The Nineteenth Manchester Phonology Meeting

ABSTRACTS BOOKLET

Thursday 19th - Saturday 21st May 2011

Held at
Hulme Hall, Manchester

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

This booklet contains the abstracts for all the papers presented at the nineteenth Manchester Phonology Meeting, held at Hulme Hall, Manchester, in May 2011.

The abstracts are arranged in alphabetical order by the surname of the (first named) presenter. Unfortunately, one presenter did not submit the non-anonymous version of their abstract in time for inclusion in this booklet; otherwise all abstracts should be here.

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

All sessions for papers listed in this booklet will take place in either the Old Dining Hall, the JCR or the dining hall area in Hulme Hall. The opening and closing addresses and the special session will be held in the Old Dining Hall.

The final programme, included in your registration pack and available on the 19mfm website, gives the details of which papers are in which room, and at which times.

Oral papers

Pretonic unstressed syllables in English

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The paper aims to contribute to the study of phonological strength. It is well-known that certain positions (e.g., stressed vowels, word-initial or post-coda consonants) are stronger, that is, more resistant to lenition (weakening, incl. all types of reduction and deletion) than others (e.g., unstressed vowels, word-final or coda consonants) both synchronically and diachronically. As a typical representative of the Germanic pattern, English exhibits a stress-sensitive system in its consonants, i.e., there is a difference between their pre-stress and post-stress behaviour. In particular, consonants immediately preceding full vowels are strong (note the aspirate in *atomic* and *vehicular*) but weak otherwise (cf. *atom* and *vehicle*). This extends to vowels, as only schwas are subject to deletion (syncope – *battery* vs. *batt'ry*).

The present paper investigates the strength of pretonic unstressed syllables. First, word-initially their consonant differs from their vowel: in words of the *potato* type, the consonant of the first syllable is strong while the vowel is weak, even deletable. Therefore, the evaluation of the strength of that syllable as a whole is ambivalent. We take this observation as argument for abandoning the syllable as a theoretical tool in the discussion of phonological strength and as evidence for the need to treat the consonant and the vowel separately, as is done in CVCV phonology (Lowenstamm 1996, Scheer 2004).

Second, pretonic unstressed syllables do not exhibit the same degree of phonological strength/weakness in different positions: word-initially their consonants are generally stronger (as in *potato*, with almost as much aspiration on the /p/ as on the first /t/) than medially (as in *Winnepesaukee*), while the reverse is true for their vowels (the schwa being more prone to syncopate in *potato/suppose* than in *nationalize*). From this, the paper concludes that foot-based adjunction analyses, propagated in Jensen (2000), Davis (2003), etc. are inadequate either because they predict the same amount of aspiration in *Winnepesaukee* as in *potato*, or because they allow for a reduced vowel in a monosyllabic foot.

Therefore, in the present paper the claim is made that (i) the phonological strength of consonants and vowels should be evaluated separately, a consequence of which is that (ii) stress is a property of vowels (rather than syllables) which *may* percolate to neighbouring consonants, and that (iii) prominence relations can be reduced to a system of V-to-V and V-to-C interactions. It follows, then, that a theoretical framework based on Ségéral and Scheer's (1999) and Dienes and Szigetvári's (1999) definitions of government and licensing as two antagonistic lateral forces (cf. Scheer 2004, Scheer and Ziková 2010) is a suitable model. With a CVCV skeleton, it is capable of expressing the relative weakness/strength of vocalic and consonantal positions separately. This way, it accounts for the above observations avoiding the debatable notion of the syllable and without making reference to foot structure.

Voicing contrast in Hungarian fricatives

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This presentation aims to explore voicing contrast in Hungarian fricatives especially in word- and utterance-final position. Hungarian is not a final-devoicing language, i.e. there are minimal pairs which differ in the voicing quality of the word-final obstruent: *mé*[z] 'honey' - *mé*[s] 'lime'. According to the literature this contrast is cued by phonetic voicing.

Recent studies (Kiss-Bárkányi 2006, Bárkányi-Kiss 2010) on the double-faced phonological behavior of [v] in Hungarian show that *v* in utterance-final position is devoiced due to the aerodynamic conflict involved in the realization of voiced fricatives (e.g. Stevens 1998, Johnson 2003, Jansen 2004, Fuchs-Brunner 2005). Based on this we hypothesize that the other voiced fricatives [z] and [ʒ] are also devoiced in final position. The following questions arise: Is there contrast preservation between voiced and voiceless fricatives in this position? If so, which phonetic parameters might encode the difference when phonation is lacking? Even if there are measurable differences between the voiced-voiceless contexts are they robust enough to be perceived by speakers? How much voicing is needed for a fricative to be perceived as voiced? We realized acoustic and perception experiments in order to answer these questions.

In Experiments 1 and 2 we examined (with 6 native speakers of Hungarian) the acoustic realization of /s/-/z/ and /ʃ/-/ʒ/, respectively, in utterance-final position. Our results confirm that voiced sibilants are highly unphonated - over 70% in the fricative interval. However, even compeletely unphonated voiced and voiceless sibilants are reliably disinguished by the length of the fricative and the length of the preceding vowel (and their ratio) - in accordance with the literature on the issue (e.g. Wells 2000). (There are other parameters like intensity of the fircative, preaspiration of the preceding vowel, which we did not measure in this study, but seem to contribute to partial contrast preservation. We also observed that there is considerable inter-speaker variation, but the same speaker usually realizes the voiced-voiceless pairs with different phonation.) An important finding is that when our test words appeared in sentence-medial position we did not find any differences in the length of the preceding vowel. This means that in a phonetically impoverished context, when phonation is lost, a "secondary" cue is enhanced to prevent neutralization. So phonetic features that have been thought to be redundant in the phonology of Hungarian are actually crucial for maintaining the voicing contrast in phonetically unfavorable position.

Experiment 3 aims to find out whether speakers really perceive voiced fricatives as such in final position. Unphonated stimuli (over 90% of devoicing in both the phonologically voiced and phonologically voiceless case) were chosen from the acoustic studies. Data was presented as a forced choice test to 20 native speakers of Hungarian through stereo headphones with the help of Praat's ExperimentMFC. Our preliminary results show that if the whole final syllable is presented, both voiced voiceless fricatives are recognized correctly most of the time although with voiced fricatives performing significantly worse. When a lone consonant is presented, voiceless fricatives are recognized correctly, while voiced fricatives are recognized in less than 50% of the cases. They are perceived voiceless. This corroborates that the role of the preceding vowel is crucial in this impoverished position and shows that there is only partial contrast preservation. In Experiment 4 stimuli were chosen from Experiment 1 with different degrees of phonation from 0-100% of voicing in 10% steps and were presented as in Experiment 3. Our results so far show that recognition considerably improves if around 30% of the fricative is realized with phonation.

Contrary to our expectations, we did not find a statistically significant difference in the voicing of compact and diffuse voiced fricatives in final position. This entails a further question: can we really explain the phonological behaviour of /v/ by its phonetic properties? We will show that while the articulatory target of /v/ is a labiodental narrow approximant (as Bárkányi-Kiss 2010 based on Padgett 2002) claim, the articulatory target of [z] and [ʒ] is an alveolar and post-alveolar voiced fricative, respectively, and this has phonological consequences.

Prosodic faithfulness: evidence from poetic meter

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In this talk I use evidence of prosodic similarity in poetic meter to propose a general correspondence theory for prosodic structure.

The notion of contrast in Optimality Theory is connected with correspondence: faithfulness constraints only refer to those aspects of representation which can be used contrastively. While this idea has been well worked out for segmental features, prosodic correspondence is understood poorly. One problem is that different levels of the prosodic hierarchy appear to behave differently. The orthodox view is that syllable structure is not generally contrastive, and thus there are no faithfulness constraints referring to it. On the other hand, because stress is sometimes lexical, at least some faithfulness constraints must make reference to it (e.g. McCarthy 2008). Likewise, compensatory lengthening and other quantity-preserving effects suggest that moras are subject to constraints like DEP(μ) and MAX(μ). Moreover, the nature of the faithfulness constraints is not uniform across the hierarchy. As McCarthy (1995) points out, moras persist under deletion (akin to tones in autosegmental phonology), suggesting constraints that directly refer to moraic structure. Stress, on the other hand, lacks such autosegment-like persistence. For this reason, stress faithfulness constraints are assumed to refer not to stress itself but to the role of segments in stress feet (e.g. Ito, Kitagawa & Mester (1996)). The piecemeal approach to prosodic faithfulness results in a patchwork of methods — an undesirable property, as faithfulness is OT's measure of similarity, and similarity in rhythmic or prosodic shapes of entities is no doubt linguistically relevant.

A methodological difficulty in working out a *general* theory of prosodic correspondence is that it does not tend to play a significant role in ordinary input-output mappings, hence evidence for it is sparse. In this talk I propose to build a theory of prosodic correspondence using a domain which is largely, if not entirely, based on the evaluation of similarity of prosodic structures, viz. the theory of poetic meter. One of the effects of the proposal is to partly divorce faithfulness and contrast.

A standard generative view of metrical verse conceives it as consisting of two simultaneous structures: a metrical template, and the text which must be somehow matched with that template (e.g. Halle & Keyser 1969). The template is pure prosody — it consists of rhythmic structure disembodied from segmental content. Lines of poetry conform to a meter to the extent that their prosodic structure is similar to the template. I propose a theory of meter that evaluates such similarity based on text-template prosodic correspondence and faithfulness constraints stated on that correspondence relation. Unlike in input-output mappings, prosodic faithfulness required for meter spans the entire prosodic hierarchy, and provides evidence for a more articulated constraint set — indeed, for a general theory of correspondence (i.e. similarity) for prosodic structure.

Many problems of input-output prosodic faithfulness can be solved using this generalized theory. In meter, correspondence between the prosodic structures of the text and template is not direct, but mediated by correspondence at just one of the levels of structure, called the c-level. For example, if the c-level is the mora, then only moras of the text and template correspond, while constraints on syllables, feet, etc. are stated in terms of the corresponding moras' role in those larger constituents. The choice of the c-level is subject to parametric choice, and affects the nature of meter: if the c-level is mora, a quantitative meter results; if it is syllable, a syllable-counting meter; if it is the prosodic word, a stress-counting meter. Input-output prosodic correspondence becomes a special case of the more general scenario: in the input-output case, the c-level is *always* the mora. The problem of the different nature of constraints at different levels of the hierarchy thus disappears.

More generally, I will argue that the effects of the complete set of prosodic correspondence constraints, while fully visible in meter, are masked in input-output mappings for external reasons.

Ambisyllabicity: German versus English

Another argument against ambisyllabicity and a (crucial) argument against the skeleton

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The idea of ambisyllabicity was already present in Paul's *Mittelhochdeutsche Grammatik* (cf. Paul et al. 1998 [1881]), even though it is usually assumed that Kahn invented it in his 1976 dissertation. Kahn's contribution (see also Anderson & Jones 1974) is interesting insofar as it provides a representation for A(mbisyllabic) C(onsonants) within Autosegmental Phonology.

Goal – The concept of ambisyllabicity and the corresponding representation are disputed in the literature (cf. Bermúdez-Otero 2007, Borowski et al. 1984, van der Hulst 1985, Jensen 2000). Nonetheless, AC's are commonly represented as a *single* piece of melody associated to *one* x-slot but *two* adjacent syllables **(**1**)**. This paper provides additional evidence against ambisyllabicity and shows that, in order to exclude AC's from the inventory of possible phonological structures, we must assume that there is no skeletal tier.

Study – The focus is on the different uses of ambisyllabicity. Two antagonistic uses are identified: in German (Hall 1992, Wiese 1996), Danish (Basbøll 1988) and Dutch (van der Hulst 1985), where stressed syllables must be heavy, consonants are made ambisyllabic in order to make otherwise light / open syllables heavy / closed **(**2**)**; in English, however, AC's are used to account for flapping **(**3**)**. In other words, ambisyllabicity is held responsible for consonant *strength* in German, Danish and Dutch, but for consonant *weakness* in English.

Problem – This situation, whereby a single representation is held responsible for both strength *and* weakness, is embarrassing: ambisyllabicity seems to be able to cause two opposite effects, which is hard to believe if we assume that the same causes should have the same effects.

A number of authors (cf. Borowski et al. 1984, van der Hulst 1985 or Seiler 2009 among others) have argued that AC's should be represented / analysed as geminates in languages like German, Danish or Dutch (AC's → strength). Since the behaviour of English AC's is the opposite of German, Danish and Dutch AC's, we may freely assume that English AC's are to be represented as singleton consonants (cf. Ségéral & Scheer 2008a,b). Ambisyllabicity becomes useless. This is confirmed by Vogel (1977) who reports that no language exhibits a three-way contrast between geminate, AC and singleton consonants. As a consequence, a theoretical framework which excludes ambisyllabicity in the first place seems to be better equipped than a framework which needs a specific device (cf. Hall 1992's ambisyllabicity filter) to do so.

The skeleton and Strict-CV – The skeleton is harmful: it provides the opportunity to represent AC's, which we want to remove from the inventory of phonological representations. Strict-CV (Lowenstamm 1996), where the skeleton is not represented because it is redundant (Scheer 2004:LV), unlike other frameworks may dispense with it, and thus appears to be better equipped to capture the fact that no single language exhibits a three-way contrast.

Figures

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The role of syllable weight in learning a natural and unnatural stress pattern

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Recent research into the learning of natural and unnatural pairs of artificial languages have demonstrated that it is easier to learn a phonological rule that is based on naturalness in language than a similar, but unnatural version of the same rule. This effect has been seen in a variety of phonological research including phonotactics (Pater & Tessier 2005), tone sandhi (Zhang & Lai 2010) and stress based on vowel height (Carpenter 2010). The research presented here tests a natural and unnatural pair of stress rules based on syllable weight.

A universal phonological principle of stress is that, all else being equal, languages stress heavy syllables over light syllables. Heavy syllables are those that have a coda or a long vowel such as CVC, CV: and CVV syllables. Cross-linguistically, languages differ in which types of syllables are deemed heavy, however, in the artificial languages created for this experiment heavy syllables are CVC and light syllables are CV.

In an artificial language-learning task, native English-speaking participants learned one of two language rules: 1) stress the first heavy syllable, else the first syllable, or, 2) stress the first light syllable, else the first syllable. They were trained on the target language by listening to a set of nonsense words exemplifying the stress rule and looking at an accompanying picture for each word. The total training of 27 words was divided into blocks of four 3-syllable words and five 4-syllable words. Following each block participants were given a forced-choice task to choose the correct version of the words they had just learned. Following the training procedure, participants were tested on novel words with the same stress pattern.

The results of the novel word testing was that the group learning the natural rule, stress heavy syllables, else the first syllable, performed significantly better than the group learning the unnatural rule, stress light syllables, else the first syllable. An OT account of the preference for heavy syllables being stressed calls for the Weight-to-Stress constraint (which requires that heavy syllables be stressed) to dominate alignment constraints requiring the head of the prosodic word to be aligned with the left or right edge of the word, ALIGN-HEAD LEFT and ALIGN-HEAD RIGHT, respectively.

To account for the learnability of both the natural and the unnatural rules, I argue for the interaction of a general cognitive mechanism that facilitates learning and a language-specific one that can access universal phonological principles to aid in language-learning.

Preaspiration in Spanish: the case of Andalusian dialects

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The present paper aims at providing an account of the phenomenon of preaspiration in Andalusian dialects of Spanish. Preaspiration is known from Northern Germanic languages, where it is typically held to be the result of an /h/ plus consonant cluster (e.g. Helgason 2002). I show that this is not the only phonological identity of preaspiration: in the dialects metioned preaspiration has quite different workings, while being similar or identical on the surface.

Three Southern varieties are examined, one spoken in Sevilla (Western Andalusia WA), and two from the provinces of Granada (GR), and Almeria (Al), respectively (Eastern Andalusia, EA) (Morris 2000). Common to all dialects is the loss of obstruents in coda position, which in EA (Almeria and Granada), but not in WE (Sevilla), triggers compensatory lengthening (CL) of the following consonant, which thus geminates (this CL is the *only* source of geminates in these dialects) (Gerfen 2001, Jimenez and Lloret 2007). Compare Standard Castilian (SC, where coda consonants are stable, and which thus witnesses the state of affairs of the ancestor common to all dialects) with relevant EA dialectal forms: SC *obispo* [oβíspo] = Al [oβíʰppo] = GR [oβíppo] 'bishop', SC *capta* [kápta] = Al [káʰtta] = GR [kátta] 'captures', SC *adverso* [aðβérso] = Al [aʰββérso] = GR [aββérso] 'adverse'. The critical observation is that the geminate may (Al) or may not (GR) be accompanied by preaspiration. That preaspiration is a consequence of CL/gemination is confirmed by words with sonorant codas, which are not completely deleted: there is no gemination and no aspiration either (in the aspirating dialect Al): SC *alto* [alto] = Al [aˡto] 'tall', SC verde [bérðe] = Al [béʳðe] 'green'. In the variety spoken in Sevilla on the other hand, preaspiration is observed, but no gemination: SC [oβíspo] = WA [oβíʰpo].

In sum, thus, three out of four logical possibilities regarding the co-occurrence of (consonantal) length and aspiration in varieties that have lost obstruent codas are attested: 1) both length and aspiration (Al), 2) length, but no aspiration (GR), 3) aspiration, but no length (WA). The missing pattern is 4) neither length nor aspiration.

I argue that the surface variation observed is based on invariable phonological representations: all dialects have identical underlying representations. That is, dialect 3) has done CL just as dialects 1) and 2), only is the way in which a geminate is signalled phonetically different (i.e. by aspiration). In other words, the variation is not one of different phonological representations, but one of different mappings of identical representations onto phonetic exponents. Phonological length may be signalled as phonetic length (GR), or as aspiration (WA), or (redundantly) as both (Al). In this view, preaspiration is epiphenomenal: having no existence in phonology, it is a means that is chosen by the dialects in order to mark a phonological distinction in the phonetic signal. The missing pattern (neither length nor aspiration), then, is impossible for a dialect with phonological length: no matter in which coat, phonological distinctions are always carried to the surface. A language where phonological structure cannot be recovered from the phonetic signal would be unlearnable. Therefore pattern 4) may occur, but represents a further step in diachronic evolution, i.e. one where the geminates created by CL are lost altogether, including in phonological representation.

The idea that phonological length is always signalled phonetically but not necessarily by phonetic length is expressed by the concept of virtual long vowels (Lowenstamm 1991) and virtual geminates (Ségéral & Scheer 2001, Barillot & Scheer 2005). Virtual length goes one step further than ambisyllabicity, which is another solution found by analysts when faced with phonetically simplex consonants that behave as if they were geminates. Ambisyllabic consonants try to maintain a one-to-one mapping between phonology and phonetics: a single x-slot is associated to two constituents (a coda and an onset). Such a one-to-one mapping, however, is neither necessary nor desirable: on the one hand, we know that there is some slack between phonological representations and their trace in the phonetic signal anyway (English aspiration of voiceless stops is an example); on the other hand, ambisyllabicity introduces an extra configuration into syllable structure without reason, and indeed a configuration that creates serious trouble (Jensen 2000, Hall 2002, Caratini 2009). On a broader note, it is thus argued that virtual geminates are a better solution than ambisyllabicity in all cases, and that the mapping of phonological representations upon the phonetic signal, rather than phonology itself, is the locus of much variation that is found on the surface.

LARYNGEAL TIMING IN IXCATEC CONSONANTS

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Languages with complex laryngealized segments often differ in how laryngealization is timed relative to the consonant (Howe and Pulleyblank, 2001; Bird et al., 2008; Maddieson et al., 2009). The timing of laryngeal gestures may vary with stress, constraints on syllable structure, or even general constraints on perceptibility (Kingston, 1990; Silverman, 1997). In this paper, I present original field data from Ixcatec, a moribund Oto-Manguean language with 8 speakers, spoken in Oaxaca, Mexico. Ixcatec has a large inventory of aspirated and glottalized consonants (Fernández de Miranda, 1959). Using acoustic data from three speakers, I examine the effect of word position on the realization of aspirated and glottalized obstruents and sonorants. There is a significant effect of word position on the duration of laryngealized consonants ($t = 6.9$, $p_{MCMC} < .001$). Word-initial obstruents are significantly longer than word-medial obstruents, which is reflected both in the mean duration of closure and the mean duration of VOT. This data is shown in Figure 1 for stops. Duration is significantly longer in plain obstruents, while VOT is significantly longer in both aspirated and glottalized obstruents ($t = 3.7$, $p_{MCMC} < .001$), demonstrating a type of trading relation in glottal timing. This trading relation is more robust for consonants in word-medial, post-tonic position than in word-initial, pre-tonic position.

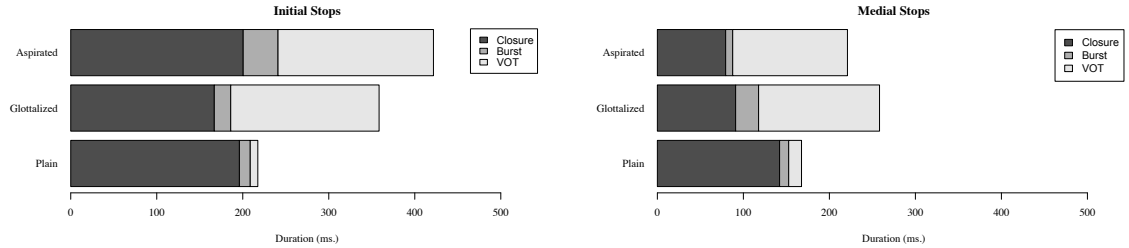

FIGURE 1. Stops in Initial position (left) and Medial position (right)

Glottalized consonants surface as post-creaky voiceless stops, ejectives, or as stops followed with a short duration of modal voicing prior to the onset of creaky phonation. However, these surface phonetic variants correlate with changes in the duration due to positional effects, where more sequential glottal timing patterns surface in word-initial position. I argue that the longer durational window present in word-initial, pre-tonic position permits more careful, sequential timing of the glottalization gesture than the shorter window present word-medially, where the glottalization gesture overlaps more substantially within the consonant. The timing and surface realization of glottalization in Ixcatec are influenced by general prosodic patterns of positional strengthening (Keating et al., 2000). This particular finding suggests that variation in the production of ejectives may be governed more by the prosodic structure of the language than by perceptual constraints on phonetic structure (Kingston, 1990).

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What do we know about French liaison ?

Sanford Schane's 1965 thesis inaugurated a long tradition of work wherein French liaison is envisaged firstly as an essentially phonological question, secondly as the passive result of the non deletion of underlying segments, thirdly as easily explicable if the right theoretical tools are used (be they distinctive features, boundaries, rules or constraints). In this article, we present an alternative methodology for the study of liaison followed within the PFC programme (*Phonologie du Français Contemporain: usages, variétés et structure* Durand, Laks, Lyche 2003, 2009). Our starting point will be the PFC database as it was in December 2010, i.e. 35 survey-points involving 372 speakers and 49728 codings of liaison sites. We will defend the idea that French liaison (arguably unlike sandhi-r in English) is essentially a multifactorial and inter-level phenomenon intertwining zones of relative stability with areas of inherent variability (a conclusion partially reached by other specialists like Côté 2005, 2010 but based here on extensive data which are strictly comparable given the methodology adopted in the PFC project). We will show (a) how orthographical forms and practices interfere with prosodic and linking phenomena typical of French, (b) how morphosyntactic and even semantic cohesion (fixed phrases, constructions) play a central role. But above all we will demonstrate through a detailed quantitative analysis based on a syntactic analysis of the data-base how the majority of liaisons are taken care of by a small number of contexts in a way which globally supports a construction approach based on Zip (1935) - i.e. the frequency of each and every construction triggering liaison tends to be inversely proportional to its rank in a frequency table. This last point may explain why "hypercorrective liaisons" ("false liaisons" in a prescriptive terminology) are practically absent from our corpus of conversations but present in the reading aloud of the PFC text, whereas they are claimed to be frequent in public speech (radio, speeches, lectures, etc.), all registers which create contexts of complex planning and self-monitoring favoring "errors" with respect to the norm.

Of course, liaison cannot be reduced to the simple repetition of memorized chunks. Speakers do generalize and produce unexpected liaisons in what are felt to be appropriate ways. The classical theoretical phonologist will see this as the proof that a general mechanism is at play but some psycholinguists will argue that a bottom-up analysis from extensive data is possible and indeed desirable (Chevrot et al. 2009, Dugua et al. 2009) and moreover sociolinguists will remind us that this cognitive capacity and phonological knowledge are not totally encapsulated and are highly sensitive to written norms in French. Our arguments will be accompanied by precise quantitative results and interpretations concerning register, gender, educational level as well as diatopic factors and will be compared with the conclusions reached on the same parameters by (inter alia) Malécot (1975), Ashby (1981), van Ameringen & Cedergren (1981), Booij & de Jong (1987), De Jong (1994) and Ranson (2008).

Phonetic Change and Phonology

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In this paper, we argue that diachronic phonetic change exhibits dynamics distinct from those shared by phonological, morphological, and syntactic change. Unlike these other grammatical domains, phonetic changes progress as gradient shifts through the continuous phonetic space. As such, competition models of change which are fruitfully applied to these latter changes cannot be applied to phonetic change. Rather than call into question the empirical necessity of an abstract, categorical and contrastive phonology, however, in many cases larger generalities can be captured by taking into account the phonological representation of the segments involved. We model phonetic changes, then, as gradual shifts in the language specific phonetic implementation of phonological features.

In diachronic morphosyntactic change, what changes is the relative frequency of use of discrete variants in competition. These changes have been fruitfully modeled in terms of *competing grammars*, or probabilistic parameter settings (Kroch, 1989; Yang, 2002). Fruehwald, et al. (2010) also found evidence of grammar competition in phonological change, and most classic sociolinguistic variable-rule analyses can be understood as competition between phonological grammars (Weinreich, et al. 1968; Cedergren & Sankoff, 1974). Phonetic change, on the other hand, is very different. The first large scale acoustic study of phonetic changes in progress, Labov, et al. (1972), concluded that they are gradient and continuous. There is no sense, then, that in the Canadian Shift a retracted TRAP vowel is replacing a fully front TRAP vowel through competition, to choose an example (Clarke, et al. 1995).

Despite lacking a categorical competition model for phonetic change, categorical phonological representation is not irrelevant to the phenomenon. First, there is what Labov (2010) calls the *binding force* in segmental phonology. A phonetic change in an allophone (say, TRAP before nasals) does not license a phonetic change in the same allophonic context of an adjacent phoneme (say, LOT before nasals). Second, at all stages of a phonetic change, the entire phonological system is analyzable in terms of equivalencies or contrasts. This fact can be contrasted with the simulations of de Boer (2001), where the phonemic system of the language passes periods "of chaos" while changing from one state to another. Finally, there are crucial cases where phonetic changes affect in parallel many segments which belong to a phonological natural class. For example, TRAP retraction in the Canadian Shift is triggered by the low-back merger. In many instances of this shift, TRAP retraction has also generalized to DRESS and KIT, which are retracting in parallel (Boberg, 2005; Durian, 2009). Similarly, parallel fronting of GOOSE, GOAT and MOUTH is a widespread pattern in North America (Labov, et al. 2006).

We propose that phonetic changes of this sort can be modeled as shifting language specific phonetic implementation of phonological features. For our model of the phonology-phonetics interface, we propose that phonological features get mapped to targets on continuous phonetic dimensions. In the Canadian Shift, target for [−back] along the dimension of vowel backness is retracting, taking with it the vowels which share this feature: TRAP, DRESS and KIT. Along with the parallelism found in many phonetic changes, this approach also ensures the segmental unity of phonemes undergoing phonetic change, and the regularity of neogrammarian sound change, since the phonetic implementation of a segment is at all times dependent upon its phonological representation.

In conclusion, we suggest that the fact of phonetic change and variation is not so dire for categorical phonology if properly modeled as occurring in the phonetic implementation of phonological objects. Furthermore, it draws up interesting questions as to the nature of phonological representations. In our approach, the phonetic implementation of phonological features is neither universal nor immutable. The role of features does not, then, appear to be to define the phonetics of a segment, but rather its place in a system of equivalencies and contrasts.

Aspects of Rotuman Phonetics: Implications for Rotuman Phonology

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Rotuman has been the focus of a great deal of work in the area of theoretical phonology, often providing valuable data for whatever particular theoretical framework (SPE-type, autosegmental, Optimality-theoretic) was in vogue at the time. For the most part, scholars working on the language have had to rely upon Churchward's (1940) description of the language. Churchward's grammar is challenging (or perhaps 'challenged' is more accurate) from an organizational standpoint, and, not having availed itself of then new concept of the 'phoneme', often obscures understanding of Rotuman phonological processes beneath a sea of observational phonetic detail. While it is not possible to assess in detail Churchward's observations regarding the language in the early 20th-century from our current standpoint (giving the temporal divide), the contemporary language can be examined to determine just how well it matches up with Churchward's impressions, using sophisticated modern phonetic techniques, and the implications of any mismatches explored. Indeed, there is so much detail in Churchward's phonetic observations (and recall there are no *phonological* observations), that individual researchers have generally been compelled to decide just which provided details to attend to as at least potentially relevant to the phonological analysis of the language.

In this paper, we subject three areas of serious lack of clarity in Churchward's discussion to acoustic analysis (using Praat), based on contemporary recorded storytellers: vowel length and its relationship to stress, vowel quality along the tense/lax dimension (including coarticulation effects), and glide formation. Each of these areas has implications for the proper phonological analysis of Rotuman; none has been analyzed using contemporary acoustic techniques to date (to our knowledge).

As an example, Churchward (1940:74) reports the following regarding length: "it appears that each of the primary vowels may be medium, long, or short; the secondary vowels, medium or short; the tertiary vowels, medium only." Three degrees of length is already somewhat odd, cross-linguistically, but of course even more so when tied to Churchward's notion of 'primary', 'secondary' and 'tertiary' vowels ('secondary' and 'tertiary' vowels are generally treated in contemporary phonological terms as allophones of the primary vowels: 'secondary' vowels triggered by coarticulation effects, 'tertiary' by 'phase distinction' processes). Moreover, he notes (1940:85) that "[w]ords which end in a long vowel lengthen this vowel still further…before the suffixes *-t, -s,* and *-m(e)*." When we tie all this together with Churchward's claim (1940:73) that in Rotuman "every long vowel is accented, though not every accented vowel is long (most, indeed, are only of 'medium' length)" it becomes clear that some investigation of the status of vowel length in the language is needed. A similar lack of expositional clarity reigns in the other two domains we treat.

In the end, determining the most insightful phonological analysis for any language rests on having a clear sense of what the data actually is. While many claims have been made regarding Rotuman phonology, they have been asserted within the context of an impressionistic and often confused set of assumptions about what kinds of issues the *phonetics* of Rotuman indicates are actually in play. We hope to improve the empirical grounding of theoretical work in this domain.

Labialized dorsals and the underspecification of secondarity

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Clements (2009) attributes cross-linguistic patterns in the shapes of phonological inventories to several principles, among which are Feature Economy (FE) and Marked Feature Avoidance (MFA). FE predicts that if a feature is used contrastively in a language at all, it will be used to something approaching maximal advantage—e.g., rather than having one voiced stop, a language is more likely to have a series of voiced stops displaying the same range of places of articulation as their voiceless counterparts. MFA predicts that segments that have larger numbers of marked features will be relatively rare; Clements (2009: 41–42) notes that one way in which this prediction is borne out is in the fact that inventories containing any given marked segment tend to have higher-than-average total numbers of segments.

A survey of inventories containing labialized consonants reveals that these principles are at odds with the conventional notion that secondary labialization is represented by a marked feature [+round], or by a [labial] feature under the V-place node (Clements & Hume 1995). Of the 628 inventories contained in Mielke's (2008) P-base database, 117 have at least one labialized consonant—but 26 of these have *only* one labialized consonant, in an apparent departure from FE. In inventories with only one or two labialized consonants, these are almost always velar. The apparent affinity between dorsal primary place and labial secondary constriction can also be seen through the application of Clements's test for markedness: inventories in P-base that contain /kʷ/ have on average 33.1 consonants each, but inventories containing /tʷ/ average 69.5 consonants each. As /t/ is not generally held to be more marked than /k/, the markedness asymmetry between /tʷ/ and /kʷ/ must be attributable to something else.

There are thus two distinct but related mysteries about secondary labialization: first, why it is deployed in such an apparently uneconomical way, and second, why it is most often paired specifically with dorsal primary place. I propose that there are two distinct phonological roles that labialization can perform in an inventory. In languages such as Tangale, where lip-rounding is contrastive across all or nearly all primary places of articulation, the standard view holds, but in languages like Wichita (which contrasts /k/ and /kʷ/ but lacks /p/; Rood 1975), labialized consonants function—and are represented—as though they constitute a distinct primary place of articulation in their own right. Specifically, I assume, following Rice (1995, 2002), that the dorsal and labial places of articulation are grouped together under a more general Peripheral node, in opposition to Coronal. In a language like Wichita, /kʷ/ has both [dorsal] and [labial] as dependents of the Peripheral node, like a labiovelar /k͡p/. In such a language, rounded velars function as a distinct primary place of articulation, rather than as velars with the addition of rounding. In languages like Tangale, on the other hand, rounding on consonants is represented in the traditional way, independent of primary place.

This non-unified approach offers some insight into a pattern in Tashlhiyt Berber noted by Ní Chiosáin & Padgett (1993), in which labialized velars undergo dissimilatory unrounding when they are preceded by labials. Ní Chiosáin & Padgett (1993: 16) note that this dissimilation is unexpected in the usual V-Place model, because it involves an interaction between instances of [labial] that appear to belong to two different tiers. They propose that plain labials that do not contrast with rounded labials have a redundant marking for [round] on the V-Place node, and that it is this node, rather than the primary [labial] place, that motivates delinking of [round] from the velars to satisfy the OCP. Given the representations proposed here, the interaction between labials and labialized velars in Tashlhiyt is related to the contrasts present in the system, though not in the way N&P suggest. In Tashlhiyt, rounding is contrastive only on dorsals, and there are no labiovelars such as /k͡p/; accordingly, /kʷ/ and /gʷ/ are represented with [labial] as a sister to [dorsal], so that it occupies the same tier as the primary place of /m/. Under this analysis, non-contrastive structure (such as the structure that would be needed to identify the labiality of /kʷ/ as a secondary articulation) is underspecified, whereas N&P's proposal relies on the *over*specification of contrastive labiality on /m/.

Merger or not? The case of Standard Southern British /u/-fronting

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Previous studies have shown that young speakers of Standard Southern British English (SSBE) produce the 'back' vowel /u/ rather fronted, i.e. with high second formant values (F2), which results in partly overlapping distributions of the vowels /i/ and /u/ along the F2 dimension (Hawkins & Midgley 2005, Harrington, Kleber & Reubold 2008). Due to this phonetic overlap, /u/-fronting is sometimes refered to as (near-)merger.

SSBE /u/-fronting presents an interesting case of a discrepancy between phonetics and phonology: Despite its phonetic shift, the phonological behaviour of SSBE /u/ mainly remained unchanged (as illustrated by Uffmann 2010). This poses a problem for phonological theories that assume an innate and universal connection between phonological categories and their phonetic realisations: the phonetic /u/-fronting implies a phonologically fronted phoneme. Uffmann (2010) solves this problem by proposing /u/ is underlyingly underspecified for the feature [back]. This, however, does not account for the emergence of /u/-fronting: what caused the shift to an underspecified [back]?

Harrington et al. (2008) employed a phonetic account for /u/-fronting, namely Ohala's *hypocorrection* proposal (Ohala 1971 and following): the fronting of /u/ has taken place because language learners were unable to compensate for the co-articulatory, fronting effect of coronal contexts on the high back vowel, and interpreted the fronted allophone as the underlying vowel category. When turned speakers, they consequently produced a fronted /u/ in all contexts.

Instead of assuming misperception for the phonetic shift and underspecification for the phonological non-shift, the present study proposes that the data on /u/-fronting are best explained with a model that assumes arbitrary and learned connections between phonological categories and their phonetic realizations. In the present proposal, /u/-fronting emerged as the gradual shift from a strong connection between low F2 values and vowel backness to a stage where F2 became a less reliable cue for backness due to large allophonic variation and a stronger articulatory bias towards fronted /u/, to the present stage where other acoustic cues than F2 are employed to distinguish the two high vowels in SSBE.

These theoretical assumptions are supported by our results of a perception experiment with two age groups of SSBE speakers. Preliminary results show that the younger SSBE-speakers reliably distinguish between the two tense high vowels /i/ and /u/ by employing other acoustic dimensions than F2 (namely diphthongization and duration) in the cases of ambiguous F2 values, while the older speakers are less sensitive to these alternative cues.

The proposed changes in association between cues and phonological categories are modelled as interaction of cue constraints and articulatory constraints in Boersma's (2007) *Bidirectional Phonetics and Phonology*. The model allows the phonological representation of the fronted back vowel to be independent of its phonetic realisations. This way, phonological behaviour does not have to change along with the phonetic realizations. However, the change in phonetic realizations might introduce new phonetically-motivated processes.

In sum, the present proposal shows that in a theory where phonetics and phonology are independent of each other and where phonetic realizations have to be learned, a phonetic (near-)merger on one phonetic dimension, such as SSBE /u/-fronting along the F2 dimension, does not have to result in a phonological merger.

Welsh /h/: now you see it, now you don't

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The segment [h] in Welsh exhibits an interesting alternation with zero. It is stable word initially (1), but alternates with zero word medially (2).

(1) Stable [h]

hanes	[ˈhanɛs]	'history'
hanesion	[haˈnɛʃɔn]	'stories'
hanesyddol	[hanɛˈsəðɔl]	'historical'

(2) Alternating [h]

brenin	[ˈbrɛnɪn]	'king'
brenhinoedd	[brɛnˈhɪnɔð]	'kings'
brenhines	[brɛnˈhɪnɛs]	'queen'
breninesau	[brɛnɪˈnɛsa]	'queens'
brenhinol	[brɛnˈhɪnɔl]	'royal'

Observationally the [h] occurs word-initially – regardless of whether or not the initial syllable is stressed – as in (1), or word-medially in the onset of a stressed syllable, as in (2). Stressed syllables may be vowel-initial in Welsh; this has led to the assumption that [h] here derives from an underlying /h/, rather than being an epenthetic segment, and that it surfaces in these two environments, but is suppressed medially if it would occur in the onset of an unstressed syllable (cf. Awbery 1986: 111-115). Moreover, Awbery (1986:113) ascribes the behaviour of /h/ to an input condition, specifying what segments /h/ may be preceded and followed by, and an output condition, stipulating that /h/ may surface in medial position only when followed by a stressed vowel.

In this paper I show that the behaviour of /h/ can be attributed to the interplay of structural constraints on foot type (FTBIN, RHTYPE-TROCHAIC, RIGHTMOST(HDFT)), constraints on the parsing of underlying material (PARSESYLL), input-output correspondence constraints (MAXIO), and a constraint requiring that at the surface [h] be foot-initial (FT-INIT-*h*). This is exemplified in the tableaux for *brenin* 'king' in (3) and *brenhines* 'queen'in (4).

(3) {brenhin}	FT-INIT-*h*	PARSESYLL	RHTYPE-T	RTMOST	MAXIO	FTBIN
☞(ˈbrɛnɪn)					*	
(ˈbrɛnhin)	*!					

(4) {brenhin-es}	FT-INIT-*h*	PARSESYLL	RHTYPE-T	RTMOST	MAXIO	FTBIN
☞(brɛn)(ˈhɪnɛs)						*
(brɛn)(ˈɪnɛs)					*!	*
(ˈbrɛnɪ)(nɛs)				*!		*
(brɛn)(hɪˈnɛs)			*!			*
brɛn(ˈhɪnɛs)		*!				
(ˈbrɛnhɪ)(nɛs)	*!			*		*
(brɛnˈhɪ)(nɛs)	*!		*	*		*
(brɛnˈhɪ)nɛs	*!	*	*	*		

Accounting for /h/ in this way unifies the environment of occurrence of [h] to simply foot-initial: an underlying /h/ will surface if foot initial. Along with the data in (1) and (2), the interaction of these constraints will also be shown to account for the occurrence of [h] associated with irregular stress, e.g. *byrhau* [bərˈhaɨ] 'shorten'. The advantages of this analysis are threefold: along with providing a unified account of the environments illustrated in (1) and (2), the importance of binary feet and exhaustive footing in Welsh more generally is revealed. Finally, this account also has wider implications with respect to the analysis of irregular stress in the language.

Swedish Quantity: Central Standard Swedish and Fenno-Swedish

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Swedish is a quantity language in which quantity is contrastive only in stressed syllables. Most varieties of Swedish allow only one of two basic quantity patterns: a short vowel in the stressed syllable must be followed by a long consonant (or by two qualitatively different consonants) or a long vowel in the stressed syllable must be followed by a short consonant. The varieties in which these restrictions apply do not allow light (short or monomoraic) stressed syllables. Central Standard (CS) Swedish, the variety of Swedish spoken in and around Stockholm, adheres to this quantity scheme, and this is also the dominant pattern in Fenno-Swedish (F-S), the variety of Swedish spoken in Finland.

In this paper, we investigate the durational realization of the Swedish complementary quantity contrast in monosyllabic and disyllabic target words in CS Swedish and in F-S. Speakers of CS Swedish were recorded in Stockholm and speakers of Fenno-Swedish were recorded in Turku. Several systematic durational differences between the two varieties were observed, most of which can be summarised by stating that in F-S short segments are shorter and long segments longer than in CS Swedish. This is explained as partly due to the qualitative differences between long and short allophones in CS Swedish, which may reduce the reliance on durational cues to uphold the quantity contrast. In F-S, by contrast, long and short vowel allophones are qualitatively very similar and contribute very little to upholding the quantity contrast. A further explanation lies in influence from Finnish, in which vowels and consonants have a binary quantity contrast independent of each other. This influence from Finnish comes from the fact that most F-S speakers are bilingual, that is, they speak and hear Finnish on a day-to-day basis. Thus, speakers of F-S have learned to make more accurate durational distinctions than is needed in CS Swedish. The effect is an apparent exaggeration of the durational opposition in F-S as compared to CS Swedish.

The F-S speakers were consistent with the CS Swedish system and with each other in their quantity contrasts except for one type of word: some of our subjects pronounced all the words like *baka* ‘to bake’ (long vowel and medial voiceless stop in CS Swedish) as [baakka] and others as [baaka]. According to Kiparsky (2008), Itkonen (1965) and Reuter (1982) suggest that such differences in F-S are a result of Finnish influence. Specifically, the suggestion is that words in CS Swedish which have a long stressed vowel followed by a short voiceless stop were perceived ambiguously by Finnish speakers and this ambiguity is the reason for a dialect split (CVVCCV pronunciation vs. CVVCV) in F-S speakers. We found striking evidence to support this suggestion. There was a very large durational difference between the voiced and voiceless stops in CS Swedish (but not in F-S). The voiceless/voiced occlusion ratio in CS Swedish was 2.31 in medial, short stops in disyllabic words. This means that voiceless stops are over twice as long as voiced stops in CS Swedish. Considering that we are comparing two sets of phonologically short stops, this difference is very large and we can conclude that the voiceless stops in CS Swedish are very long compared to voiced stops. In contrast, the ratio of voiceless/voiced stops in F-S medial, short stops for the [baaka] speakers was just 1.74. Hence, it is reasonable to suggest that the reason some speakers of F-S produce words with medial voiceless stops after long vowels as long (CVVCCV, a possible pattern in Finnish but not in CS Swedish) is that the CS Swedish pronunciations are ambiguous—the stops in words like *baka* are neither clearly long or short to ears used to the Finnish quantity system.

A foot based account of the Limburg tonal accents

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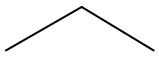
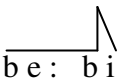
THE PROBLEM. Limburg dialects have two tonal accents, Accent1 and Accent2. Phonetically, it is a timing difference of the intonational melodies. The question melody, for instance, is a rise. In words with Accent1 it is an *early* rise; in words with Accent2 it is a *late* rise.

(1) Accent1 (early rise)



t e : m a ‘theme’

Accent2 (late rise



b e : b i ‘’baby’

Gussenhoven (2000) assumes that the difference between the two accents is a matter of lexical tones; morphemes with Accent2 have a lexical high tone on the second mora of the stressed syllable. This approach, however, cannot account for the fact that in polysyllables the quality of the tonal accents is determined by the posttonic vowel in the following way:

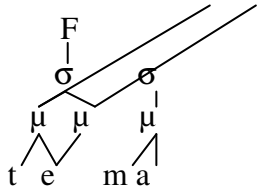
2a) If the posttonic vowel has high sonority (if it is low or mid), then the stressed vowel has Accent1.
2b) If the posttonic vowel has relatively low sonority (if it is high), then the stressed vowel has Accent2.

posttonic low vowel		posttonic mid vowel		posttonic high vowel	
[ba:[1]ta]	brand	[ha:[1]lo]	‘halo’	[ba:[2]li]	‘railing’
[te:[1]ma]	‘theme’	[re:[1]tro]	‘retro’	[he:[2]li]	‘helicopter’

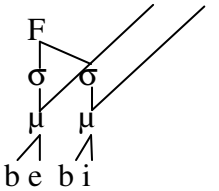
It is not really possible to account for these facts in a theory that describes Accent1 and Accent2 with lexical tone. One would have to formulate a constraint that relates the quality of the poststressed vowel to the tone of the stressed syllable. Such a constraint is very complex; it does not offer any insight, and it is just a restatement of the facts.

THE PROPOSAL. A) To solve this problem I propose that the accents should not be represented in terms of lexical tone, but rather in terms of foot structure. Specifically, I propose that Accent1 is a *monosyllabic* moraic trochee, whereas Accent2 is a bisyllabic moraic trochee.

(3) Accent1 L H



Accent2 L H



B) In Limburg dialects intonational tones are assigned to moras. Therefore, in (3) Accent1 is realized with an early rise, because the entire LH melody can be assigned to the stressed syllable. In Accent2, on the other hand, only the first tone of the melody can be assigned to the stressed syllable. (The fall after the high tone, as in (1), is due to a boundary tone).

C) In Limburg dialects, foot structure is *sonority driven* (de Lacy 2002); high sonority in a foot’s unstressed syllable is avoided. Thus, in a case like *[te:[1]ma]* the vowel *a* cannot be parsed in the foot’s dependent. Consequently, in bisyllabic words, the preceding syllable must be bimoraic, because of the minimal size requirement. A vowel of low sonority, on the other hand, can occupy a foot’s dependent position. This gives rise to a bisyllabic moraic trochee in a case like *[be:[2]bi]*. The fact that the vowel is realized as long is a phonetic matter, as it is in Dutch (Van Oostendorp 2002).

Tonal Opacity and Paradigm Structure in the Kinande Verb System

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In Kinande (Bantu, Democratic Republic of Congo), many verb forms are assigned complex tone patterns which realize inflectional features such as tense, aspect, and mood (Mutaka, 1994). In this talk, I present a constraint-based analysis of one of these patterns and discuss how, when considered properly, it sheds light on both the syntagmatic and paradigmatic organization of Kinande verbal morphology. The main properties of this pattern are as follows.

First, within the verb stem, a disyllabic H tone span is realized at either the right edge or the left edge of the verb stem, depending upon the tonicity of the root. In verbs with *toneless* roots, a H tone span is realized at the *left* edge of the stem, so that H tones surface on the first syllable of the stem and on the first syllable before it (1). In verbs with *H-toned* roots, a H tone span is realized at the *right* edge of the stem, so that H tones surface on the penultimate and ante-penultimate syllables (2). (In (1) and (2) below, syllables realizing these H tones appear in bold.)

Second, just in case the strong tone pattern is assigned, whether or not a H-toned root's underlying H tone appears on the surface depends upon what morpheme immediately precedes the root; for example, a H tone *does* surface when a H-toned root is preceded by the affirmation marker *-na-* (2b), but does *not* surface when it is preceded by the tense marker *-a-* (2a). (In (1) and (2), syllables which realize a root's underlying H tone are underlined.)

(1) Strong Tone Pattern in verbs with toneless roots (*-hum-* 'hit')
   a. **tw-á**-||-[**hú**maniriraga]$_{Stem}$ 'we hit each other on purpose'
   b. tw-a-||-**ná**-[**hú**maniriraga]$_{Stem}$ 'we indeed hit each other on purpose'

(2) Strong Tone Pattern in verbs with H-toned root (*-túm-* 'send')
   a. tw-a-||-[tumani**rírága**]$_{Stem}$ 'we sent each other on purpose'
   b. tw-a-||-ná-[tumani**rírága**]$_{Stem}$ 'we indeed sent each other on purpose'

In this talk, I first argue that the Kinande strong tone pattern, and particularly the non-realization of H in (2a), results from the assignment of a **LHL** melody which crucially distinguishes between morphemes which are dependent upon finite inflection (e.g. tense/aspect markers and subject agreement) and morphemes which are not (e.g. affirmation/negation, object agreement, and various derivational prefixes). This represents a departure from previous work (Mutaka 1994; Black 1995) that has argued that the relevant morphological distinction is between Macrostem (i.e. the Stem + object marker) and non-Macrostem morphemes.

I then turn to the central question of why the location of the disyllabic H tone span varies according to the tonicity of the verb root. I argue that the right edge of this tone span is primarily attracted to a strong prominence on the stem-initial syllable, but that it migrates rightward to a weaker prominence on the penult if the syllable before the stem already bears a H tone (2b). The question then becomes why we also see rightward migration in forms like (2a), where there is no surface H tone before the stem. This appears to be an instance of tonal opacity, where an underlying H tone is able to affect the surface tone pattern even when it fails to surface itself.

I propose that this apparent opacity is a paradigm uniformity effect: the H tone span surfaces at the right edge of the verb stem, even though it could surface at the left edge, so that all forms within a paradigm surface with the same pattern of inflectional tone. I present a formal analysis along these lines in Optimal Paradigms theory (McCarthy, 2005), and then discuss what the paradigm structure of Kinande would need to look like for this analysis to work. Interestingly, this structure is very similar to that which has been observed in more familiar Indo-European languages, such as Chicano Spanish and Romanian: the paradigm consists of all forms that contain the same derivational structure *and* the same finite inflection structure, differing only in agreement features and non-finite inflection (e.g. affirmation and negation).

Modeling the acquisition of covert contrast

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Introduction. A growing body of research suggests that many cases of apparent neutralization may in fact be reliably distinguished at the phonetic level (Hewlett, 1988; Labov et al., 1991; Scobbie et al., 2000). Examples include differences in the realization of underlying and derived mid-rising tone in Cantonese (Yu, 2007) and the incomplete neutralization of word-final devoicing in Dutch (Warner et al., 2004). Together with studies demonstrating variability in the perception and production of near-merger at the population level (Labov et al., 1991), the question arises of whether such COVERT CONTRASTS represent an essentially transitory stage in language acquisition and change, or whether even subtly cued contrasts could persist indefinitely within a speech community and across generations of speakers.

Proposal. This paper explores the learnability of covert contrast through a series of statistical learning simulations using human production data, modeling phonetic categories as components in a GAUSSIAN MIXTURE MODEL (GMM). Allowing the model to learn both the number of categories as well as parameters of those categories provides a way to explore the potential stability of category structures. The results indicate that while a statistical learner can be quite effective at inducing covert contrasts, success depends crucially on the number and distributional characteristics of the relevant cue dimensions, as well as the range of individual variation to which the learner is exposed.

Model and simulations. A series of GMMs were fit to the production data of the 14 Dutch speakers reported in Warner et al. (2004), consisting of words which differed only in the underlying voicing of the final consonant (eg *nood*∼*noot*). The number of categories was selected automatically by computing the optimal trade-off between model fit and complexity in terms of the BAYESIAN INFORMATION CRITERION (Schwarz, 1978). A contrast was considered recovered if the optimal number of components matched the number of underlying categories. The type and number of cue dimensions were systematically varied to determine what combinations, if any, were sufficient to recover the underlying contrast.

Results. When fit to data estimated from the entire set of Dutch speakers, GMM learners were unable to recover the underlying contrast regardless of the number of cue dimensions provided. When fit to subsets of the data, however, learners were often able to recover the contrast. This is consistent with the findings that some members of a speech community can show covert contrast/near mergers in production, perception, or both, while others neither produce nor perceive such contrasts (Labov et al., 1991). However, the results also demonstrate that statistical separability of a contrast cannot necessarily be inferred from separability along individual acoustic-phonetic dimensions, underscoring the need to consider not just sensitivity to individual acoustic dimensions, but also to determining which cue dimensions are relevant and how those dimensions are weighted by individual listeners.

Conclusions. The results of model-based clustering indicate that an unsupervised statistical learner is in principle capable of recovering covert contrasts, with a success rate dependent on the type and number of cues provided. This suggests both that (i) covert contrast could be successfully transmitted and acquired as such by human learners and (ii) covert contrast may be a stable state unto itself, rather than just a temporary phase in the loss or acquisition of a contrast. However, the incidence of covert contrast in a given population is at least as critical a factor in determining the survival of the contrast.

Defining phonological relationships: the role of alternation

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The concept of phoneme/allophone has always been central in phonology (e.g., Jaeger 1980, Marslen-Wilson & Warren 1994, Norris et al. 2003). The traditional definition has relied on distribution: if two (phonetically similar) sounds are in complementary distribution and hence are predictable from the environment, they are allophones of the same phoneme (e.g., Bloch 1950, Harris 1951, Hualde 2005). However, in frameworks such as Optimality Theory, two sounds in complementary distribution need not map onto the same underlying representation if no evidence from morphological alternations requires them to derive from the same UR. The goal of this study is to determine the relative contributions of *distribution* and *alternation* in leading speakers to group sounds as members of the same category.

Using previously established methods of testing speakers' perception and processing of sounds, *similarity rating* and *semantic priming*, we investigate the processing of *s* and *sh* in three languages in which these sounds participate in different types of relationships. In English *s* and *sh* are contrastive (e.g., *see-she*). In Korean *s* and *sh* are in complementary distribution and participate in morphological alternation. In Mandarin, *s* and *sh* are in complementary distribution without morphological alternations. If complementary distribution is sufficient to establish relatedness in the absence of alternations, we would expect Mandarin speakers' response to *s* and *sh* in these tasks to be similar to that of Korean speakers.

The first experiment tested 20 Mandarin, 22 English, and 20 Korean speakers' similarity rating judgments of *s*, *sh* (and a contrastive fricative *f*), following research showing that speakers tend to rate allophones as more similar than phonemes (e.g., Boomershine et al. 2008). The results showed that the ratings of *s* and *sh* for the *Mandarin* group patterned the same with those for the *English* group.

The second experiment investigated the extent to which *s* primed *sh*, or vice versa (60 in each language group), following previous research which found facilitation between variants of a category, but not between sounds belonging to different categories (e.g., Sumner & Samuel 2005). The results were compared with the priming effects of *s* and *sh* on a clearly contrasting sound (*f* in Mandarin and English, and fortis *s'* and *sh'* in Korean).

Condition	Same	Swapping	Contrastive
Prime→Target	'Sunday' → 'Monday' 'shoulder' → 'arm'	[ʃʌndeɪ]→'Monday' [sɔldɚ]→'arm'	[**f**ʌndeɪ]→ 'Monday' [**f**ɔldɚ]→'arm'

The results for *English* semantic priming showed that no facilitation (faster response time in lexical decision) was found in Swapping or Contrastive conditions. This confirmed that *s* and *sh* are separate categories in English. The results for Korean showed that the facilitation was statistically larger in Swapping than in Contrastive condition, confirming that *s* and *sh* are variants of the same phoneme. The results for Mandarin semantic priming, however, showed an in-between pattern: priming effects were found in both Swapping and Contrastive conditions, but there was no difference in the degree of facilitation.

The similar pattern of the similarity rating judgments for both Mandarin and English groups suggests that for Mandarin speakers, *s* and *sh* behave more like members of independent phonemic categories than allophonic variants of a single category. This supports the conclusion that alternation does play a role in defining phonological relationships. The results from speech processing of *s* and *sh* seem to suggest that the idea of phoneme categories is gradient rather than categorical (e.g., Hall 2009) with English and Korean on the two ends and Mandarin in between.

Chain shift metaphony, Harmonic Serialism, and contrast

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Several Italian dialects present a type of raising harmony (metaphony) by which stressed mid vowels raise by one degree only, i.e. /ɛ/→[e], /ɔ/→[o], and /e/→[i], /o/→[u]. In some of the dialects metaphony extends beyond the stressed syllable, raising also pretonic vowels. The first phenomenon raises a problem for the version of OT known as Harmonic Serialism (McCarthy 2009, 2011), and the second poses a problem for non-serial classic OT.

The problem for Harmonic Serialism derives from the fact that in a case like (1) (Ascrea, Fanti 1938, Walker 2006), the constraints that favor /ɛ/→[e], /ɔ/→[o] and the constraints that favor /e/→[i], /o/→[u] must both precede faithfulness constraints banning changes in [high] and [ATR]. Hence the fell-swoop mappings /ɛ/→[i], /ɔ/→[u] in (1b) will always be more harmonic than the gradual mappings /ɛ/→[e], /ɔ/→[o].

(1)	a.	véʃte	víʃti	'this-F.PL/M.PL'	b.	méto	méti	*míti	'put-1SG/2SG.PRES.IND.'
		sórda	súrdu	'deaf-F.SG/M.SG'		ɔ́ssa	óssu	*ússu	'bone-SG/PL'

The problem for classic OT arises in varieties that have the raising /e/→[i], /o/→[u] in stressed position (whether or not they also have /ɛ/→[e], /ɔ/→[o]), and also have metaphony extended to pretonic syllables. Consider the following case (Servigliano; Camilli 1929, Nibert 1998, Walker 2006; similar cases without /ɛ/, /ɔ/ raising, in Central Veneto and Grado):

(2)	a.	vérd-e	vird-ú	' green-SG'/'deep green-PL'	b.	pɛ́d-e	péd-i		'foot-SG/PL'
		fjór-e	fjur-í	'flower'/'to flower'		mɔ́r-e	mór-i		'he dies'/'you die'
	c.	ʃténn-e	ʃtinn-í	ʃtenn-énno	'he extends'/'extending'/'to extend'				
		pɔ́r-a	pur-ítt-u	por-étt-a	'poor-F.SG(prenom.)/M.SG/F.SG				
	d.	merénn-a	merenn-étt-a	'lunch'/-DIM'	pɔ́r-a	por-étt-a	'poor-F.SG'/'poor-DIM.F.SG'		

In (2a) pretonic /e/, /o/ raise to [í], [ú], as expected. But in (2c) underlying /ɛ/, /ɔ/ should raise to [e], [o], as in the regular cases in which the raising affects the stressed vowel (2b); instead they raise to [i], [u]. This could be explained in a rule-based system, since these varieties have also vowel reduction, with the effect /ɛ/→[e], /ɔ/→[o], as shown in (2d). After vowel reduction, the mid close reduced vowels can raise again to high by metaphony. But in a parallel framework it is impossible to capture this generalization, because the effect of the constraints favoring metaphony and favoring reduction will have the same parallel effect. No such problem arises in Harmonic Serialism, where the mapping will proceed in two steps, since /ɛ/→[e], /ɔ/→[o] will give the optimal output in the first evaluation and /e/→[i], /o/→[u] will be optimal in the following, converging evaluation.

After analyzing several alternatives, I will propose that a serial analysis can be maintained not only for the second case, but also for the first, if gradual mapping in stressed position is derived from constraints requiring preservation of contrast. The mappings /ɛ́/→[í], /ɔ́/→[ú] are avoided because there are other mappings /é/→[í], /ó/→[ú] that would eliminate the lexical constrasts /ɛ/-/e/, /ɔ/-/o/. The one degree mappings are preferred to fell-swoop mappings because they yield the maximal metaphonic effects without compromising preservation of contrast. In unstressed position, the first raising is not due to metaphony but to vowel reduction, and since the constraints forcing reduction outrank preservation of contrast, successive raisings are allowed.

How to get autosegmental morphophonemic Second Velar Palatalisation in Polish without morphological labels

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This paper analyses Second Velar Palatalisation in Polish (henceforth Second Velar) as the output of two palatalising vowels being successively cyclically concatenated with a stem-final consonant, where the first palatalising vowel and the consonant are headed by the shared palatality element {I} (temporarily giving First Velar Palatalisation; henceforth First Velar), and where the presence of the second vowel leads to the deletion of the first vowel and loss of the {I}-sharing relation, leaving the consonant {I}-headed, with the second vowel having a separate (non-shared) {I}-head, which gives the representational distinction between Second Velar and First Velar. Consider data in (1)–(3).

(1) *walk–a* [k] ‘fight, n. (nom.sg.)’ *walcz–y–ć* [ʧɨʨ] ‘fight, v. (inf.)’
(2) *sługa* [g] ‘servant (nom.sg.)’ *służ–y–ć* [ʒɨʨ] ‘serve, v. (inf.)’
(3) *strach–ϕ* [x] ‘fear (nom.sg.)’ *straszy–ć* [ʃɨʨ] ‘frighten (inf.)’

The data in (1)–(3) (with superimposed morphological divisions) show First Velar (see *SPE*: 421–424, Rubach 1984: 110–115, but also Rubach 1993: 101–107). In Rubach (1984), a palatalising vowel, assumed to be //i//, turns dorsals into coronals; //i// is then retracted to [ɨ] by a later rule. Compare the behaviour of velars below.

(4) *walk–a* [k] ‘fight, n. (nom.sg.)’ *walc–e* [ʦɛ] ‘(id. dat.sg.)/(id. loc.sg.)’
(5) *sługa* [g] ‘servant (nom.sg.)’ *słudz–e* [ʣɛ] ‘(id. dat.sg.)/(id. loc.sg.)’
(6) *wysok–a* [k] ‘high, adj.’ *wysoc–e* [ʦɛ] ‘high, adv.’
(7) *sługa* [g] ‘servant (nom.sg.)’ *słudz–y* [ʣɨ] ‘(id. nom.pl.)’

The data in (4)–(7) show Second Velar (see Rubach 1984: 121–127, but also Rubach 1993: 107–110). Second Velar in Polish is said to be restricted to just a handful of morphological environments: a) singular datives and locatives (shown in (4), (5)), b) adverbials derived from adjectival stems (shown in (6)), and c) nominative plurals (shown in (7)) (Rubach 1984: 121–123). In Lexical Phonology, Second Velar’s SD crucially relies on morphological labelling (p. 123). Without the morphological context Second Velar is not found in Polish, which raises doubts if it is a phonological regularity. While [ʦɛ] can be found morpheme-internally (e.g. [ʦɛ]*cha* ‘feature’, [ʦɛ]*na* ‘price’, [ʦɛ]*l* ‘goal’), Polish appears not to have a single word beginning with [ʣɛ], and apparently has only one popular word beginning with [ʣɨ], viz. *dzyń-dzyń* [ʣɨŋʣɨŋ] ‘ding-dong (onomatopoeic)’. This presentation will follow the concept of cyclic palatalisation in Polish as instances of {I}-head spreading and sharing advocated in Michalski (2009), an analysis built on Gussmann (2007). In First Velar the triggering vowel is {I}-headed and spreads its {I}-head onto the consonant. The current proposal extends this idea onto Second Velar and insists there be two palatalising vowels to be concatenated. When the second one appears, the first one is deleted (a mechanism known for Slavic languages since Jakobson 1948), leaving the {I}-head on the consonant, while the second vowel cannot spread its {I}-head, since the consonant already has one, and, as is practised in Government Phonology, an element cannot appear twice in a single segment. This exceptional configuration explains the rarity of [ʣɛ] or [ʣɨ] morpheme-internally in Polish; they are not expected to abound without successive cyclic concatenation. The postulate of there being two vowels involved in the transformation offers quite a literal explanation why Second Velar is indeed ‘second’ in synchronic terms, with no diachronic considerations. Finally, this proposal operates on the phonological values of vowels and a few truly phonological generalisations alone, without any recourse to morphological labels whatsoever, which is its major advantage over the 1984 Lexical Phonology treatment.

REFERENCES: Chomsky, Noam — Morris Halle. 1968. *The Sound Pattern of English*. New York: Harper & Row. [Reprinted 1991, Cambridge, MA: The MIT Press.] [=*SPE*] • Gussmann, Edmund. 2007. *The Phonology of Polish*. Oxford: Oxford University Press. • Jakobson, Roman. 1948. Russian Conjugation. *Word* 4: 155–167. • Michalski, Grzegorz. 2009. Phonology with interfaces. The morphophonology and post-lexical phonology of English and Polish. [Doctoral dissertation. Adam Mickiewicz University, Poznań]. [LingBuzz/000986]. • Rubach, Jerzy. 1984. *Cyclic and Lexical Phonology. The Structure of Polish*. Dordrecht: Foris. • Rubach, Jerzy. 1993. *The Lexical Phonology of Slovak*. Oxford: Oxford University Press.

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Epenthesis typology in Harmonic Serialism
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Harmonic Serialism (HS) (Prince and Smolensky, 1993/2004; McCarthy, 2000, 2008a,b) employs the constraint interaction mechanism of Parallel Optimality Theory (POT) (Prince and Smolensky, 1993/2004), but uses a restricted GEN in which only one operation may apply at a time. Because HS is more complex than either POT or serial rule-based frameworks (e.g. SPE), it should only be taken seriously as a phonological model if it produces a better match with typological data than either of these. This paper argues that it does. Specifically, while both parallel OT and rule-based frameworks produce as possible phonologies unattested systems in which segmental epenthesis resolves metrical markedness, HS rules out these systems while still producing attested epenthesis.

Blumenfeld (2006) points out that epenthesis is never used to avoid metrical markedness such as stress clash, stress lapse, or subminimal feet. In POT, if the Weight-to-Stress Principle (WSP) is high ranked, epenthetic syllables can appear just in case they resolve a stress lapse.

(1) Epenthesis resolves a stress lapse:

/bakdupikibti/		WSP	*Lapse	Dep
a.	bak(dú.pi)(kíb.ti)	*!		
b.	(bák.du)pi(kíb.ti)		*!	
→ c.	(bák.du)(pí.ʔə)(kíb.ti)			*

Candidate c. wins because it has satisfied all the top-ranked constraints: the WSP by stressing all heavy syllables, and *Lapse by epenthesizing an extra syllable and building a foot around it.

This paper proposes that epenthesis of a segment into a syllable is a single operation in HS, while epenthesis of a segment directly into a foot or higher level prosodic structure is not. This proposal contributes to ongoing research on the content of HS operations (McCarthy, 2010). It follows that epenthesis cannot resolve metrical constraint violations in a single step. Candidate (1c) above avoids the lapse in candidate (1b) by epenthesizing a syllable and also parsing it into a new foot. In HS, this would be minimally three steps: (bák.du)pi(kíb.ti) → (bák.du)piə(kíb.ti) → (bák.du)(pí.ə)(kíb.ti). Because the second step of this path introduces a faithfulness violation without resolving the *Lapse violation, this path is impossible in HS. HS correctly fails to produce this unattested epenthesis.

HS can still produce phonologies which correspond to the typology of epenthesis in Broselow (1982). Because segments can be epenthesized straight into syllables, epenthesis can resolve syllabic markedness (see Elfner, 2009). Segmental markedness can be resolved in a single step by epenthesis because it does not interact with prosodic structure.

Epenthesis is also attested as a repair for word-subminimality. I argue that this is not segmental epenthesis, but rather null-morpheme epenthesis of the type described in Wolf (2008). Morphemes, unlike segments, can be epenthesized into prosodic structure, and thus can fulfill a minimal word template in a single step. In Swahili (Hinnebusch, 1998), the infinitive morpheme /ku-/ is recruited to repair word-subminimality (/si-la-i/ → [sili] but /la/ → [**ku**la]). The relevant derivational step is illustrated below:

(2) Morpheme-epenthesis:

{(la)}		WordMin	Dep-Morph
a.	{(la)}	*!	
→ b.	{(ku.la)}		*

In sum, HS with the proposed set of operations produces attested types of epenthesis, but fails to produce unattested footing-driven epenthesis.

Effects of ATR, fronting and rounding harmony on reduction

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Much has been written on the reduction of vowels in unstressed syllables with data coming mainly from Indo-European languages, but little has been said about the effects of vowel harmony on vowel reduction. Gendrot and Adda-Decker (2006, 2007) claim that phonetic reduction is linked to the phonetic duration of the vowel rather than to a phonological entity. In short syllables, the vowel converges towards a schwa-like quality. My earlier research suggests that this claim is valid in non-harmonic languages but it also suggests that reduction is blocked in vowel harmony domains. Within a harmony domain, even in vowels of short duration, the quality of the vowel retains the quality of the feature which is spreading. This appears to hold true in a pilot study covering a number of languages. I am now moving on to investigate these results in more detail. This paper concentrates on two languages spoken in Chad. We will examine fronting, rounding, and height harmony in Kera (Chadic), and ATR harmony in Massalit (Nilo-Saharan). Both languages confirm the fact that harmony in some way blocks the reduction.

The prediction of this paper is that the Kera F2 reduction will be affected by the harmony condition (from fronting and rounding processes which work against the reduction), while F1 will reduce in both conditions (as height harmony works in the same direction as the reduction). The prediction in Massalit is that the F1 reduction will be affected by the blocking process (as the active +ATR feature works against reduction, and the F1 value is the main cue for ATR in Massalit) while F2 reduces in both conditions (as the F2 value is a minor cue for ATR in Massalit, and is therefore unlikely to show a significant effect).

Texts from 10 speakers were recorded in each language. Each of the 20 speakers were analysed separately, and statistical significance was achieved for all twenty speakers on at least 80% of the key vowels where predicted. Most speakers had results which were 100% in keeping with the claims made here. The paper also includes extra investigations made for the Kera /u/ vowel which demonstrate that the effect applies to all underlying vowels in the word regardless of whether they are the trigger or target for harmony. However, epenthetic vowel reduction is not blocked even if the vowel agrees with surrounding vowels. The reduction is blocked only when the vowels are within a harmonic domain, not when they just happen to agree.

If these claims are validated for a number of languages, the implications could give rise to new claims concerning privative features and the motivation for blocking the reduction. The hypothesis of this paper is that the harmony and lack of reduction are both marking domain boundaries, and that the information from the harmony is of sufficient importance in the parsing process that the extra effort required to produce the clear vowels is considered cost effective. This cannot be proved on the basis of two languages, but it is hoped that the data presented here will form part of an extended study on several languages.

Open your mouth and say X-bar

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Background. Earlier versions of Government Phonology (GP 1.x, Kaye, Lowenstamm & Vergnaud 1985, 1990) differentiated open [ɛ]/[ɔ] and closed [e]/[o] in typical 7-vowel systems by headedness: In [ɛ] the element **A** was head and **I** non-head ("operator"), i.e. **({I}A)**, while [e] was the reverse: **I**-head and **A**-operator, **({A}I)**. Analogously for [ɔ]/[o], with **U** instead of **I**. The defining characteristic of GP 2.0 (Pöchtrager 2006, Kaye & Pöchtrager 2009 etc.), as opposed to GP 1.x, is the increasing importance of structure. GP 2.0 also completes the abandonment of the segment ("non-segmentalism", Jensen 1994): phonological expressions like the ones above are redefined in the syntax-like tree structures of GP 2.0.

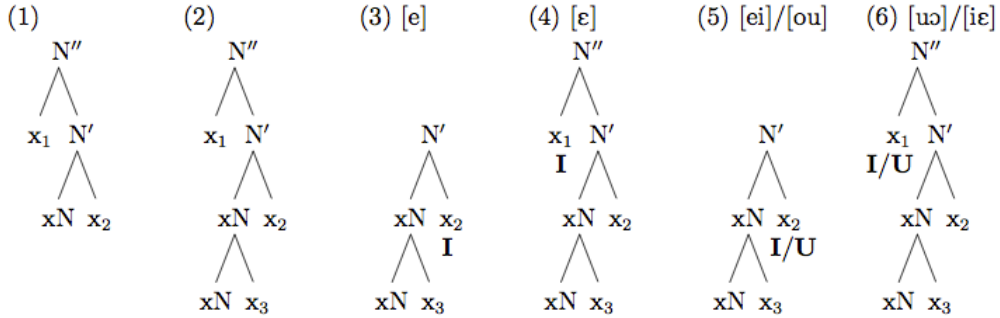
Proposal. Differences in openness should be structural in GP 2.0: The internal structure of a vowel is the X-bar structure in (1); complement and specifier are optional. A head can expand into an adjunction (2), which is the representation of the old element **A** (Pöchtrager 2010). Former heads, **I** in [e] **({A}I)**, are now expressed by melodic material in the complement (3), while former operators, **I** in [ɛ] **({I}A),** occupy the specifier (4): [ɛ]/[ɔ] are structurally *bigger* than [e]/[o].

Predictions. Several interesting consequences can be derived from (1–4):

(i) In 7-vowel systems, there is typically a merger amongst the mid vowels in unstressed position (Italian, Brazilian Portuguese, Slovenian). It is the *open* mid-vowels that fail to occur in weak positions. If we assume that prosodic weakness corresponds to smaller size (length distinctions are also often lost in unstressed position), then the merger follows: [ɛ]/[ɔ] are too big to occur in weak positions.

(ii) Putonghua (Jensen, Kaye, Živanovič & Pöchtrager 2009) *independently* required a structural difference for [ɛ]/[ɔ], [e]/[o]: Onglides (specifiers) spread into following positions, creating *open* [ɛ]/[ɔ] (6), while offglides (complements) spread into preceding positions, yielding *closed* [e]/[o] (5). (Leaving aside why Putonghua interprets them as diphthongs, not monophthongs.)

(iii) (3–4) also shed light on Finnish vowel harmony (FVH), where *e* and *ä* differ in openness and behave differently in FVH: *ä* triggers **I**-harmony, *e* is neutral. Based on their phonological behaviour (not on their superficial, hence unreliable, phonetic interpretation) *e* was argued to be **({A}I)** and *ä* **({I}A)** in GP 1.x (Kaye 2000, Pöchtrager 2006), i.e. the same as (3–4). The different behaviour with respect to FVH can be teased out of (3–4): *e* has **I** lower down, while *ä* has it higher up. The **I** lower down seems not to be seen by the outside world, thus the vowel is neutral and can combine with any other. In contrast, an **I** in the specifier *is* visible to the outside world. Again, a similar reasoning was applied in consonant-vowel (CV) interactions in Putonghua (Jensen, Kaye, Živanovič & Pöchtrager 2009): an element in a C is only visible to a following V if that element sits in the specifier of the C, but not if it sits further down.



English stress, syncope and the direction of proper government

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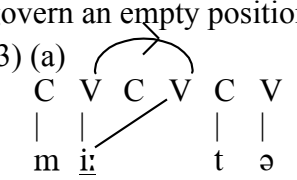
The distribution of short and long stressed vowels (the latter including diphthongs) in English (RP) is almost complementary: short vowels cannot occur in an open syllable (1c-d), except in (1a), while long vowels are ruled out in a closed syllable (2b, 2f), except in (2e).

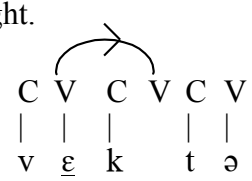
		(1) short	(2) long
internal	(a) _ $CV	ˈkæmərə ‘camera’	ˈmiːtə ‘meter’
	(b) _ C$CV	ˈvɛktə ‘vector’	*
	(c) _ $V	*	ˈruːɪn ‘ruin’
final	(d) _ #	*	braʊ ‘brow’
	(e) _ C#	hʊk ‘hook’	hɔɪk ‘hoick’
	(f) _ CC#	gʌlp ‘gulp’	*

I propose a CV analysis of these facts (in terms of Lowenstamm 1996), where “syllable structure” consists of a strict alternation of C and V positions, as a result of which the representation of long vowels, geminates and consonant clusters contains an empty nucleus. I utilise trochaic (left-to-right) proper government (PG) (following Rowicka 1999). I analyse the restriction on stressed rhymes by requiring the stressed position in English to properly govern an empty position to its right.

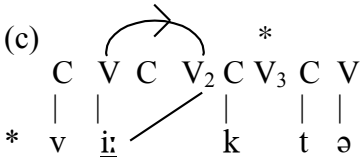
(3) (a)



(b)

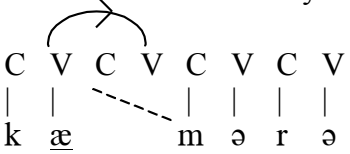


(c)

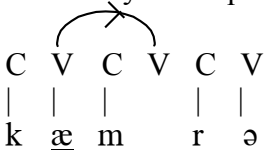


The requirement of PG is satisfied by long vowels in “open syllables” (3a) and short vowels in “closed syllables” (3b). Long vowels cannot occur in “closed syllables” (3c), because that would create a lapse of non-governor empty nuclei, V_2 and V_3. Short vowels in seemingly open syllables must be followed by a virtual geminate to satisfy the requirement of PG (4a).

(4) (a)



(b)



Syncope in this model can be understood as another means of satisfying the requirement of PG (4b), at the same time avoiding a lapse at one level higher, that of pronounced (unstressed) vowels. Syncope in English optionally deletes a schwa between a stressed and an unstressed vowel: *sép(a)rate*$_A$ vs. *sép*(a)ràte*$_V$. If a stressed vowel follows, as in the verb, there is no metrical lapse to trigger syncope. In the Government Phonological literature, syncope is generally accounted for by right-to-left PG (e.g. Harris 1994), but then it is unclear why only an unstressed vowel can PG, and what the role of the preceding stressed vowel is.

There is another interesting property of syncope in English, which is unexpected in a CV account involving either type of PG, namely, the schwa can also be deleted after a consonant cluster or a long vowel: *cómp(a)ny*, *ív(o)ry*. To explain this, I use a third strange feature of English syncope, viz. that it is sensitive to the quality of the flanking consonants: the consonant following the alternating vowel can only be a liquid or a nasal, and in addition it must be more sonorous than the consonant preceding the schwa (i.e. no syncope is possible in words like *anál*(o)gy* or *fél*(o)ny*). These are the same conditions as those applying to syllabic consonant formation, which can be regarded as a previous stage of syncope, and which I utilise in my explanation. Finally, I discuss the question of how to represent the ternary contrast between empty nuclei that always remain silent (*HénØry*), those that are either silent or pronounced (*gén(e)ral*), and those that are always pronounced (*plénary*).

An advantage of the CV analysis is that it can unify the representation of coda-onset clusters (*vector*) and bogus clusters (*Henry*), both of which can follow short stressed vowels. In addition, trochaic PG can explain the relationship of stress to the distribution of vowels on the one hand and to syncope on the other.

Trimming down the phonological toolbox – when simple is simply ternary.

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Recent research on Northern Low Saxon demonstrates rather explicitly the presence of a third level of vowel duration in production and perception (Prehn 2009). The question arises whether a ternary quantity contrast is a liable analytical possibility, here. And moreover, is a threefold vowel length contrast possible *at all*?

The issue. Ternary length systems are not exactly common and have been assumed to be particularly unstable (Schmidt 2002). One general assumption is that they are avoided from the outset by establishing subsidiary prosodic categories, e.g. tone or vowel quality (McRobbie-Utasi 2007). Languages still retaining three degrees of vowel duration employ additional prosodic features, e.g. F0, intensity, or duration ratios, to corroborate the contrast (McRobbie-Utasi 2007:195f.). The following languages are assumed to feature three durational degrees in the vowel system: Yavapai, Seri, Mayo, Wichita, Seneca, Sarcee, Central Siberian Yupik, Hopi, Mixe, (Luanyjang and Agar) Dinka, Scottish Gaelic, Estonian, Northern Low Saxon and the Low and Central Franconian dialects.[1]

A phonological toolbox. Two languages emerge as actually having a true ternary length contrast at the phonological surface level: Yavapai and Dinka. The occurrence of the distinction is particularly confined in Yavapai (i.e. to the closed vowel /i/ only), producing a rather unusual asymmetry in the vowel system. Dinka shows no qualitative restrictions to the contrast. It displays an across the board ternary vowel length distinction of V *vs.* V: *vs.* VV: in the phonological surface form. Length in the other twelve languages is reanalyzed by means of a variety of phonological tools: morphological structure, pitch peak alignment, phonological Cs standing in between the overt V:V sequences, a phonological V:V sequence (bi-segmental rather than mono-segmental), metrical processes applying to the phonological surface (Iambic Lengthening), syllable cut, tonal or tone accent differences, compensatory processes due to C deletion, a combination of quality and quantity, syllable structure, and foot structure. Although the main goal of phonology is to be restrictive in order to give a meaningful explanation of facts, we see that we can indeed be restrictive in about eleven different ways. The phonological toolbox that is employed in order to reanalyze the ternary contrasts is surprisingly expansive – in fact so expansive that it might predict the occurrence of languages featuring even more than three length degrees.

Restrictions to length contrasts. The typology indicates, however, that there are certain limitations to phonological contrasts, restricting the length oppositions to a maximum of three degrees. The phonetically based approach of Remijsen & Gilley (2008) provides a possible answer as to why phonological ternary systems are rare. They assume an upper boundary for the available duration of segments. Within this limited scale and with reference to auditorily recognizable contrasts, a language may establish its length oppositions. In order to make a contrast most salient, less length categories (preferably two) have to be arranged on the scale. Accommodating three length categories then results in a rather crowded durational space. The individual categories are perceptually not as distinct as in the case of a binary length contrast. This can be taken as the main reason to either phonetically enhance the contrast (e.g. by means of differing pitch contours in Estonian), or introduce a distinctive opposition of another prosodic feature (e.g. in Mayo, Sarcee, Central Franconian, North Low Saxon). Boiling down the analyses, we find that only four approaches (i.e. the pitch related accounts for Mayo, Hopi, Low and Central Franconian, and the twofold binary account for North Low Saxon) provide a *solid* analytical alternative to the ternary length contrast at the phonological surface level in the respective languages. For the remaining eight languages we can say with Sherlock Holmes: when you have eliminated the impossible, whatever remains, however improbable, must be the truth. Surface ternarity, though rather rare cross-linguistically, is for now a necessary means to account for the overt ternary duration contrasts.

[1] Standard High German has been assumed in the literature to show a ternary length contrast as well, but yields no convincing evidence for a third degree of vowel duration.

Potential vowel contrasts in English: the relevance of sonority

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To account for English neutralization patterns it is usually assumed that the so-called ‚free' vowels as in (1a), as well as diphthongs as in (1b), are associated with two prosodic positions as shown in (1c), while the so-called ‚checked' vowels as in (1d) are associated with one position as shown in (1e) (Giegerich (1992), similar proposals abound (Harris (1994), Hammond (1999)). The idea is to explain the gap in (1d) as a minimality violation: a sole position (or mora, respectively) is insufficient for a word in English.

(1)a.	[biː] ‚bee'	b.	[baɪ] ‚buy'	c.	N	N	N	d.	*[bɪ]	e.	N
	[buː] ‚boo'		[bɔɪ] ‚boy'		/ \	/ \	/ \		*[bʊ]		|
	[lɔː] ‚law'		[beɪ] ‚bay'		x x	x x	x x		*[bɛ]		x
	[pɑː] ‚pa'		[bau] ‚bow'		\ /	\ /	| |		*[bʌ]		|
					i	ɑ	a ɪ		*[bæ]		ɪ

Neutralization patterns in English not captured by the representations in (1c,e) include the following:

(2) Only high tense vowels and closing diphthongs occur in prenuclear position: all other vowels are excluded (cf. Loan adaptations sich as Am.Engl. [ɪzɹ**i.**əl], RP [ɪzɹ**eɪ.**əl] ‚Israel' [kæɹ**i.**əʊki] ‚karaoke' [n**aɪ.**iːv] ‚naiv')

The gap in (2) indicates an inviolable constraint *NN (no hiatus) in English, which appears to not be violated by prenuclear high tense vowels or closing diphthongs. These patterns are explained by assuming the representations in (3), where high tense vowels associate with nucleus and coda, the off-glide in closing diphthongs associates with the coda, while all other vowels, including lax high vowels, associate with the nucleus alone. (The more centralized vowels often transcribed as off-glides in closing diphthongs are considered phonetic reflexes of tense high vowel phonemes, conditioned by the (weak) coda position.)

(3)a	N C	N C	b.	N C	d.	N	N
	\ /	\ /		| |		|	|
	i	u		a i		ɑ	ɪ

The syllable structures in (3) are motivated by sonority: high tense vowels are both less loud and more constricted than all other vowels. They are consequently best suited among the vowels to associate with the syllable margin. The proposal here is that in English high tense vowels **must** associate with the margin, preferably the coda, the additional association with the nucleus in (3a) being restricted to contexts where a nucleus is needed. Additional sandhi phenomena explained by the syllable structures in (3) are listed in (4).

(4)a. High lax vowels are excluded from word-final position (*happy*-tensing).
b. /r/-insertion applies after /ə/, /ɔ/ and /ɑ/, but not after high tense vowels or closing diphthongs.

The neutralization pattern in (5) is also accounted for, assuming that high tense vowels and /ɹ/ are too close in sonority.

(5) High tense vowels are excluded from the position before ambisyllabic /r/ (cf. [mɪɹiəd] ‚myriad', *[miːɹiəd], Am. Engl. [plʊɹəl] ‚plural' *[pluːrəl]).

The patterns in (1) indcate then that English words need to end in a coda. Words ending in phonetic [ə], [ɑː] or [ɔː] are either systematic exceptions to this constraint or end in an underlying /ɹ/, pronounced only in pre-nuclear position (cf. 4b).

Simulated learning of phonotactics via syllabification

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It has been observed that infants are sensitive at an early age to the statistical patterns of phoneme strings they are exposed to and may use it for segmenting continuous speech (Saffran et al. 1996). One of the proposed mechanisms for learning patterns of phoneme concatenation, or phonotactics, include transitional probability between phonemes, or phoneme bigram, i.e. the probability of one phoneme being followed by another (Daland and Pierrehumbert 2010). In this work we propose that the same mechanism may be used for online syllabification, and assess its plausibility by computer simulation. Our proposal is that syllabification and phonotactic learning go hand in hand: the learner uses two kinds of knowledge, rudimentary syllable structure, i.e. C^*VC^* ('*' denotes zero or more occurrences), and the statistical knowledge induced from the data.

The statistical learning method we employ is the Maximum Likelihood Estimation, in which the learner chooses, amongst the possible hypotheses, the one that would make the observed data the most probable. In our case, given a phoneme sequence, the learner chooses, amongst the possible ways to cut it up into syllables, the one with the greatest probability based on the phoneme bigram statistics. Thus the phonotactic learning and syllabification hypotheses are rendered interdependent.

In this simulation, the primary aim of which is modelling a possible manner of phonotactics learning with the minimum prior knowledge, we pay due attention to simulating the learning situation appropriately. We first ensure that the procedure works incrementally in an online manner: the learner processes the phoneme sequence on the fly, although long pauses are considered to delimit utterances. We use child-directed speech data (CHILDES, MacWhinney 2000), where utterances and words are relatively short, so the intractability of the hypthesis space is not so much of a problem. We also test two types of add-on parameters in the simulation, partial (self-)supervision (the utterance consisting of a single monosyllabic word gives guidance to subsequent syllabifications) and phonemic biases (use of sonority scale and articulatory proximity). We evaluated the results against two standards, the correct syllabification (Standard A) and the less stringent, English phonotactic rule compliance (Standard B). The totally unsupervised and unbiased version produced results which, though mostly significantly better than the random baseline (about 30% precision), are rather disappointing in precision at 50-60% against Standard A, but encouraging 60-65% against B. Good results (80-85% against A, nearly 90% against B) are obtained for the supervised and biased version, with intermediate versions (parameters on and off) showing figures inbetween, suggesting the sufficiency of bigrams in combination of these parameters for phonotactics learning.

There remain some elements that prove difficult to learn, which themselves are instructive. The bigrams of frequent syllable-ending and frequent syllable-starting consonants, such as /dð/ or /ŋt/ are hard to rule out without sufficient supervision. Furthermore, a big gap between the performances against Standards A and B mainly comes from the fact that a long series of consonants tends to be divided at some mid-point in it, even where a syllable should end or start with a vowel: e.g. /nɛks-taɪl/ for 'next aisle'. These results can be taken to indicate the possible pre-requisites and tendencies of infants' phonotactic learning, which we discuss at the end of the presentation.

PF and LF opacity: predictable and unpredictable, (non)concomitance

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Problem (empirical). The "minimal" pair *cómparable* "roughly the same" vs. *compárable* "to be able to be compared" is often used in order to illustrate the concomitance of PF and LF opacity (e.g. Marvin 2002:75): while the former is opaque on both sides (semantically non-compositional, unpredictable stress), the latter is fully transparent (compositional and regular stress). It is not the case, however, that PF and LF always go hand in hand: there are also cases of LF-only and PF-only opacity. *Párent-hood* for example is phonologically opaque (stress), but semantically compositional. *Twinkling* "a short moment" on the other hand is semantically non-compositional, but phonologically transparent (unlike *twinkeling* [twɪŋkəlɪŋ] "the act of twinkling" which has a schwa in an open syllable or, in free variation, a syllabic liquid before a vowel). All four logical possibilities thus exist.

Problem (theoretical). The possible simultaneous impact on LF and PF suggests that phonology-internal means of dealing with opacity do not qualify: mechanisms must be broad enough to be able to simultaneously affect PF and LF. The literature offers two ways to go about (eventually concomitant) LF-PF opacity. In Distributed Morphology (e.g. Marantz 2007), opacity is held to be a consequence of the merger of a piece directly to the root, i.e. before the first xP is formed (inner word formation, producing words from roots). By contrast, outer word formation occurs when a piece is merged to an item that contains at least one xP (producing words from existing words). This operation is always transparent. *Cómparable* is thus a case of direct merge (of *-able* to the root below the first xP: [[compare][able]]$_{aP}$), while *compárable* is the result of the merger of *-able* to an xP: [[[compare] [v]]$_{vP}$ [able]]$_{aP}$. The alternative account of LF-PF opacity is phase-based (Chomsky 2000): the PIC (Phase Impenetrability Condition) prevents previously interpreted strings from being modified (they are frozen). On this count, the contrast between *párent-hood* (PF-opaque) and *parént-al* (PF-transparent) is one of phase structure: the former identifies as the complex [[parent] hood] (class 2 affixes are phase-building), while the latter has only one phase [parent al] (class 1 affixes are phase-neutral). The opaque stress of *párent-hood*, then, is the result of stress assignment to [párent] in isolation, which cannot be undone on later phases.

Neither theory can cover the entire spectrum. A key property of DM is that all xPs are phase heads, i.e. trigger spell-out (e.g. Marantz 2007, Embick 2010). This makes DM incompatible with regular PIC-based accounts of opacity, which are crucially based on contrasting phase structures, i.e. the fact that some xPs do, while others do not trigger spell-out (like in the abovementioned *párent-hood* vs. *parént-al*). It cannot be the case either that *párent-hood* is the result of direct merge: we would expect semantic opacity at least for some words, since in DM direct merge is the (only) source of opacity (but does not necessarily produce opacity). Also, in *góvern-ment$_2$-hood$_2$*, and *univérs-al$_1$-ness$_2$*, *-hood* and *-ness* behave as expected, i.e. they do not shift stress and hence create an opaque non-penultimate pattern. However, due to the presence of the intervening *-ment-* and *-al-*, they cannot be the sister of the root. Therefore the opacity that they are responsible for cannot be due to direct merge. If thus DM cannot do PF-only opacity, the PIC-based analysis on the other hand is unable to handle LF-only opacity: as was mentioned, *twink-ling* "a short moment" is phonologically transparent and therefore must represent a single phase. On the PIC-based analysis, though, its LF opacity requires the existence of an inner phase. Hence PF transparency and LP opacity issue conflicting requests for phase structure that cannot be simultaneously satisfied.

Predictable and unpredictable opacity. In principle there is no reason why all cases of opacity should have the same source. PF-only opacity can be done by the PIC (or purely phonology-internal mechanisms), and LF-only opacity by direct merge. It is implausible, though, that simultaneous PF/LF opacity (the two *comparables*) has two distinct sources. A means to find out which type of opacity we are facing may be the distinction between predictable and unpredictable opacity: *cómparable* "roughly the same" is PF-opaque because it does not have penultimate stress – but we do not know why stress falls on the first vowel. That is, once we know that the word is PF-opaque, we cannot predict *in which way* it will be opaque. By contrast, the opaque stress pattern of *párent-hood* is the same as the one that is found when *párent* is pronounced in isolation, and this is predicted by the PIC and cyclic derivation (*parent* is a cycle of its own). PIC-based accounts thus produce predictable opacity. Direct merge on the other hand is only said to be a source of opacity – what this opacity will look like remains unspecified. Applying this criterion, the source of the opacity for the two *comparables* identifies as direct merge. And a prediction is made to the end that PF-only opacity will always be of the predictable kind (because direct merge is out of business here).

Consonant-Tone Interaction as Agreement by Correspondence

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Consonant and tone interaction has been a challenge for standard theories of tone because tone association is typically restricted to vowels or prosodic nodes as tone-bearing units (TBU; Yip 2002). Onset consonants that interact with tone exist outside the TBU, and forcing the interaction of these consonants with tone requires direct reference to segmental features (e.g., [laryngeal] or [voice]; Bradshaw 1999; Downing 2001; Lee 2008; a.o.). In this paper, I argue that a single dimension—sonority—underlies the relationship between segments and tone and that consonant-tone interaction can be modeled using the similarity-based theory of Agreement by Correspondence (ABC; Hansson 2001; Rose and Walker 2004) as tonal disagreement between segments that lack sufficient similarity in sonority.

In an ABC analysis of tone, segments that are similar in sonority strive to become more similar by also agreeing in tonal specification (IDENT-XX {*x* sonority} » MAX-XX » IDENT-XX (T) » IDENT-IO (T); following McCarthy's implementation of ABC without CORR (2010)). Because vowels and sonorant consonants are more similar in sonority, they are more likely to agree in tone cross-linguistically than vowels and obstruents. Common consonant-tone interaction behavior, such as depressor effects (Bradshaw 1999; Lee 2008; Tang 2008; a.o.), emerges when IDENT-XX {*x* sonority} targets a contiguous range of the sonority hierarchy that includes obstruents, thereby forcing them to correspond with sonorants. In such cases, a markedness constraint that outranks the constraint requiring tonal agreement on corresponding segments (e.g., *T/OBSTR » IDENT-XX (T)) will cause opaque consonant-tone interaction, including typical depressor phenomena such as the blocking of H tone spread or the insertion of L tone (following Hansson 2007 and Rhodes, in prep, on opacity in ABC).

Using stringent sonority hierarchy constraints (de Lacy 2004), ABC predicts that more sonorous segments will never block tonal harmony when less sonorous segments in the same system will allow it. This paper provides evidence from Dioula d'Odienné (Braconnier 1982; Braconnier and Diaby 1982) that this implication holds true. In Dioula, sonorant consonants can pattern like obstruents in inhibiting tone spread. Furthermore, a subcategorical, gradient effect exists amongst the sonorants. Segments that are more sonorous (liquids: /l, r/) are more likely to allow right-to-left H tone spread before a H tone (1), while those that are less sonorous (nasals: /m, n, ŋ/) are more likely to block H tone spread, limiting H tone docking to the final syllable (2).

		before H	
(1)	hɛ̀rà	h**ɛ́rá**	'peace, happiness'
(2)	dágbànàn	dágb**ànán**	'stuttering'

The gradient patterning of Dioula sonorant consonants illustrates the intuition behind the ABC analysis presented here: more sonorous segments are more likely to transmit pitch and agree in tone, and conversely, less sonorous segments are more likely to inhibit tone agreement.

ABC, unlike previous approaches to tone based on TBUs, such as autosegmental theory, places no a priori restrictions on which segments may enter into corresponding relationships, making it a natural framework for capturing the sonority basis to consonant-tone interaction. Although originally developed for long distance consonant agreement (Hansson 2001; Rose and Walker 2004), ABC has since been extended to vowel harmony (Rhodes, in prep), and its extension in this paper to tonal phenomena addresses the debate of whether ABC and autosegmental feature spreading are concurrently necessary in our theoretic arsenal (Gallagher 2008).

Nivkh palatalization as articulatory conflict resolution

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The aim of the *Sound Materials of the Nivkh Language* project is to record and publish data of Nivkh (formerly Gilyak), a linguistic isolate spoken by approximately 100 speakers on the lower reaches of the Amur river and on the island of Sakhalin, in the Russian Far East. The recordings are transcribed with the aid of a native speaker and then translated into Russian, English, and Japanese. The texts (.pdf) and audio files (.wav) are made available on the Internet. So far, about seven hours of recordings have been published, containing daily conversations and recitations of folktales and songs. The *Sound Materials* provide a valuable source for the study of Nivkh phonology.

In our talk, we focus on one aspect of Nivkh phonology, viz. palatalization. Earlier sources transcribe all Nivkh consonants except /t, d, n/ as having palatalized allophones before /i, e/ (see Panfilov 1962; Gruzdeva 1999). However, the data in the *Sound Materials* (taken from the dialect of West Sakhalin) do not bear this out. What we observe instead is a much more restricted distribution of palatalization: the only environment in which consonants are consistently transcribed as palatalized is before an /e/ which in turn precedes a uvular stop or fricative, e.g. /p^heq/ [p^{hj}eq ~ p^{hj}aq] 'chicken'.

A reasonable hypothesis would be to interpret Nivkh palatalization as 'articulatory conflict resolution' (cf. Gick & Wilson 2006), with the conflict involving an advanced palatal target for the front vowel and a retracted dorsal/radical target for the following uvular consonant. From this perspective, palatalization can be viewed as a kind of realignment, such that the palatal gesture of /e/ is phased before the dorsal/radical gesture of the uvular. However, we submit that this realignment is best viewed as a strategy to maintain the perceptual salience of the front vowel, and can in fact not be accounted for in Gick & Wilson's approach in any straightforward way. We suggest instead that the phenomenon should be represented using acoustically based elements, viz. |A, I, U|, with /e/ having a complex specification |I, A|. Palatalization then involves leftward spreading and optional delinking of |I|, giving [C^je ~ C^ja]. We will also show that an |A, I, U| model can account for a further aspect of Nivkh phonology, viz. that uvulars occur in syllables with non-high vowels only (cf. Jakobson 1957), in terms of the obligatory sharing of |A| between uvulars and adjacent vowels.

However, any analysis is only as good as the data on which it is based. In the case at hand, we should not rule out an alternative possibility, namely that what is transcribed in the *Sound Materials* as palatalization is in fact phonetically closer to a reduced [e]. Nor should we exclude the possibility that the realization of /e/-plus-uvular sequences is much more variable than is suggested by the available transcriptions. Both findings would argue against a categorical phonological analysis and suggest a gradient approach instead. The first author is currently collecting fieldwork data which should give us a better insight into these issues. We hope to include an analysis of these data in our paper.

Why phonologists should care about Exemplar Theory

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Exemplar theory (ET) has been actively pursued as a potential source of diachronic explanations within phonology and phonetics for over a decade now. However, a number of researchers have questioned its validity as an alternative approach to the phenomena that form the core area of interest for phonologists in the generative tradition, and its ability to account for observed patterns of sound change. More specifically, it has been claimed that (i) ET wrongly predicts that categories should spread indefinitely under the influence of the biases affecting them in different lexical items (Bermúdez-Otero 2007) and (ii) that the frequency effects predicted by ET are only observed in a small subset of sound changes (Labov 2006). In this talk, I argue that these objections are only relevant to exemplar theoretic models to the extent that they refuse to acknowledge the existence of categories. Moreover, I use simulations to demonstrate how exemplar-based models incorporating the notion of category can provide interesting accounts of certain generalisations about phonological inventories.

Exemplar theoretic models of phonology are based on the idea that speakers have the ability to store detailed memories of individual speech events. There are two main strands of research within ET, which mainly differ in the role they afford to phonological categories (cf. Bermúdez-Otero 2007): (i) word-based ET, according to which categories emerge from the connections that exist among holistically stored words (e.g. Bybee 2001), and (ii) category-based ET, which holds that the basic units of exemplar-based storage are more abstract phonological categories such as segments (e.g. Pierrehumbert 2002). The word-based line of research has not been able to address the criticisms above, which is due to the fact that it does not provide clear indications as to how the connections among words should be implemented (but see Kirchner et al. 2010).

I present results from a number of simulations based on Pierrehumbert (2001), which indicate that category-based variants of ET are capable of handling the problems above. The simulations model the repeated production of categories embedded in different phonetic contexts, which have a weak but consistent influence on their realisation. The productions are fed back into the lexicon, and serve as the basis of new productions; older exemplars have a weaker effect due to memory decay. When a given production of a category is misperceived, there is a small chance that it will be discarded (Labov 1994; Wedel 2006), which introduces an implicit bias towards contrast maintenance. The main difference from previous simulations in the same framework is that I look at the behaviour of several competing categories at the same time.

The first result concerns the empirically unwarranted increase in the variance of categories referred to above. Simulations with a range of different parameter settings show that the extent to which a category can spread is, in fact, always limited, and can be defined as a function of the initial parameter settings. Interestingly, there is no need for any extra mechanisms such as entrenchment to achieve this effect (*pace* Pierrehumbert 2001). The results of the simulations also exhibit a number of effects that are familiar from the phonologies of natural languages. At certain parameter settings, the categories expand as long as they do not overlap with competing categories, which means that smaller inventories show more variable category realisations (Rice 1995 describes the same effect in natural languages). The simulations also show dispersion effects (cf. Liljencrants & Lindblom 1972): the implicit bias towards contrast maintenance results in inventories where the category centres are kept relatively far apart. Furthermore, in cases where only a single category is included, the bias factors have a stronger influence on it, resulting in a situation where the absence of contrasts leads to the emergence of unmarked categories. This phenomenon has also been observed for natural languages, and serves as the basis for certain implicational universals.

Finally, I argue that the frequency-effects observed in Pierrehumbert (2001) are due to a misinterpretation of the simulations. Pierrehumbert looks at the development of a shifting category after 10 000, 50 000 and 100 000 iterations and argues that these distributions could represent words of different frequencies. The most advanced distribution is the one after 100 000 iterations, which is interpreted as support for frequency effects. However, these distributions are not comparable: their decay rates are not equal, due to the 'fast-forward' technique used in obtaining the higher-frequency distributions. When the decay rate is kept constant, the frequency effects disappear, suggesting that category-based ET is compatible with sound changes unaffected by frequency.

Phonetic evidence on phonology-morphosyntax interactions: sibilant voicing in Quito Spanish

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This paper reports on the results of an experiment set up to discriminate between two competing theories of phonology-morphosyntax interactions. The case under investigation is that of Quito Spanish /s/-voicing, which has been analysed as phonologically opaque, and received alternative explanations from the proponents of output-output correspondence (Colina 2009) and cyclicity (Bermúdez-Otero 2007, 2011), crucially with divergent empirical predictions concerning the categorical or gradient nature of the process.

In Quito Spanish /s/ undergoes voicing in the coda before a sonorant segment (e.g. the /s/ in /plasma/, or /gas#noble/). The process overapplies to tokens of word-final /s/ followed by a vowel in the next word, as in these contexts /s/ undergoes resyllabification into the onset (where no voicing is expected). The data are summarised in (1).

(1)

Type	UR	SR – OO-correspondence	SR – cyclicity	Gloss
A	/plasma/	[plaS.ma]	[plaz.ma]	'plasma'
B	/gas#noble/	[gaS.no.βle]	[gaz.no.βle]	'noble gas'
C	/gas#akɾe/	[ga.Sa.kɾe]	[ga.za.kɾe]	'acrid gas'
D	/gasita/	[ga.si.ta]	[ga.si.ta]	'gauze, dim.'
E	/gas/	[gaS]	[gas]	'gas'

As shown in (1), both analyses agree on the placement of (surface) syllable boundaries, and the environment for overapplication, but involve different phonological outputs. Crucially, Colina's (2009) analysis relies on the assumption that all tokens of /s/ in the coda are underspecified for voicing on the surface; word-final prevocalic /s/, though surfacing in a derived onset, becomes delaryngealised too by OO-correspondence. In presonorant positions, delaryngealised [S] is then claimed to undergo coarticulatory passive voicing in the phonetics (types A, B, and C in (1)).

We asked 7 native speakers of Ecuadorian Spanish (3 females and 4 males, aged 16-28, all born and resident in Quito) to read 4 repetitions of 21 sentences, each containing a token of a prevocalic, or pre-sonorant /s/. The test items corresponded to types A – D from (1). We analysed the sound files in Praat (Boersma & Weenink, 2010), and recorded measurements related to voicing, including duration of the frication, and duration of voicing during frication.

Surface underspecification would be expected to produce a variable and gradient pattern in A – C type tokens, manifested by a unimodal distribution of the duration of voicing during frication. However, the data were found to pattern otherwise. All speakers appeared to have two options in their realisation of /s/-voicing: there was partial voicing during frication (0-20 ms) in some cases, but the majority of tokens (60.5%) were realised with full voicing during frication, which altogether yielded a bimodal distribution of voicing duration both for the population and for individual speakers in every condition (A, B, and C). This type of distribution is typical of an optional, but categorical process; therefore, it cannot be modelled with surface underspecification, which poses a challenge to the solution based on OO-correspondence proposed by Colina (2009).

In diachronic terms, the facts accord well with the scenario proposed in Bermúdez-Otero (2011), who posits analogical levelling of coda delaryngealisation to word-final prevocalic tokens, followed historically by the reanalysis of passive voicing in presonorant position as categorical. Before endorsing this cyclical solution, however, we gauge the support for the claim that the C-type cases are indeed opaque, reviewing the data with an eye on the minimal level of abstractness that is necessary and sufficient for a learner to generalise the pattern.

μ-Suffixes and μ-Circumfixes in Dinka

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Background: The Western Nilotic language Dinka (Andersen 1995) has two types of vowel-length changing morphology. Whereas centrifugal derivation (CF) and 3sg agreement systematically lengthen the vowel of their morphological base by 1 μ (short/1-moraic vowels get long/2-moraic, long/2-moraic vowels get extra-long/3-moraic), the benefactive derivation (BEN) imposes 2-moraicity on short and long base vowels alike:

(1)

Basic		**Centrifugal**	**3sg**	**Benefactive**	
1 μ	wɛ̀c	wɛ́ːc	wɛ̀ːc	wɛ́ːc	'kick'
2 μ	lɛ̀ːr	lɛ̂ːːr	lɛ̀ːːr	lɛ̂ːr	'roll'

Flack (2007) claims that these data provide definite evidence for morpheme-specific markedness constraints (Pater 2000, 2006). Both patterns derive from μ-affixation, but the BEN-μ triggers a markedness constraint blocking 3-moraic outputs while 3sg/CF don't.
Analysis: I show that all Dinka data follow from a contiguity requirement in a Colored-Containment-theoretic (van Oostendorp 2005) approach to μ-affixation (Zimmermann and Trommer 2011) under the assumption that 3sg/CF are moraic suffixes whereas the BEN is a circumfix consisting of a μ-prefix and a μ-suffix. I adopt the approach to affixation of Bye & Svenonius (2010), where morphemes may consist of different exponents with distinct linearization requirements. BEN consists of one μ-exponent (the μ-prefix) which is prefixed to the first μ of the base and one μ-exponent suffixed to the last μ of the base (the μ-suffix). Crucially, I assume that different exponents of a single morpheme have the same morphological color and are subject to the CONTIGUITY constraint in (2):

(2) MCONTIGUITY$_\mu$: Assign * to every phonetic μ M_1 intervening between two phonetic μ's M_2, M_3, and $\text{Color}(M_2) = \text{Color}(M_3) \neq \text{Color}(M_1)$

If MCONT$_\mu$ and $\mu \rightarrow \bullet$ (requiring that every μ dominates some segment underlyingly or in phonetic representation) dominate all relevant faithfulness constraints (3), the association between a base V and its mora(s) necessarily become phonetically invisible because this is the only possibility (apart from line-crossing configurations) to associate both components of the μ-circumfix and to satisfy MCONT$_\mu$. On the other hand, 3sg/CF which each consist of a single μ-suffix result in simple augmentation of the base V because attaching a single colored μ to a V vacuously fulfills MCONT$_\mu$.

(3)

Input: = (3-c)	MCONT$_\mu$	$\mu \rightarrow \bullet$	MAX |	DEP |
☞ a. μ μ μ ⫩ wec			*	**
b. μ μ μ ∣ wec	*!			**
c. μ μ μ ∣ wec		*!*		

Extensions: I show that μ-affixation in Dinka is subject to a further general restriction which blocks association of a vocalic root node to μ's of more than two colors, deriving the fact that 3sg morphology may not further augment BEN forms. Finally, I argue that the floating circumfix + contiguity approach extends to other cases of apparent morphologized featural overwriting such as tone-dominant affixes in Hausa (Inkelas and Zoll 2007) and apophony in Berber (Bye 2009).

The Darkening of English /l/: A Stochastic Stratal OT Analysis

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The process of /l/-darkening in English, whereby /l/ is realised with a delayed tongue-tip gesture (Sproat & Fujimura, 1993), shows a remarkable degree of variation depending on position of its target in the word or phrase. Although it is widely agreed that /l/ surfaces as light [l] in the onset (e.g. *light, love)* and as dark [ɬ] in the coda (e.g. *dull, fall)*, this generalisation is not always true on the surface. Data from Hayes (2000) and Boersma & Hayes (2001; cf Table 1), inferred from acceptability judgments, show that overapplication in /l/-darkening is morphosyntactically conditioned: dark [ɬ] occurs in the onset in phrases such as *heal it* (hence, [hiː.ɬɪt]), and complex words such as *healing* (i.e. [hiː.ɬɪŋ]).

Environment type	**Inferred frequency of light [l]**
l*ight*	99.956 %
*free-**l**y*	94.53 %
*Hay**l**ey*	76.69 %
*hea**l**-ing*	16.67 %
*hea**l** it*	0.49 %
*be**ll***	0.0011 %

Adapted from Boersma & Hayes (2001:30)

Boersma and Hayes (2001) constructed an Optimality Theory (OT) grammar which successfully matched the darkening frequencies in Table 1. This grammar modelled variation through stochastic constraint ranking, acquired through the Gradual Learning Algorithm (GLA). Following Hayes (2000), Boersma & Hayes used Output-Output Correspondence (OOC) as their theory of the morphosyntax-phonology interface, explaining overapplication in *mai**l** it* and *mai**l**-er* by OCC with *mai**l***. However, by factorial typology, Hayes's OOC constraints predict a grammar with greater frequency of opaque dark [ɬ] word-internally (e.g. in *hea**l**-ing*) than across word boundaries (e.g. in *hea**l** it*). Hayes notes that such grammars are impossible and avoids them by stipulating an innate ranking of OOC constraints in UG. This solution has been criticised by Bermúdez-Otero (2011: 2043), who shows that innate ranking stipulations are unnecessary in a cyclic framework.

In this paper, I present a stochastic analysis of the /l/-darkening data which assumes a different theory of the morphosyntax-phonology interface, that of Stratal OT (Bermúdez-Otero, 1999, 2007, 2011; Kiparsky, 2000). Stratal OT states that phonological processes apply cyclically over a hierarchy of stem-level, word-level, and phrase-level domains; each domain is subject to stratum-specific OT grammar. Using Boersma & Hayes's inferred frequencies, this paper demonstrates the calculation of individual rates of darkening for each level, a problem which has not been addressed thus far. Given the life cycle of phonological processes (Bermúdez-Otero, 1999, 2011; Harris, 1989; McMahon, 2000) it is predicted that smaller morphosyntactic domains will show lower rates of application of a variable phonological process. Guy (1991) conducted a similar analysis, combining Labovian variable rules with Lexical Phonology, but he assumed *a priori* that phonological processes have equal rates of application at all levels. By contrast, I present a reanalysis of the data based on *cycle-specific* calculations of rates of application. Unlike previous methods, my analysis correctly predicts that /l/-darkening will show lower rates of application in higher morphosyntactic domains.

Furthermore, my results show that an SSOT analysis is an improvement on previous models assuming OOC because it does not rely on innate constraint rankings and does not predict the existence of impossible grammars. Instead of assuming *a priori* that phonological processes have an equal rate of application in all morphosyntactic domains, my analysis takes into consideration the fact that phonological processes become more embedded in morphosyntactic structure as they age. Accordingly, I show that morphosyntactically conditioned opacity, such as the variable overapplication of /l/-darkening in English, can best be understood with due consideration of the diachronic evolution of phonological processes.

Contrast constrains neutralization: statistical testing of the functional load hypothesis.
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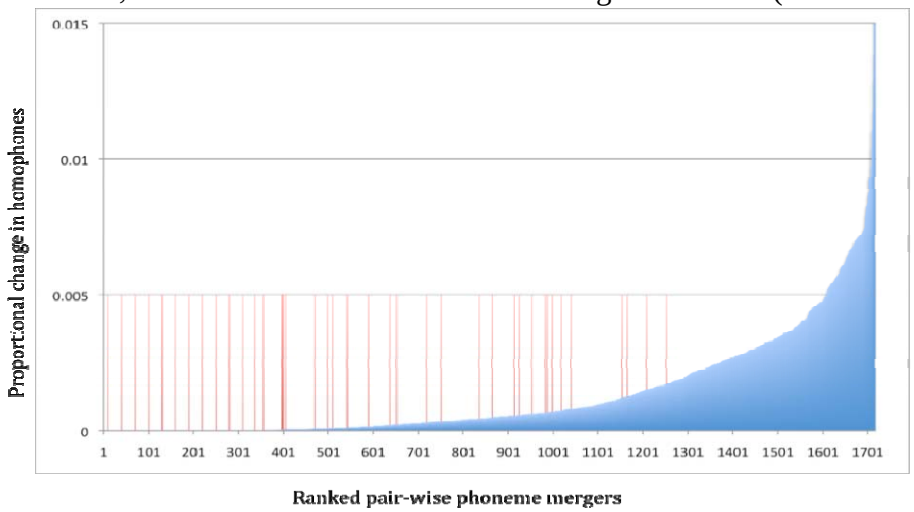
The idea that phonological neutralization is constrained by the communicative function of lexical contrast has a long history (e.g., Trubetzkoy 1939, Martinet 1955, Hockett 1967). A few case-studies have asked, with mixed results, whether occurring neutralizations have a lower impact on lexical contrast than non-occurring ones, either by creating fewer homophones (e.g., Silverman 2010, Kaplan in press) or by incurring a relatively small drop in lexical-level entropy (Surendran and Niyogi 2006). However, if functional load is just one influence on sound change we expect to find many 'counter-examples' to the functional load hypothesis. Instead, we need to assess case-studies jointly using statistical methods. Toward this end, we are building a database of diachronically recent mergers in languages for which there exist frequency-coded phonemic word lists. The database currently includes forty mergers occurring in German, French, Korean, and several varieties of English. These data reveal a statistically significant difference between the distributions of these mergers versus non-occurring mergers in three measures of functional load for oppositions: changes in homophony, lexical entropy and segmental entropy.

To ask whether a neutralized contrast has a lower functional load, comparison to a set of non-merged contrasts is necessary (Surendran & Niyogi 2006). Rather than drawing a distinction between plausible and implausible mergers, we included all structurally similar oppositions. As an example, the figure below shows the ranks of each opposition in the data set with regard to the degree of associated homophony increase; occurring mergers are significantly more likely to be ranked lower than non-occurring mergers. We show that for these languages, phonetic plausibility of merger cannot explain this effect: mergers between phonologically similar contrasts do not score lower on our measures of functional load than more phonologically distant contrasts, and functional load remains as statistically significant in datasets eliminating mergers between oppositions with more than one feature difference. Ranking oppositions either by their associated decreases in lexical or segmental entropy upon merger (Surendran and Niyogi 2006) show similar statistically significant shifts. To our knowledge, this represents the first statistical evidence consistent with the hypothesis that functional load influences the probability of contrast neutralization, whether measured at the lexical or segmental level (Hockett 1967).



All oppositions are ranked by proportional change in homophony upon merger. Red vertical lines indicate actual mergers. Median ranks for actual versus non-occurring mergers are 509 and 845 respectively. Mann-Whitney U = 44015; n1 = 40, n2 = 1676; $p < .001$, one tailed.

THE LICENSING OF VOWEL QUANTITY IN SCOTTISH ENGLISH

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Most varieties of English show a quantity contrast by which words like *pool*, *naught*, and *lead* possess long vowels as opposed to *pull*, *not* and *lid*. The notable exception is Standard Scottish English (SSE), where /i/ and /u/ are long only when followed by /v, ð, z, ʒ, r, g, dʒ/ and morpheme-finally (Scobbie, Hewlett and Turk 1999, Scobbie and Stuart-Smith 2006) and (Pukli 2006). Non-close tense vowels and non-native Scottish diphthongs are long regardless of their environment. These properties of SSE are referred to as the Scottish Vowel Length Rule (SVLR).

The purely allophonic pattern is disturbed by a contrastive distribution of two modern descendants of the Middle Scots (MS) /iː/: /aːi/ and /ʌi/. The first of them appears in the environments where long SSE close vowels are found as well as in open syllables. /ʌi/ is found in SVLR short contexts and, again, in open syllables. Two important questions concerning the distribution of /aːi/ and /ʌi/ should be asked: 1) why should it be the open-syllable context and not any other that favoured the phonemic split and 2) why is it this and not any other vowel that underwent the split? The first aim of this presentation is to answer these two questions. The other aim is to present an analysis of SVLR couched within the framework of Strict CV Phonology (Scheer 2004, Cyran 2010), by which SSE quantity pattern is a consequence of the working of five principles: a) all long vowels in all languages must be licensed; b) final nuclei may be parametrically licensed; c) licensing potential of syllable nuclei is scalar (see Cyran 2010); d) the substantive complexity (number of primes) of a consonant C is inversely proportional to the licensing potential that affects the vowel preceding this C; e) the amount of licensing that a vowel V requires to be long depends on the preponderance of element A within the internal make up of this V.

Principle (a) expresses the fact that long vowels are marked objects and imply the presence of short vowels in a given language. (b) makes sure that some languages have long vowels morpheme-finally, e.g. SSE, and some do not. According to (c) long vowels are more likely to be found in open rather than closed syllables. Principle (d) accounts for the fact that long close vowels in SSE are found before consonants with low substantive complexity e.g. /v/{U.h}, /g/{ʔ.h} but not before e.g. /t/{A.h.ʔ.H}. Finally, (e) states that it is /i/{I} and /u/{U} that require the strongest licensing in order to surface as long and that the phonological length of these vowels implies the presence of long non-close vowels. It also says that long /e/{I.A} or /o/{U.A} implies the presence of long /ɛ/{A.I} or /ɔ/{A.U} within the same system. I would like to argue that (e) forced the split of the descendant of MS /iː/ into /aːi/ and /ʌi/. Sound changes operative in the 15th and 16th centuries resulted in the dearth of a long open-mid monophthongs in the late 16th and 17th-century Scots (Aitken 2002:152-162). The only long open-mid vowel was /ɛːi/, which lagged at this height until the late 17th century, when some /aː/s were raised to /ɔː/. This lagging prevented /ɛːi/ from shifting to /aːi/ and exposed it to the effects of SVLR shortening, which had a greater scope in the 16th and the 17th century than it has now. In the late 16th century two variants of /ɛ(ː)i/ existed. /ɛːi/, occurring in SVLR long environments and in open syllables before unreduced vowels, and /ɛi/, in SVLR short contexts and in open syllables followed by an epenthetic /ə~ʌ/. In the 17th century, when many unstressed short vowels had been reduced to /ə~ʌ/, the phonemic split attested today took place giving the distribution of /aːi~ɑːi/ in *nitro*, *hydro*, *micro*, *libel*, *miser* and /ɛi~ʌi~əi/ in *bible*, *sidle*, *title*.

Tone in Arapaho: Tone-augmentation, Tone-subtraction or Tone-shifting?

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Main Claim The same morphology is apparently marked with different tonal 'templates' for different stems in Arapaho. I argue that these different tone patterns can always be attributed to the the presence of a single tonal morpheme (=a morpheme consisting at least of an H) in every morpho-syntactic context.

Background Three general factors are crucial in the assignment of tone in Arapaho: certain morphemes demand tone on their preceding syllable (Cowell and Moss, 2008, 30), adjacent high-toned TBUs are avoided and tones/tonal templates mark certain morpho-syntactic context. The latter often result in asymmetries for different stems in the same morpho-syntactic context. What looks like morphological tone-shifting for some stems (*nonóóhob* → *nonoohób*) is apparent morphological tone-augmentation for other stems (*cíih?oh* → *cíih?óh*). In other contexts, morphological tone-subtraction deletes all surface tones for some stems (*nonóóhob* → *nonoohob*) whereas others exhibit no change in their tonal make-up (*cíih?oh* → *cíih?oh*). I argue that this asymmetric behaviour of morphological tone follows from a phonological analysis that attributes the different behaviour of these stems to their different phonological structure.

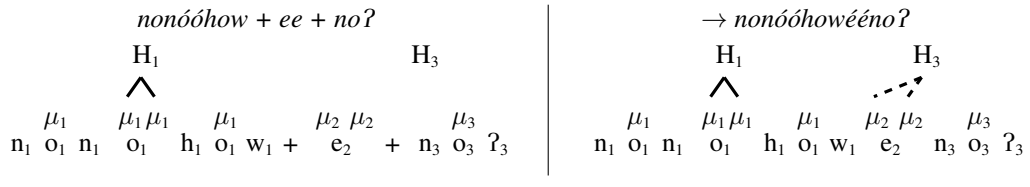
Analysis That some affixes demand tone on a preceding TBU follows if these morphemes have a floating high tone in their representation that must associate to a TBU belonging to the preceding morpheme. This is taken to be a Derived Enviroment Effect due to (1): an underlyingly floating tone can not associate to a TBU that belongs to the same morpheme, cf. (4). The second crucial assumption in the analysis is the fact that coda consonants rescue adjacent high-toned syllables from violating the OCP (Odden, 1986). This follows if the mora is taken to be the TBU and if coda consonants are moraic in Arapaho (although they are never possible TBUs). If now an affixal H associates to the stem it makes the realization of the preceding stem tone impossible due to the OCP if no moraic coda consonant intervenes between the underlying stem tone and the newly associated affix tone, cf. (3). The second asymmetry in morphological tonal behaviour – tone subtraction vs. tone preservation – is predicted if a morpheme consisting of a defective empty root node associated with a TBU and a H is infixed before the stem-final syllable. This defective morpheme will never be realized overtly (the consonantal empty root node is never realized due to general phonotactic restrictions about possible C-cluster) but nevertheless causes an opaque OCP-effects if it follows a high-toned open syllable as in (5). Note that the fact that neither the H, its mora or the root node is ever integrated into the structure in a phonetically visible way is irrelevant given the definition of the OCP in (2): only the phonetically visible association between TBU and H-tone is relevant for the constraint.

(1) ALTERNATION (van Oostendorp 2006)
If an association line links two elements of colour α, the line should also have colour α.

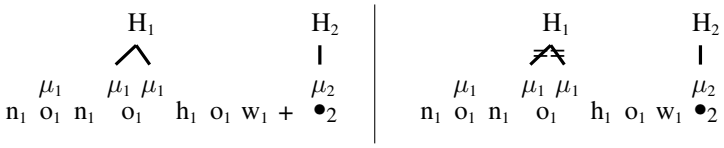
(2) OCP: Assign a violation mark whenever two adjacent TBUs are linked to two different H-tones in a phonetically visible way.

(3) cíih?oh + H → cíih.?óh
nonóóhob + H → no.noo.hób *no.nóó.hób

(4)



(5)



Why do glottal stops and low vowels like each other?

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An investigation of phonological phenomena involving glottal stops and vowels shows that the presence of glottal stops influences the quality of the surrounding vowels: the vowels are lowered. For example, in Klallam, non-low vowels /i u ə/ are lowered to [ɛ o a], respectively, when followed by [ʔ]: /pʻíx^{w}ŋ/ is pronounced as [pʻɛʔx^{w}ŋ] 'overflow'/'overflowing' and /šúpt/ as [šóʔpt] 'whistle'/'whistling' (Thompson et al. 1974).

Furthermore, it appears that glottal stops and low vowels are likely to co-occur from a typological point of view. Supportive evidence comes from various types of phonological processes. For example, in Besleney (an East Circassian language) the epenthetic vowel [ə] is realized as [i] in the context of palatalized consonants, as [u] in the environment of labialized consonants and as [a] adjacent to gutturals including laryngeals (Paris 1974; Rose 1996).

Lillooet (a Salish language) shows a clear coarticulation-induced variation in schwa-epenthesis: /ə/ changes to [•] between labialized non-uvular/non-pharyngeal consonants (C^{w}_C^{w}), to [•] before labialised uvular/pharyngeal sounds, and to [ɪ] between coronal sounds. However, if a glottal stop follows the schwa, then the schwa changes to [a] (Show 1994).

In Karanga and Zezuru (dialects of Shona, a Bantu language) the hiatus is resolved in the following way: if the second vowel is /i/ or /e/, a glide [j] is inserted between the vowels. Where the second vowel is /u/ or /o/ a glide [w] is epenthesized. However, if the second vowel is /a/, then the glottal stop appears (Mudzingwa 2010).

In Tigrinya (an Ethio-Semitic language), the mid central vowel /ə/ is lowered to [a] following pharyngeals and laryngeals in the regular conjunction pattern. For example, /səbərə/ is pronounced as [ʔabərə] 'he broke/he arrested' (Berhane 1991).

Another piece of evidence comes from an investigation of German spontaneous speech (Pompino-Marschall & Zygis 2010). It has been shown that the word-initial low vowel /a/ is significantly more often glottalized or preceded by a glottal stop than a word-initial mid or high vowel.

The consistency with which this co-occurrence can be found in the most diverse languages leads to the assumption that it might be the result of a very general property of human articulatory and/or perceptual capacities. In fact, we will hypothesize that (i) low vowels and glottal stops share laryngeal settings, i.e. especially a retracted tongue root and a raised larynx (often due to the sphincter mechanism) and that (ii) glottalized vowels are perceived lower in their height.

Regarding (i) we will briefly compare and discuss the laryngoscopic data of glottal stops and low vowels from different languages. We will focus, however, on (ii) by presenting the results of a perceptual experiment on glottalized and non-glottalized vowels.

In this experiment we hypothesized that vowels are perceived lower in their height if they are glottalized. In order to test our hypothesis we conducted a perceptual experiment with a non-glottalized and glottalized German continuum *b[i]ten-b[e]ten* ('to offer'- 'to pray'). 23 German subjects took part in an identification test in which they were asked to indicate whether they perceived words from these continua as *b[i]ten* or *b[e]ten*. The data show very clearly that subjects perceive *b[e]ten* more often, i.e. earlier in the continuum, than *b[i]ten* if the vowel is glottalized.

The results indicate that the co-occurrence of glottal sounds and low vowels in the different world languages could potentially originate in a reinterpretation of glottalized higher vowels as lower ones.

Poster papers

‘To Explain the Present’: the Case for a Database of Eighteenth-century English Phonology

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Research in the historical phonology of the Late Modern English period has tended to lag behind that in syntax and pragmatics. Although Beal (1999) and Jones (2006) have produced monographs on the phonology of Late Modern English, there are few other scholars working on the historical phonology of this period. One explanation for this could lie in the increasing availability of corpora for the study of these other aspect s of language, compared with the lack of such electronic resources for the study of phonology. Although the database *Eighteenth-century Collections Online* (ECCO) has made many (though by no means all) important eighteenth-century works on pronunciation more accessible to scholars, the idiosyncratic notation systems used by eighteenth-century authors to convey the sounds of English make it very difficult to search ECCO for phonological information. In this poster, I outline plans for a searchable database of eighteenth-century English phonology and demonstrate how this might inform our understanding of the processes leading to phonological variation between dialects of English within and beyond Britain.

References

Beal, J. C. (1999) *English Pronunciation in the Eighteenth Century: Thomas Spence's 'Grand Repository of the English Language’* Oxford: Clarendon Press.

Jones, C. (2006) *English Pronunciation in the Eighteenth and Nineteenth Centuries*. Basingstoke: Palgrave Macmillan.

Eighteenth-century collections online (ECCO) http://gale.cengage.co.uk/product-highlights/history/eighteenth-century-collections-online.aspx

Do phonological and phonetic contrasts go hand in hand?
An acoustic and lexical study of anti-harmonc and vacillating stems in Hungarian

Sylvia Blaho (RIL HAS Budapest) & Dániel Szeredi (NYU)

Background: Hungarian vowel harmony has been in the centre of interest of 'traditional' phonological research (cf. Booij 1984; Clements 1976; Dienes 1997; Esztergár 1971; Hare 1990; van der Hulst 1985; Kontra & Ringen 1986 ff. Kornai 1987; Morén 2006; Ringen 1978 ff., Ringen & Vago 1998 ff., Vago 1976 ff., Zonneveld 1980, *inter alia*) which has, however, relied on largely impressionistic descriptions of the data. Within the recent laboratory phonology paradigm, Benus et al. (2004); Benus & Gafos (2007) studied the phonetic properties of stems containing the vowels [i], [iː], [e] or [eː] in Hungarian, where some stems take front suffixes (transparent stems), but other stems with the same vowels take back ones (anti-harmonic stems). The traditional claim (cf. Siptár & Törkenczy 2000) has been that the two classes show no differences in vowel quality, and thus each stem or stem vowel has to be lexically specified for triggering front or back harmony. Benus & Gafos challenged this position, claiming that the vowels in anti-harmonic stems are pronounced with a more back articulation than the vowels in transparent stems. based on ultrasound and magnetometric evidence from 3 speakers.

While this study has successfully argued against the traditional position, it fails to answer some questions. First, as Hayes et al. (2009) have shown, the number of neutral vowels at the left edge of the stem has an influence on the choice of the suffix, suggesting that the difference in articulation cannot be the only explanation for the different behaviour of these stems. Second, 'vacillating' stems are unaccounted for: these can take both front and back suffixes.

Research questions: Our first goal was to determine whether and to what extent the articulatory contrast reported by Benus & Gafos (2007) is mirrored in the speech stream (recall that Scobbie & Stuart-Smith 2002 have shown that articulatory differences do not always show up in the acoustics). In addition, we set out to investigate whether vowels in vacillating stems pattern with vowels in transparent stems, anti-harmonic stems, or show different behaviour altogether.

Experiments: We conducted two pilot experiments with the same 2 subjects. In the experiment determining which stems are vacillating for each subject, the same set of words was presented with both front and back suffixes. Each form appeared in 2 carrier sentences: one consisting almost entirely of front vowels, the other of back vowels. Participants were asked to choose whether only the front or the back suffixed form or both forms were acceptable.

The acoustic experiment included the words from the first experiment, plus the slightly modified set of transparent–anti-harmonic word pairs used by Benus & Gafos (2007). Each word appeared twice in the same carrier sentence, and was presented three times in random order, yielding a total of six occurrences.

Results: In the first experiment, the set of stems deemed vacillating was different for the two subjects, and both sets were different from the expectations of the authors. There was a strong lexical element visible in the choice of suffixes: words of the shape CaCiCi could either be fully vacillating or fully back. The carrier sentences had no effect on the participant's choices.

The findings of the acoustic experiment were partially in line with Benus & Gafos's results: for a subset of stems, transparent stems showed significantly higher F2 than the corresponding anti-harmonic stems. However, the effect was reversed for other transparent–anti-harmonic stem pairs, especially with non-high vowels. Vacillating stems, however, complicated the picture further: they were acoustically indistinguishable from anti-harmonic stems for one speaker, but were consistently pronounced more back than anti-harmonic stems for the other speaker.

Conclusions: Our findings support the view that contrasts previously thought to neutralise during phonological computation can actually be carried over to phonetic realisation. On the other hand, phonetic behaviour alone is not a sufficient indicator of the phonological behaviour of transparent, anti-harmonic and vacillating stems. While it is clear that much more empirical research is needed to adequately describe the Hungarian facts in their complexity, we believe the data already at hand call for a more sophisticated model of the phonetics-phonology interface than is standardly assumed.

French gender allomorphy in multi-level phonological grammars

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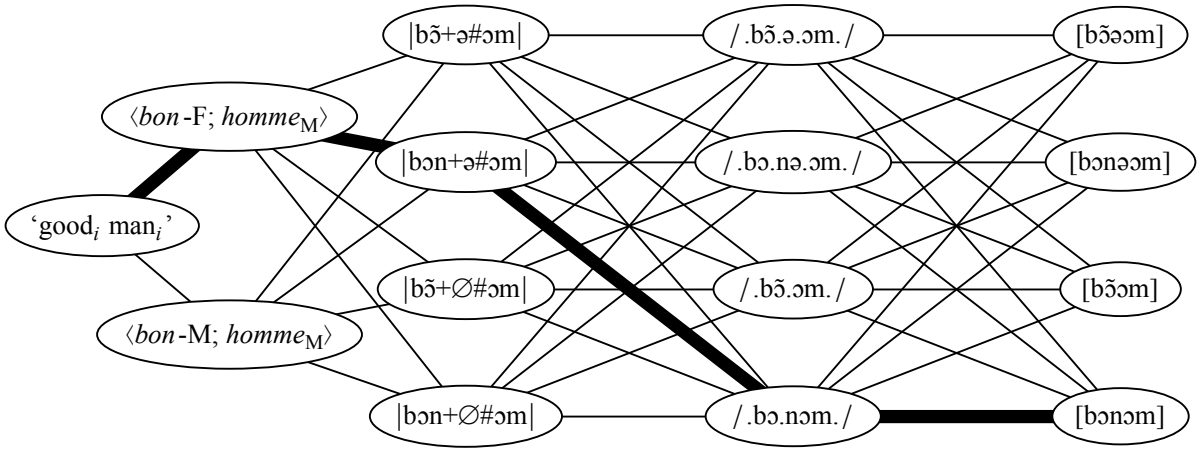
Data. In the phenomenon of "liaison" in French, the phrases 'good_i son_i', 'good_i man_i' and 'good_i woman_i' are pronounced [bɔ̃fis], [bɔnɔm], and [bɔnfam], respectively, where it is understood that the underlying forms of the three nouns are |fis|, |ɔm| and |fam|, respectively, and the first two nouns are masculine (M), the last feminine (F).

Existing analyses. The serial account by Dell (1973) and others traditionally analyses the adjective ⟨*bon*⟩ 'good' as underlyingly |bɔn|, and the ⟨F⟩ and ⟨M⟩ suffixes as |+ə| and |+∅|; the masculine |bɔn+∅| then surfaces as /.bɔ̃./ before consonants and as /.bɔ.n/ before vowels. The parallel account by Encrevé-Lambert (1971) and Tranel (1996), however, argues for "gender allomorphy": 'good_i man_i' selects the female morpheme ⟨*bon*-F⟩ to avoid a violation of faithfulness in the "later" mapping from underlying to surface form.

Make the learner decide. A *multi-level bidirectional stochastic constraint grammar* (Boersma 2007, Apoussidou 2007) with a sufficient number of constraints allows both of the above analyses, and more. This figure shows the possible production paths (from left to right) and comprehension paths (from right to left) in this model for the meaning 'good_i man_i':



The five levels of representation shown here are: meaning, morphemes, underlying form, (phonological) surface form, and phonetic form. The thick path is the gender allomorphy analysis. Here we summarize that analysis, Dell's traditional analysis, and two more analyses:

- Gender allomorphy: 'good_i man_i' ⟨*bon*-F; $\textit{homme}_\text{M}$⟩ |bɔn+ə#ɔm| /.bɔ.nɔm./ [bɔnɔm]
- Traditional saved *n*: 'good_i man_i' ⟨*bon*-M; $\textit{homme}_\text{M}$⟩ |bɔn+∅#ɔm| /.bɔ.nɔm./ [bɔnɔm]
- Phonological *n*-insertion: 'good_i man_i' ⟨*bon*-M; $\textit{homme}_\text{M}$⟩ |bɔ̃+∅#ɔm| /.bɔ.nɔm./ [bɔnɔm]
- Phonetic *n*-insertion: 'good_i man_i' ⟨*bon*-M; $\textit{homme}_\text{M}$⟩ |bɔ̃+∅#ɔm| /.bɔ̃.ɔm./ [bɔnɔm]

The following constraint set allows at least these four analyses: Adjective-noun agreement: *⟨FM⟩; Suppletion: *⟨*bon*-F⟩|bɔ̃|, *⟨*bon*-F⟩|bɔn|, *⟨*bon*-M⟩|bɔ̃|, *⟨*bon*-M⟩|bɔn|; Regular gender: *⟨-F⟩|+ə|, *⟨-F⟩|+∅|, *⟨-M⟩|+ə|, *⟨-M⟩|+∅|; Faithfulness: *|ɔ̃|/ɔn/, *|ɔn|/ɔ̃/, *|ə|//, *||/ə/; Markedness: */n./, */V.V/; Cues: */ɔ̃/[ɔn], */ɔn/[ɔ̃], */ə/[], *//[ə].

With these 19 constraints we make the learner decide which of the four representable analyses she prefers. We let her start with all 19 constraints ranked at the same height, then feed her 100,000 sound–meaning pairs drawn from the three "Data" above. The learning procedure follows Stochastic OT or HG with partial information (Boersma 2007, Apoussidou 2007). After learning, we ask the learner what paths her current grammar selects for the three meanings 'good_i son_i', 'good_i man_i' and 'good_i woman_i'. Success (i.e. Frenchlike phonetic forms) is achieved more easily with HG or with a "weighted" update rule than with OT & GLA; the analyses that learners come up with are any of the four above, plus several others.

Where's the contrast?

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We consider one aspect of the conference theme of contrast: how does the pre-eminently phonological notion of contrast relate to the phonetics, and what does it imply about representations?

For several decades, distinctive feature theory has provided a clean abstract representation which locates contrast in the opposition of discrete featural properties. In some accounts, features are innate and universal, such as in *SPE* or in versions of OT with features embedded in the constraints. Such universal claims have obvious problems with the variability of language(s), and so a range of approaches has developed in which features can emerge, whether within one speaker's learning, or within the development of language(s) (see Mielke 2008).

On the other hand, exemplar approaches initially abandoned categories as such, leaving only fuzzily separated clouds of points in phonetic space, or not even that in the case of word exemplars. While this dealt nicely with observed effects such as word-specific phonetic detail, social indexing etc., it made classical phonological insights challenging to incorporate. Hence hybrid models (e.g. Pierrehumbert 2002) were also developed, which combine 'modular feed-forward' phonology with exemplar theory, and so still have to address the issue of phonological representations.

Thus a key question is, are distinctive features a good model, and is there reason to think they are part of the mental representation of language? There is a long strand of work addressing this; two of the main techniques are experiments on people, to show an observed effect that is (or is not) consistent with the predictions of a theoretical model, and simulations, to show that a theoretical model can generate an observed effect.

In this presentation, we take as a starting point one example from each of these two strands: Boersma and Chládková (2010a,b), which use simulations in Boersma's bidirectional OT-based theory to argue that features are supported by differing perceptual boundaries between vowels in different languages (Czech and Spanish); and Kingston (2003), which uses experiments on American English speakers learning to recognize German vowels to argue that the learners are (sometimes) recognizing distinctive features rather than just doing category assimilation (Best 1994 etc.).

In the first case, we show that similar results, in terms of matching experimentally observed perceptual boundaries (Raimo et al 2002+), can be obtained by a simulation model of acquisition which has no inbuilt notion of feature, and indeed no phonological concept other than 'phoneme'. The model combines the idea of prototypes with 'acceptable regions' derived from experience, with the prototypes being the barycentre of the acceptable region. In forced categorization, the metric is distance to an acceptable region; thus perceptual boundaries are affected both by the location of the prototypes, and by the shapes and size of the acceptable regions. The match with reality obtains even though the model has almost entirely abstracted away from phonetic detail; thus consistent with the theory that categorization is a general cognitive process rather than a specifically linguistic process (a theory that is relied on by the Kingston work). Czech and Spanish have simple vowels, and use mostly F_1, F_2 cues (Savela 2009). We go on to investigate more refined models which can address languages with a wider range of cues (work currently in progress). We also discuss how to account for the effects of vowel reduction and category overlap, which have been demonstrated even in Spanish (Harmegnies and Poch-Olivé 1992).

In the second case, starting from Kingston (2003), we adapt our model to adult learning of foreign sounds, to investigate whether the apparent distinctions between examplar learning, prototype learning and feature learning, which form the basis of Kingston's argument, can also arise in a single framework, and so may explain the puzzle of why Kingston finds feature learning supported in some instances but not others.

Lenition and the status of affrication: The case of spontaneous RP English /t/

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This poster reports on a study of /t/-lenition in spontaneous RP English. Lenition has been a topic of debate in phonological theory and historical linguistics for a long time, and much of the debate centres on the criteria for classifying an observed pattern as an instance of lenition or otherwise (see Bauer 2008 and Honeybone 2008 for recent overviews). The status of plosive affrication is particularly debatable: some researchers consider it an example of lenition in most environments (Lass and Anderson 1975, Harris 1990, Honeybone 2005), some consider it fortition (Hooper 1976, Bauer 2008), and some suggest it might be either depending on the language and phonological environment in which it occurs (Lavoie 2001, Szigetvári 2008). What seems clear is that a decision as to the status of a given pattern of variation or change involving affrication should be based on thorough phonetic and phonological analysis, taking into consideration the temporal and spectral characteristics of the sounds involved, as well as their distribution across phonological environments. In fact, we would argue that previous discussions of the status of affrication have often unfairly focused on some of these parameters at the expense of others. We present a phonetic and phonological account of /t/-affrication in RP English, based on a larger investigation of approximately 1000 instances of /t/ in recordings of spontaneous speech. The account covers multiple relevant phonetic parameters and an overview of the phonological environments in which /t/-affrication is most frequently attested. Crucially, we compare affricated instances of /t/ with aspirated and fricated ones in the same dataset – the former canonical in this variety, the latter uncontroversially the result of lenition. In this way, we aim to offer a comprehensive view on the nature and status of /t/-affrication in RP English, and firm empirical grounding for future accounts of plosive affrication more generally.

High vocoids in some Romance languages

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Lexical status of glides has been largely discussed in the literature. Following Roca (1997) i Harris and Kaisse (1999), among others, we assume there is no glides in underlying form and glide formation occurs under the interaction of prosodic and phonological conditions. Nevertheless we propose an exceptional nuclear status for the so called historical rising diphthongs in some Romance languages.

It is well known that Vulgar Latin open mid vowels became rising diphthongs in stressed position with different degrees of regularity in some Romance languages such as Spanish, French or Italian (Sánchez Miret 1998, among others). They alternate with mid vowels in unstressed position (Spanish: *pie* 'foot' – *pedal* 'pedal', French: *pied* – *pédale*; Italian: *piede* – *pedale*). According to Chitoran & Hualde (2007), the presence of historical diphthongs favours glide formation in rising sonority sequences. Thus these languages generally interpret high vowel sequences as rising diphthongs (Spanish: *Luis* ['lwis]; French: *Louis* ['lwi]; Italian: *Luiggi* ['lwid͡ʒi]). It seems that the pressure of the so called historical diphthongs is in the origin of this realization (Cabré & Prieto 2008).

By contrast, other languages without this kind of historical rising diphthongs, such as Catalan or Portuguese, interpret the lexical high vowel sequences as falling sonority diphthongs (Catalan: avui [ə'βuj] 'today'; Portuguese: muito ['mujtu] 'much').

It seems evident that these opposite outcomes follow specific language patterns. Languages such as Spanish with falling (*baile* 'dance') and rising (*fuego* 'fire') diphthongs offer two patterns for glide formation. The frequency and regularity of the historical rising diphthongs in Spanish make this pattern more accessible than the falling one. So tautosyllabic high vowel sequences are realized as rising diphthongs. Conversely, Catalan has to choose falling pattern (*cu[j]na* 'kitchen', *ci[w]tat* 'town') because the language lacks historical rising diphthongs.

Nevertheless, when the sequences under study consist of two high vowels split up by a morpheme boundary, Catalan unexpectedly displays a rising diphthong, as in Spanish (Cat. *fatu* 'fatuous' *fatwität* **fatujtát* 'fatuity'; Sp. *fatuo* 'fatuous' *fatwidád* 'fatuity'). The following tableaux illustrate these examples:

fatu+itat (Cat)	ONSET	NOCODA	NO COMPLEX
☞fatwi.tát		*	*
fatu.i.tát	*!	*	
fatuj.tát		**!	
fatu+idad (Sp)			
☞fatwidád		*	*
fatu.i.dád	*!	*	
fatuj.dád		**!	

As we can see, the hierarchy of syllabic constraints decides the optimal outputs. Prosodic conditions force derived high vowel sequences to be interpreted as rising diphthongs in both languages. In sum, the pronunciation of tautosyllabic high vowel sequences depends on their position. Internal morpheme sequences follow the pattern of the language, while sequences split up by a morpheme boundary are submited to prosodic conditions.

The goal of this paper is to show how one historical process becomes a phonological pattern of the language. This explains the opposite outcome of high vowel sequences between Catalan and Spanish. Instead when markedness constraints work and override faithfulness constraints, rising diphtongs arise in both languages.

Morphologically conditioned intervocalic rhotacism in Algherese Catalan. An account with lexically indexed constraints

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1. Data. In Algherese Catalan, a diachronic process of intervocalic rhotacism turning intervocalic coronal laterals and dental voiced stops into a flap has applied: *o̲li* [ɔ̝ɾ̲i] 'oil', *Na̲dal* [naɾ̲ál] 'Christmas' (Kuen 1934). So far, however, the process has been described as applying categorically, and little attention has been given to its lack of activity in certain lexical items (*a̲legria* [a̲lagría] 'happiness', *o̲di* [ɔ̝d̲i] 'hate' (Cabrera 2009)) and to the morphological and lexical factors that determine it. In this paper, four patterns of intervocalic rhotacism are considered. **1.1.** In root-internal position, the process has applied diachronically to a closed set of inherited words, and it is no longer productive: thus, loanwords and learned words exhibit a systematic lack of rhotacism (*sò̲lid* [sɔ́l̲it] 'solid', *esca̲dença* (It.) [askad̲énˈsa] 'expiration'). The percentage of rhotacism in this position is 33% (Cabrera 2009). **1.2.** At the left edge of the root, rhotacism is always blocked: whenever a vowel -final prefix is added to a root starting with /l, d/, the input is always mapped faithfully (*a̲linear* /a + l̲ine + a + ɾ/ [a̲lineá] 'to align', *a̲dolorir* /a + d̲olor + i + ɾ/ [a̲duɾuɾí] 'to hurt'). The percentage of rhotacism in this position is 0% (Cabrera 2009). **1.3.** At the right edge of the root, application and non-application of rhotacism is almost equally distributed in the lexicon: whenever a vowel-initial suffix is added to a root ending in /l, d/, the rotacized mapping occurs in half of the cases, whereas the faithful one occurs in the other half. This context supplies some evidence of still syncronically productive alternations (cf. *llençol̲* /ʎensɔ́l̲/ [ʎanˈsɔ́l̲] 'sheet' but *llençol̲et* /ʎensɔl̲ + ɛt/ [ʎanˈsuɾ̲ɛ́t] 'sheet DIM.', *fred̲* /frɛd̲/ [frɛ́t̲] 'cold' but *fred̲a* /frɛd̲ + a/ [frɛ́ɾ̲a] 'cold FEM.'). The percentage of rhotacism in this position is 52% (Cabrera 2009). **1.4.** Within the suffix, rhotacism is always triggered, except for only the suffixes *-ed̲u* (Sard.), *-id̲i* and *-d̲ura*, which systematically fail to apply the process (cf. *arribad̲a* /arib + a + d̲ + a/ [aribáɾ̲a] 'arrived FEM.' but *adobad̲ura* /adob + a + d̲uɾa/ [adubad̲úɾa] 'repair'). The percentage of rhotacism in this position is 98% (Cabrera 2009). **2. Analysis. 2.1.** Following Uffmann (2005) and Pons (2008), it is assumed that the triggering factor for intervocalic rhotacism is the drive towards minimization of sonority contrast in the transition between two vowels: the most sonorous the intervocalic consonant is, the better. Thus, by ranking faithfulness constraints between (*VdV >>) *VlV and *VɾV, the process can be accounted for straightforwardly. **2.2.** The uneven behavior of rhotacism at the edges of the root can be understood as a positional faithfulness effect according to which the identity of the segment standing at its left edge is maximally protected, whereas in root-internal position it is less protected and, within the suffix, it is minimally protected, as shown in the following scale: $\text{FAITHFULNESS}_{\text{LeftRoot}}$ >> $\text{FAITHFULNESS}_{\text{Root}}$ >> $\text{FAITHFULNESS}_{\text{Suffix}}$. This idea is consistent with the well-known assumption of the peripheral character of prefixation (McCarthy 1981) and the salience assigned to the beginning of the word in studies of word recognition (Hawkins 1988). **2.3.** The irregular behavior of rhotacism within the root can be captured, along the lines of [6] and [7], by splitting the markedness constraints *VdV and *VlV into a general and a lexically indexed version, the latter targeting the 33% - 52% of roots that exceptionally allow rhotacism. **2.4.** Similarly, the exceptional behavior in suffixes (§ 1.4) can be captured by splitting the faithfulness constraint that protects the suffix into a general and a lexically indexed version, the latter targeting the 2% of suffixes that exceptionally lack rhotacism. **3. Extentions of the analysis.** Along the lines of Coetzee & Pater (2006), the observed/expected ratio of the sequences /VdV/, /VlV/ and /VɾV/ within the root will be calculated, in order to derive the hierarchy between the markedness constraints targeting them from the degree to which they are obeyed in the lexicon.

The emergence of contrast: a Usage-Based approach

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This paper discusses the emergence of contrast as a consequence of sound change and neologism. Usage-Based phonology (Bybee, 2001, 2010) and Exemplar Models give the theoretical foundation to the analysis to be presented (Johnson, 1997; Pierrehumbert, 2001, 2003; Foulkes & Docherty, 2006). The emergence of contrast to be discussed involves alveolar stops and affricates in Brazilian Portuguese (henceforth BP). Affricates were formerly introduced in BP as a consequence of palatalization where an alveolar stop followed by a high front vowel became an affricate: *tia* [tia]>[tʃia] *aunt* or *dia* [dia]>[dʒia] *day*. Consequently, alveolar stops were not expected to be found followed by a high front vowel: *ti, *di, neither affricates were expected to be followed by a vowel different from [i]: *tʃ, *dʒ. So, due to complementary distribution contrast between alveolar stops and affricates was not expected. However, these unexpected patterns became productive in BP, giving rise to the emergence of contrast between alveolar stops and affricates. This paper shows that contrast between alveolar stops and affricates in BP emerged through neologisms as well as a consequence of sound changes. Regarding neologisms one observes that affricates followed by any BP vowel became productive in recent years: *cappuccino, Thatcher, Tchetchenia, Gorbachev*, etc. Neologisms, thus, introduced new types: affricates followed by vowels different from [i]. We suggest that the new pattern, i.e., affricates followed by vowels different from [i], became productive as a consequence of two different sound changes. The first sound change involves dj-sequences in forms such as *adjetivo adjective* which was formerly pronounced as *a[d.ʒ]etivo*: with an alveolar stop followed by a fricative. Epenthetic vowels in BP intervene between consonantal sequences (Collischonn, 2002), so that as a consequence of epenthesis dj-sequences were manifested as an affricate followed by a fricative: *a[dʒiʒ]etivo*. Due to gestural compression the epenthetic vowel was suppressed - *a[dʒʒ]etivo* - yielding to a voiced affricate followed by a vowel different from [i]: *a[dʒ]etivo*. Thus, a voiced affricate followed by any vowel started appearing due to the sound change related to dj-sequences. In order to observe a more widespread occurrence of affricates followed by any vowel in BP let us then consider a second sound change which involves hiatus where the high vowel is suppressed. In a form such as [patʃiu] *patio* the hiatus is reduced to a single vowel, being that the high vowel is not manifested: [patʃu]. This kind of sound change is very productive in BP and also occurs in all environments: pretonic position (*dietetic* [dʒiɛ]tético>[dʒɛ]tético *dietetics*); postonic position (*pátio* [ˈpatʃiu]>[ˈpatʃu] *patio*) and in primarily stressed position (teatro [tʃiˈatɾu]>[ˈtʃatɾu]threatre). Affricates then became productive in any environment so that contrast between alveolar stops and affricates emerged: *pato* [ˈpatu] *duck* versus *patio* [ˈpatʃiu]>[ˈpatʃu] *patio*. New lexical items also express the contrast between alveolar stops and affricates: *TAM* [ˈtã] *Airline* and *Tchan* [ˈtʃã] *Musical Group*. We suggest that the emergence of contrast between alveolar stops and affricates in BP follows from the introduction of a new pattern - affricates followed by vowels different from [i] – which gradually spread through the lexicon by sound changes in a lexical diffusion fashion as proposed by Usage-based Phonology (Bybee, 2001, 2010).

The placeless nasal in Latin

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This paper discusses a minor case of nasal lenition in Latin that has been well known in terms of data but has not yet been described in strictly speaking satisfactory terms phonologically. The prefix *con-/com-* displays odd behaviour in that its nasal, while assimilating to certain consonants in a fashion similar to other nasals, is dropped before stem-initial vowels (e.g. *co-ercere* 'coerce'). This cannot be explained as a sandhi-phenomenon (*pace* de Vaan 2008 s.v.) and is not, in fact, similar to what happens at word boundary. The behaviour of the nasal in *con-/com-* contradicts generalisations about syllable structure in that it is present *only* when it constitutes a coda and is dropped *only* when a hiatus is thereby created. This can be explained if one assumes that the nasal is placeless but this explanation only holds if it is complemented by the assumption that vocalic and consonantal place features and/or place nodes do not occupy the same position in feature geometry (cf. Clements & Hume 1995).

The analytical goal of the talk is to give a coherent explanation of the behaviour of the prefix *con-/com-* that is firmly grounded in a model of phonological representation and therefore has explanatory power. The conceptual goal of the paper is to test the prediction of the claim (first made explicit in Clements & Hume 1995, then adopted in much of the literature) that because of their different positions in the feature tree the interactions between vocalic and consonantal place features and/or place nodes are restricted in a principled way. In terms of data, the analysis is based on volume 1 of the Brepols Corpus (CLCLT-5 – Library of Latin Texts by Brepols Publishers, Release 2002).

Arbitrariness in grammar: Palatalization effects in Polish

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A widely held assumption that underlies many prominent phonological theories is that phonological composition of segments is determined on the basis of their phonological patterning. To the extent that phonology is distinct from phonetics, phonetic facts need not find a fully accurate reflection in phonological representations (Trubetzkoy 1969, Dresher 2009). Taken to its logical conclusion, this assumption allows for the possibility of positing multiple representations for a single (phonetic) segment when the phonological patterning provides sufficient evidence. Various accounts of palatalization effects in Polish have argued for such abstract representations. Two lines of research can be identified within the phonological approach to palatalization: (i) purely phonological (generative tradition), claiming that phonology is sufficient in accounting for palatalization (Rubach 1984), and (ii) morphophonological (Government Phonology), which argues that a phonological account must be supplemented with lexical specifications (Gussmann 2007). Both approaches heavily rely on phonological representations.

It is argued that the phonological component in both analyses is neither necessary nor sufficient. It transpires that whether palatalization occurs in a given context or not is largely due to arbitrary factors. It is shown that on the morphophonological approach as many as four representations of *e* are necessary to account for the palatalizing/non-palatalizing/depalatalizing effects that the vowel has on preceding coronal/dorsal consonants. In addition, individual words still have to carry information about the applicability of palatalization to a particular consonant and the type of palatalization. This amount of lexical marking and abstractness is tantamount to denying the process a phonological basis.

The discussion of allomorphs suggests that their selection cannot be stated in terms of phonological universals such as natural classes or elements. The patterning of some consonants is contingent on morphological factors (a specific suffix), rather than on the syntagmatic phonological environment (palatalized consonants). Given the unpredictability and variation in allomorph selection, phonological universals cannot play a significant role in shaping grammar. Rather, redundancy pervades natural language and linguistic patterns are arbitrary (Anderson 1981). The theorem originally voiced by Roman Jakobson that human language is based on the optimization of the use of its information channel has a potential flaw. “While it may well be a desirable engineering goal to exploit the communicative capacity of a given channel to its fullest, it is by no means obvious that the empirical facts of human language are founded on the same considerations” (Anderson 1985). A phonological approach to palatalization effects encounters several problems: (i) the role of phonological universals (natural classes and elements) is undermined; (ii) a high level of abstractness of underlying and/or intermediate representations is necessary to account for the data (against Kiparsky 1973); (iii) phonetic facts must be purposefully suppressed and (iv) despite a high degree of complexity, a significant portion of the data remains exceptional.

In view of accumulating evidence it is suggested that the lexicon contains rich-memory inputs with palatalization effects directly encoded in them. It is proposed that the regularities as well as deviations surrounding palatalization effects in Polish testify to the lexical storage of entire words, while the productivity of the arbitrary patterns points to an analogical, rather than phonological, basis of the processes.

A dictionary database of contemporary English: when the tool meets the needs.
The particular case of word stress assignment in disyllabic verbs.

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In the mid 60's Lionel Guierre made a computerized version of all the entries in D. Jones' *English Pronouncing Dictionary* (12th edition, 1964). He added information such as syntactical categories, stress patterns and reversed spelling. His computerized corpus allowed him to formulate hypotheses on English pronunciation and to demonstrate their validity. Since 2008 we have developed a new database following Guierre's idea.

The database enables us to have an up-to-date reliable source on the pronunciation of lexical units in contemporary English including all necessary syntactical, lexical and morphological information, usage data, and variation: it compiles the information contained in three major dictionaries, Jones' *Cambridge English Pronouncing Dictionary*, Wells' *Longman Pronunciation Dictionary*, (Southern British English and General American English) and *Macquarie Dictionary* (Standard Australian English).

The exploitation of our database allows to check the validity of established rules for stress placement and uncover rules for unaccounted parts of the vocabulary. The aim of this poster presentation is to illustrate the kind of research that can be done with the database using the case of word stress assignment in disyllabic verbs. Indeed, specialized works on English stress (Roach 1983, Giegerich 1992 or Carr 1999) attribute a specific stress tendency to dissyllabic verbs, *i.e.* stress on the second/last syllable. However, a number of verbs do not conform with that assumption. Our analysis argues that only prefixed verbs are stressed in /01/, while non-prefixed verbs tend to be stressed on the first syllable (/10/). These two interpretations of the structure of the stress system radically differ. Our work focuses on monocategorial verbs and primary pronunciations. For this particular study we have re-assessed our results in light of the usage frequencies information from the COCAE (particularly stress pattern tendency of frequent verbs as opposed to less frequent ones, if they happen to differ).

The following table gives the final results of our study, the distribution of stress pattern in dissyllabic verbs being clearly linked to morphology:

	/1–/		*/–1/*		**Total**
	nbr	**%**	**nbr**	**%**	
Suffixed	177	73,75%	63	26,25%	240
derivatives	*79*	*95,18%*	*4*	*4,82%*	*83*
not derived	*98*	*62,42%*	*59*	*37,58%*	*157*
Compounds	245	84,78%	44	15,22%	289
Prefixed	92	7,28%	1171	92,72%	1263
Bases	673	88,79%	85	11,21%	758
Total	**1187**	**46,55%**	**1363**	**53,45%**	**2550**

References

Carr, P. (1999), *English Phonetics and Phonology: an Introduction*, London: Blackwell.

Chomsky, N., Halle, M., 1968, *The Sound Pattern of English*, New-York: Harper & Row.

Descloux E., Fournier, J-.M., Fournier ,P., Girard, I., Martin, M., Structure, variations, usage & corpora: the case of word stress assignment in disyllabic verbs, PAC Workshop 2010 :Structure, Variation, usage and corpora, Université Paul Valéry – Montpellier III.

Giegerich, H.J. (1992), *English Phonology. An Introduction*, Cambridge: CUP.

Guierre, L., 1984, *Drills in English Stress-Patterns*, 4th ed., Londres: A. Colin - Longman.

Roach, P., 1983, *English Phonetics and Phonology, a Practical Course*, Cambridge: CUP.

Jones, D., 2006, *Cambridge English Pronouncing Dictionary*, 17th edition, edited by P. Roach, J. Setter & J. Hartman, Cambridge: CUP.

Macquarie Dictionary, 2005, 4th edition, Sydney: Macquarie Dictionary Publishers Pty Ltd.

Wells, J.C., 2008, *Pronunciation Dictionary*, 3rd edition, London: Longman.

Corpus Of Contemporary American English, Mark Davies: http://www.americancorpus.org.

Phonological contrasts in the representation of clicks

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This paper investigates the question which phonological contrasts must be accounted for in an adequate and exhaustive phonological representation of click consonants. A new classification scheme is proposed that attempts to capture all attested contrasts in a way that is both phonetically grounded and maximally economical. For that purpose, some new categories are introduced, while other, established categories are reinterpreted. The classification is primarily based on articulatory distinctions, but aerodynamic, acoustic and auditory interpretations of the contrasts involved are also offered. The analysis is for the most part based on the author's own fieldwork data.

As is well known, clicks have of necessity two closures, an anterior one (which is [labial] or [coronal]) and a posterior one (which is [dorsal]). The present study concentrates on the properties of the *anterior closure* and on the *relationship between the anterior and the posterior closures*. The contrasts that are associated with the *posterior closure alone* are what could be called more "conventional" consonantal contrasts, which combine with the more "click-specific" ones to form the representation of the click consonant as a whole.

First of all, a case is made for a feature [suction] that characterizes all clicks to the exclusion of all non-clicks. Arguments are presented why it might be preferable to assume such a feature (similar to the corresponding feature already proposed by Chomsky & Halle 1968) rather than a configurational characterization as e.g. the one in Sagey (1990).

As mentioned above, [labial] vs. [coronal] are necessary to accurately capture the active articulator involved. This is taken to be indeed an articulatory (and not, or at least not primarily, an auditory) contrast in clicks. However, the precise places of articulation of different coronal clicks are claimed to be non-contrastive *enhancing features* (Stevens & Keyser 1989). Similarly, the contrast between e.g. [!] and [ǂ] is argued to be *not* primarily one of apicality vs. laminality but rather of the *overall shape* of the tongue. A contrast of [concave] vs. [convex] is therefore introduced that is claimed to have several observable consequences that are all relatable to the same cause, namely overall tongue shape.

The possibility for clicks to contrast in terms of [central release] vs. [lateral release] has long been recognized (e.g. Beach 1938). This feature continues to be indispensable, and the laterality as an articulatory contrast is supported by diachronic evidence (Traill & Vossen 1997).

The contrast [tense] vs. [lax] has been criticized as being often used in an unsystematic, ill-defined, or weakly supported way (e.g. Ladefoged & Maddieson 1996). Traill (1985) hesitatingly adopted the terms in his description of !Xóõ clicks, and the position is taken here that tenseness is indeed a consistent contrastive category in many click languages. A rigorous definition of the category is proposed, and evidence is presented why it might capture some aspects of the data more accurately than the more traditional categories of [abrupt release] vs. [gradual release].

Finally, concerning the relationship between the anterior and posterior closures, Miller et al. (2009) have argued that the alleged place-of-articulation contrast ([velar] vs. [uvular]) between clicks like [!] and [!͡q] (as proposed e.g. by Ladefoged & Maddieson 1996) is better analyzed as a contrast between a simple segment and a segment involving a (so-called *linguo-pulmonic*) *airstream contour*. In the present study, this idea is taken up and extended in such a way that [!] is analyzed as a linguo-pulmonic *simultaneously released* click, whereas [!͡q] is described as a linguo-pulmonic *sequentially released* click, building on Sagey's (1990) distinction between *complex* vs. *contour* segments.

An unexpected role for the prosodic word domain in Bamana compounding: Revisiting *compacité tonale*

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Compacité tonale (CT) is a tonological phenomenon well known in the Bamana (Bambara) literature as tonal compactness or the noun-compounding rule. It is one of the few widely agreed upon features of the Bamana tonal system, and its presence and outcome have been corroborated by Mandeist scholars for some time (e.g. Courtenay 1974; Creissels 1978, 1992; Creissels & Grégoire 1993; Dumestre 1987; Green 2010) in Bamana and its close relatives (i.e. Maninka and Dyula). Generally speaking, CT is a process by which non-initial tones of a compound or other polymorphemic derivative in Bamana are neutralized such that one of two predictable tonal melodies results. One tonal scheme is typically found for 'high' words, and another scheme exists for 'low' words. While the melodic results of CT are known, a formal mechanism motivating the application and outcome of the process, particularly when it fails to apply, has been largely overlooked. Little consideration appears to have been given, up until this time, as to the role of particular morphemic constituents or other structures in driving the outcome of this process or why the process fails to occur in notable instances. The current paper, drawing upon data presented in these earlier works, reconsiders CT and formalizes its outcomes in terms of tonal spreading within the prosodic word domain. This proposal provides a principled explanation for the two major tonal outcomes of the process, as well as for key instances where the process yields 'minor' tonal schemes that have previously been considered to be exceptions. Consider the representative examples of High tone and Low tone CT in (1) and (2), respectively.

(1) [básá] + [wòló]	→	[básáwóló]	'lizard skin'
(2) [jàrá] + [wòló]	→	[jàràwóló]	'lion skin'

In these and other instances of CT, the High tone version of the process yields an 'all High' melody, while the Low tone version yields a 'Low-High melody'. This regularly occurring process unexpectedly fails to occur in instances like (3) but then applies as otherwise expected when additional rounds of compounding occur, as in (4).

(3) [dá] + [bìlá]	→	[dábìlá]	'to stop'
(4) [dábìlá] + [bálí]	→	[dábílábálí]	'incessant'

This paper argues that the observed outcomes of CT, both when the process applies or fails to apply, can be explained by defining tonal spreading within the bounds of the prosodic word domain. Only the tone associated with the head of the prosodic word can spread and does so when a trigger is available until it reaches the domain boundary. As proposed in recent work by Green (2010), phonological processes underway in Bamana implicate the left edge of a word as a strong, prominence attracting position in the language. The observed tonal outcome of CT further supports this position in that CT fails to occur in those instances where the head of the compound to be formed is not the head of the resultant prosodic word, and thus its tone cannot spread (3). Once the prosodic word head has been assigned for the compound however, it has the ability to participate in regular CT when another round of compounding occurs (4). Thus, the seemingly unusual tonal melodies observed for words like (3), in fact, are not exceptions but rather, they are entirely predictable based upon a defined mechanism for CT and the environment necessary to trigger the process. These predictions extend to and account for both nominal and verbal compounds, as well as other more complex derived constructs in Bamana.

Coda Place Perception in Taiwan Southern Min

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Stop (inclusive of oral and nasal stops) place perception has attracted many linguists' attention since 1950s (Miller 1955, Bilger 1973, Jun 1995, Hume et al. 1999, Winters 2001, Wright 2001, Kochetov & So 2007), and no consensus was reached partly due to experimentation disparity and partly due to influence from adjacent vowel(s). This study departs from the above-mentioned literature in centering on coda place perception of a tone language, namely Taiwan Southern Min.

To avoid lexical frequency effect, the data set of the first experiment contains 36 nonsense or rarely known CVC syllables (2 onsets x 3 vowels x 6 codas), and that of the second experiment contains 54 nonsense $CVC_1.C_2V$ syllables (3 vowels x 3 C_1 x 3 C_2 x 2 (C_1C_2 = stop/nasal)). Tone of the stimuli was fixed on 33 or 3 in accordance with the free-checked distinction. The two experiments were conducted using E-prime 2.0 and ParadigmV1.0 RCI respectively. 13 male and 8 female Taiwanese-speaking university students with normal hearing ability served as subjects.

Results of the first experiment indicated that (a) nasal codas had significantly higher perceptual saliency than stop codas, (b) the perception scale of labial > coronal > dorsal significantly held in both stop and nasal coda, (c) the reaction time for labials was significantly shorter, and (d) the adjacent vowel was more significantly related to coda place perception than the onset.

Results of the second experiment showed that (a) nasal codas were significantly more salient than stop codas, (b) the perception scale of labial > dorsal > coronal was statistically significant in both stop and nasal coda, (c) the reaction time for labials was significantly shorter, (d) the adjacent vowel was significantly related to coda place perception, and (e) a labial inhibited the perception of the preceding labial, whereas perception enhancement occurred in coronal cluster and dorsal cluster.

One important point from the two experiments suggests that labial is the most salient place (basically cued by vowel duration pursuant to later acoustic measurements), and coronal is most susceptible to the following onset. Further support comes from coda exchange in my Taiwanese speech errors corpus and casual speech elision of Tianjin trisyllabic sequences (Wee 2008). An immediate question is: if labial has greatest perceptual saliency, why does it disappear first in coda attrition in most Chinese dialects? In addition to the labial constraint which bans two [+lab] in a syllable, a possible reason lies in that just like the cross-linguistically prevalent word-final devoicing by which the less sonorant voiceless segment stays in the perceptually weak position, coda attrition in most Chinese dialects naturally resist the labials to closely match positional perception.

No compensatory lengthening in OE after loss of /x/ after /l r/
Manchester Phonology Meeting 19

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This paper challenges received analyses which assume that there was compensatory lengthening (CL) in Old English after the loss of /x/ after /l r/. First, there was in all likelihood no CL in this environment: there is no internal or external evidence for it. Second, CL involving non-adjacent segments is rather problematic. While Harris (2007) claims compensatory lengthening to occur between neighbouring segments (see also Sagey 1986, etc), precisely such processes are reported in the well-argued paper by Wetzels (1986) from dialects of Ancient Greek (*cf* Bickmore 1996 too).

The data in (1a) illustrate CL as presented in classic handbooks of OE such as Campbell (1959), Hogg (1992), *Sweet's Anglo-Saxon Primer* or *Bright's OE Grammar & Reader*, while those in (1b) present the data as they are preserved in the documents:

(1a) *m***ea***r***h** – *m***ēa***res* 'horse; NomSG – horse; GenSG'
*w***ea***l***h** – *w***ēa***les* 'foreigner; NomSG – foreigner; GenSG'

(1b) *m***ea***rh* – *m***ea***res* 'horse; NomSG – horse; GenSG'
*w***ea***lh* – *w***ea***les* 'foreigner; NomSG – foreigner; GenSG'

The difference between (1a) and (1b) lies in the assumed lengthening of the stem vowel in forms where /x/ is deleted. Indeed, long vowels here are unwarranted and unmotivated: only /x/ is deleted.

The paper first demonstrates that we have no hard evidence at our disposal to claim that CL did actually take place in OE. This is already pointed out by Quirk & Wrenn (1957: 137) who write that evidence is 'inconclusive' and that the problem has not received proper attention. According to Campbell (1959), 3 types of (internal) evidence can bear on this issue: place-names, metre, and orthography. Even he admits (1959: 104, 140 225) that none of these provides conclusive evidence for CL in this environment: evidence points to short vowels in *h*-less forms. External, comparative, evidence also casts doubt on a possible CL: for instance, Bremmer (2009: 37) in his *Introduction to Old Frisian* explicitly claims that 'medial *h* after the consonant *l* or *r* was lost without compensation' (although data are fairly scarce for OFris).

The problem with the presumed OE CL is how to represent CL in this configuration:

(2) V{/r/,/l/}/x/V > VV{/r/,/l/}V

The OE data could be viewed as an illustration of CL where 'onset deletion can trigger CL of the vowel in the preceding syllable' (Wetzels 1986: 310) like in Eastern Ionic dialects of Anc Gk: **o***d***w***os* > **ō***dos* 'threshold', *ks***e***n***w***os* > *ks***ē***nos* 'stranger'. This analysis would certainly be tempting, if only OE had CL in this environment.

The OE data have been discussed by Opalińska (2004) in terms of Derivational OT. Her analysis crucially relies on mora preservation throughout the derivation and calls the process 'opaque type of CL' (as opposed to transparent CL as in *f***eo***h* > *f***ēo***s* 'money; NomSg – GenSg'). In Standard OT, her tableau (7) (2004: 244) already gives the *correct* output candidate in my view, with 1 μ over the stem *short* vowel and 1 μ over the suffix (she had !☞ for this candidate). However, she is pushed on to DOT tableaux (8-9) in 2 layers simply because her assumption was that there was CL in this case. But interestingly, Standard OT gives the result that there was no CL, and this is in line with the historical evidence.

I am not claiming that theoretical solutions *à la* Wetzels or in terms of DOT may not be called upon to explain sets of data, but relevant data need to be found because the OE deletion of /x/ after /r l/ does not trigger CL of the preceding vowel.

"Heaviness" as evidence for a *derive-and-compare* grammar

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Overview. "Heaviness" is a notion frequently invoked to explain grammatical output that deviates from canonical behavior on account of its relationship with a heavy syntactic constituent. Previous research has suffered from the lack of a precise theory of what heaviness is, as demonstrated by the quotation marks that tend to accompany the term. In this paper, we argue that **heaviness is a scalar phonological variable** measured by the number of prosodic units. Furthermore, we argue that **heaviness effects are manifestations of prosodically-motivated preferences**, and as such are fundamentally different from the grammar that builds syntactic structure.

In light of this, we propose a grammatical architecture which consists of two modules: one in which rule-based grammars derive possible options, and a separate system consisting of a hierarchy of constraints which compares the options and arbitrates the outcome. We present two case studies of heaviness effects to support this position: a study of extraposed relative clauses in Icelandic, and a study of auxiliary contraction in English.

Zeroing in on the "heaviness" effect. We first refine the nature of heaviness:

- **Heaviness is not an effect of information structure or syntax.** We argue that a theory that attributes heaviness effects to discourse status or to structural complexity makes unattested predictions.
- **Heaviness is not a binary feature.** We show that there is a very robust linear effect between the rate of extraposition and the length (in words) of a relative clause in our data set from the IcePaHC corpus (Wallenberg et al., 2011). This effect supports a treatment of heaviness as a scalar or continuous variable. We attribute this effect to phrase length in words (cf. Stallings, et al., 1998; Shih & Grafmiller, 2011).

Outlining a grammatical architecture. We model the grammar as consisting of two distinct systems: one which derives grammatical strings via ordered rules, followed by a filter component that evaluates grammatical outputs and picks the one that is optimal given some set of preferences.

- **Rule-based derivational component.** We follow two camps in our rejection of a constraint-based derivational component: Embick (2010), who argues that a globalist derivational component overgenerates patterns of allomorphy that are in fact unattested; and the large body of literature that rejects non-rule-based derivational components on the grounds of opacity. However, the combination of gradience and a sharp cutoff found in our data is difficult to account for in a rule-driven generative component; hence, the second component of our model.
- **Comparison-based evaluation component.** Our argument for comparison-based filtering comes from a corpus study of variable auxiliary contraction in English (e.g., Kaisse, 1983). We present data demonstrating a sharp cutoff in the use of contracted auxiliaries when the preceding subject reaches a heaviness of 8 words. We account for this heaviness effect using a hierarchy of constraints, specifically a model in which a cutoff point distinguishes between categorical decisions and decisions about relative acceptability (Coetzee 2004; 2006). We propose such a cutoff point between the markedness constraints that disfavor contracted auxiliaries after subjects of 8 and 9 words.

Our results support a theoretical model in which structure-building takes place in multiple computationally efficient, locally-oriented rule grammars, with comparison-based filtering, based on a hierarchy of constraints, arbitrating the final outcome.

Onset cluster reduction in Moroccan Arabic and Berber

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This paper considers the reduction of complex onset clusters by children acquiring Moroccan Arabic and Tashlhiyt Berber phonology and asks what child data can tell us about theories attempting to explain such complex onsets.

Cluster reduction in child phonology has been widely discussed and the patterns that emerge seem to be very similar across languages. The most prevalent is the retention of the less sonorous sound from the pair in conformity to Clements (1990) Core Syllabification Principle. Evidence for this pattern can be found in languages where the input contains only canonical obstruent + sonorant clusters such as French (Rose 2000) and Portuguese (Freitas 2003). Goad & Rose (2004) discuss two patterns emerging in the acquisition of what they term 'left-edge clusters in West Germanic languages (English, Dutch and German). One, which they name the 'sonority pattern' ensures that the less sonorous sound from the input is retained. Clearly this pattern is evident in the languages mentioned above and would cause the retention of a stop from an s+stop cluster as well as from an obstruent + approximant cluster. The other pattern, described as the 'head pattern' makes the same predictions as the sonority pattern except that the sonorant from an /s/ sonorant cluster is retained. This is because the /s/ is analysed as an adjunct to the syllable of which the sonorant is the head.

Moroccan Arabic exhibits left-edge clusters of rising sonority (/kla/ eat), falling sonority (/rkel/ 'kick', /lqa/) and flat sonority (/kteb/ 'write', /mnam/ 'dream'). Boudlal (2001) suggests that MA has respects a *COMPLEX constraint and analyses the initial sound in any of these clusters as a 'minor syllable'. Only the second consonant is the onset to the main syllable. A similar explanation could be advanced for Tashlhiyt where the syllable is maximally five segments (Dell & Elmedlaoui 2002). In a sequence of segments the one with the highest sonority value is attached to the nucleus and segments to its left are attached to the onset node, which is maximally two segments. These can be of rising sonority (/kraD/ 'three', /dru/ 'share'), falling sonority (/rku/ 'be dirty' , /ndu/ 'churn') or flat sonority (/kti/ 'remember', /bdu/ 'start'.

We discover that, where the cluster is of flat sonority – for example /kt/ - the learner will opt for the second of the input segments. Otherwise, they opt for the less sonorous. If we accept the minor syllable analysis we would have to claim that the second segment on the left is the 'head' since the minor syllable is outside the main syllable (as in the case of /s/ + sonorant) clusters. This analysis can account for the reduction of the flat sonority syllable and for that of falling sonority, but fails to account for the case of rising sonority.

Edgemost Faithfulness

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Positional Faithfulness (PF; Beckman 1997, 1998) is a standard account of distributional asymmetries in phonology. Initial syllables (Beckman 1997), onsets (Lombardi 1999) and roots (Baković 2000) often allow more contrast than other positions, which is attributed to PF constraints specific to those positions. In this paper, I argue that PF should be extended to the segment closest to a domain edge.

Distributional asymmetries are readily found in voicing assimilation. Typically, voicing of an obstruent cluster is determined by the rightmost obstruent. Since the rightmost obstruent is in the onset, Lombardi (1999) attributes the effect to onset faithfulness. Her approach falls through when complex onsets are considered. As a solution, Rubach (2008) proposes prevocalic/presonorant faithfulness, which preserves voicing of the obstruent in the position before a vowel/sonorant. However, his proposal fails to account for prepausal obstruent clusters.

In Hungarian, voicing of an obstruent cluster is determined by the rightmost, presonorant obstruent (1-a). In prepausal obstruent clusters, voicing is also determined by the rightmost obstruent (1-b), even though no sonorant follows. In languages like Hungarian, Prevocalic Faithfulness correctly predicts phrase-internal voicing assimilation (2-a), but fails to explain why the prepausal positions exhibit the same pattern (2-b).

In response to this challenge, I propose an additional PF constraint that is specific to the rightmost obstruent within a domain (3). Rightmost Faithfulness is grounded in the cognitive (McCarthy & Prince 1993; Beckman 1998; Bye & de Lacy 2000) and phonetic (Klatt 1976) prominence of domain edges. The effect of Rightmost Faithfulness on a prepausal obstruent cluster is shown in tableau (4). IDENT-R$_{Obs}$(voice) preserves voicing of the final obstruent.

In voicing assimilation, the effect of Rightmost Faithfulness is apparent in the absolutely prepausal position. Other patterns suggest that it is the segment closest to an edge that matters. In Inseño Chumash (Applegate 1972; Poser 1993), sibilants within a PWd agree in terms of anteriority, which is determined by the rightmost sibilant, even if several syllables away from the edge. In Turkana (Noske 2000), vowel harmony depends on the rightmost vowel within a PWd, while in Shona (Beckman 1997) vowel harmony depends on the leftmost vowel in the root. In short, Edgemost Faithfulness is cross-linguistically well supported.

(1) Hungarian voicing assimilation (Siptár & Törkenczy 2000:78 and own data)

a. **Presonorant** obstruent determines voicing of a cluster

viːz̲-nɛk	'water-DAT'	viːs̲-**t**øːl	'-ABL'	viːz̲-**b**ɛn	'-INESS'
lɒkaːʃ̲-nɒk	'flat-DAT'	lɒkaːʃ̲-**t**oːl	'-ABL'	lɒkaːʒ̲-**b**ɒn	'-INESS'

b. **Final** obstruent determines voicing of a cluster

ɒz̲-ok	'that-PL'	ɒs̲-**t**	'that-ACC'	ɒz̲	'that'
aːʃ̲-nɒk	'dig-3PL'	aːʒ̲-**d**	'dig-IMP.2SG'	aːʃ̲	'dig'

(2) a. Prevocalic Faithfulness works

/apda/	ID$_{PreV}$	AGREE	ID	*VOIOBS
apda		*!		*
☞ abda			*	**
apta	*!		*	

b. . . . except before a pause

/apd/	ID$_{PreV}$	AGREE	ID	*VOIOBS
apd		*!		*
☹ abd			*	*!*
☞ apt			*	

(3) IDENT-R$_{Obs}$(voice)
The Rightmost *Obstruent* in the output and its correspondent in the input must have identical values for the feature [voice].

(4) The effect of Rightmost Faithulness

/apd/	ID-R$_{Obs}$	AGREE	ID	*VOIOBS
apd		*!		*
☞ abd			*	**
apt	*!		*	

Segmental Substitution Patterns in Child Language and Aphasia

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A salient characteristic of both child language and aphasia is that target segments are often produced unfaithfully. In this study, we show that these substitution patterns are not random; we also show to what degree both groups perform alike, and where differences occur.

Background. The Regression Hypothesis (Jakobson 1941/1963) states that language attrition in aphasic patients mirrors stages of language acquisition in children. It has been shown (Linke 2011) that this claim has to be rejected on the segmental level. However, in the same study interesting feature-based patterns have been found underlying segment substitutions in aphasic language. For the present study, the same methodology has been applied to child language acquisition data. The results enable us to compare the sub-segmental substitution patterns of aphasics and children, thus allowing for the investigation of a more sophisticated version of the Regression Hypothesis.

Data. The child language data comes from five monolingual Dutch children in the CLPF (Fikkert 1994, Levelt 1994) corpus. The corpus contains spontaneous speech recorded roughly at biweekly intervals, starting from on average 1;8, for a mean period of 10 months. Data were taken at two points in the children's development: the stages at which their productive lexicon contained at least 100 or at least 500 words.

The aphasic language data stems from recordings of standardized clinical tests (e.g. Akense Afasietest 1992, PALPA 1995) of eight native Dutch aphasic speakers (all diagnosed with a phonological impairment, but no impairment of articulatory or auditory organs) that were provided by Rijndam Revalidation Center (Rotterdam, Netherlands). Only recordings of non-spontaneous speech collected during naming, repetition and reading task therapy sessions were used due to the requirement of unambiguous target-actual word/phrase pairs.

Methodology. For each subject group, every segment in the consonant inventory of Dutch (e.g. Booij 1995) was compared with all of its actual realizations. This was done separately for onset and coda positions of monosyllabic words, to begin with. This yielded target-actual confusion matrices that were subsequently analyzed to determine the relative error frequency as a function of feature-based phonemic distance. Phonemic distance was measured using the PMV metric (e.g. Bailey & Hahn 2005). The contribution to the relative error frequency of each of the three dimensions (Place of Articulation, Manner of Articulation, Voice) was subsequently measured for both positions and each group.

Results. All groups show a non-random pattern of segment-for-segment substitutions. In all cases, the relative error frequency shows a decline for increasing phonological distance. A comparison between the younger and older children reveals that the latter perform better over all. Furthermore, for both child groups, there is an important difference between single dimensional errors, i.e. errors of only PoA, MoA or Voice, and errors that involve multiple dimensions, in that the latter occur far less often. The aphasic patients pattern with the older children, but show less sensitivity to phonological distance.

Conclusions. The data reveal that neither aphasics, nor children at various developmental stages show random substitutions. Our results resemble findings by White & Morgan (2008), who showed gradient sensitivity of infants to increasing degrees of mispronunciations in perception studies. So, although the Regression Hypothesis is too strong when considered at the segmental level, new and interesting results can be found in the sub-segmental domain.

Ordering Restrictions in Aymara: the role of contrast

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This talk provides an account of restrictions on the distribution of laryngeal features in Peruvian and Bolivian Aymara. The analysis argues both for modeling phonological patterning through the interaction of ranked, violable constraints, as in OT (Prince and Smolensky 2004), and for contrastively specified representations. While restrictions on representations are generally rejected in OT analyses, I demonstrate that contrastively specified outputs can be achieved through constraint ranking. I adopt the theory of the contrastive hierarchy according to which contrastive specifications are determined through hierarchical ordering of features with some features taking scope over others (Dresher 2009).

Peruvian and Bolivian Aymara both have a three-way laryngeal contrast among stops with plain stops, aspirates and ejectives. Both varieties of Aymara are subject to restrictions on the cooccurrence and ordering of ejectives and aspirates. In Peruvian Aymara, ejectives and aspirates must be the leftmost stop in a form (1a). Multiple aspirates and ejectives are not permitted and aspirates and ejectives are also barred from occurring with one another (1b).

1a.	k’anta ‘wheel’	qʰatu ‘market’	sirk’u ‘nerve’	(from MacEachern 1999)
	*kant’a	*qatʰu	*pirk’u	
b.	*k’ant’a	*qʰatʰa	*k’antʰa	

The Bolivian dialect has similar restrictions but the constraints on aspirates are less stringent. In Bolivian Aymara, multiple ejectives may not cooccur but multiple aspirates can (2a) as can combinations of aspirates and ejectives. Generally, when aspirates and ejectives cooccur, the ejective precedes the aspirate (2b). As in Peruvian Aymara, if a form contains only a single aspirate or ejective, it is the leftmost stop.

2a. pʰutʰu ‘hole, hollow’ b. tʃ’ipʰa ‘leather net’

Ordering restrictions and cooccurrence constraints in Peruvian and Bolivian Aymara are analyzed as resulting from the interaction of constraints on the distribution of marked features. These constraints crucially refer only to features which are designated as contrastive through a contrastive hierarchy. Differences between the dialects result from simple constraint reranking.

Additional constraints are needed in order to capture the relative order of aspirates and ejectives in Bolivian Aymara forms containing both. In the general case, ejectives precede aspirates. However, if the initial stop is a labial, the order of laryngeal features is reversed with the aspirate preceding the ejective as shown in (3).

3. pʰant’a ‘black coat’ pʰitʃ’i ‘coat pin’

This is a case of emergence of the unmarked. Ejective labials are permitted in general but are avoided in just those cases where aspirates and ejectives cooccur. In analyzing the interaction of place and laryngeal features in Bolivian Aymara, I follow MacEachern (1999) who argues that ejective labials are articulatorily difficult and typologically marked, thereby motivating use of the markedness constraint *p’. While the existence of *p’ is well-motivated, determining its place in the constraint hierarchy leads to an apparent ranking paradox. The paradox can be resolved by crucially relying on contrastive representations consistent with the theory of the contrastive hierarchy.

TETU effect in a DEE pattern

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The regular realm of vowel harmony in Assamese consists of right-to-left regressive [ATR] vowel harmony. However, a pair of morphemes allows raising of the otherwise opaque vowel /ɑ/ and fronting/backing of /ɑ/ depending on the [Back] quality of a mid vowel adjacent to /ɑ/. Raising is strictly local in the presence of preceding high and low vowels; and there is another pattern which shows backness assimilation to a previous vowel, if there are mid vowels preceding the /ɑ/ of the input. Exceptional raising occurs to allow [ATR] harmony to spread regressively by changing the [–ATR] low vowel into a [+ATR] mid vowel. The paper shows that an emergence of the unmarked analysis is required to account for the low back vowel which alternates with a front vowel if there is a preceding front vowel. /ɑ/ undergoes regressive [+ATR] harmony and occasionally progressive [Back] harmony, and both of these occurrences happen in the presence of /–ijɑ/ and /–uwɑ/ (although progressive [Back] harmony is not directly dependent on /–ijɑ/ and /–uwɑ/, but rather on a raised /ɑ/). The locality conditions are such that /ɑ/ becomes [+ATR] only if the following vowel is a part of [–ijɑ] or [–uwɑ]. /ɑ/ agrees in backness with a preceding mid root (but not prefix or high/low) vowel, if one exists; else /ɑ/ maps to [o]. For example, compare /ɑlɑx/ ‘luxury’ and /ɑlox-uwɑ/ ‘pampered’ with /ɛlɑh/ ‘laziness’ with /ɛleh-uwɑ/. I argue below that the derived environment effect (DEE) in Assamese is not necessarily blocked in non-derived domains. The Assamese derived environment effect shows that there is no active blocking in non-derived environments and there is a paucity of data showing the relevant trigger and target occurring in that environment. Apart from the absence of non-derived [e...o] sequences, even in derived domains the phonological DEE is the result of a derived environment created by the presence of an exceptional morpheme. Wherever the boundary of the trigger and target span a morpheme boundary, the DEE is not seen. The accidental gap of the absence of [e…o] in roots in the phonology of Assamese is not so accidental, and the reason for this gap may be assigned to a constraint prohibiting unbridled occurrences of front and back mid vowels. Therefore, we posit a licensing constraint prohibiting instances of the mid back vowel in non-licensed positions - LICENSE [–High –Low +Back] which licenses [–High –Low +Back] in the root and/or in the root-inital position. ROOT–INITIAL IDENT[Back] (which assigns a violation mark if the root initial vowel changes its value for [Back]) allows backnesss assimilation only if the vowel belongs to the root. ROOT–INITIAL IDENT[Back] protects the alteration of underlying [Back] vowels. Thus, the markedness constraint conflicts with the faithfulness constraint which has the function of preventing /ɛ/ from alternating with the back vowel [ɔ]. A markedness constraint which has been dormant till now becomes active and this gives us the emergent pattern under analysis in this paper. The blocking of [o] leads to an emergent harmony pattern, which can be accounted for by the ranking ROOT FAITH » M » FAITH in the OT model. Within OT, approaches like that of local conjunction and comparative markedness try to address the difficulties presented by a process which is sensitive to a phonological derivation or a morphological boundary. We will show how these approaches would founder with the data encountered in Assamese.

On the Learnability of English Word Stress:

How to Harmonize a Polish English Stress System?

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This paper outlines a constraint-based model to the learnability of English word stress in a context of Polish English (henceforth PE). The model is built on Optimality Theory (OT) assumptions (Prince and Smolensky 1993/2004, McCarthy 2003 a) and supplied with some elements of other approaches like Harmonic Grammar (HG) (Boersma and Pater 2008). The nature of the model is to explain a mechanism of PE stress patterns on both theoretical and empirical grounds in terms of OT-theoretic constraint rankings. The proposal combines the insight that feet are minimally binary and syllabic rather than moraic but weight sensitivity is shown to be positional (within the foot). Moreover, an interpretation of PE stress behaviour is outlined by means of adopted tools of Gradual Learning Algorithm (GLA) (Boersma 1997) and (HG).

Earlier studies on PE stress variation (Marczak 2007, 2009) indicated that certain productive regularities can be found in a momentary, unstable PE stress system. It will be shown that empirical data obtained in a study on PE stress production can be interpreted in terms of an OT-theoretic constraint ranking algorithm (Marczak 2009), but at the same time can be explained as a developmental stage of PE stress learnability. The PE stress system is observed as a snapshot system here. Its inherent OT constraint rerankings, which take place in a process of English stress learnability, are analyzed by means of certain regulations of sensible constraints, which undergo a constant mobility of constraint promotion and demotion. Sensibility of constraints are interpreted as attested stress shift alternations of the PE production in the following stages:

(1) At an early stage: ‘from antepenult to penult’ which essentially follows the Polish stress system (fre’quency, abi’lity).
(2) At a later stage: ‘from penult to antepenult’ ‘consensus, ‘develop).

Data obtained in experiments (Marczak 2007, 2009, 2010, 2011) show constant alternations in stress production between trochaic and dactylic foot types which appear to constitute a pair of two free variants : TROCHAIC and DACTYLIC in the PE stress grammar. TROCHAIC is identified as a similar prosodic structure existing in both systems: PE and EE, therefore as a positive parameter setting (Altmann 2006) may cause a major difficulty in a PE learning process and resulting in a frequency of PE stress variation.

Dependencies in Rounding Harmony

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Labial harmony is typically sensitive to height specifications (e.g. Yawelmani) and often co-occurs with palatal harmony (e.g. Turkish), while labial harmony operating on its own seems to be rare or non-existent (Krämer 2003).

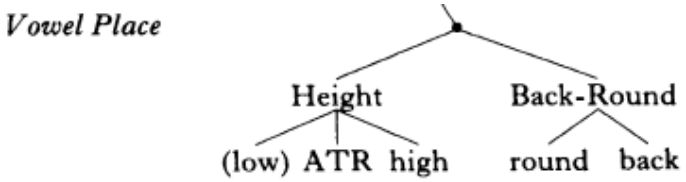
I will argue that the framework of Radical cv Phonology (Van der Hulst 2005, MS), which draws on Dependency Phonology (Anderson & Ewen 1987), restricts the set of possible vowel harmony patterns to those that are attested, thus excluding vowel harmony patterns that do not occur. I assume that the following four elements are involved in rounding harmony, which have a dual interpretation, depending on their status as heads or dependents (Den Dikken & van der Hulst 1988):

(1)

	Head	*Dependent*	
|∀|	ATR	high	aperture
|A|	low	retracted	aperture
|U|	back	round	color
|I|	front	--	color

Odden (1991) argues for a feature geometry in which the vowel place features divide into two branches: Back-Round, and Height:

(2)



The grouping of [back] and [round] follows naturally from the system developed here, since they belong to the same element, i.e. |U|. Similarly, the equivalent to Odden's Height node ([ATR], [high] and [low]) would be "aperture". Furthermore, although each of the four elements can occur in vowels or in consonants, there is an affinity of |A| and |U| to be in the syllable nucleus (they are 'vocalic'), while |∀| and |I| prefer syllable margins (they are 'consonantal').

Vowel harmony is regarded as lateral licensing of a variable element '(ε)', that is encoded as such in the phonological representation of lexical items, by an instance of that same element ε on an adjacent segment. Furthermore, height restrictions operating on labial harmony are subject to the Head-Dependent Asymmetry (Dresher & van der Hulst 1989), which requires the head to be more or equally strong than its dependent, which in effect rules out a consonantal (|∀|) trigger and vocalic (|A|) target. In addition, there seems to be asymmetry between the licensing of head elements and dependent elements: if the head of an element can be licensed, then the dependent of that element can also be licensed, but not vice versa. Notably, this accounts for the interaction between |I| and |U|; in front vowels, the labial element |U| is in a dependent position, which is a better configuration for licensing (i.e. vowel harmony).

References: Anderson, J.M. and C.J. Ewen (1987). *Principles of dependency phonology*. Cambridge: Cambridge University Press. • Dikken, M. den and Hulst, H.G. van der (1988). Segmental hierarchitecture. In: H. van der Hulst and N. Smith (eds.). *Features, segmental structure and harmony processes*. 1-59. Dordrecht: Foris. • Dresher, E. and H.G. van der Hulst (1998). Head-dependent asymmetries in phonology: complexity and visibility. *Phonology* 15. 317-352. • Hulst, H.G. van der (2005). The molecular structure of phonological segments. In P. Carr, J. Durand and C. Ewen (eds.), *Headhood, elements, specification and contrastivity*. 193-234. Amsterdam: John Benjamins Publishing Company. • Krämer, M. (2003). *Vowel Harmony and Correspondence Theory*. Berlin/New York: Mouton de Gruyter. • Odden, D. (1991). Vowel geometry. *Phonology* 8. 261-289.

Salience in sociophonetics – a case study of Hungarian hiatus resolution

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It is a widely accepted fact in sociolinguistics that listeners are able to exploit certain systematic dialectal differences to guess the speaker's background, while other such differences remain unnoticed (Labov, 1972; Foulkes & Docherty, 2006). This is mostly observed for the realisations of phonological variables. The difference is widely attributed to salience (Kerswill & Williams 2002 and references therein): listeners only pick up on variables with salient realisations. Despite the large body of research on the subject, the empirical concept of salience remains elusive, and so it is difficult to predict which variable will be singled out by language users. This is a theoretically relevant question, since variables with salient realisations behave differently in language change (cf. Tagliamonte & Roeder 2009 on definite article reduction in York). This paper offers an operationalisation of salience based on probability distributions of segmental realisations of phonological variables. The method is illustrated through the example of hiatus resolution in Hungarian.

Conservative Standard Hungarian (CSH) has two hiatus resolution patterns, an obligatory one in vowel clusters with [i] and a variable one in clusters with [e:]. Innovative SH has a third, variable pattern, in clusters with [ɛ]. The intrusive segment is always [j] (Siptár & Törkenczy, 2007). This is illustrated in the table below. An attitude test performed with ten native speakers of CSH shows a significant rejection of hiatus resolution in case III, whereas no such tendency is observable in cases I-II. This strongly suggests that case III hiatus resolution is salient in CSH.

I. [i]V/V[i]	fiú női	[fiju:] [nø:ji]	'boy' 'female'
II. [e:]V/V[e:]	büféasztal ráér	%[byfe:jɒstɒl] %[ra:je:r]	'buffet table' 'to be at leisure'
III. [ɛ]V/V[ɛ]	tea beakad	%%[tɛjɒ] %%[bɛjɒkɒd]	'tea' 'gets stuck'

My hypothesis is that the variable's salient realisation follows from the rarity of the involved segmental strings [ɛj]/[jɛ] *vis-à-vis* the strings involved in non-salient hiatus resolution, namely, [ij]/[ji] or [e:j]/[je:] in CSH. In order to test this claim, a frequency search was performed on a 17 million word-sample of the Hungarian Webcorpus (Halácsy et al., 2004). The corpus is written, and there is no reliable data on variable hiatus resolution, so clusters of the form V[i]/[i]V and V[ɛ]/[ɛ]V were used as a basis of comparison. This is because, in CSH, hiatus resolution is obligatory in the former and absent in the latter – [ɛj]V/V[jɛ] sequences are possible, but will not occur through hiatus resolution. The results show that the [ij] pattern is roughly ten times as frequent as the [ɛj] one. This means that the probability of a [j] following an [ɛ] is much smaller than that of a [j] following an [i]. As a result, the former sequence is more surprising for the listener than the latter one. This stands despite the fact that [j] is also a contrastive segment in Hungarian, and occurs regularly next to [ɛ].

This method of operationalising the salience of the realisation of variables is relevant to phonologists in two ways: first, it assumes a prior phonological segmentation, and second, in language change, it predicts a divergent behaviour for variables with different segmental distributions. In any case, it supplies us with a hitherto lacking tool in investigating the relationship of salience and social language use.

Latin rhotacism: a case study in the life cycle of phonological processes

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Rhotacism in Latin is a well-known phonological generalisation which, in its paradigm cases, can be stated simply as "intervocalic /s/ is realized as [r]". It has attracted scrutiny, however, because of a number of apparent under- and over-generations with respect to the basic rule. The goal of this paper is to demonstrate that these "exceptions" are due to the fact that the historical record attests multiple diachronic stages of the language, throughout which rhotacism follows the standard progression through the life cycle of a phonological process (see Bermúdez-Otero 2011): its domain of effect shrinking as it moves from the word- to the stem level, before it finally becomes a systematic property of the lexicon.

There is an apparent paradox in the treatment of *miser* 'wretched', where rhotacism seems to be blocked by dissimilation against the nearby [r], as compared with *soror* 'sister' $<$ **swesor* (cf. German *Schwester*). Then again, in transparently morphologically complex words exceptions to rhotacism are regularly found at morpheme boundaries: *dē-siliō* 'I jump down' (cf. *saliō* 'I jump'), *nī-sī* 'unless' (cf. *sī* 'if') (see Leumann 1977 §180).

I propose the following progression of constraint rankings and levels for Latin rhotacism:

Stage	Result
Stage 0: phonetic tendency	/s/ $\rightsquigarrow$ [z]
Stage 1: phrase level	/s/ $\rightarrow$ [z] / V__V
Stage 2: word level	/s/ $\rightarrow$ [z] / r(μ)__
	[z] / __(μ)r
	[r] / V__V
Stage 3: stem level	/s/ $\rightarrow$ [r] / V__V
Stage L:	lexically stored exceptions

Following Allen (1978), I assume that rhotacism began with a phonetic tendency for intervocalic fricatives to be voiced. I argue that this became formalised in the phrase-level phonology. With the ascent of the process to the word-level came a change of repair strategy: rather than voicing, /s/ was made a sonorant [r], giving the observed pattern of rhotacism.

I claim that the voicing repair strategy continued to be selected in forms like *miser* due to a constraint against co-occurring instances of [r] separated by no more than one mora. This is parallel to the case of syllable-adjacent dissimilation in Yimas discussed by Suzuki (1998). This constraint was subordinated to faithfulness, however, in cases where the co-occurring /r/s were already present in the UR: I argue that, in default of an alternating form with [s], the [r] in *soror* was part of the UR by lexicon optimization, whereas in *miser*, the presence of the related participle *maestus* 'lamented' was sufficient to cause /s/ to be retained in the UR.

This claim, that [r] continued to be recognised as an exponent of underlying /s/ wherever alternants with [s] were available, is crucial to explaining why we have [s] in compounds such as *de-siliō* and *nī-sī*: the UR remained /s/ throughout Stage 2, so that when rhotacism reached the stem level, the environment ceased to be apparent.

Finally, rhotacism came to be lexicalised, and did not affect late loan-words with intervocalic [s], such as such as *basis* 'pedestal' (from Greek), or *cisium* 'cabriolet' (from Gaulish). Its domain could also be extended gradiently by paradigm levelling, as in *honōr* 'honour', formerly *honōs* (but never **mōr* from *mōs* 'custom').

Tonal coarticulation as prosodic boundary marker in Wenzhou Chinese

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The articulation of segments is known to be influenced by the prosodic structure into which an utterance is organized. For example, the degree of segmental coarticulation correlates to a large extent with the level of the prosodic boundary that intervenes between the two segments (e.g. Cho 2004). In this report, we will show that a similar effect of prosody-conditioned coarticulation applies to tonal realizations in Wenzhou Chinese.

It is well known that in tone languages, lexical tones can be influenced by neighbouring tones both in a categorical and gradient manner. While the first process, commonly known as "tone sandhi", has been widely documented to be dependent on prosodic structure (Selkirk and Shen 1990; Shih 1997; Chen 2000), the connection between gradient tonal coarticulation and prosodic structuring is less clear. The goal of the present study is to systematically investigate the degree of tonal coarticulation in different prosodic and tonal contexts.

In this study, two types of trisyllabic phrases were investigated. They comprised adverb-verb constructions, which are typically prosodified as two prosodic phrases $((adv)_{\varphi}(v)_{\varphi})$, and verb-object constructions, which are prosodified as a single phrase $((v)_{\omega}(n)_{\omega})_{\varphi}$. Furthermore, two types of contour tones (rising/falling) were included as stimuli, as they provide clear test cases for tonal coarticulation. Monosyllabic words with these contour tones were placed in initial and final position in the trisyllabic phrases, in two different tonal contexts: Conflicting (e.g. a rising tone followed by a low tone), and compatible (e.g. a falling tone followed by a rising tone) contexts (following Xu 1994).

(1) Initial position, both conflicting tonal context

a. Adverb (Verb-verb)	***ji24*** *(kong22-poe33)*	'already announce'
b. Verb (Noun-noun)	***ma24*** *(huo22-dou33)*	'buy soybeans'

(2) Final position, both compatible tonal context

a. (Adverb-adverb) Verb	*(tchang42-ji31)* ***ma24***	'buy every day'
b. (Verb-verb) Noun	(*si42-chy31)* ***ma24***	'like horses'

Our results show that in conflicting contexts, the tones on the monosyllable in the adverb-verb constructions retained their falling/rising contours more clearly, whereas the tone trajectories on the monosyllable in verb-object constructions were flatter. We interpret the flatter tone trajectories to be a result of greater coarticulatory adjustment to the preceding/ following tone, which would speak for a greater amount of tonal coarticulation between prosodic words than prosodic phrases. This lends support to the view that the magnitude of tonal coarticulatory adjustment varies systematically with the strength of the prosodic boundary that intervenes between the two coarticulated tones.

Frequency Effects within Grammatical Categories

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Generative phonology, based on the notion of "grammar", has proven very successful during the last decades. Simultaneously, usage-based theories, which concentrate on lexical modelling, have gradually gained ground. Assuming that both theories are essential for a full understanding of the structure and use of language, an increasing effort to develop complementary models can be observed (e.g. Smolensky & Legendre 2006, Ernestus 2009, van de Weijer 2009). One of the central issues in these hybrid models is to account for the transmission of information from the lexicon to the grammar and vice versa, i.e. how much and which lexical information passes through the grammar in production and which types of information are stored in the lexicon. However, there is a tremendous lack of agreement on the question how usage and grammar interact exactly. An important aspect of usage is the frequency with which forms are used. What is the nature of the intersection between grammar and frequency? What exactly is the division of labour between "grammar" and "lexicon"? The function of the lexicon can be reduced to two processes: storage and categorisation (Bybee 2010:8). From this perspective, effects of language use surface as processes which apply across all categories, e.g. reduction and coarticulation under the influence of high speech rate, high frequency words or informal register. If, on the other hand, particular processes apply within certain categories, we usually refer to them as part of the grammatical system, e.g. nasal place assimilation in a particular prefix. However, in language variation and change, grammatical processes often do not affect a category as a whole, but only partially. We might therefore expect frequency effects to occur *within* a particular grammatical category. This paper provides an example of this type of interaction. It shows that experimental approaches are particularly well suited to gain an understanding of how lexical and grammatical information are entangled, contributing to current phonological modelling.

A sentence shadowing task was conducted to investigate the pronunciation of /ɛː/ in standard German in south-west Germany. This vowel can be pronounced as either [ɛː] or [eː]. The /ɛː/ can be lexically underlying as in *Träne* 'tear' or the result of umlaut, e.g. in diminutives such as *Rad ~ Räd-chen* 'wheel.DIM' and plurals *Grab ~ Gräb-er* 'grave.DIM'. It is shown that in a particular group of (highly educated) speakers, umlauted /a/ is more likely to be pronounced as [ɛː] and lexical /ɛː/ as [eː]. Furthermore, frequency effects affect pronunciation, such that the words with the lowest frequency (LF) have a relatively high pronunciation, moderately frequent (MF) words have a relatively open pronunciation and high-frequency (HF) words also have a relatively high pronunciation. This U-shaped frequency effect occurs across all stimuli. Since diminutives, as a class, are very infrequent (their log frequency range is 0.182-3.230, whereas the log frequencies of the roots range from 2.403-4.400), one would expect that the vowel of the HF diminutives is pronounced in the same way as roots with the same frequency. However, this is not the case; *within* the class of LF diminutives we find a similar U-shape frequency effect as in roots and plurals.

This U-shaped frequency effect calls for a complementary model of lexicon and grammar, in which (OT-like) competition plays an important role. Strong lexical representations (HF words) win out over a relatively weak phonological process. LF words are not susceptible to the rule because of their weak ties to the category, and therefore they are pronounced with the 'default' [eː], which is by far the most frequent mid front vowel in German. The diminutives show the same pattern as the other words, but stand apart as a class, because the here umlaut is also involved. This results in a competitive model in which weighted constraints, a measure for lexical strength and neighbourhood strength all play a role.

Vowel Harmony in Votic and Lokaa

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In this talk we will analyze the essentials of two vowel harmony systems, that of the Finnic language Votic (Ariste 1968) and the Benue-Congo language Lokaa (Akinlabi 2009). These languages are of interest in that they both possess both types of neutral vowels defined in Van der Hulst & Smith (1986), viz. transparent and opaque. Transparent vowels are – apparently – invisible to harmony. Opaque vowels block the passage of harmony. We will show that both types of harmony systems receive a straightforward interpretation in an approach which combines insights from Dependency Phonology and Optimality Theory.

Votic has left-to-right palatal (front) harmony, which in our approach involves the harmonic element |I| in a *head* position. In Votic, the vowel /i/ is transparent. However, a word containing only /i/ conditions front harmony on a following suffix, e.g. /siili-ssææ/ 'hedgehog-ELATIVE'. In this respect Votic differs from Finnish, where a minority of /i/-words are disharmonic, i.e. do not trigger front harmony.

Lokaa has right-to-left ATR harmony, which in our approach involves the harmonic element |I| in a *dependent* position. In Lokaa, the high ATR vowels /i, u/ are transparent. to ATR-harmony. Stems with only high vowels may be disharmonic in their effects, i.e. occur with non-ATR-prefixes, e.g. /kɛ̀-yú/ 'riches, wealth'. Similarly, high ATR vowel prefixes may co-occur with non-ATR stem vowels, e.g. /kú-blɛ̀nì/ 'sleeping mat'. In this respect, the high vowels of Lokaa behave similarly to /i/ in Finnish.

Turning to opaque vowels, both languages present interesting cases. Votic has a restriction on the front vowel /ø/ occurring in non-initial syllables, a case of positional neutralization. Only its back (harmonic) counterpart /o/ is normaly possible. /o/ is opaque to front harmony when it occurs anywhere except in initial syllables, e.g. /mæŋg-o-ssɑ/ 'play-NOMINALIZER-ELATIVE'. /ø/ triggers front harmony in initial syllable position, e.g. /lø-mmæ/ 'hit-PRES.1PL'.

In Lokaa we have a quite different complication. Here /a/ is opaque *despite* the fact that its ATR partner /ə/ occurs in the language. /ə/ can be preceded by any ATR vowel, and also preceded by /a/ as a prefix or stem-vowel, but by no other non-ATR vowel. Of the pair /a/ and /ə/, only /a/ can occur as a prefix, even preceding an ATR vowel, including /ə/, e.g. /à-bə̀/ 'pits'.

We will demonstrate that an analysis using single-valued features is simple in both cases. Our solution makes use of constraints against known problematic feature combinations, alignment constraints, and a distinction between floating and linked harmonic features.

Directional cyclic syllabification and vowel epenthesis in Mongolian

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This paper aims to investigate the nature of directional syllabification and vowel epenthesis placement in standard Ulaanbaatar Mongolian (Svantesson 1994, 1995, Svantesson *et al.* 2005) in Harmonic Serialism (McCarthy 2010) by focusing on specific cases of cyclic syllabification in which the optimal syllabification algorithm is obscured by the morphological structure in derived and inflected words. Surface syllables in Mongolian have the structure (C)V(V)(C)(C)(C), and demand a strictly decreasing sonority profile; this is enforced by word-internal vowel epenthesis: /xatŋ/→[xa.təŋ] 'queen'. In underlying CCC sequences, the location of an epenthetic vowel differs as a function of right-to-left directional maximal syllabification. If the last two consonants can form a complex coda with decreasing sonority, the epenthetic vowel follows the first consonant: /ɢʊtmʧʃ/→[ɢʊ.təmʧʃ] 'street'. Otherwise, the epenthetic vowel follows the second consonant: /xitmŋ/→[xit.məŋ] 'pear'. Right-to-left maximal syllabification is clear in cases like /jort^{h}nʦ^{h}/→[jor.t^{h}ənʦ^{h}] 'world', which cannot surface as *[jort^{h}.nəʦ^{h}]. In addition to this, syllabification interacts cyclically with morphology. This can be seen from minimal pairs containing the same underlying segmental string but differing in the location of morpheme boundaries: /xʊʦ-t-la/→[xʊ.ʦət.la] 'ram-VERB-PAST', *vs.* /xʊʦ-tl-a/→[xʊʦ.tə.la] 'bark-TERM-REFL'. In order to examine these facts, I develop a theory of serial syllabification in Harmonic Serialism (see also Pater 2008, Elfner 2009) using a small set of syllable building operations that make use of Levin's (1985) notion of the syllable as a maximal projection of a Nucleus node. GEN is defined here as a list of operations that can parse maximally two segments into some N projection. A vowel, optionally preceded by a consonant, can be parsed into a syllable directly: $(V)_{N''}$, $(CV)_{N''}$. A sequence of one or two consonants can also be parsed into a syllable. In these cases, however, GEN must provide an empty nucleus in order to project an intermediate N node, $(\_C)_{N'}$, $(\_CC)_{N'}$, or a maximal N node, $(C\_)_{N''}$, $(CC\_)_{N''}$. This representational assumption ensures that the markedness constraints on syllable structure and intrasyllabic sonority distances are able to evaluate degenerate syllables containing an empty nucleus. The later syllable formation operations correlate with violations of a markedness constraint that assigns one violation mark for every N node projection of an empty nucleus. Later on in the derivation, nucleus-less syllables are repaired by means of vowel insertion or parasitic N conflation if there is an available pre-existing syllabified vowel: $(CV)_{N''}(\_C)_{N'}$→$(CVC)_{N''}$. There is also a cost-free coda resyllabification operation to the onset of the following syllable, interpreted here as a one-step operation. This theory of syllabification accounts straightforwardly for cases like [ɢʊ.təmʧʃ]. This paper also develops a theory of prosody-morphology interface in which the input to the phonological component is a set of phonologically non-contiguous morphs— the precedence relations between which have nevertheless been determined by morphology—, and in which morphs become phonologically contiguous once they are parsed into the same prosodic word. GEN is constrained to select at most two morphs. If an input contains a root plus two or more affixes, only the root and the first affix can be parsed at once into the same prosodic word. This proposal accounts for the problem of cyclic syllabification, as illustrated by the following derivations derived by the simplified constraint ranking Lx ≈ Pr » PARSE-SEGMENT » PARSE-σ: (a) /xʊʦ-t-la/ > [xʊʦt]-la > [xʊʦt]-(la) > [xʊʦ(_t)$_{N'}$]-(la) > [xʊ(ʦ_t)$_{N'}$]-(la) > [(xʊ)(ʦ_t)$_{N'}$](la) > [(xʊ)(ʦ_t)$_{N'}$(la)] > [(xʊ)(ʦət)(la)]; (b) /xʊʦ-tl-a/ > [xʊʦtl]-a > [xʊʦt(_l)$_{N'}$]-a > [xʊʦ(t_l)$_{N''}$]-a > [xʊ(_ʦ)$_{N'}$(t_l)$_{N''}$]-a > [(xʊ)(_ʦ)$_{N'}$(t_l)$_{N''}$](a) > [(xʊ)(_ʦ)$_{N'}$(t_l)$_{N''}$(a)] > [(xʊ)(_ʦ)$_{N'}$(təl)(a)] > [(xʊʦ)(təl)(a)] > [(xʊʦ)(tə)(la)]. (Brackets mark prosodic word boundaries, parentheses syllable boundaries, and degenerate syllables are given in subscripts.)

Special session

Contrast in Phonology

How contrast emerges from bidirectionality

Paul Boersma (University of Amsterdam)

If the grammatical elements that constitute the phonetics-phonology interface (i.e. the cue constraints) are used bidirectionally (i.e. both in speaking and in listening), the maintenance, loss and shift of contrast emerge automatically. That is, contrast is preserved, enhanced, obliterated, or shifted if the language user learns the phonetic-phonology interface as a listener and then just reuses the resulting perception-optimizing grammar as a speaker.

On the Role and Evaluation of Contrast in Phonology

B. Elan Dresher (University of Toronto)

I will present the main components of the Modified Contrastive Specification (MCS, aka Toronto school) approach to the role and evaluation of contrast in phonology (Avery & Rice 1989; Dresher, Piggott & Rice 1994; Dresher & Rice 2007; Dresher 2009). My focus will be on the extent to which these components are shared by other approaches to phonology and in what ways they differ. First, MCS adopts the Contrastivist Hypothesis (Hall 2007), which posits that only contrastive specifications are computed by the phonology. Versions of this hypothesis have been proposed over the years; some phonologists adhere to a weaker version of it, to the effect that *some* phonological processes are limited to contrastive specifications (Clements 2001; Calabrese 2005; Nevins 2010). An obstacle to properly evaluating the Contrastivist Hypothesis is uncertainty as to which properties of segments are contrastive. I will argue that contrast is determined by ordering distinctive features into a contrastive hierarchy, from which contrastive specifications are assigned by the Successive Division Algorithm (Jakobson, Fant and Halle 1952; Jakobson and Halle 1956; Dresher 2003; Hall 2007; Dresher 2009; Mackenzie 2009). I will compare this approach with another one that is currently popular, which holds that a feature is contrastive if and only if it uniquely distinguishes between phonemes in an inventory (Padgett 2003; Calabrese 2005; Campos Astorkiza 2007; Nevins 2010). Third, I will argue that there is variation in the contrastive hierarchies of different languages. If languages with similar inventories can have different contrastive specifications, we need to have a way of determining what the contrasts are in a given language. MCS looks to phonological *activity*: if the Contrastivist Hypothesis is correct in assuming that only contrastive features can be active, then it follows that active features must be contrastive. The emphasis on phonological activity is reminiscent of proposals by phonological 'minimalists' of various types (Anderson 2005; Anderson and Ewen 1987; Carr, Durand & Ewen 2005; Clements 2001; 2003; 2009; van der Hulst 1995; 1996; 2005; Hyman 2001; 2002; 2003; Morén 2003; 2006). The emphasis on representations as driving activity is something that MCS has in common with Government Phonology and the Parallel Structures Model. Finally, MCS adopts enhancement theory (Stevens et al. 1986; Stevens & Keyser 1989; Dyck 1995) to account for how contrastively specified representations are elaborated in the phonetics. Like Dispersion Theory (Liljencrants & Lindblom 1972; Flemming 2002; Padgett 2003), the contrast and enhancement model accounts for why inventories tend to have certain common shapes (Hall 2011).

Contrast, tradition and data: what should we believe?

Bruce Morén-Duolljá (University of Tromsø)

What do we mean when we talk about contrast in phonology? The answer to this question might seem self-evident at first glance. However, it becomes clear upon reflection that this is far from a simple question, and it certainly does not come with an easy answer.

We all have intuitions about what we, individually, mean when we discuss or make use of the term "contrast", but is there something more than intuition behind this? Is there a communal uniformity or even usefulness about this concept? Does "contrast" have an independent status in phonological representations and/or computations, or is it epiphenomenal?

When one looks at the phonological discussions of the past several decades, "contrast", "contrastiveness", "distinctiveness", etc. have been used in reference to a number of things, including features, segments, stress and pitch accents. The literature mentions things such as context-free contrast, context-specific contrast, within-language contrast and maybe even cross-linguistic contrast.

The purpose of my talk is to be controversial and provocative - i.e. to get us to think a little about a topic that is fundamental to the way we do phonology and to challenge one of our most cherished notions. I will begin by briefly considering the above issues and then move on to the question of how one establishes "contrast" when looking at a language. This includes a discussion of the pros and cons of minimal pair analysis. I will then give several examples of "contrasts" found in the mainstream literature and suggest that the data and/or analyses are incorrect for various reasons. Importantly, I will suggest that we should be highly skeptical about using other's claims of contrast in our own work without verifying those claims via our own detailed examination of the language in question. I will conclude that "contrast" is a coherent notion, but only if we use it coherently.

On Dispersion Theory and contrast

Jaye Padgett (UC Santa Cruz)

Phonologies are shaped in part by human perception. Nowhere is this more obvious than in the facts of contrast. I begin this talk by reviewing evidence that contrast is governed by perceptual distinctiveness and that a form's properties therefore cannot be fully understood without reference to other forms. Perhaps surprisingly, these principles bear on explanations of many allophonic processes too. I discuss Dispersion Theory in OT, one approach to modeling contrast in phonology, touching on its strengths and potential drawbacks. I then turn to other, more self-organizational, approaches to modeling dispersion effects, discussing the sorts of evidence that could distinguish among them. Finally, I discuss some ways in which overly-phonetic approaches to contrast fail, in particular with reference to word-final effects.