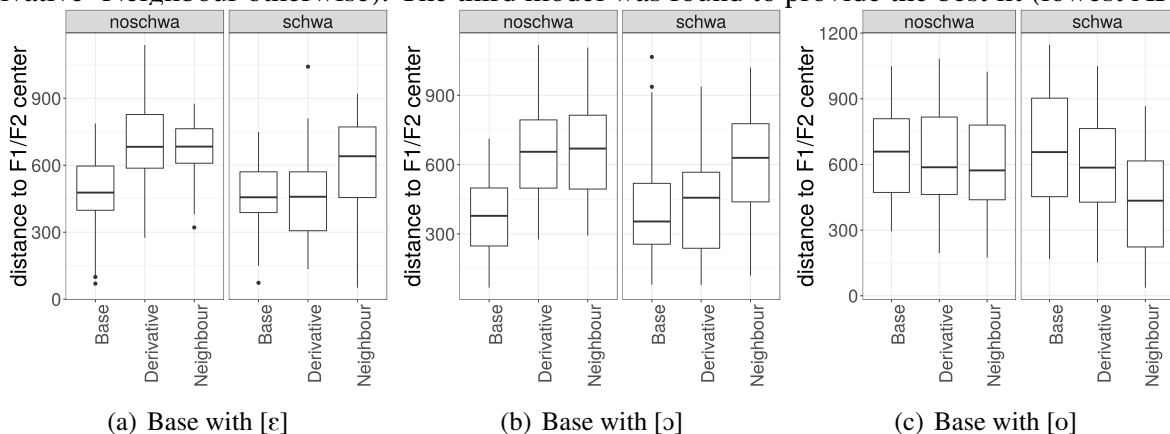
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## Phonologically-conditioned cyclicity in Standard French • Benjamin Storme (CNRS)

**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  $\text{ə}$ -vowel and  $\text{ə}$ -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 [ $\text{ɛ}$ ,  $\text{ɔ}$ ] are more central than tense mid vowels [ $\text{e}$ ,  $\text{o}$ ].

**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 ([ $\text{ɛ}$ ,  $\text{ɔ}$ ,  $\text{o}$ ]). 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).



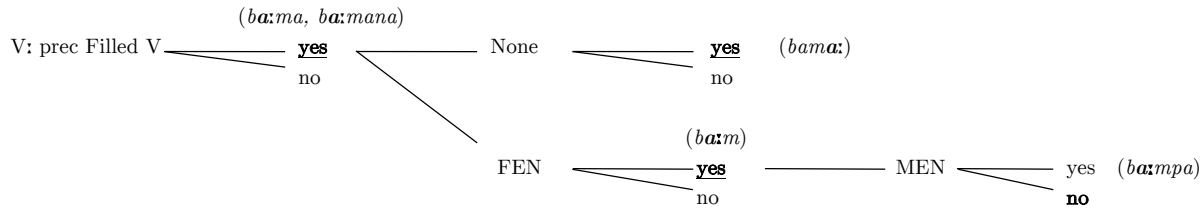
**4. Discussion and conclusion.** The preliminary results of this study add to the body of evidence suggesting that preschwa syllables have a special status in French. Durand (1976) and Selkirk (1978) hypothesize that these syllables are prosodically prominent: this prosodic prominence could explain 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.

## English prevocalic tenseness and the typology of vowel length (in Strict CV)

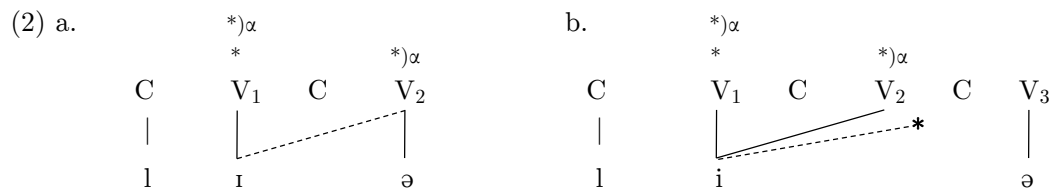
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This presentation connects the process of Prevocalic Tenseness (PT) with Current Southern British English’s place in the broader typology of long vowel (V:) distribution. The analysis of PT is couched in the framework of Strict CV, but the presentation 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 /i:, u:/ precede schwa. This reveals a contrast between diphthongs and V+schwa hiatuses: (a) [lɪə] → [lɪ:] ‘Lear/leer’ vs. [li:ə] ‘Leah’ & (b) [ʃʊə] → [ʃo:] ‘sure’ vs. [su:ə] ‘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. [ba:ra]) (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) [ba:mØpi], (b) Final Empty Nucleus (FEN) [ba:mØ], or (c) nothing [bama:].

(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: [lɪ:] ‘leer’ in (2a), while the  $V_3$  of hiatus sequences has fallen outside of the domain of incorporation: [li:ə] ‘Leah’ in (2b).





## Contribution of parameter dependencies to descriptive adequacy of accent theory

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**Introduction.** Il est bien connu que les théories métriques de l'accent tendent à surgénérer fortement. Le présent exposé vise à proposer un système paramétrique non-métrique qui comprend un ensemble de paramètres accentuels enrichi de dépendances paramétriques et à démontrer que le système résultant engendre exactement tous les systèmes accentuels phonologiques (à savoir, ceux à accent phonologiquement prévisible) qui sont effectivement attestés, et uniquement ceux-là.

**La théorie « S&P ».** J'opère ici dans le cadre général de la théorie dite la *Scales-and-Parameters theory* (S&P) dont le caractère non-métrique est fondé sur la séparation (justifiée dans van der Hulst 1996, van der Hulst & Goedemans 2014, McGarrity 2003, entre autres) entre l'*accent* (« primary stress ») et le *rythme* (« non-primary stress »), assignés aux formes sur des plans phonologiques distincts par des algorithmes indépendants. Le présent exposé se limite à l'accent. La S&P prend pour point de départ la *Primary Accent First theory* (PAF ; van der Hulst 1996, 2010) dont un avantage important est de surgénérer moins que les théories métriques et, en même temps, de ne pas sous-générer.

**L'Hypothèse de Localité Accentuelle.** Un des aspects originaux de la S&P consiste à introduire des relations de dépendance entre certains paramètres du système. En particulier, le présent exposé décrit une relation de dépendance extrinsèque entre trois paramètres, à savoir *Nonfinalité*, *Poids* et *Select*. Le paramètre de *Nonfinalité* rend la syllabe finale invisible au mécanisme d'accentuation. Celui de *Poids* détermine, pour une langue donnée, si celle-ci est sensible au poids syllabique ou non. Au cas où elle l'est, les syllabes lourdes (et elles seules) sont projetées sur la ligne 1 de la grille à l'intérieur du domaine accentuel (la chaîne de syllabes accentuables dans une langue donnée). Enfin, le paramètre *Select* (Left/Right) place une marque sur la ligne 2 de la grille au-dessus de la première/dernière marque de la ligne 1, assignant ainsi l'accent de mot.

Un examen attentif des données et descriptions extraites du *StressTyp* (actuellement, la base de données la plus large des schèmes accentuels attestés dans les langues du monde) a révélé la dépendance extrinsèque suivante :

(1) Dans les systèmes *bornés* (c'est-à-dire ceux dont le domaine accentuel est disyllabique) où les paramètres de *Nonfinalité* et de *Poids* sont fixés sur « Oui », le paramètre *Select* est toujours fixé sur « Droite » (2a). Les schèmes accentuels tels que (2b) ne sont pas attestés dans les langues du monde.

(2) a. l h l l (h 'h) < $\sigma$ >]

b. \*l h l l ('h h) < $\sigma$ >]

Par exemple, la forme [kon'struktus] « érigé » en (3a) est attestée (en latin), alors que \*['konstruktus] en (3b) ne l'est pas.

(3) a.	*	Select (Droite)	b.	*	Select ( <b>Gauche</b> )	ligne 2
	(* *)	Projection de poids		(* *)	Projection de poids	ligne 1
	h h <h>]	TailleDomaine (Borné)		h h <h>]	TailleDomaine (Borné)	
	kon'struktus	Nonfinalité (Oui)		*'konstruktus	Nonfinalité (Oui)	

En généralisant (1), qui se limite aux systèmes bornés, à d'autres types de systèmes accentuels, on aboutit à l'hypothèse (4). Celle-ci implique la prédiction (5).

(4) Dans les systèmes accentuels phonologiques à *nonfinalité* en général, c'est toujours la dernière syllabe lourde dans le domaine accentuel qui reçoit l'accent de mot.

(5) *Dans les systèmes accentuels phonologiques à nonfinalité en général, l'accent ne tombe jamais ailleurs que sur la dernière syllabe lourde du domaine.*

**Les tests.** J'ai conduit une série de tests de (5) contre les données du StressTyp (que j'avais préalablement corrigées et réanalysées où nécessaire en me servant de littérature préexistante) pour les systèmes *non-bornés* ayant {Poids (Oui), Nonfinalité (Oui)}, et ce, pour chacune des valeurs du paramètre *Unité de Nonfinalité* (Syllabe/Segment). Les tests révèlent qu'*aucun système ainsi défini n'a le paramètre Select fixé sur la valeur « Gauche »* (du moins, aucune langue recensée dans le StressTyp).

Par exemple, Sindhi possède bien les formes accentuées sur la dernière syllabe lourde (= non-centrale) accentuable (6a), mais pas de schèmes accentuels tels que (6b) incompatibles avec (5).

(6) a. *mok'ləŋi* [(h l 'h) <h> ] « farewell »      b. \*[( 'h l h) <σ>]

Je conclus que la prédiction (5) est correcte et que l'hypothèse (4) se trouve ainsi étayée, impliquant à son tour la dépendance paramétrique (7). Celle-ci a pour effet de bloquer la valeur « Gauche » du paramètre Select.

(7) [Nonfinalité (Oui) & Poids (Oui)] → Select (Droite)

**Au seuil de l'adéquation descriptive.** La dépendance ci-dessus, de concert avec les autres dépendances paramétriques du système proposé (jointes à l'exclusion de l'« extramétricalité à l'initiale »), résultent en une réduction drastique de l'espace paramétrique engendré par le système de paramètres de la S&P, de façon à rendre cette théorie (quasi-) descriptivement adéquate. En effet, d'une part, les 22 types de systèmes phonologiques engendrés par la S&P sont tous attestés et, de l'autre, tous les systèmes phonologiques attestés (excepté le hopi) sont effectivement engendrés par la S&P.

**Pour clore.** La théorie S&P est comparée à la *Simplified Grid Theory* (Idsardi 1992, Halle & Idsardi 1995), une théorie métrique dont le formalisme suffisamment direct facilite la mise en rapport des deux approches. Il sera démontré qu'à la différence de la S&P, la *Simplified Grid Theory* se caractérise par une puissance générative très élevée qui résulte en une surgénération massive et des ambiguïtés paramétriques (posant un problème d'apprenabilité).

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