The Sixteenth Manchester Phonology Meeting

ABSTRACTS BOOKLET

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Held at
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Organised by phonologists at the **University of Edinburgh**, the **University of Manchester**, the **Université de Toulouse-Le Mirail**, and elsewhere.

This booklet contains the abstracts for all the papers presented at the **sixteenth Manchester Phonology Meeting**, held at Hulme Hall, Manchester, in May 2008.

The abstracts are arranged in alphabetical order by the surname of the (first named) presenter.

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 **Seminar Room** or the **bar area** in Hulme Hall. The opening and closing addresses and the special session will be held in the Old Dining Hall. The parallel sessions for the oral papers will be held in the Old Dining Hall and the Seminar Room, and the poster sessions will be held in the bar area.

The Old Dining Hall is in the main Hulme Hall building, upstairs, and just through the bar area and the area where the meals are held. The Seminar Room is in the new building which is opposite the entrance to the main Hulme Hall building. It takes about a minute to walk from one to the other. The **final programme**, included in your registration pack, gives the details of which papers are in which room, and at which times.

Oral papers

A universally gradient co-occurrence restriction?

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A premise of virtually all current approaches to gradience in phonology is that if a phonological process occurs gradiently in one language, it may be obligatory in another. This parallel is neatly accounted for by positing that the constraints involved are ranked strictly in some languages and probabilistically or incompletely in others. In this paper, I argue that not all patterns of lexical underrepresentation are mirrored by categorical bans, and that some restrictions may be universally gradient. I discuss a gradient restriction in English whereby certain combinations of onset and coda clusters such as *trVsp* or *plVsk*, are statistically avoided. Interestingly, this pattern does not mirror any documented categorical effect ("complex codas are allowed only if the onset is simplex"). I suggest that this discrepancy is due not to a grammatical difference between this and other patterns, but rather to a learning bias that makes categorical effects of this complexity unstable.

English allows *sC* clusters in onsets and codas (***st***ill,li***st***) and stop-liquid clusters in sonority-appropriate order (***cl***ip, mi***lk***). It is hard to estimate how often clusters are expected to occur, but the counts in (1), based on the 6292 monosyllabic lemmas in CELEX, show that in the aggregate, coda *sC#*, *lC#* clusters are about as common as their singleton *s#*, *l#* counterparts. However, as shown in (2), words with two cluster types simultaneously (***gra*sp**, ***spelt***) are rare (Fisher's exact $p<.0001$ for both). Furthermore, nonce word ratings preliminarily confirm that speakers notice and encode this pattern. Importantly, unlike other restrictions noted in the literature (***pli*l**, ***sp*ip**), the pattern cannot be attributed to independent OCP restrictions on place or multiple liquids, but must be learned as a combination of **sC* and **Cl*/**lC*.

The restriction in (2), though intuitive, is unlike any known categorical restriction. These data pose a challenge to the idea that gradient patterns are due to grammatical constraints, since constraints should also allow categorical rankings. A completely extra-grammatical account is equally unsatisfying, however, since it misses the fact that the restriction is composed of bans on the occurrence of clusters, which are (in simpler form) seen categorically. I provide an analysis of these facts using a grammar of weighted constraints, in which co-occurring onset and coda violations may "gang up" to be worse than either cluster alone: (**sC* + **lC*) > MAX > **sC*, **lC*. I attribute the lack of corresponding categorical effects to a learning procedure that seeks to maximize the probability of attested forms. If *#sC* and *lC#* occur independently, MAX must be weighted sufficiently far above the relevant **CC* constraints to allow them to surface with probability approaching 100%. This goal is at odds with the weighting needed to get a complex categorical effect, in which the sum of the two **CC* constraints must be far above MAX. Without positive evidence showing alternations in *plusk*-type words, the learner places MAX well above **sC*/**lC*, precluding a categorical ganging up effect. Thus, a categorical version of (2) is grammatically possible, but unstable given the biases of the learning procedure. Confirmation comes from the fact that similar categorical patterns do occur in acquisition (Levelt &al 1999). Under the current account, this reflects brief states during which constraints are not yet far enough apart to reliably allow clusters.

(1) Clusters are common with singletons

Onset	s#	sC#
bV	10	17
dV	7	5
gV	8	6
pV	15	11
tV	3	9
lV	12	12
rV	3	16

Onset	l#	lC#
bV	23	20
gV	13	11
wV	25	25
mV	16	17
sV	16	14
pV	27	9
tV	18	6

(2) Combinations of clusters are rare

Onset	s#	sC#
grV	11	3
trV	7	3
plV	6	1
drV	3	0
glV	3	0

Onset	l#	lC#
spV	8	1
stV	17	3
swV	7	0
snV	3	0

A cross-linguistic perspective on the role of prosodic structure in the acquisition of Manner of Articulation features

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Most research on phonological development in child language has focused on the acquisition of individual segments, either in general or in specific prosodic positions. Studies that explicitly looked at the distribution and interaction of phonological features within larger domains, such as whole words, are fairly limited, and mostly refer to Place of Articulation (PoA) features in consonant harmony (e.g. Pater & Werle 2003, Fikkert & Levelt *to appear*). Yet, the study of word patterns with respect to features may provide us with substantial information on the development of phonological representations.

The present paper investigates the acquisition of Manner of Articulation (MoA) features in child language. We analyzed spontaneous longitudinal speech data of four German (Grimm *submitted*), six Dutch (Fikkert 1994, Levelt 1994) and two French children (dos Santos 2007), aged from one to three years old. The consonants in monosyllabic CVC- and disyllabic CVCV-nouns were coded for their MoA. Following the main stress patterns of the languages, we selected trochaic nouns for Dutch and German only. In Dutch and German, we found a consistent developmental pattern for CVC- and CVCV-words:

(i) at the earliest stages of development, the consonants within a word share their MoA;
(ii) phonological contrasts are sequentially introduced: first, in initial position.

The outcome is in accordance with recent findings of Fikkert and Levelt (*to appear*) on PoA features, suggesting that phonological features take scope over whole words rather than specific segments at early stages of development, and that phonological contrasts are introduced into the system step by step. Given the fact that German and Dutch are trochaic languages in which postvocalic positions are phonetically weaker, it is quite expected that contrasts are introduced in initial position. Yet, the question is whether in Dutch and German the greater prominence of the first consonant compared to the second is due to stress or to the fact that it appears in the initial position of the word.

French acquisition data may shed light on this issue: German and Dutch are trochaic languages; hence, initial and stressed positions coincide. In contrast, French has (phrasal) final stress; hence, the postvocalic consonant is stressed in CVCV-words (particularly in one word utterances). If manner contrasts are introduced in initial position, we expect French children to show the same developmental pattern as we observed for German and Dutch. In contrast, if stress plays a role, we expect that first consonant in CVC-words to pattern with the second consonant in CVCV-words in French. Our preliminary analysis of the French data indicates that the second hypothesis is supported, suggesting that prosodic structure interacts with the acquisition of MoA features.

This finding is in line with results on the perception of phonological contrasts in infants: Vihman and colleagues (2004) showed that in bisyllabic trochees, 11 month-old English infants recognize a sound change in the onset of the first but not in the onset of the second syllable. In contrast, Hallé and de Boysson-Bardies (1994/1996) reported the opposite pattern for French infants. Taken together, these results point to a crucial role of stress for the recognition of phonological contrasts, too.

West-Nordic sound-shifts and fissions: A Pan-Chronic view.

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The West-Nordic sister-tongues, Icelandic and Faroese, show general similarities but differences in detail in their phonological organisation. Both show signs of a consonant shift, from an opposition in stops based on voicing toward and opposition of (pre- and post-) aspiration. In foot internal environments new voiceless stops develop in geminate nasals and laterals, and in some cases from fricatives (Árnason 1990).

Both languages bear the marks of a quantity shift, involving open syllable lengthening, and a shortening of old long vowels in closed syllables (also known to have happened in Swedish and Norwegian, see Riad 1992). A large scale merger of originally long and short vowel systems was in both languages avoided by diphthongisation of long vowels and laxing of short ones. But the individual changes in vowel quality are widely different. Thus e.g. the Modern Faroese correspondents of the old long monophthongs /iː/ and /ɑː/ are two diphthongs, respectively [ʊi] and [ɔɑ], whereas Icelandic has a monophthong [i] corresponding to /iː/ and a diphthong [au] corresponding to /ɑː/.

Applying the comparative method and reconstructing individual vowel and consonant changes before the quantity shift leads to paradoxes. The wave model fairs better, modelling the development as the spread of innovations.

But what is it that spreads, and what directs or checks the spreading? It will be suggested that the units of "phonological manipulation" involved in the development can be classified as follows:

Natural (chaotic) tendencies:

- A rich vowel system (9 qualities) originally created by umlaut is prone to disintegration: complex segments are marked and tend to undergo melodic fission (Schane 1984).
- Open syllable lengthening tends to get rid of marked syllable structure (disyllabic stress matrices) by lengthening vowels.
- A "new", perhaps substratal, articulatory setting causes fission in consonants: (pre- and post-) aspiration of stops, prestopping in geminate /l/ and /n/ and the creation of stops in some fricative clusters.

Normalising tendencies:

- Retain contrast. This affects both the vowel and consonant shifts, preventing large scale mergers.
- Make sense of metrical structure and rhythm. (Different solutions affect the synchronic function of aspiration and preaspiration in the two languages.)
- Preserve morphological patterns and (in the case of Icelandic) do not move far away from the written norm.

In the spirit of Evolutionary Phonology, and with metaphoric reference to OT, the outcome for the two languages can be seen as two "outputs" given variant rankings in realisation of the tendencies listed aove.

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Effects of Speaking Rate on Voice-Onset Time in Swedish: Phonological Implications

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In order to understand the phonology of speech categories, it is often necessary to observe how they change in different contexts. Consider the differences in word-initial stop voice onset time (VOT) in English, Thai, and French. English has a two-way stop contrast: aspirated (long-lag VOT) vs. short-lag VOT. French has a two-way stop contrast: prevoiced (negative VOT) vs. short-lag VOT. Thai has a three-way stop contrast: prevoiced vs. short-lag vs aspirated. Many phonologists have assumed that the three-way contrast in Thai is phonologically one of privative [spread glottis] ([sg]), [voice], and [∅], whereas the two-way contrasts in French and English are [voice] vs [∅] in French and [sg] vs [∅] in English. Kessinger & Blumstein (1997) provide support for this distinction in an acoustic analysis examining the effect of speaking rate on voicing in these three languages. They found an asymmetric effect of speaking rate: as speech rate decreased, the amount of prevoicing increased in Thai and French and the amount of aspiration increased in Thai and English, whereas there was little or no change in the short-lag stops in any language.

These effects are difficult to make sense of if we assume a simple notion of phonetic dispersion serving to maximize phonological contrast—such a view would lead us to expect a symmetrical increase in slow speech VOT effects. (For example, in slow speech in English, we should find not only an increase in the aspiration of long-lag stops, but also the development of prevoicing in the short-lag series.) However, K&B's findings *do* make sense if, at slower rates, a phonological contrast is heightened by a selective increase in the phonetic cue for the marked feature; thus, slowing down causes longer aspiration in English and Thai, and longer prevoicing in French and Thai. The fact that the voiceless unaspirated stops in all three languages remain unchanged provides some support for the phonologists' claim that this is the unmarked category.

We report on the results of an experiment on Swedish stops designed to investigate the effect of speaking rate on VOT. Swedish, like Thai, has both prevoiced and aspirated stops (Helgason & Ringen to appear). But unlike Thai, Swedish has only a two-way contrast. Hence, the phonological features involved in this contrast are less clear than they are in Thai, English, and French. It might be argued that both [sg] and [voice] are phonological features of Swedish stops, but that there are no stops specified as [∅]. Or it might be suggested that one stop series is phonologically specified (with either [sg] or [voice]), while the other series is unmarked.

According to the selective increase of marked features hypothesis sketched above, if the effect of slowing in Swedish results in only the prevoicing, but not the aspiration, being lengthened, it would indicate that [voice], *but not* [sg], is the marked feature of contrast. If, on the other hand, the aspiration is increased, but the prevoicing is not, it will indicate that [sg], *but not* [voice], is the marked feature in Swedish. Finally, and most interestingly, if both prevoicing and aspiration increase in slow speech, it would suggest that *both* [voice] *and* [sg] are marked features of phonological contrast in the language.

References

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Characterising the Arabic Sound System
(Consonant Resonance and Phonological Representations)

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This paper is broadly concerned with the issue of sound system typology, focusing on resonance (the elements I, U and A) in consonants, and the application of this to Arabic.

Arabic is well known for its emphatic consonants, usually said to be characterised predominantly by secondary pharyngealisation / velarisation. Following previous work, this paper assumes that Arabic 'emphaticness' is characterised by the presence of the element A. The 'primary' emphatics are a set of 'pharyngealised' coronal obstruents (*ṭ ṣ ḍ ~ ð*,[1] depending on the dialect) which trigger a spreading process called 'emphasis'. Consonants susceptible to 'emphasis' are called 'secondary' emphatics (typically at least *ṛ ḷ ṃ ḅ*).

However, the literature reveals problematic data. Firstly, many dialects have a number of lexemes said to be at least partly emphatic, but in which there is no 'primary' emphatic. Compare some typical examples often cited for various dialects:

(1a)	*ḅāḅa*	'Daddy'	(1b)	*bāb-a*	'his door'
	waḷḷā(h)	'by God'		*walla*	'he appointed'
	ṃayy	'water'		*mayyit*	'dead (m.s.)'
	ǰāṛ-i	'my neighbour (m.s.)'		*ǰāri*	'flowing (m.s.)'

Such 'emphatic' examples as in (1a) always involve a low vowel, but the low vowel *per se* does not trigger 'emphasis' (1b). Secondly, in some dialects, 'emphaticness' seems to arise from certain consonant combinations. Compare Baghdadi Arabic 'emphatic' (2a) vs. non-emphatic (2b) combinations:

(2a)	*gaṃṃaḷ*	'he got lice'	(2b)	*kammal*	'he completed'
	gaḅuḷ	'before'		*balad*	'country'
	ḅuṛaṃ	'he plaited'		*risam*	'he drew'

This paper argues that, aside from variant and gradient *phonetic* spread of the pharyngealisation associated with ('primary') emphatics, one major problem is the assumption that there is one process involved in such data, i.e. 'emphasis', typically approached as if it were one phenomenon occurring in isolation. Using data from Baghdadi Arabic, I focus on the role of emphatics within the overall phonological system, and argue that words in Arabic consist of domains necessarily associated with one resonance quality (i.e. the element I, U or A). Further, I argue that examples of what is often called 'emphatic' where there is no 'primary' emphatic trigger are in fact non-I (= non-'front') domains. Crucially, 'frontness' (the I element) also spreads across domains – a process called *imāla* ('inclination') by the Arab grammarians, but generally disregarded in generative analyses of 'emphasis'.

Working roughly within a Revised Element framework, but also inspired by Harris (1994), Nasukawa & Backley (2005) and Botma (2004), the analysis follows Bellem (2007) in assuming a contour structure to phonological representations. I argue that non-emphatic coronals in Arabic are 'front' consonants because their phonological representation has an I element (although this is not necessarily the case cross-linguistically for coronals). Overall, the Arabic consonantal system is fundamentally characterised by resonance qualities which participate in a number of processes. Moreover, there are small differences cross-dialectally which make the issue of 'resonance' in Arabic sound systems typologically interesting.

[1] In Arabic transliteration, emphatics are denoted by a subscript dot; macrons denote long vowels.

[ðə swɪˈŋɒmɪtə ˈtɜːnd əˈgenst sə ˈmɪŋɪs ˈkæmbəl]. Evidence for Chung's Generalization.

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In present-day English, the noncoronal voiced plosives /b, g/ undergo deletion in the coda after a homorganic nasal. Deletion applies transparently within stem-level domains (1a,b), but overapplies before word-level suffixes (1c).

(1)	a.	bomb	[bɒm]	long	[lɒŋ]
	b.	bombard$_V$	[ˌbɒm.ˈbɑːd]	elongate$_V$	[ˈiː.lɒŋ.ˌgeɪt]
	c.	bombing	[ˈbɒ.mɪŋ], *[ˈbɒm.bɪŋ]	longish	[ˈlɒ.ŋɪʃ], *[ˈlɒŋ.gɪʃ]

Although deletion cannot see word-level suffixes, rule-based Lexical Phonology assigned it to the word level in order to uphold the Strict Cycle Condition (Halle and Mohanan 1985: 96). In consequence, the relevant rule was forced to refer to word-level morphological brackets:

(2) $\begin{bmatrix} -\text{sonorant} \\ +\text{voice} \\ -\text{coronal} \end{bmatrix} \rightarrow \varnothing \; / \; [+\text{nasal}] \_\_ \rrbracket$ (word level)

However, this solution was unsatisfactory for two reasons. First, it completely subverted the concepts of cyclic domain and phonological level: rule (2) was assigned to the word level even though it was insensitive to phonological structure on the other side of a word-level bracket. Secondly, the Strict Cycle Condition was independently refuted by Kiparsky (1993).

In Stratal OT, in contrast, a word-level analysis of this phenomenon is unavailable because phonological processes must apply transparently within their cycle (Kiparsky 2000). Postnasal plosive deletion must therefore be assigned to the stem level. The absence of deletion in forms like *e-long-ate*$_V$ is explained by the fact that they are based on roots rather than on stems, i.e. ⟦$_V$ iː ⟦$_√$ lɒŋg⟧ eɪt⟧, and roots do not constitute cyclic domains (Kiparsky 1982: 144-45; Inkelas 1989: §3.5.5).

The Stratal OT analysis makes two correct predictions. First, if deletion does indeed apply at the stem level, then it should overapply not just before word-level suffixes (1c), but also before stem-level suffixes in stem-based (as opposed to root-based) constructions. This prediction is borne out by the neologism *swing-ometer* [swɪ.ˈŋɒ.mɪ.tə], *[swɪŋ.ˈgɒ.mɪ.tə]. Deletion overapplies before the neoclassical element *-ometer*, even though the latter clearly defines a stem-level domain since it causes primary stress to shift to the right.

Secondly, one of the theorems of Stratal OT, known as Chung's Generalization after Chung (1983: 63), asserts that a phonological process displaying cyclic misapplication within the stem level will be neutralizing or at least have lexical exceptions (Bermúdez-Otero and McMahon 2006: 400, Kiparsky 2007). This is because phonological properties derived in an early stem-level cycle can be opaquely preserved in later stem-level cycles only if the relevant faithfulness constraints are ranked highly in the stem-level hierarchy. However, these high-ranking faithfulness constraints will also protect the same phonological properties when found in underlying representations in accordance with Richness of the Base. Thus, the cyclic overapplication of postnasal plosive deletion in the stem-level form *swing-ometer* correctly entails that the existence of outright lexical exceptions like *dinghy* [ˈdɪ.ŋɪ], *hangar* [ˈhæ.ŋə], and the proper nouns *Singapore* [ˌsɪ.ŋə.ˈpɔː], *Sir Menzies* [ˈmɪ.ŋɪs] *Campbell*, *Sir Bernard Ingham* [ˈɪ.ŋəm], etc.

Thus, *pace* McCarthy (2007: §2.3.4.2), Stratal OT fulfils one of the programmatic goals that Lexical Phonology set out for itself in the 1980s but failed to deliver: namely, to establish nontrivial links between the domain of phonological processes and their mode of application.

Contrastive prosodification and underlying floating segments: false epenthesis in Hungarian

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This paper re-examines the nature of floating elements. Based on data from Hungarian, we argue that epenthesis is not always a function of phonotactics only, but that there is a coherent notion of an underlying epenthetic segment: it is incorporated into morphological but not prosodic structure.

While a salient property of classical OT (Prince & Smolensky 1993) is the stipulation that prosody is absent from inputs, we argue that prosodification can be contrastive, therefore it should be included in the underlying representation (cf. Inkelas & Orgun (1998); Inkelas (1999); Morén (1999) and Scheer (2004) *inter alia*). Accordingly, CON is argued to contain faithfulness constraints on prosodic structure.

Three groups of Hungarian nominal stems are to be distinguished: stems ending in a CC cluster in both unsuffixed forms and when followed by a vowel-initial suffix (1), stems ending in CVC in both cases (3), and stems ending in CVC in unsuffixed forms but in CC when preceding a vowel-inital suffix (2) (cf. Siptár & Törkenczy 2000).

(1) CC∼CC: [sø**rɲ**]–[sø**rɲ**-ɛk] 'monster'
(2) CC∼CVC: [to**roɲ**]–[to**rɲ**-ok] 'tower'
(3) CVC∼CVC: [su**roɲ**]–[su**roɲ**-ok] 'bayonet'

(4) $\sigma \Rightarrow \left\{ \begin{array}{l} \langle \sigma, C_1 \rangle \\ \langle \sigma, V \rangle \\ \langle \sigma, C_2 \rangle \end{array} \right\}$ (under σ: / | \ ; $C_1\,V\,C_2$)

(5) 1.$\{\langle \sigma, C_1\rangle, \langle \sigma, C_2\rangle\}$
2.$\{\langle \sigma, C_1\rangle, \langle V\rangle, \langle \sigma, C_2\rangle\}$
3.$\{\langle \sigma, C_1\rangle, \langle \sigma, V\rangle, \langle \sigma, C_2\rangle\}$

Since the two stem-final consonants are identical in the three examples above, the pattern cannot be purely phonotactically motivated. Moreover, it cannot be analysed as either epenthesis or deletion: if it is epenthesis, it should occur in (1) as well; if it is deletion, why does it fail in (3)?

We argue that this pattern is the result of an underlying floating vowel in alternating stems and prosodic faithfulness constraints. Adopting the (independently developed) formalism of Blaho (2004, 2008), we extend it to account for floating features/segments and prosodic faithfulness. Geometrical notation is represented by sets of n-tuples (4). We propose that the three goups of stems have different underlying representations (5). Crucially, the lexical representation of alternating stems (2) contains a floating vowel between the two stem-final consonants.

We use two kinds of faithfulness constraints on segments: DEP, which is sensitive to the presence or absence of segments regardless of whether they are associated to higher prosodic structure, and IDENT, sensitive to the association between segments and syllables. Accordingly, mapping a CC input to a CVC output violates both DEP and IDENT, while mapping an input with an underlying floating vowel to a CVC output only violates IDENT. Thus, the ranking DEP.V≫*CC/__#≫ IDENT.V correctly accounts for the Hungarian data.

(6) CC∼CC#

$\{\langle\sigma,C_1\rangle, \langle\sigma,C_2\rangle\}$	DEP.V	*CC	ID.V
a.$\{\langle\sigma,C_1\rangle, \langle V\rangle, \langle\sigma,C_2\rangle\}$	*!	*	*
b.$\{\langle\sigma,C_1\rangle, \langle\sigma,V\rangle, \langle\sigma,C_2\rangle\}$	*!		*
☞c.$\{\langle\sigma,C_1\rangle, \langle\sigma,C_2\rangle\}$		*	

(7) CC∼CVC#

$\{\langle\sigma,C_1\rangle, \langle V\rangle, \langle\sigma,C_2\rangle\}$	DEP.V	*CC	ID.V
a.$\{\langle\sigma,C_1\rangle, \langle V\rangle, \langle\sigma,C_2\rangle\}$		*!	
☞b.$\{\langle\sigma,C_1\rangle, \langle\sigma,V\rangle, \langle\sigma,C_2\rangle\}$			*
c.$\{\langle\sigma,C_1\rangle, \langle\sigma,C_2\rangle\}$		*!	

We demonstrate that phonotactically-driven epenthesis is blocked in Hungarian (6); but false epenthesis, i.e., syllabifying an underlyingly floating vowel, is a strategy for resolving clusters (7). These data require a notion of underlying prosodic structure and corresponding faithfulness constraints. In addition, we present a unified faithfulness template for privative feature geometry, floating features/segments and prosodic faithfulness.

The Obligatory Contour Principle in Artificial Language Segmentation

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Many languages restrict the co-occurrence of homorganic consonants across intervening vowels (Hebrew: Berent & Shimron 1997; Arabic: Frisch & Zawaydeh 2001; English: Berkley 2000). This paper supports the hypothesis that gradient distributions over consonant co-occurrence are represented as abstract constraints, which affect speech segmentation. We tested this hypothesis using artificial language segmentation, a task known to be affected by phonological properties of the native language (Onnis, Monaghan, Chater & Richmond 2005).

Lexical statistics. We collected statistics on non-adjacent consonant pairs in Dutch (CELEX). Under-representation is expressed by the Observed/Expected ratio, calculated as p(AB) / p(A) * p(B). We found that labial pairs are strongly under-represented (O/E = 0.45) while in word-initial position, labials are strongly over-represented (O/E = 2.0). From these observations, we hypothesized two abstract constraints: OCP-LAB requires that consonant pairs across a vowel should not both be labials. ALIGN-LAB requires labials to occur in word-initial position. In order to examine whether the hypothesized constraints are used for segmentation, we ran two artificial language experiments.

Experiment 1. Native speakers of Dutch were trained in an artificial language that consisted of six P syllables (P_1={po, be, ma}, P_2={pa, bi, mo}) and three T syllables (T={tu, do, ne}), which were concatenated into a synthetic speech stream (…$P_1P_2TP_1P_2TP_1P_2T$…) with flat prosody. Other potential cues for segmentation from lexical statistics, such as transitional probabilities between syllables and segments and positional syllable frequency were controlled. If participants were able to segment words from this stream, predictions from OCP-LAB and ALIGN-LAB were that that PTP words should come out best, and TPP words should come out worst. In the test phase, participants had to decide which of two CVCVCV strings was a word from the language they had been trained on. Participants (N=42) were assigned to one of three test conditions: PTP-PPT, PTP-TPP, or PPT-TPP. The 48 test pairs were matched for lexical factors (cohort and lexical neighbourhood density). As predicted, PTP words, which satisfy OCP-LAB and ALIGN-LAB, were preferred to be words over PPT ($p < .001$) and TPP ($p < .05$). In particular, the strong preference PTP > PPT suggests that OCP-LAB has an impact on segmentation. In the PPT-TPP comparison, the predicted preference for PPT, due to ALIGN-LAB alone, was not found. This suggests that the PTP segmentation may have been too dominant over the PPT or TPP segmentations for a PPT-TPP comparison to be possible. A replication of the experiment using different syllables yielded the same result.

Experiment 2. In order to rule out a possible interpretation that the result was not caused by OCP-LAB, but by a general perceptual preference for identity at edges (ABA > AAB, ABB, regardless of values of A,B), we ran a second experiment. Participants were trained in an artificial language similar to the language in Experiment 1, the only difference being that P_1 was replaced by T (T_2={ta, di, no}). In Dutch, consecutive coronals are less under-represented (O/E = 0.77) than labials. Accordingly, we hypothesized that any coronal co-occurrence effects be over-ruled by ALIGN-LAB. Hence, we expected a PTT segmentation. As in Experiment 1, we assigned participants (N=42) to one of three test conditions, contrasting TPT-TTP, TPT-PTT, or PTT-TTP pairs. As predicted, PTT words were favoured over TPT ($p < .001$) and TTP ($p < .001$). In the TTP-TPT comparison, none of the words was favoured, which supports the prediction that ALIGN-LAB affected segmentation, not a general preference for ABA.

Conclusion. Our study suggests that gradient phonotactic distributions from the lexicon may be represented as abstract constraints in the grammar. Moreover, our results offer new evidence for the psychological reality of phonological constraints, which may be used by listeners for speech processing.

The phonetics and phonology of Dutch mid-vowel laxing

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A long-standing problem in the phonology of Dutch concerns the nature of the phonological contrast in vowels. As is well known, Dutch monophthongs display a phonetic correlation between tenseness and length, such that non-high tense vowels are long and all lax vowels are short. The traditional position is that the underlying contrast is one of length, given that tense/long vowels pattern with diphthongs (see e.g. Zonneveld 1978). For instance, both can occur in stressed word-final open syllables, while lax/short vowels cannot:

(1) la [laː] 'drawer' *[lɑ]
kei [kɛi] 'cobble' *[kɛ]

However, more recent approaches generally assume that the underlying contrast is one of tense vs. lax (see esp. Smith et al. 1991, Van Oostendorp 2000). Van Oostendorp argues that this analysis is, among other things, supported by evidence from stress assignment, syllable markedness and vowel typology. Smith et al. maintain that underlying length is a property only of what they call 'French' tense and lax vowels (/iː yː uː/ and /ɛː œː ɔː/, respectively). These vowels are marginal, occurring only in final superheavy syllables (2a) and penultimate syllables preceding schwa (2b):

(2) a. crême [krɛːm] b. expert [ɛkspɛːr] c. expertise [ɛkspɛrˈtizə]
record [rəkɔːr] controle [kɔnˈtrɔːlə] controleer [kɔntroˈlɪːr]

Van Oostendorp observes that these vowels occur only under primary stress. In the absence of primary stress, e.g. if an autostressed suffix is added, they are realised as 'short' tense or lax, depending on whether they occur in an open or closed syllable (2c).

A potential problem for the tense–lax approach concerns the phenomenon of 'mid-vowel laxing'. In Standard Dutch, the realisation of the mid vowels /e o ø/ differs depending on whether they precede an obstruent or an oral sonorant (i.e. /l r/ and, for some speakers, /j w/). This is shown in (2), where we follow the transcription used by, among others, Trommelen & Zonneveld (1989) and Van Oostendorp (2000):

(2) *pre-obstruent* *pre-/l/*
pot /pɔt/ [pɔt] 'jar' pol /pɔl/ [pɔɬ] 'clump'
poot /pot/ [pot] 'leg' pool /pol/ [pɔːɬ] 'pole'

Implicit in these transcriptions is the claim that laxing neutralises the underlying qualitative (i.e. tense vs. lax) contrast, and that the surface contrast between tense and lax vowels in this environment is one of quantity (i.e. length) instead. If these transcriptions are correct, they could be taken as an argument in favour of the presence of underlying length in tense vowels.

To test the validity of transcriptions such as [pɔɬ] and [pɔːɬ], speech data were gathered from 15 (young female) speakers of Standard Dutch. Duration and formant measurements of tense and lax vowels in the contexts in (2) showed that the difference between tense and lax vowels in pre-/l/ context is indeed primarily a difference in length for these speakers, though this difference is much less salient than in pre-obstruent context, as in *pot* vs. *poot*.

In our talk we report on the findings of our experiment, and consider how these findings can be accommodated in the dependency-based tense–lax approach to the Dutch vowel system of Smith et al. (1991).

Duration in Inari Saami

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Inari is one of several Saami languages with a three-way contrast in the duration of consonants (Itkonen 1946; Sammallahti 1998). In Inari Saami, this contrast is illustrated by the (near) minimal triplet /pino/ (short /n/) 'stack ACC/GEN.SG' • /pinno/ ('half-long' /n/) 'stack NOM.SG' • /tin:no/ (fully long /n/) 'flintstone NOM.SG'.

This study focuses on disyllabic words of the form $CV_1C_xV_2(C)$, where V_1 may be phonologically short or long, and C_x may be phonologically short, half-long or fully long. Duration measurements were obtained for C_x, V_1 and V_2 under the 6 conditions that result from varying the quantity of V_1 and C_x. In order to minimize the effects of segmental quality on duration, only words were used in which V_1 was a low vowel /a/ or /ɑ/, and C_x was a sonorant /n/ or /l/. The words were elicited using the standard techniques from five speakers bilingual in Inari Saami and Finnish. Separate least squares regression models were then fitted so that the effect of each factor could be tested separately for each speaker. Our starting assumption under both conditions was that the phonetic duration of V_1 and V_2 should, if anything, decrease as the quantity of the consonant increased. The results we report as significant have a p-value of $p < .01$.

Under the short $\breve{V}_1$ condition, the results are as expected. Following short $\breve{V}_1$, the three-way length distinction is robust for all speakers consulted. There is some tendency to shorten $\breve{V}_1$ in proportion to the quantity of C_x, but its significance and extent varied widely between speakers. The quantity of C_x exerted a far greater effect on the duration of V_2, which for 4 of the speakers is significantly shorter following a fully long C_x than elsewhere.

Under the *long* $\bar{V}_1$ condition, the duration of V_1 emerges as a more reliable cue to the ternary contrast than the duration of C_x itself. Speakers show the expected trade-off between V_1 and C_x, with the duration of long $\bar{V}_1$ decreasing as the quantity of C_x increases. The duration of V_2 under the long V_1 condition, however, behaves in an unexpected way. None of the speakers showed a decrease in the duration of V_2 after a fully long C_x as happened under the short $\breve{V}_1$ condition. On the contrary, for three speakers, V_2 was in fact significantly *longer* following fully long C_x than elsewhere.

We propose that this striking asymmetry is due to a difference in foot structure that can be motivated synchronically on independent phonological and morphological grounds. The proposed difference is moreover a transparent result of a series of historical changes, which we shall briefly mention here to show how the distinction arose. Disyllables with short $\breve{V}_1$ and fully long C_x have been disyllabic since Proto-Saami. Words with *long* $\bar{V}_1$ and fully long C_x, however, derive from Proto-Saami trisyllables. Originally, Saami and Balto-Finnic assigned stress by constructing syllabic trochees from left to right across the word: $/\sigma\sigma\sigma/ \rightarrow (\sigma\sigma)\sigma$. At some point, Inari Saami broke rank from the other varieties of Saami and introduced right to left parsing: $/\sigma\sigma\sigma/ \rightarrow (\sigma)(\sigma\sigma)$. At a later stage, final vowels were apocopated but the foot structure was crucially retained, giving rise to a synchronic distinction between disyllables: $(\sigma\sigma)$ • $(\sigma)(\sigma)$. The unexpected increase in the length of V_2 after *long* $\bar{V}_1$ + fully long C_x may therefore be interpreted as resulting from a phonetic rule that lengthens a vowel when the head of a foot. *Within* the foot domain, however, fully long C_x has a shortening effect on V_2.

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German vowel length: quantity and activity

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Vowel length is a central topic of German phonology, in synchronic as well as diachronic studies (Hall (1992); Kyes (1989: 153-176); Lahiri & Dresher (1998: 678-719); Moulton (1959: 372-381); Vennemann (1990: 211-243); Wiese (1996)). In German (NHG), long vs. short vowels are said to occur in open (e.g. *Leben* [e:] "life") vs. in closed syllables (e.g. *senden* [ɛ] "to send") (Hall (2002: 33-75) among others). The NHG distribution of long and short vowels is a consequence of two diachronic processes that occurred between Middle High German (MHG) and NHG: lengthening and shortening. It is commonly assumed (cf. Paul (1884: 101-134); Ritzert (1898: 131-222); Lahiri & Dresher (1998: 678-719) among others) that occurred in open syllables (so-called Open Syllable Lengthening, OSL). However, the facts are more complicated than that: not all vowels in open syllables lengthen. Rather, several conditions had to be met for a vowel (V) to lengthen btw. MHG and NHG:

- V **had to be stressed** – e.g. MHG ***si****ge* vs. i*c*- > NHG ***S*****[i:]***g* "victory" vs. -**[ɪ]***g* "-ly";
- the following consonant (C) **had to be voiced** – e.g. MHG *biber* vs. *buter* > NHG *B***[i:]*****b****er* "beaver" vs. *B***[ʊ]*****t****ter* "butter";

Furthermore, it is usually held that OSL only occurred in open syllables. This is not true inasmuch as it is also observed in closed syllables, provided that two conditions are met:

- the following C **had to be root-final** – e.g. MHG *g(e)rob* > NHG *gr*[o:]***b*** "coarse";
- and it **had to be voiced** (at the underlying level) – e.g. MHG r***a/d/*** vs. *bl****a/t/-*** > NHG *R***[a:]***d* "wheel" vs. *Bl***[a]***tt* "sheet of paper".

Finally, OSL applied **within a precise domai**n – i.e. the root – and never across domain 'boundaries': morphological operations do not have any influence on the length of the root vowel – e.g. *l***[e:]***b* "live!", *L***[e:]***b-en* "life", *l***[e:]***b-te* "(he) lived", *l***[e:]***b-bar* "liveable".

German has strong (e.g. *geben* "to give") and weak (e.g. *leben* "to live") verbs. It appears that vowel length is decided along the same lines in strong and weak paradigms. Strong and weak verbs thus behave alike. However, morphology has an impact on vowel length in strong, but not in weak paradigms. That is, morphologically complex forms are treated as a whole in strong paradigms whereas the roots alone are considered in order to compute length in weak paradigms. It may therefore be said that the only difference between strong and weak paradigms is the status of the internal boundaries: phonology treats strong (but not weak) forms like simple morphemes: *l*[e:]*ben* "(to) live", *g*[e]*ben* "(to) give", *l*[e:]*bt* "(he) lives" vs. *g*[ɪ]*bt* "(he) gives". Therefore one has to posit that morphological boundaries have been lost in the strong paradigms: we are facing a case of non-analytic morphology as of Kaye (1995: 291-332). Phonology treats strong forms (even inflected ones) as a whole, i.e. as one morpheme: each of them must therefore be a lexical entry.

There is no vowel length variation whatsoever in **weak** paradigms of Germanic origin – e.g. *l*[e:]*b* "live!" vs. *l*[e:]*bt* "(he) lives"… However, quantity alternation can be observed in some loan paradigms with stress alternation – e.g. *M*[ø:]*bel* "furniture" vs. *m*[ø]*blieren* "(to) furnish". Alternations can also be observed in **strong** paradigms of Germanic origin – e.g. *g*[e:]*be* "(I) give" vs. *g*[ɪ]*bst* "(you) give". Finally, lots of loans do not follow the rules assumed for native items – i.e. have short vs. long vowels in open vs. closed syllables (e.g. *voil*[a] "here it is!" or *H*[ø:]*ft* "horn (geography)". It is therefore necessary to stop saying that NHG has synchronic active rules such as OSL or shortening. It will be shown that the only type of vowel length regulation in German concerns roots and that there is no active process in German as far as vowel length is concerned. The results are grounded on the analysis of an electronic corpus containing about 16 000 monomorphemes[i].

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Phonetically-based sound change in dialects of Polish

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Perception has been reported to play an important role in sound change (Ohala 1981, Blevins 2004), and such a model is used to account for Grimm's Law in Early Germanic by Iverson & Salmons (2003) and Blevins (2004). It is argued that variable aspiration of the voiceless stops was a prerequisite for the affrication and subsequent spirantization of the voiceless stops. Aspiration of the voiceless stop is reinterpreted as fricative noise, which is perceived as a homorganic fricative, and is phonologized as part of an affricate with the preceding stop. The latter is dropped from its weakly cued pre-obstruent position (Jun 2004). An explanation along the same lines is available for contemporary Liverpool English (Honeybone 2001).

I claim that misperception is responsible for the decomposition of soft labials in the Kurp dialect of Polish (/p^{j}/ → [pɕ], /b^{j}/ → [bʑ], /f^{j}/ → [ɕ], /v^{j}/ → [ʑ] and /m^{j}/ → [ɲ]). The aerodynamic factors attributable to the gestural overlap and release (in the case of stops) result in the perception of a soft fricative or nasal in the North Mazovian and Kurp dialects. What sets apart the Polish data from the Germanic data discussed is the fact that the emergent fricative is not homorganic with the preceding labial. I argue that the palatal place of the fricative (or the nasal) is a result of gestural delay (Browman & Goldstein 1990). Retiming of the labial gesture and the lingual gesture has consequences for the acoustic signal. Evolutionary Phonology (Blevins 2004) provides a theoretical framework for the proposed sound change. This paper contributes to the understanding of consonant strength (Lavoie 2001) by showing evidence that the [p^{j} px^{j} pj] continuum reflects the decremental overlap of the lingual and labial gestures, with subsequent phonologization of the palatal percept.

A close examination of the reflexes of soft labial fricatives shows divergent phonologization of the palatal frication. In the Kurp dialect, the labial element is dropped completely and only the palatal segment remains. This development is in accordance with Grimm's Law, where the weakly cued pre-obstruent segment is subject to elision. The realization of the soft labial as a palatal fricative is an indication of a complete sound change, resulting from the internalization of phonetic detail.

Next, I highlight the difference in the patterning of word-final soft labials in Standard Polish /p^{j}/ → [p] and Kurp /p^{j}/ → [pɕ]. The hardening in Standard Polish calls for a perceptual account. Word-finally, after a voiceless obstruent (due to final devoicing) the glide /j/ is likely to devoice. Because of the weak perceptibility of word-final voiceless sonorants, deletion in the next generation of speakers is expected. In contrast, the strongly-cued sibilant fricatives in the Kurp dialect are preserved even in non-prevocalic position.

Hardening is evidenced in the Kurp dialect as well, but the motivation and the context are different. I propose that the dissimilatory process of labial hardening in Kurp is attributed to a misanalysis of speech signal. A feature that covers a sequence of segments may be interpreted as having a source in one segment (false coarticulation).

Finally, I discuss imperatives, where the palatal fricative fails to emerge, even though the context is met. I resort to Paradigm Uniformity, as phonetically-based sound change alone cannot account for this underapplication. It is claimed that lexical access facilitation within a paradigm underlies the unexpected behavior of imperatives.

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On Word Prosody in Loanword Phonology

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One issue in the current debate on loanword adaptation is the role of subphonemic variants in influencing the phonological form of loanwords. Under a phonetic view incorporating the P-map (i.e. Perceptual-map) hypothesis of Steriade (2001a,b) and applied to loanwords as in Kenstowicz (2001, 2003), loanword adaptation is seen as a problem of perceptually matching the words of one language into another, maintaining as much information from the source word while still satisfying the constraints of the recipient language. An alternative view is the phonological view developed in La Charité and Paradis (2002, 2005) who emphasize the role of the bilingual in the borrowing process. Since the bilingual speaker has access to the phonology of both the source and recipient languages, borrowing is inherently phonological, with little or no role to subphonemic variants. Much of the discussion regarding this debate has focused on issues of segmental phonetics and phonology. In this paper we focus our attention on the somewhat understudied area of the borrowing of word prosody. We will present several cases in which prosody of words in a source language is ignored when they are borrowed into the recipient language, especially focusing on cases where source language word prosody could be accommodated by the recipient language but isn't. The question that arises in such cases is why the dimension of word prosody can be ignored when other aspects of loanword phonology can be elucidated by constructs like the P-map. Our focus will be on Japanese borrowings into Taiwanese (Southern Min). But as background we will briefly present several other cases where word prosody is ignored in loanword phonology. For example, when English words are borrowed into North Kyungsang Korean (Kenstowicz and Sohn 2001, Kim 2005) the location of the stress on the English word is irrelevant to the assignment of accent class. This is not a matter of "stress/accent deafness" since Korean speakers have been shown to be virtually flawless in their ability to perceive the location of English stress (Altmann 2006) and despite the fact that the stress location in English words can easily be accommodated as accented syllables given the Kyungsang lexical accent patterns. Instead a default accentuation pattern emerges with the English loanwords that is not apparent from the lexical pitch accent system of the Kyungsang dialects. In our focus on the borrowing of Japanese words into Taiwanese, we maintain that previous analyses such as Hsieh (2006) have missed the generalization that the tonal assignment on Japanese loanwords reflect a pitch-accent system. Analyses such as Hsieh propose that a Japanese loanword gets a tone assigned based on rhyme structure of the syllables within the borrowed word and that additionally general tone sandhi rules can apply (exceptionally within a word) that can create tone sequences in loanwords that are not normally found within a word. However, in the paper we show that a detailed examination of a full range of borrowed Japanese words with different length and different syllable structures shows a consistent pattern in tone assignment that is a suggestive of a pitch accent system. Namely, a high tone is assigned to the syllable (peak) containing the penultimate mora with all the other tones in the word being predictable regardless of the pitch pattern of the original Japanese word. Consider the following:

	Japanese	pitch pattern (on moras)	gloss	Taiwanese	tone pattern (on syllables)
a.	sasimi	L H H	sashimi	saçimi?	M H M
b.	obaasan	L H L L L	woman	ObasaN	M H HL
c.	handoru	H L L L	bumper	hantolu?	MH H M

This is suggestive of a system of accent that assigns a High tone (accent) to the peak vowel of a right edge trochaic foot (with vowels and nasal codas being moraic) and is supportive of analysis like that of Duanmu (2000) that posits trochaic feet in Chinese dialects for independent reasons. We conclude by offering suggestions as to why word prosody can be ignored in loanwords.

Reconsidering feature organization: Evidence from Spanish

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Although the interplay of resonance and continuancy plays an important part in the classification of natural classes such as fricatives, oral stops, and others (Hall 2007:314), the common consensus among phonologists is that resonance is a major feature, but continuant is not. This paper discusses phonological phenomena from Spanish that show that resonance and continuancy can operate in conjunction (1) or separately (2, 3), independently of major feature [consonantal]. The relevance of these phenomena is double: first, they suggest that resonance and continuancy have the same status in the phonological system of this language; second, they provide evidence that [sonorant] can be modified independently from [consonantal], and consequently, that single major features can operate on their own (Kaisse 1992).

(1). Continuant and sonorant together: Spanish has a well-known alternation between voiced stops [b, d, g] and their continuant counterparts. Although this alternation is commonly referred to as 'spirantization', acoustic evidence shows that the continuant counterparts of [b, d, g] are approximants rather than fricatives; they lack friction noise, show formant structure, are voiced throughout, and are shorter and more vowel-like than fricatives (Ladefoged 1982, Martínez Celdrán 1984, 1991, Romero 1995, Hualde 2005). Thus, the alternation between [b, d, g] and [β̞, ð̞, ɣ̞], involves a change in the specifications for both continuancy and resonance; while [b, d, g] are [-continuant, -sonorant], [β̞, ð̞, ɣ̞] are [+continuant, +sonorant].

Does continuancy depend on resonance? Since in Spanish both feature specifications can operate separately in phonological phenomena (2, 3), this suggests that they are independent.

(2). Continuancy: In Northern Peninsular Spanish, voiceless stops /p, t, k/ are realized as fricatives, most commonly [θ], syllable-finally before coronal stops. For example: 'director' /direktor/ is pronounced [di.ɾeθ.tor], and 'etnia' /etnia/ [eθ.nja] (Quilis 1992, González 2007). This shows that the feature [continuant] can operate independently of major features [sonorant] and [consonantal].

(3). Resonance: In Eastern Andalusian Spanish, continuant allophones of /b, d, g/ alternate between approximants [β̞, ð̞, ɣ̞], and voiced fricatives [ß, ð, ɣ]; the latter occur after aspirated /s/ (Romero 1995). In this case, a change in resonance specification is involved, independently of [continuant] (and of the [consonantal] feature). This suggests that resonance can operate independently of both of these features.

Since continuancy and resonance can operate together or independently, this suggests that both features have a similar status in feature organization, at least in Spanish. It is proposed that [continuant] and [sonorant] are major features, and it will be argued that [approximant] (Clements 1990, Clements and Hume 1997) is redundant as a root node. Since [sonorant] can be involved in phonological phenomena separately from [consonantal], this provides further evidence that major features can operate independently of each other (Kaisse 1992; cf. McCarthy 1988). The implications for feature organization will be considered, as well as for an Optimality Theoretic approach that integrates aspects of feature organization.

Modelling the formation of phonotactic restrictions across the mental lexicon

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We present a computational model that can explain type- vs. token learning effects that were found in the psycholinguistic experiments on phonotactic restrictions by Hamann & Ernestus (submitted). In these experiments, participants who had been trained with a large number of word types (i.e. 80 different words presented once each) performed better than participants presented with a smaller number of word types but the same number of tokens (i.e. 40 different words presented twice each). Hamann & Ernestus concluded that phonotactic co-occurrence restrictions are formed across lexical entries (as already suggested by e.g. Pierrehumbert 2003), since only lexical levels of representation can be sensitive to type frequencies.

A problem seems to arise when we try to propose an on-line learning model of how the participants behaved in Hamann & Ernestus' task. Simple connectionist and similar phonological models of processing (TRACE: McClelland & Elman 1986; Harmonic Grammar: Smolensky & Legendre 2006; Stochastic Optimality Theory: Boersma & Hayes 2001) update their connection (or constraint) weights at every incoming piece of data. Superficially, one could be inclined to predict that such models are sensitive to token frequency rather than to type frequency.

In the present study we tested this prediction and submitted Hamann & Ernestus' data to an interactive multiple-level bidirectional model of phonology and phonetics (Boersma 2007), extended with a semantic-morphemic level of representation, as in Apoussidou (2007). A crucial property of this extended model is that underlying phonological forms are not 'stored' in the lexicon but 'emerge' every time a speaker has to compute the pronunciation of a morpheme. A hundred virtual learners were simulated with several constraint-based learning procedures available in the Praat program (Boersma & Weenink 2007), namely multilevel Stochastic Optimality Theory and Harmonic Grammar learning. We modeled the acquisition of the phonotactic restrictions in the following way. The first time that a word form (with meaning) occurred, the virtual learner creates a *strong* connection (in her lexicon, one could say) between the given underlying form and the given meaning ('oneshot learning'). The same first occurrence of a new word form additionally triggers the creation of a weak phonotactic constraint at the phonological surface level (in her grammar, one could say; 'gradual learning'). Further occurrences of the same word do not trigger any creations of connections/contraints at any of the three levels, because these connections/constraints already exist. What *is* changed by later occurrences of the same word is the strengths of the phonotactic constraints, entirely in line with the learning algorithms that have been proposed in the above literature. The strengths of the form-meaning connections also changes (by the same learning algorithms), but these connections were strong to begin with, and these changes have hardly any effect. The combined result of virtually learning the connections/constraint at three levels of representation (the morphemic meaning, the underlying form, and the surface form) with a single learning algorithm is a sensitivity to type frequency. Indeed, virtual learners who were trained on 80 word types (presented once each) ended up with stronger phonotactic constraints than virtual learners who were trained on 40 word types (presented twice each). This difference in phonotactic constraint strengths predicts that the former group (in a grammaticality judgment task) is better at generalizing the learned phonotactic restrictions than the latter group.

Our proposed model is much simpler than previous generative accounts of phonotactic learning (such as Tesar & Smolensky 1998, Prince & Tesar 2004, Hayes & Wilson 2006), yet makes the same kind of generalizations. However, unlike these previous models, it does this in a way that is compatible with psycholinguistic findings.

Umlaut is phonological. Evidence from ineffability

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A number of studies have argued in recent years that West-Germanic umlaut is an example of a (non-concatenative) morphological process (e.g. Wiese 1996, Kurisu 2001, Iscrulescu 2006), rather than a productive phonological rule. In this paper, we argue instead for a phonological analysis of at least some dialects: the umlaut factor (e.g. a feature [-back]) spreads from the suffix to the stem. New evidence will come from some surprising data about an ineffability effect, which partly have gone unnoticed in the literature.

Background. The diminutive suffix /kə/ has a fronting effect on preceding vowel(s) in West-Germanic dialects such as those spoken in the Dutch province of Limburg. The process is fully productive, witness forms like:

(1)	[se:derɔm]	'CD-Rom'	[se:derœmkə]
	[kanʊn]	'cannon'	[kanʏnkə]
	[matrɑs]	'mattress'	[matræskə]

Two different approaches are possible in principle: a morphological or a phonological one. Under the former, formation of the Limburg diminutive would consist of addition of /kə/, and of fronting vowel(s) in the stem (or choosing an appropriate stem allomorph). The second view postulates a floating feature as part of the underlying inventory of the diminutive. Umlaut would then be spreading of this feature from the suffix to the stressed vowel, due to Prosodic Licensing. Note that there does not seem to be a triggering feature (umlaut factor) in the domain of the suffix, but it is usually assumed that such a feature is floating.

New evidence for the phonological view. We show that umlaut exhibits autosegmental spreading behavior, which morphological approaches cannot explain at all. Interestingly, if the stress is non-final in the stem, then, not only is umlaut blocked, diminutivization itself is impossible (an ineffability effect, cf. Féry and Fanselow 2003 for a similar observation on German):

(2)	[puma]	'puma'	*pumakə, *pumɛkə, *pymɛkə, *pymakə
	[o:ma]	'grandma'	*o:makə, *o:mɛkə, *ø:mɛkə, *ø:makə
	[ho:mo]	'gay person'	*ho:mokə,*ho:møkə,*hø:møkə, *hø:mokə

These facts fit quite easily into the phonological approach. The umlaut span must be maximally binary. Therefore, from the suffix it cannot reach the antepenult, stressed syllable. Yet, in Limburg it must spread to the stress. This is what causes ineffability. There is one environment where the stress may be non-final. This happens when the final syllable is schwa, as shown in (3).

(3)	[va:dər]	'father'	[vɛ:dərkə]
	[mo:dər]	'mother'	[mø:dərkə]

Again this directly follows from autosegmental theory. Schwa lacks a place node and can therefore not act as an anchor for the spreading umlaut factor.

Further, rather surprising, confirmation that umlaut is spreading comes from a new set of facts: stems with a stressed front vowel followed by a back final vowel. These cannot be diminutivized either, as shown in (4).

(4)	[he:ma]	kind of store	*he:makə, *he:mɛkə
	[tyba]	'tuba'	*tybakə, *tybɛkə
	[tina]	girl's name	*tinakə, *tinɛkə

To reach the stress, the umlaut factor must spread, thereby removing the original [-back] feature, creating a ternary umlaut span, which is not allowed. Under a morphological approach, it is unclear why a stem which already has a front stressed vowel and therefore does not require a stem alternation, would not be a possible input to the diminutive form.

Structural complexity and 'strong positions' in government phonology

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The paper examines the relationship between structural (or representational) complexity of segments occurring in phonologically strong positions in the framework of government phonology (Harris and Lindsey 1995, Cyran 1997, Backley and Takahashi 1998). In particular, the pre-vocalic change (1a) will be shown to be a genuine case of phonological strengthening:

(1a) k^w > p / ___ V and g^w > b / ___ V
(1b) IE ***k^w** > AncGreek *(h)e*[**p**]*e-* 'follow' (*cf* Lat *se*[kw]*i-*)
IE ***g^w** > Gr [**b**]*ous* 'cow' (*cf* Gmc [k]*u*)

(1c)	Latin	Rumanian	gloss
	*a***qu***a*	*a***p***ă*	'water'

The /k^w g^w/ segments are represented as a contour structure in the received approach:

(2)

In this representation, it is very problematic that, apparently, (1a) produces a structurally simpler sound, /p/, in a strong position, where 'gaining structure' is expected. However, there are reasons to think that the change involves gaining a melodic 'head' from the labial dependent /w/: velars having no place specification (Harris–Lindsey 1995, Cyran 1997), a **U**-headed labial, /p/, is a more stable structure, exactly as expected in strong positions. Going further to extend the element activation proposal made by Backley and Takahashi (1998) to consonantal representations, it will be argued that labialized velar stops have a 'colour tier' which is dominated by the **U** element, and no complement tier to reinforce this labiality. Plain labial stops, on the other hand, have both a 'colour tier' dominated by **U**, and a complement tier (only the colour tier and its complement tier are depicted here, to save space):

(3)

The change in (1a) then involves the activation of the **U** complement tier in a pre-vocalic, that is, a licenced position. Activating the complement tier means that the segment becomes more stable (its labiality is reinforced), and actually more complex than it had been before the change (although neither is a contour structure). Therefore, becoming more stable structurally (in this case, gaining melody / place specification) *is* a genuine form of phonological strengthening, which occurs in phonologically strong positions, just as expected.

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Too many levels, too few solutions: mutations and postlexical phonology in Breton

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In this paper I examine the interaction of initial consonant mutations and sandhi processes in Breton dialects. I argue that this interaction cannot be explained unless we assume that mutations and sandhi are dealt with in non-parallel fashion. My contention is that mutation in Breton should not be considered part of the phonological computation.

The initial consonants of Breton words are subject to two types of processes: *initial mutation*, triggered by preceding words and morphosyntactic factors, and *sandhi*, triggered by the surface-phonological context (Falc'hun, 1951; Jackson, 1967; Le Dû, 1986). I concentrate on cases where the interaction of these processes is challenging to theories which eschew multiple derivation levels.

I review several types of such interaction. In Berrien (Ploneis, 1983) the spirant mutation, which creates unvoiced fricatives, feeds several phonological lenition processes. "Lenition-and-provection" involves spirantization and devoicing of voiced stops (in a derivational theory, order is important here). However, [d] is simply devoiced, even though its spirantization is otherwise attested. This means that the featural make-up of the (auto)segments involved is not enough to derive all the correct mutations, and a parallel account is impossible.

Dialects also differ with respect to the interaction of the spirantization of voiced stops and the requirement that obstruent clusters be voiceless: in the dialect of Le Bourg Blanc (Falc'hun, 1951), spirantization precedes devoicing, creating voiceless spirants from voiced stops; in other dialects (e. g. Saint-Pol-de-Léon; Sommerfelt, 1978), devoicing bleeds spirantization. Finally, in some dialects mutation is blocked if place specification is shared across the trigger-target boundary (e. g. *da'm pen* 'to my head' instead of the expected **da'm fen*, *pen* 'head'). The latter two cases involve a markedness constraint interacting with the process that drives mutation.

These facts are an insurmountable challenge to theories which attempt to compute mutation in the on-line phonology, in particular autosegmental approaches (Lieber, 1987; Wolf, 2007). I consider several technically possible parallel accounts of the above facts and show that some kind of serialism is unavoidable. I show that the relevant processes involve both opacity and optimal candidates which do not improve on markedness.

I also show that the explanation of the above facts is not available in terms of Lexical Phonology and its OT implementations (Bermúdez-Otero, forthcoming). Both mutation and sandhi must necessarily take place at the postlexical level. Dialects may differ in their postlexical systems, but this variation is not connected to morphosyntactic differences (the contexts for mutation are broadly similar across dialects), and thus these differences must be due to language-specific rankings on the postlexical stratum. However, as I argue above, parallel computation of mutation and sandhi is not the best solution.

One line of attack on this conundrum is accepting that the postlexical level can have cyclic and noncyclic strata (*contra* Bermúdez-Otero, forthcoming). However, I propose that mutation is not an on-line phonological process and must be taken out of the computation altogether. I propose that mutation forms part of the input to the phonological component of the grammar: it is encoded in the lexicon (Bye, 2006; Green, 2007) or accounted for in a "pre-phonological" module (Hayes, 1990). This decision allows for a straightforward account of the phonological irregularities in mutation (e. g. the behaviour of [d] in lenition-and-provection, which is the result of several layers of sound change) and the unavoidable serialism of the interaction between mutation and sandhi. It also explains why mutation can fail to improve on markedness: this is due to simple faithfulness to the input rather than faithfulness to floating structure (Wolf, 2007).

Vowel harmony has direction and context: evidence from a corpus study

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In this talk, we present results from a large scale project that investigates vowel co-occurrence patterns in Turkish in the context of two corpora (*Turkish Electronic Living Lexicon* (TELL) and *Morphologically Analyzed and Disambiguated Newspaper Texts* (MADNT) and provide empirical data to shed light on theoretical issues concerning the dynamics of vowel harmony (VH) and its representation. We argue that disharmonic vowel co-occurrences in roots are not random, but tend to be constrained by the regular VH patterns, and hence VH should be regarded active in roots. We show that asymmetries and tendencies in vowel co-occurrences are straightforwardly explained if we distinguish "triggers" from "targets" and consider harmony as a (long distance) spreading process with a direction and context. We report transitional probabilities for each possible vowel sequence in different syllable positions and show, contrary to commonly held assumptions, that markedess is not a strong predictor for commonly found disharmonic sequences. More specifically, "unmarked" vowels (i.e., [i, e, o, u, a], Clements & Sezer 1982) do not seem to combine freely, and the "marked" ones ([ɨ, ü, ö]) commonly occur in disharmonic roots, sometimes even more frequently than unmarked ones (e.g., /i-u/ is less common than /a-ü/, /ü-u/, and /i-ü/). Indeed, /ü-a/ ranks as one of the most common disharmonic sequence in Turkish, outranking those with unmarked vowels (e.g., /e-u/, /i-o/, /u-e/). This provides counter-evidence for analyses of disharmony that crucially rely on the notion of markedness (e.g., Kirchner 1993, Polgardi 1999). We further show that a given pair of vowels does not combine with equal frequency in either order (V_x-V_y vs. V_y-V_x) within roots, yielding significant asymmetries in both corpora (e.g., $\text{MADNT}_{\text{token}}$: /o-u/=19244 vs. /u-o/=787). Likewise, we find substantially more [ROUND]-[NON-ROUND] sequences than [NON-ROUND]-[ROUND] ones, which are indeed much less frequent than the expected value if the choice of roundness within root vowels would be random. Closer examination reveals that in [ROUND]-[NON-ROUND] sequences, V_2 is mostly [LOW]. This suggests that VH exhibits a dependency relationship between the trigger and the target. Last but not least, we find that the more harmonic vowels co-occur in a given sequence within a root, the less likely it is for disharmony to arise in subsequent syllables within the same root, showing that featural agreement (cf. AGREE (F) in OT) arises as a chain reaction.

Based on these results we argue that the interplay of markedness constraints (**ü, *ö, *ɨ*) with directionless harmony constraints (e.g., AGR(F); Kiparsky & Pajusalu 2003) fail to explain the aforementioned asymmetries since a given vowel sequence *x-y* incurs as many constraint violations as *y-x*. Furthermore, the asymmetries in the transitional probabilities of, e.g., [o-u] vs. [u-o], and [a-ü] vs. [ü-a], cannot be explained via markedness constraints since these sequences will incur the same amount of markedness violations notwithstanding their order of occurrence. Instead, we argue that VH should crucially be viewed as a feature spreading process with a direction and context, and must be active within all kinds of Turkish roots, harmonic and disharmonic alike. We propose that everything else being equal, when features in a sequence cannot be shared between the trigger and the target vowel via regular vowel harmony rules, the sequence will constitute an exception, its rate of occurrence being determined by how restricted the offended harmony rule is. The narrower the scope of the rule, the less likely the occurrence of its offender will be. On this basis, we explain why palatal disharmony is more common than labial disharmony since the latter has a more restricted context than the former. This also accounts for the fact that [NON-ROUND]-[ROUND] sequences are less preferred than [ROUND]-[NON-ROUND] ones because the target vowel should not surface as [ROUND] in the absence of a proper context that satisfies the rounding harmony. In [ROUND]-[NON-ROUND] sequences, however, [ROUND] is not expected to spread unless the target vowel is high, explaining why the majority of [NON-ROUND] vowels in such contexts is [LOW].

A three-way distinction in syllable weight: evidence from Finnish stress

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The Weight-to-Stress Principle, or WSP, (Prince 1990) allows for only a two-way distinction in syllable weight, light versus heavy. This is based on the standard view in moraic theory (McCawley 1968, Prince 1976, Prince 1983, van der Hulst 1984, Hyman 1985, McCarthy and Prince 1986, Hayes 1989, Ito 1989, Zec 1988) in which each element of the rhyme projects a mora and syllables are maximally bimoraic, or, in exceptional cases, trimoraic. CV syllables are thus monomoraic, while CVC and CVV syllables are both bimoraic. To account for the different patterning of CVC syllables across languages as heavy versus light, Hayes (1989) proposes the parameter of Weight-by-Position, which assigns moras to vowels obligatorily but to coda consonants optionally. This proposal allows for flexibility in the treatment of CVC syllables, but still allows only a two-way distinction in syllable weight, with CV versus CVC/CVV syllables on the one hand and CV/CVC versus CVV syllables on the other.

In Finnish, the evidence from both stress facts and minimal word effects argues for a three-way distinction in syllable weight, with CVV syllables acting heavier than CVC syllables, and CVC syllables heavier than CV syllables (Karvonen 2005). Outside the first two syllables of the word, CVV and CVC syllables both pattern as heavy and attract secondary stress, disrupting the normal alternating rhythmic pattern. However, content words in Finnish must be minimally (C)VV or (C)VCV (Hanson & Kiparsky 1996, Harrikari 2000), suggesting that CVC here patterns as light, as shown in (1) below:

(1)	.maa.	‘land’	.ka.la.	‘fish’
	.suo.	‘marsh’	.u.tu.	‘mist’
	.yö.	‘night’	.lu.mi.	‘snow’

CV and CVC content words do not exist, and a potential subminimal word like *mi* ‘what’ is augmented to the CVCV form *mikä* on the surface, an observation originally made by Harrikari (2000). This results in a conundrum, since CVC syllables pattern as heavy in terms of stress assignment, but as light in terms of minimal word effects. An additional wrinkle comes from the stress patterns of adjacent word-medial CVC and CVV syllables in pentasyllabic and longer words. In such cases, the CVV syllable is always stressed, regardless of the linear order of the two heavy syllables:

(2) *Word-medial CVC.CVV and CVV.CVC sequences: CVV always stressed*

hó.ri.son.tàa.li	‘horizontal’
dí.ag.nos.tìik.ka	‘diagnostics’
á.ka.tèe.mik.ko	‘Academy member’
á.na.lỳy.tik.ko	’analyst’

The data in (2) provides the crucial evidence for a clear three-way distinction. Finnish is not alone in this regard; Gordon (1999) discusses other languages which have more finely articulated scales of syllable weight, with three- and even four-way distinctions in weight. Such languages prove difficult to analyze within traditional moraic theory, which allows for only a two-way distinction in syllable weight. Following a proposal made by de Lacy (2002), I suggest a solution to the problem by splitting the WSP into a family of syllable weight markedness constraints, militating against stressless syllables of various types. This proposal allows for cutoffs at various points along the scale, accounting for more fine-grained distinctions in weight and predicting a richer typology of syllable weights than previously reported.

An Analysis of Glide Formation in Continental French

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Kaye and Lowenstamm (1984) propose that any word-internal glide resulting from active derivation must be not only non-nuclear but also consonantal thus being syllabified in the preceding onset, (1a). By corollary, a branching onset would block glide association in the onset (since all constituents in French are maximally binary), forcing glide epenthesis, (1b):

(1) a. CV+V→ CGV *lier* 'to tie' but b. CLV+V→ CLV.GV *plier* 'to fold'

However, such models, often based on limited data, do not take into account the variable nature of the phenomenon. Durand and Lyche (1999) observe for example in Midi French:

(2) a. *câbliez* 'you cabled' [ka.**blje**] CLGV but b. *oubliez* 'you forget' [u.**bli.je**] CLV.GV

In a preliminary study examining a divergent sample of French varieties the situation appears to be even more variable. These data are drawn from the database of the international research project *la Phonologie du français contemporain* (PFC) (Durand, Laks & Lyche 2003). Four geographically as well as dialectally divergent regions (Belgium, Normandy, Midi and Switzerland) were selected, and samples of semi-directed conversations were coded for seven factor groups including internal factors PRECEDING SEGMENT, PRECEDING SYLLABIC STRUCTURE, UNDERLYING HIGH VOWEL, FOLLOWING VOWEL and the external factors INDIVIDUAL SPEAKER and DIALECT REGION. The statistical significance of each of the factors in all instances of syneresis is put to a multivariate (regression?) analysis using *Goldvarb X*.

Three factor groups are determined to be significant in the application of the dependant variable (syneresis): PRECEDING SYLLABIC STRUCTURE, FOLLOWING VOWEL and the DIALECT REGION itself. Subsequent analyses show that the data subdivide along regional lines (Northern versus Southern regions). In the Northern regions the factors FOLLOWING VOWEL and INDIVIDUAL SPEAKER factor significantly in occurrences of syneresis, whereas, the Southern regions show that syneresis is significantly determined by PRECEDING SYLLABIC STRUCTURE as well as the PRECEDING SEGMENT.

As the nature of working with spontaneous speech is such that we cannot control for breadth of tokens within the sample, the total number of tokens (273) in this analysis does not allow for an nuanced examination of the interactions between factors. As much for a detailed description of the variation as for the elaboration of an adequate grammatical model, glide formation phenomena must be examined in a much more extensive corpus of French (standard and non-standard varieties alike) in order to properly document that which is shared and that which is not shared in these various grammars. With a view to achieving this goal, this study examines the interactions between individual factors more elaborately.

Using advanced coding methods for vowel/glide recognition developed by the LIMSI—Laboratoire d'Informatique pour la Mécanique et les Sciences de l'Ingénieur research group of the Université de Paris 6 & 11, we are able to code a greater number of survey points from the PFC corpus thus increasing the sample size. We examine the acoustic data from the two principal dialect regions using a formant extraction script in PRAAT in order to better understand what specifically about a PRECEDING SYLLABIC STRUCTURE and a PRECEDING SEGMENT is significant in determining instances of syneresis in the southern varieties while in northern varieties the only significant linguistic factor is FOLLOWING VOWEL.

Speech production with an exemplar-based lexicon

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A fundamental question of linguistic theory is how spoken language is encoded in the mental lexicon. The standard view, that speech signals must be mapped to symbolic phonological representations for linguistic processing and storage, has increasingly come under attack, as failing to provide a natural account of frequency effects and gradient sound change, see e.g. Johnson 1997, Jusczyk 1997, Goldinger 1998, Bybee 2001, Pierrehumbert 2001, Gahl and Yu 2006 (and other articles in *Linguistics Review* v. 27), Port 2007. Rather, these works propose a lexicon in which words are stored as clusters of exemplars: detailed, individuated memories of the phonetic signal for previous tokens with the same semantic labels. Speech perception/recognition, under this approach, involves matching the incoming signal with the word (or perhaps whole phrase) class to which it is most similar. Exemplar-based speech production, however, is not so straightforward. A production system cannot work simply by selecting an exemplar of the target word and outputting it verbatim. For example, the intended word may be something the speaker has heard before (perhaps only once) but has no prior experience of producing: none of the relevant exemplars in such a case will include any articulatory information. The production system must therefore have the capacity to *generalise*, by computing an output that blends together portions of other exemplars, reflecting not only the prototypical properties of the target word class, but also any sound patterns strongly instantiated in similar exemplars (or portions thereof) from other words. Phonology then emerges as the set of phonetic generalisations (gradient or categorical), which the production system enforces (variably or obligatorily) upon its outputs.

Hintzman's (1986) Minerva2 provides an explicit computational model which can generalise over exemplars, but it is limited to static data, whereas speech signals are variable-length time series data. In this study, we present an alternative model, PEBLS (Phonological Exemplar-Based Learning System), and show that it is capable of generalising over a lexicon of real speech exemplars, in a way that is sensitive to the token frequency of patterns. We begin with a corpus of speech recordings, processed into mel frequency cepstral coefficient vectors, and concatenated to form a single data structure, the *field*. From this field, a frame-wise transition matrix is precomputed: a transition from frame A to frame B is high-valued if A precedes B in some exemplar, or A precedes B' where B' is similar to B; likewise, if A' precedes B and A' is similar to A. The matrix thus represents a network of (real-valued) potential transitions from parts of one exemplar into parts of all other exemplars in the lexicon. In speech production, a particular token of the intended word is randomly selected, to serve as the *target*. PEBLS then computes an optimal alignment of the target with the transition network, using dynamic programming (cf. Sankoff and Kruskal 1983). Preliminary results indicate that this system is capable of generating outputs by concatenating discontinuous portions of the field which match portions of the target, resulting in reasonably natural sounding synthetic speech. Crucially, the 'optimal' alignment here reflects not merely Euclidean distance, but also a measure of confidence, i.e. the extent to which alternative alignments, with other portions of the field, yield roughly the same scores -- as would be the case if the corpus strongly instantiates a particular pattern. This is done by hierarchically clustering the scores at each step in the dynamic programming algorithm, and selecting the cluster that maximises a function of mean similarity value, size, and variance. We predict that PEBLS, trained on a corpus of speech signals instantiating a phonetic pattern (e.g. intervocalic spirantisation), will extend that pattern to its outputs, even if it is based on a target which violates that pattern: target /beka/, for example, will be produced as output [bexa]. More broadly, this approach can be seen as an application to phonology of general methods of quantitative pattern completion from the field of Machine Learning. Though the modelling experiment outlined above uses a corpus of purely acoustic signals, this model can ultimately include articulatory (and even visual) parameters as well. Our approach, thus extended, may permit a novel answer to one of the most basic questions of phonological theory: why is speech segmentable (albeit only roughly, cf. Port 2007) into sequences of a fairly small number of consonants and vowel phonemes? Standard theories stipulate the availability of such units to the learner. Under our approach, the quasi-phonemic structure of speech derives from the system's learning of the relatively stable correlations between articulatory movements and salient perceptual cues across the lexicon of exemplars. Phonemes are simply another type of sound pattern.

Cue switching in the perception of approximants: Evidence from two English dialects

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A surprising dissimilarity is attested in the perception of approximant sounds by speakers of American and Standard Southern British English dialects. Eighteen subjects (8 AE and 25 SSBE speakers) performed an identification task in which they judged whether stimuli were more like /r/ or /w/. The stimuli comprised five sounds copy-synthesised from a source /r/, where the values of F2 and F3 were manually adjusted as follows:

A:	F1=355	F2=1201	F3=1682	(apical /r/-like formants)
B:	F1=355	F2= 963	F3=1682	(F2 at midpoint of /r/ and /w/; F3 /r/-like)
C:	F1=355	F2= 1201	F3=2541	(F2 /r/-like; F3 raised to /w/-like height)
D:	F1=355	F2= 725	F3=1682	(F2 lowered to /w/-like height; F3 /r/-like)
E:	F1=355	F2= 725	F3=2541	(/w/-like formants)

The only significant difference (t=3.146, p<.005) between the two dialect groups' performance occurred with Stimulus D, the token in which F3 was at a height typical for /r/ and F2 was lowered to that of /w/. AE speakers identified this stimulus as /r/ 90% of the time and SSBE speakers only 59% of the time. Such a disparity is unexpected given that alveolar approximant /r/ in both dialects is generally characterised acoustically by a low third formant (F3) (Delattre &Freeman 1968; Nolan 1983; Alwan et al. 1997; Stevens 1998; Espy-Wilson et al. 2000). Why then the significantly different results between the two groups when Stimulus D involves the canonical /r/ cue of a lowered F3?

A possible solution to this problem lies in the well-documented existence of a non-standard realisation of /r/ in Southeast England which is increasingly common in adult speech as a sociolinguistic variable (Foulkes & Docherty 2001; Trudgill 1988). This variant, referred to as 'labiodental' /r/ does not have a low F3 and seems to lie outside of the articulatory and acoustic continuum found for American English /r/ (Docherty & Foulkes 2001).

The performance of the SSBE subjects here may be due to greater exposure to the labiodental /r/ variant in their community. SSBE speakers must tolerate a wider diversity of /r/-types, including /r/s without a canonically low F3. As a consequence, the /r/ category in SSBE may be becoming increasingly defined by F2, rather than F3. If this were the case, SSBE speakers would weight F2 more than F3 in their perceptual categorisation, and the F2 boundary between /w/ and /r/ would become sharper in SSBE relative to AE. AE speakers, who encounter 'labiodental' /r/ less frequently, continue to attend more to F3 than F2. For them, the /r/-like low F3 in Stimulus D leads them to a definite /r/ categorisation. For the SSBE speakers, the /w/-like F2 cue interferes with the low F3 cue to cause greater perceptual uncertainty.

The implications of this apparent shift in perceptual weighting may be a further increase in production variability, even involving SSBE speakers for whom 'labiodental' /r/ is not primarily a sociolinguistic variable. As the cue for /r/ in SSBE shifts to F2, speakers may attend less to producing adequately low frequencies of F3 and therefore a gradual erosion of low F3 instances of /r/ can be predicted across SSBE.

Taking a free ride can cau[ɻ]se severe hyperrhoticity

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English *r* dropping, linking *r* and *r* intrusion have received considerable attention in the literature. *r* intrusion has been regarded as an unnatural process by McCarthy (1993), Halle & Idsardi (1997), Hale & Reiss (2000). Subsequently, intrusive *r* was successfully analysed in OT as low glide formation (Gnanadesikan 1997, Baković 1999, Krämer, to appear). Some American English varieties show an even more marked insertion pattern. Hyperrhotic accents (e.g., Massachusetts, New York) are historically nonrhotic, with linking and intrusion, and are currently returning to rhoticity. Speakers overgeneralise the (contrastive) occurrence of postvocalic *r* (as in *tuner*) to an *r* insertion rule (Wells 1982), resulting in final rhotics in words like 'tuna' and in preconsonantal rhotics in words like *cough*.

The problem: In OT, changes from input to output are seen as improvements on some markedness constraint. Since some markedness constraints stand in conflict, satisfaction of one markedness constraint can result in violation of another (e.g., to avoid a coda in a CVCCV string a complex onset can be tolerated and vice versa). Preconsonantal *r* insertion leads to more marked syllable structure by creating either a coda or even a complex coda - as in hyperrhotic *wa*[ɻ]*sh*. Since markedness constraints are usually functionally or typologically motivated (or both), there is no acceptable constraint available that triggers this insertion. There is no way of deriving this insertion from interaction of independently motivated constraints either.

The proposal: Hyperrhoticity is a side effect of lexicon restructuring during the acquisition of the source dialect (i.e., nonrhotic English with *r* intrusion). Speakers of nonrhotic intrusion varieties can store neutralised minimal pairs, such as *tuner* vs. *tuna*, either with or without an underlying *r*, but in any case they will not have a contrast. Learners actually take the simpler output as the underlying representation first (i.e., the *r*-less form). Once the learner encounters ∅~*r* alternations, s/he reranks faithfulness and markedness constraints until information from mark-data pairs is exhausted. At this point the learner changes underlying representations, positing an underlying *r* after non-high vowels for all alternating forms, but also for all non-alternating forms (with a morpheme-internal non-high vowel). That is, the latter take a Free Ride (Zwicky 1970, McCarthy 2005) on the change made to the representation of the former on the basis of the alternations these undergo. Underlyingly, all non-high vowels are followed by an *r* now. This affects words like *farm* and *cloth* alike. With changed inputs, violation marks for potential output candidates change as well and mark data pairs can be assessed again to find new ranking arguments. If a speaker of such a variety switches to rhotic English, the first step is the demotion of the constraint against coda *r*. With the new ranking, all underlying *r*s surface, resulting in hyperrhoticity.

Conclusion: The overgeneralisation that leads to hyperrhoticity does not occur during the change from non-rhoticity to rhoticity, but rather during the acquisition of the first variety. This paper shows that hyperrhoticity is by no means a 'crazy rule', but follows automatically from independently made assumptions on the acquisition of lexical representations and constraint rankings and from the very specific historic situation of a switch of a non-rhotic variety back to rhoticity. More generally, this discussion shows that hyperrhoticity does not pose a problem for OT per se, despite the general consensus on functional and typological grounding of constraints, but rather allows us to learn about the unlikely forms underlying representations can take.

Onsets: Phonological problems solvers

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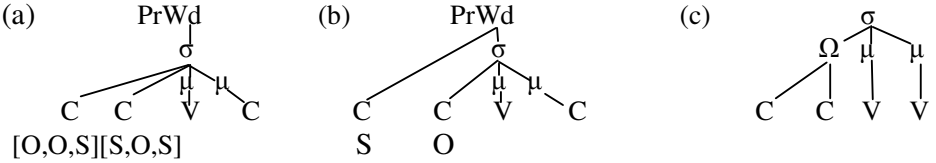
Sonority reversed word initial onset clusters, Sonorant + Obstruent (SO), have been treated in the literature as having a special phonological status (Steriade 1982, Levin 1985). Since these clusters have a declining sonority, rather than a sonority incline as required by the SSP, they are assumed to have a different phonological representation from clusters that do not violate the SSP. OS, OO, and SS clusters are syllabified as in (1a) but SO clusters are syllabified in some other fashion, for example, as in (1b).

Based on a cross-linguistic survey of word initial onset clusters in 62 languages from 22 language families, I show that of the 15 logically possible combinations of OS, OO, SS and SO clusters, only 4 language types emerge, as in (2). The implicational relations are: OS ⇒ OO ⇒ SS ⇒ SO. Emerging from the table and the implicational relations is the fact that SO clusters do not behave differently from other clusters and participate in the overall cross-linguistic onset typology. Furthermore, I show that SO clusters occur in 30% of all languages, making them much more common than previously thought. If SO clusters have a special status, we would expect SO clusters not to integrate into the onset typology and not to be quite so common cross-linguistically. Rather, we would expect them to combine freely with other language types to yield language types such as: *{OS, SO}, *{OS, OO, SO}. However, these types of languages are not empirically attested. Rather, SO clusters occur in a language only if OS, OO, and SS, also occur. I argue that if SO clusters behave like all other clusters, and integrate neatly into the typology, they must have the same phonological representation as OS, OO and SS clusters. I propose assuming the Onset (Ω) as a sub-syllabic unit of organization and suggest that the phonological representation of all cluster types is as in (1c).

By assuming the (Ω) as a sub-syllabic constituent, we are also able to formally account for the cross-linguistic observation that clusters tend to rise in sonority towards the peak without resorting to the SSP. I argue that the onset (Ω), as a sub-syllabic constituent is subject to sonority constraints imposed on prosodic units in the spirit of de Lacy (2004) and Zec (2007 and references therein). Prosodic constituents gain their sonority value through a process of feature percolation outlined in Zec (2000). The typology shown in (2) can be accounted for by placing maximal sonority restrictions on the Ω.

However, the proposal to treat the Onset as a sub-syllabic unit of organization is not novel and has been proposed in the literature in the past (Davis 1985) to resolve, among other problems, the unusual weight assignment in some languages such as Pirahã and some Australian languages. In these languages it seems that onsets play a major role in weight assignment and may influence syllable weight. Thus, assuming the Ω as a sub-syllabic constituent has the advantage of being able to account for a host of unrelated phonological phenomena such as stress assignment in some languages, the phonological representation of SO clusters, as well as giving a formal account for the SSP as a cross-linguistic observation, among other problems. Questions regarding the incorporation of the Ω into the prosodic hierarchy as well as the question of multiple onsets vs. a single onset will also be addressed.

1. (a) (b) (c)



2.

Type	OS	OO	SS	SO	Language	Occurring clusters
Type 1	✓				Basque, Wa	{OS}
Type 2	✓	✓			Kutenai, M.Hebrew	{OS, OO}
Type 3	✓	✓	✓		Greek, Irish	{OS, OO, SS}
Type 4	✓	✓	✓	✓	Georgian, Pashto	{OS, OO, SS, SO}

Positional strength in strict CV: On predicted initial weakness in clusterless languages

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In Strict CV phonology (Scheer 2004), strong positions are defined as licensed but not governed, while weak positions are unlicensed and ungoverned. A further intermediate position of *semi-weakness* is defined for intervocalic positions that are both licensed and governed. This follows from the view that nuclei in V positions have the dual role of licensing and governing C positions within CV pairs. Such licensing and government is reserved for phonetically realised vowels so that empty V positions are always preceded by weak positions. The initial position is preserved as a strong position by assuming an initial empty CV sequence that is the target of government that would otherwise fall on the initial position.

In recent research it has been argued that not all languages have an initial empty CV sequence; it is not found in languages that do not have true clusters apart from homorganic NC clusters and geminate consonants and which, in addition, show no vowel-zero alternations. The argument is that if proper government is parametric, then such languages have a negative setting that bans all internal empty positions but also renders the initial empty CV unable to be licensed. Under this view, the initial position in these languages is both licensed and governed and therefore not a strong position. This prediction is also made for languages with both sonority increasing and sonority decreasing clusters in initial position (e.g. Polish, Moroccan Arabic). This paper explores the validity of this prediction.

On the one hand, there is evidence from initial voicing in Bantu languages which shows that the initial position can be weak, while on the other hand, weakening processes in Gujoolay Eegima (Sagna 2008), a West African language of Senegal, do not affect the initial position:

(1) *Gujoolay Eegima positional strength asymmetries*

a. {p t c ɟ k} → {ɸ r ʃ j̬ x} respectively / { V_V, __# }

b. b < β intervocalically, b̥ unreleased finally

g < ɣ intervocalically, g̊ unreleased finally

Since Gujoolay Eegima as a clusterless language does not have an initial empty CV the prediction is that the initial position is weak because it is both licensed and governed. This analysis can be maintained if such languages are viewed as only having lenis stops. An alternative, which we will pursue here, is to restrict government to only two types; proper government and infra-segmental government. In this way the initial position escapes government in languages with no proper government despite the absence of the initial empty CV and can therefore be strong. In order to maintain this effect, while also allowing for the fact that under this view initial and intervocalic positions are licensed in identical fashion, it will be argued that positions that are flanked by V positions in a licensing relation are weak in a similar manner that positions flanked by a governing relation (e.g. in infra-segmental government) are inert. In the former case, licensing produces semi-weakening and in the latter, government produces total weakness, i.e. emptiness.

On the other hand languages like Polish and Moroccan Arabic that allow proper government will be predicted to show weakness in initial position. This paper therefore furthers the typology of strength relations as defined in Strict CV.

Similarities and differences between spoken and signed language phonology: insights from children's sign language development

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Like spoken languages, sign languages have duality of patterning – a meaningful level of structure (morphology and syntax), as well as a level of meaningless, yet linguistically significant units (phonology). The physical means of transmission of sign languages however, is radically different from that of spoken languages. This modality difference raises several important questions for phonologists, including the following: (1) Do the phonological representations of spoken languages adequately express sign language phonology? (2) How far does the actual mode of communication infiltrate the phonology? In our work we seek to address these issues through the study of children's phonological errors during development. We compare the types of developmental errors found in spoken and sign languages, with the aim of determining which phonological processes differ and which are comparable.

In this talk we will present naturalistic data from two longitudinal case studies (aged 1-3 years) and experimental data from 91 deaf children (aged 3-11 years) who are acquiring British Sign Language (BSL) as their native language. Analysis of the errors in sign language production in both sets of data indicate that markedness and complexity of phonological representations lead to similar errors in sign language as are found in spoken language acquisition. Just as children acquiring spoken language substitute less marked phonemes for marked ones, deaf children replace marked handshapes with simpler, unmarked ones. Just as hearing children reduce complex syllable structures, deaf children simplify clusters of path and hand-internal movements – either by deleting one of the movements, or by separating two simultaneous movements so that one is produced after the other. We also focus in this paper on one of the obvious differences between speech and sign, namely the degree of sequentiality in the representation. Speech is sequential in nature, but because of the slower articulation, sign languages place greater reliance on simultaneous representations. While there is a sequential element to sign, there is little consensus as to whether this should be captured at the level of the phonological representation. Developmental errors indicate that the sequential timing element of the sign may be maintained but the manner of movement substituted, while alternatively the first and second handshape of a sign may be interchanged whilst preserving the hand-internal movement. This suggests that the child has in the phonological representation a timing tier that is independent from handshape features. This tier may be the most basic part of the sign and that which young children start with in their own productions.

We will argue that the similarities in development between the modalities are not superficial, arising from the convenient sharing of terminology, but illuminate universal principles at play in the development of language, whatever its modality

A Limit to "Crazy" Reanalysis: The Story of /l/ Gemination in Quebec French

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Introduction In this paper, I propose that /l/ gemination affecting clitics *le* and *la* in intervocalic position in Quebec French arose from a reanalysis of the /l/ belonging to the third person singular masculine pronoun /il/, as part of the clitics: [**il**-**l**-V] → [**i**-**ll**-V]. The subject pronoun *il*, which frequently precedes the object clitics, was undergoing variable deletion in the 16th century. The development of /l/ gemination in Quebec French demonstrates that reanalysis can be powerful enough to allow a seemingly arbitrary (or "crazy") restriction of gemination to clitics (not to articles), but it is also constrained by phonological plausibility in that the gemination reanalysis is restricted to the context where it can be construed as a result of compensatory lengthening (henceforth CL) of clitic vowel deletion.

Data In Quebec French, when object clitics *le* or *la* occur between vowels, they lose their vowel and their /l/ is geminated, as in (1). If the verb is not vowel-initial, as in (2), no gemination occurs.

(1) a. /a **la** apʁã/ a**ll**apʁã
she it:fem learns 'She learns it.'
b. /mari **la** apʁã/ mari**ll**apʁã
Mary it:fem learns 'Mary learns it.'
c. /a **la** apʁãd/ a**ll**apʁãd
to it:fem learn 'to learn it'
d. /lãtmã **la** apʁãd/ lãtmã**ll**apʁãd
slowly it:fem learn 'slowly learn it'

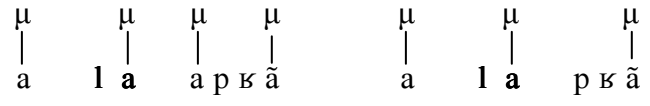
(2) a. /a **la** pʁã/ a**la**pʁã (~ a**:**pʁã)
she it:fem takes 'She takes it.'
b. /mari **la** pʁã/ mari**la**pʁã
Mary it:fem takes 'Mary takes it.'
c. /a **la** pʁãd/ a**la**pʁãd
to it:fem take 'to take it'
d. /lãtmã **la** pʁãd/ lãtmã**la**pʁãd
slowly it:fem take 'slowly take it'

In similar phonological environments, the /l/ of the articles *le* or *la* do not undergo gemination, as can be seen in (3).

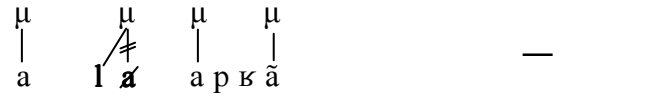
(3) /a **la** ekɔl/ a**l**ekɔl
at the:fem school 'at school'

Analysis I propose that when the clitics lose their vowel due to hiatus, they undergo CL, as illustrated in (4).

(4) **Mora assignment**



Vowel deletion and compensatory lengthening



Historically, it is likely that, as suggested by Dumas (1987), the gemination process is the result of reanalysis, illustrated in (5a), of the objects clitics *le* and *la*, following final /l/ deletion which affected the third person singular masculine subject pronoun *il* as of the 16th century.

(5) **Stage 1:** /il/ a. i**l** **l**a apʁã b. i**l** **la** pʁã
Stage 2: /il/ ~ /i/ i**l** **l**a apʁã i**l** **la** pʁã
Stage 3: /i/ i **ll**a apʁã i **la** pʁã *i **ll**a pʁã

This reanalysis, however, is not totally unconstrained: it is restricted to the environments where CL occurs. In (5b), there is no CL, because no vowel is lost. As for the articles *le* and *la*, the environments in which they occur did not trigger such a reanalysis, and therefore they never undergo gemination.

Conclusion The phenomenon of /l/ gemination in Quebec French shows how reanalysis can create an arbitrary restriction of a phonological process (namely, restriction of CL to clitics) but at the same time, it also shows how reanalysis is not so 'crazy', being constrained by certain grammatical principles.

Limited phase impenetrability at PF: a real solution to a Micronesian paradox

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Languages sometimes display paradoxical behavior by both enforcing and violating a given well-formedness condition. One well-known paradox emerges in the Micronesian languages Ponapean (Rehg & Sohl 1981) and Woleaian (Sohn 1975) where the loss of word-final vowels triggers compensatory vowel lengthening in so-called monosyllables. Ponapean examples are in (1a) and Woleaian in (1b).

(1) a. pike [piik] 'sand' b. ite [iit] 'name'
wara [waar] 'canoe' mata [maat] 'eyes'

In the phonological literature, this pattern of vowel lengthening is attributed to the enforcement of a minimality condition, requiring a word to contain more than one mora. The paradox arises from the fact that both languages also tolerate words that do not conform to this requirement. Examples of the latter in Ponapean are *dip* 'chip', *pak* 'occurrence' and dip^{w} 'clan'. Tolerance of subminimal words is reinforced in Woleaian by the persistent shortening of final long vowels without exempting monosyllables (e.g. /wa:/ [wa] 'canoe', /be:/ [be] 'divinations', /fa:/ [fa] 'string, cord'). Current attempts to reconcile the enforcement and violation of the word minimality (MINWD) constraint in the same language are all based on the empirically untestable claim that the lengthened vowel inherits a mora from the deleted vowel. Even in a framework like (non-derivational) OT the process of vowel lengthening in these Micronesian languages is directly linked to the loss of the final vowel. The assumption is that, if the enforcement of MINWD were dissociated from vowel deletion, the tolerance of subminimal words could not be explained. However, a real solution to the Micronesian paradox cannot be based on an unfalsifiable claim. In this paper, I propose a new solution to the paradox that qualifies a genuinely explanatory, because (a) it attributes monosyllabic lengthening directly to the satisfaction of MINWD; (b) it limits lengthening to disyllabic inputs; (c) it does not maintain the fiction that vowel lengthening emerges from the transfer of a mora from a deleted vowel; (d) it explains why the Micronesian languages must tolerate subminimal words. A crucial element of the new analysis is the adoption of the framework in which phonology interprets morphological structure cyclically as determined by phase theory (Chomsky 2001, 2005) and structure is assigned to words in accordance with the theory of Distributed Morphology (Halle & Marantz 1993).

Given the derivational framework, the elements of the solution to the Micronesian paradox are as follows: (a) every phase must project a prosodic word; (b) the Micronesian languages belong to a common type that enforces the MINWD only at the final phase of a derivation (i.e. X^{Max}); (b) the requirement is satisfied in these languages by any configuration that contains more than one syllable; the superheavy CVVC is such a configuration, cross-linguistically; (c) an extension of the Phase Impenetrability Condition (Chomsky 2001, 2005) to the PF component ensures that, once a prosodic word is projected, its well-formed status has to be preserved. A theory that incorporates these hypotheses predicts that subminimal prosodic words, projected at an early phase (Phase X) will be preserved at a latter phase (Phase X+1). The enforcement of MINWD at X^{Max} then ensures that CVCV inputs would be projected as a well-formed and could not be reduced to a subminimal CVC output. If final short vowels cannot be preserved (for whatever reason), the output must still be a minimal word at X^{Max}.

Voiceless consonants in North Low Saxon:
[spread glottis] equals μ-association.

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The process of compensatory lengthening (CL) after schwa-apocope results in vocalic overlength in Low German dialects (e.g. Bremer 1929). The durational increase of the preceding syllable compensates for the deletion of a final syllable. Formally, this process is assumed to be the re-association of the free mora (μ) of the lost syllable to the preceding nucleus (Hayes 1989). The prerequisite for its occurrence is an intervening voiced consonant or sonorant consonant. I propose that Low German (LG) voiceless consonants block CL, thus behaving as geminate consonants. The crucial constraints are:

(1) $[s.g]_{CC}$: voiceless consonants are geminates.
(2) *GEMINATE: avoid geminates (Holt 1997).

[s.g.] issue. Mora Theory postulates that geminate consonants contain a single μ, and syllabic geminate consonants bear μμ. Ordinary consonants are μ-less. However, those ordinary consonants show non-uniform behavior in LG with regard to CL. A preceding Middle Low German (MLG) [spread glottis] consonant blocks CL, while a voiced consonant does allow for CL:

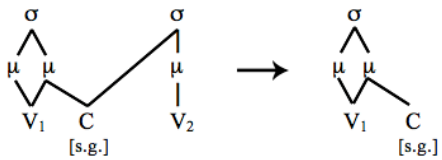
(3a) LG *riet* [riːt] 'I rip' < MLG *rîte*. (3b) LG *ried* [riːit] 'I ride' < MLG *rîde*
LG *Saak* [zɔːk] 'thing-Sg.' < MLG *sake* LG *Saag* [zɔːɔk] 'saw-Sg.' < MLG *sage*

It follows that the laryngeal features of LG consonants yield differing representation for [spread glottis] (s.g.) consonants and voiced consonants respectively.

Issue resolved. A possible solution is the assumption that LG [s.g.] consonants behave as geminates. They are associated to the second μ of the nucleus, sharing it with the preceding vowel (Broselow et al. 1997). Diachronically, the MLG [s.g.] consonants prevent CL. The vowel is kept from lengthening phonetically as well as phonologically. This is demonstrated in (4). The μ-association of [s.g.] consonants is expressed phonetically in the rather heavy aspiration of the voiceless obstruents in LG.

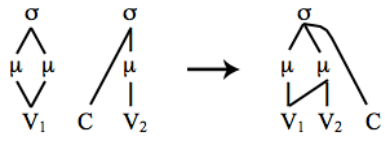
The voiced consonants, in contrast, associate directly to the syllable node as shown in (5). The preceding vowel is produced phonetically longer since the second μ is not shared. Also, CL is enabled, which leads to a (still) doubly linked V_1 and the singly linked V_2 conjoined in one syllable in LG.

(4) intervening MLG [s.g.] obstruent



MLG LG

(5) intervening MLG voiced obstruent



MLG LG

The underlying assumption is such that the more segments are assigned to a μ, the shorter the duration of the single segment becomes. This results ultimately in the adherence of MAXBIN (Prince & Smolensky 2004) since overlength (i.e. MLG long vowel affected by CL) can be expressed without postulating trimoraic vowels.

The crucial constraints are high ranked $[s.g.]_{CC}$, which outranks *GEMINATE (a member of *STRUC).

Word initial extrasyllabicity? Evidence from the acquisition of Greek

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Opposing analyses have been proposed regarding word initial consonants that violate the Sonority Sequencing Generalisation. Faced with initial consonants which cannot be accommodated by syllabification algorithms, several researchers have opted for an algorithm that leaves the first consonant outside the onset ('extrasyllabic' consonants, e.g. Booij & Rubach 1990, Halle & Vergnaud 1980, Steriade 1982). More recently, it has been proposed that the special status of these consonants stems from the presence of an empty Onset followed by an empty Nucleus at the beginning of the word ('initial CV', Lowenstamm 1999, Scheer 2004). Under the initial CV approach, a distinction is made between initial s-consonant clusters and the remaining clusters of non-rising sonority, as it is primarily the existence of the latter that depends on the parametric configuration of the initial CV site. A distinction of this type is not made by the extrasyllabic approach, a position supported by evidence that the two cluster types show similar syllabic behaviour in (adult) languages that allow them both word initially, (e.g. ancient Greek reduplication, Steriade 1982). It is therefore an open question if s-consonant clusters and the remaining clusters of non-rising sonority share the same structure in word initial position, and what their (respective or common) structure is.

If we are to develop an explanatorily adequate answer to these questions, we must take into account learnability considerations. In other words, any grammar ensuing from our analysis must be attainable by first language learners. Moreover, if we assume the continuity hypothesis - that a child's grammar at any point is a possible adult grammar - we can gain considerable insight from developmental data. Following this reasoning, I examine new experimental data from the acquisition of Greek by examining the production of consonant clusters in children acquiring Greek as their first language.

The children's consonant production provides evidence for a distinction between word initial s-obstruent clusters (sT) and other clusters of non-rising sonority (obstruent-obstruent, TT). For example, there is a clear tendency for sT clusters to be acquired before TT clusters. The difference between these cluster types is also manifest in their relationship with regular onset clusters (TR). Specifically, sT clusters are produced before TR by some children and after TR by others, in line with findings from other languages (see Barlow 2001), while TT clusters are acquired later. A comparison of the initial clusters with their word medial counterparts also shows differential behaviour. Specifically, word initial TT is acquired after word medial TT, while no such difference is found in sT (or TR) acquisition.

I argue that these developmental data lend support to the initial CV approach, whereby sT and TT are structurally different. However, we are faced with an apparent paradox: on the one hand, there is developmental evidence that the two cluster types are different in some way crucial to first language acquisition, and on the other hand, phonological processes in adult language create an identical structural profile of the two cluster types. In light of such conflicting evidence, I explore a parametric model for the acquisition of consonant clusters which employs the subset principle, a condition widely assumed to be necessary for learnability. The model explains the developmental data whilst at the same time it covers the adult language phenomena. Specifically, the marked settings of a grammar that allows initial TT clusters form a superset of the marked settings required for initial sT clusters, which explains the developmental data, while the behaviour of the two cluster types in adult language is a consequence of the resulting representations having identical structure in grammars that allow them both.

Processing differences in complex word forms: Phonology, Morphology or something else?

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Dual Mechanism accounts of complex word form representation and processing have been repeatedly criticized for their failure in explaining semi-regular processes (cf. Kielar et al., 2008). Traditionally, these models distinguish irregular word formation (as in English *sing~sang*) from regular word formation (*add-added*) and assume that irregulars are represented in associative memory, accessed directly and as whole forms, while regulars are represented in terms of their constituent morphemes, accessed via decomposition (cf. Pinker, 1997). However, forms like *keep~kept* fall in between entirely irregular and entirely regular word forms: Their stem vowel change occurs elsewhere (*discrete~discretion*), and the attached consonant resembles the regular past tense suffix. In German verb morphology, the case is even more intriguing: Here, the regular 2.P. SINGULAR suffix {-st} attaches to the stem of both regular and irregular stems (cf. *schläf-st* 'sleep, irregular'; *mach-st* 'make, regular') without any exceptions. Are these forms handled by associative memory or by the rule-based module, or by both?

Proponents of Dual Mechanism accounts suggest that representational differences are always aligned with morphological regular-irregular distinctions, based on the past tense formation. For that reason, *schläfst* is assumed to be represented in associative memory, while *machst* is not (cf. Clahsen et al., 2001).

Contrary to this position, we assume that *schläfst* and *machst* are similarly represented as stem and suffix and that the representation of the irregular stem is monomorphemic and underspecified such that it can be accessed by both the coronal and dorsal surface variants *schlaf-* and *schläf-*. We provide evidence for our claims by several behavioural experiments, suggesting that processing differences of complex word forms primarily depend on the feature-based make-up of their underlying segments, not on dichotomous class distinctions.

Further evidence against whole-form storage of 2.P. SINGULAR forms stems from a corpus analysis, showing that the final [t] of these forms is deleted independently of morphological class. Proponents of Dual Mechanism approaches would presumably conjecture that whole-form storage should behave differently from constituent storage in this respect. Whole forms could be more robust against deletions since they are stored holistically, or, in contrast, they could be more prone to deletions since they express the respective morphological category also by means of stem vowel changes and usually have higher frequencies than regulars.

Altogether, we suspect that the inconsistent priming patterns in psycholinguistic investigations of regular versus irregular word form processing are due to the lack of phonological control if stem vowel changes are involved. We offer an account which takes seriously phonological information in the mental lexicon. This information does not emerge through statistic regularities between certain forms, but is genuinely linguistic information and guides speech perception as well as speech production.

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Resyllabification in connected speech, or not:
A new empirical study of English /l/ vocalisation

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The phoneme /l/ in word-internal syllable codas in many dialects of English is a vocalised allophone, with no tongue tip contact to the alveolar ridge. Word-final /l/ is similarly vocalised, but because in connected speech the following context varies, actually we find a set of alternations. Apparently speakers vocalise word-final /l/ if it is preconsonantal or pre-pausal, while having a consonantal version (i.e. *with* tongue tip contact) if the next word is vowel-initial.

Alternation like this is used to motivate resyllabification as a mechanism of postlexical prosodic structure construction. Basically, a word-final consonant before a vowel is thought to be associated to the following word's first syllable as its onset, parallel to the behaviour of word-internal prevocalic /l/. Many phonological theories assume the /l/ remains associated to its original syllable, resulting in ambisyllabicity. Resyllabification may operate over large prosodic boundaries, or be permitted across weak boundaries and blocked by larger ones.

In some circumstances, resyllabification may not occur, even before an immediately following vowel phoneme. In such cases, phonetic glottalisation may be observed around the juncture. Analytically, the originally empty onset of the following vowel-initial word may be filled by a glottal stop (which is not a consonant phoneme of English), or the onset can be forced to remain empty, with the glottalisation being a phonetic interpretation of the unfilled structure.

We have undertaken an electropalatography study of word-final /l/ for ten speakers (five Southern Standard British English and five Scottish Standard English) in order to investigate when resyllabification occurs and how it interacts with glottalisation. The results show a great deal of interspeaker variation. We looked at coda /l/ followed by two different word-initial onset consonants, namely /b/ and /h/, both of which lack phonologically distinctive lingual articulation. (Non-lingual consonants make vocalisation easier to detect using electropalatography.) Some speakers vocalised rarely while others, especially the SSE speakers, almost always vocalised. Surprisingly, two speakers vocalised before /b/ but not before /h/. Apparently /h/ can be invisible or transparent to resyllabificication, perhaps because it is placeless. But since /lh/ is not a possible onset, this postlexical "syllable" is clearly not identical to the normal sort that governs phonemic and phonotactic distributions.

Morevoer, this special behaviour of /h/ does not sit well with the blocking nature of [ʔ]. Some of our speakers do indeed appear to use glottalisation to block resyllabification (or as a phonetic marker of an empty onset). Our analysis of the interplay of consonantal/vocalised /l/ and the presence/absence of glottalisation discusses the role of the syllable in formulating a descriptively adequate account of the behaviour of /l/. We will also consider the light/dark allophony and alternation as well as juncture glottalisation and its role in blocking r-sandhi.

We conclude that formal phonological syllables used to define word-internal phonotactics are suitable or adequate for describing and explaining the allophony and alternation of English l. We doubt the gradient, ambiguous and flexible phenomena found postlexically can motivate an extended use of "syllables", especially across word-boundaries. On the contrary, the phonetic bases of gestural coordination may, however, help explain phonological syllables and the distribution of contrast within words.

On two types of moraic consonants – Winteler's Law in the light of Moraic Theory

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1. Moraic Theory (MT, Hayes 1989) provides two possible sources for moraic consonants: They are either geminates and thus associated with a mora at the level of underlying representation or they are assigned a structural mora when in coda position (weight-by-position). For inherently moraic consonants two general observations can be made: First, they contribute to syllable weight, and second, they surface as phonetically long. As for positionally moraic consonants, it is often only their contribution to syllable weight but not their phonetic realisation that is taken into account.
This asymmetry is clearly unexpected. It might suggest that the two types of moraic consonants are interpreted differently by the phonetic component despite their surface-structural identity, an undesired result. We therefore interpret MT as follows: it predicts that in languages which exhibit both a singleton-geminate contrast and weight-by-position the moraic consonants are pronounced alike, i.e. regardless of the source of the mora (cf. Riad 1995).

2. High Alemannic dialects are of that type. They have a phonemic singleton-geminate contrast. The lengthening behaviour of vowels in monosyllabic words gives clear evidence that coda consonants are positionally moraic. However, transcriptions used in dictionaries and grammatical descriptions (Weber 1948; Baur 1939) as well as more recent phonological analyses (Kraehenmann 2003) suggest a difference in quantity between geminates on the one hand (pronounced as long) and positionally moraic coda consonants on the other (pronounced as short). If correct, this would pose a serious problem for MT.

3. However, we claim that the High Alemannic dialect of Zurich indeed behaves as predicted by MT: singleton coda consonants are phonetically long. In fact, this phenomenon has been known for more than a century as Winteler's Law according to which (sonorant) consonants are geminates when followed by an obstruent (*tsalə* ‘pay’ vs. *tsallt* ‘pays’). This is fully expected given the assumptions of MT as the sonorant consonant is positionally moraic.

4. MT additionally accounts for another hitherto puzzling phenomenon in High Alemannic: The singleton-geminate contrast is neutralised when obstruents occur in adjacent position. Kraehenmann (2003) analyses it in templatic terms claiming that the contrast is neutralised when a skeletal slot cannot be syllabified and thus is stray-erased. This predicts that the neutralised consonant is phonetically similar to a singleton consonant. However, it contradicts the intuitions expressed by the Swiss phoneticians who called the segments “half fortis” (cf. Moulton 1986; fortis = geminate). The fact that the neutralised variant is close to a geminate argues for an analysis in terms of positional moraicity.

5. In sum, MT predicts that inherently moraic consonants (geminates) and positionally moraic consonants are distinguishable only at the level of underlying representation but are indistinguishable for phonetic interpretation (Riad 1995). This is confirmed by data from High Alemannic. Winteler’s Law follows naturally from MT.

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Unstressed vowel harmony in Fowlis Wester Scots

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Fowlis Wester Scots (hereafter FWS) possesses in common with other Scots dialects a vowel harmony process which basically only affects unstressed front high vowels. In the much-studied Buchan dialect (modern studies are Trigo 1986, Fitzgerald 2002, Paster 2004) the variation is between /-i/ and /-e/ depending on the nature of the preceding consonant and the vowel before that. The VH manifests itself both in monomorphemic words, and the equivalents of the very common Scots diminutives in orthographic *–ie*.

The alternation in FWS is rather different, and takes place in a partly different set of environments. The two results are /-ɛ̈i/ and /-i/. /-ɛ̈i/ is the default form, occurring everywhere except under the following three circumstances:

(1) following a preceding high "tense" /i/, /u/ followed by any intervening consonant(s) or zero.
(2) following a preceding diphthong ending in a high vowel component, /ɛ̈i/, /ʌu/ followed by any intervening consonant(s) or zero.
(3) following any voiced obstruent /b/, /d/, /dʒ/, /g/, /v/, /z/ preceded by *any* vowel.

All other environments result in the final unstressed high vowel taking the form /ɛ̈i/. Examples of this are the following:

(4)	mɛvi	'thrush'	pɛ̈tmonɛ̈i	'Pitmonie'
	tɛ̈idi	'tidy'	laŋkɛ̈i	'lanky'
	siti	'city'	fɛmlɛ̈i	'family'
	bʌdi	'body'	smokɛ̈i	'smokey'
	pɛ̈tlandi	'Pitlandy'	deːlɛ̈i	'daily'
	dʒili	'jelly'	beːglɛ̈i	'Baiglie'

An analysis of the VH will be proposed in the light of the FWS vowel system, which will be analysed as being based on contrasts between ATR and non-ATR vowels (in this I follow Trigo 1986). A separate dimension of length is also present. The description of FWS VH also requires a reanalysis of unstressed syllable types.

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Is there a phonological poverty of the stimulus argument?

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One of the core assumptions of generative linguistics is that first language acquisition is guided by innate domain-specific mechanisms (e.g. Chomsky 1980). This claim receives support from poverty of the stimulus arguments (APSs), which aim to show that some aspects of language acquisition can only be explained through innateness. These arguments draw on two sets of observations: (i) the general ease and uniformity of language acquisition in the face of the degeneracy and finiteness of the input, and (ii) the acquisition of linguistic properties for which the input provides no evidence. Since almost all APSs come from the fields of syntax and morphology, it is not clear whether they carry over to phonology. Although there have been some recent attempts at answering this question (no: Carr 2000, 2006; Blevins 2004; yes: Bermúdez-Otero 2003; Idsardi 2005), it still awaits further discussion. Therefore, in this presentation I examine both types of APS and conclude that such arguments cannot easily be made for phonology.

I first examine some general arguments about language acquisition. First of all, children learn to produce an infinite number of utterances despite the finiteness of the input. However, it is not easy to see how this claim supports innateness—and even if it does, phonological and syntactic productivity are rather different, since most phonological generalisations are made over a finite set of morphemes or morpheme combinations. Secondly, it has been claimed that linguistic input is incomplete and degenerate. This is not the case in phonology: 'productive phonological alternations are robustly cued' (Blevins, 2004) and phonological errors rarely ever create illicit structures (Fromkin, 1988). Thirdly, grammars are often said to be underdetermined by the input. This claim depends on what kind of grammar we attribute to the speakers: theory-specific generalisations may indeed be hard to make without innateness, but they are usually not verifiable empirically, and thus cannot form the basis of an APS. Finally, universal tendencies and the uniformity of language acquisition are often explained through innateness. However, the fact that languages share some properties does not entail that these are innate: they may also be the result of extragrammatical factors (e.g. production, perception).

In the second part of the presentation I assess existing and potential phonological stimulus poverty arguments which conform to the pattern in (ii). Idsardi (2005) observes that while final devoicing is cross-linguistically frequent, last obstruent devoicing ([−sonorant, +voice] → [−voice] / __ [+sonorant]$_0$#) is unattested. He claims that this is the result of an innate simplicity metric. However, innateness may be irrelevant here: while final devoicing occurs as a phonetically motivated sound change, last devoicing does not (and could not even arise via rule inversion, rule telescoping or analogy), which is enough to explain the absence of the latter. Bermúdez-Otero (2003) claims that the appearance of intrusive-L after /ɔː/ in certain dialects of English can only be explained through innateness: a 'maximally faithful' epenthetic segment (i.e. one that shares the V-place of the preceding vowel) is chosen. Once again, an alternative analysis is available: /l/ is more likely to be reinterpreted as a predictable feature of /ɔː/ than that of any other vowel, since they are phonetically similar (Gick, 1999). The ability to discriminate between features has also been claimed to be innate (e.g. Halle 1978; Hale & Reiss 2003). Although this ability may well be genetically endowed, it does not seem to be specific to language: features can also be used in face recognition (Carr, 2006), and even animals are capable of learning phonetic distinctions (Kuhl & Miller, 1975; Kluender et al., 1987). Finally, it can be shown that even opaque phenomena such as Canadian Raising can be acquired through data-driven learning. It appears then that there are no phonological phenomena which are acquired despite a lack of evidence.

Categorical failure in the analysis of single stress systems

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Over the last years it has been strongly advocated that OT constraints should be categorical, (one constraint assesses at most one violation mark), and not gradient (counting multiple violations) (Eisner 1999, McCarthy 2003). The claim has received empirical support in the development of categorical analyses for iterative stress systems (Kager 2001, McCarthy 2003, Buckley 2006). However, the existing categorical constraints do not lend themselves to a successful application in systems with a fixed single non-lexical stress, failing to achieve the descriptive adequacy of a gradient analysis.

In single stress systems, stress is assigned within the first three syllables counting from either edge, with possible variations concerning final stress assignment. With the use of gradient alignment, the entire typology can be derived by the interaction of five constraints: one constraint defining the foot type (FT=IAMB, or FT=TROCHEE), two gradient alignment constraints:ALIGN(FT,L/R), and two constraints prohibiting the alignment of the head foot with an edge of the prosodic word: NONINITIALITY, and NONFINALITY. Overgeneration is minimal and involves the following unattested systems: peninitial but initial in disyllabic words, consistently postpeninitial; penultimate, but word-final in trisyllabic words; and antepenultimate, but penultimate in trisyllabic words. Interestingly, three out of the four unattested systems involve NONINITIALITY dominating NONFINALITY, so the overgeneration could potentially be explained as an effect of right edge dominance.

Once gradient alignment (AL (Ft,L/R)) is replaced by categorical alignment (AL (L/R,Ft)), additional constraints are needed to derive some attested stress patterns, notably postpeninitial non-final (Azkoitia Basque), and antepenultimate (Macedonian). One possibility (based on Gordon 2002) is the use of *EXTENDEDLAPSE L/R constraint, that prevents a sequence of three or more unaccented syllables from a specified word edge. However, the system enforces secondary stress assignment, harmonically bounding candidates with a single foot. Harmonic bounding can be prevented by imposing the one foot per word pattern, either by a constraint like AL-L/R(Ft,Head PWd), or by restrictions on GEN. Still, the motivation behind the use of *LAPSE constraint family is dubious, as the definition of *LAPSE constraints makes reference to distances between stress peaks. Therefore, it is arguably misguided to use those constraints in a system with a single stress peak per domain.

Another point of criticism against*LAPSE constraints (and gradient ALIGN constraints) is their non-locality (Buckley 2006). Buckley (2006) proposes a solution based on (local and categorical) ALIGN, and *ALIGN constraints. Assuming headless feet, it is possible to derive all the existing single stress systems, crucially the antepenultimate stress in Macedonian. Yet, there are serious restrictiveness issues with such a constraint set. Constraint permutation allows, for instance, for a generation of the following hypothetical grammar:

(1) HEADL » *ALIGNL » ALIGNL » *ALIGNR » ALIGNR » PARSEσ » AL-L/R(Ft,Head PWd)

For an iambic foot, this grammar predicts final stress in disyllabic and trisyllabic words, penultimate stress in quadrisyllabic words, and from quintasyllabic words on the grammar cannot decide where the stress should fall. On top of that, the use of constraints like *ALIGN is controversial in potentially allowing an overpowerful and unwarranted creation of OT constraints by negating the existing constraints.

Given the shaky foundations of the *LAPSE analysis, and the serious restrictiveness issues of the categorical (*)ALIGN analysis, neither of the two categorical approaches seems to be a viable alternative for gradient ALIGN in single stress systems. Thus, either an alternative categorical analysis is called for, or the status of gradient alignment in CON must be reconsidered.

Accounting for Subphonemic Centralization in Hungarian

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No phonemic centralization or reduction has been described in Hungarian, but in casual speech vowels can be reduced and centralized. This paper presents an experiment to measure the extent of this process in speech for some vowels, and to determine the factors that affect the rate of centralization. It also discusses the theoretical background to the problem that could predict the pattern of reduction for vowels that have not been studied yet in the experiment.

Four environments were studied (/tɒz/, /ʃɒk/, /hoɟ/ and /kɛɟ/) in four stress conditions: stressed, unstressed and unstressed in function words in casual speech and stressed in careful speech.

Results show that subphonemic centralization is an existing phenomenon in spoken casual Hungarian. One factor that affects the extent of centralization is the quality of the underlying vowel: /ɛ/ does not centralize its F2 formant, however its F1 formant is lowered to a quality around [e̞] in faster speech, regardless of the presence of stress; /o/ and /ɒ/ do centralize their formants towards the target of [ə] and the degree of this process is indeed related to stress as the more stressed the vowel is the less reduction it undergoes. For summary see the table below.

In the account of Crosswhite (2004) the pattern seen in Hungarian belongs to the prominence reduction type. As thus, it can be analyzed using markedness constraints like e.g. UNSTRESSED/ɒ and faithfulness constraints of given vowel features like MAX[+BACK] that are ranked high, so in careful speech no reduction is present. These faithfulness constraints are then re-ranked below certain markedness constraints in casual or faster speech, thus certain features are oppressed in the surface.

This analysis however fails to answer why some faithfulness constraints are demoted and some are not. The account of Harris (2004) that handles vowel reduction as a loss of some elements of information (called (A), (I) and (U) for vowels) that define spectral properties of vowels provides a more elegant analysis of the Hungarian phenomena. In this account, Hungarian reduction seems to be similar to the Catalan process cited in Harris (2004), but while Catalan suppresses the (A) and (I) elements while preserving the (U) element in unstressed environments; Hungarian seems to suppress (A) and (U) while preserving (I). This account can also provide some predictions for the reduction of vowels that are yet to be examined in future research, e.g. /y/ > [i] ∼ [ɪ] but /u/ > [ʊ] ∼ [ə].

	/ʃɒk/	/tɒz/	/kɛɟ/	/hoɟ/
careful speech	[ɒ̟]	[ɒ̟]	[ɛ]	[o]
stressed	[ɐ̯]	[ɐ]	[e̞]	[o̞]
unstressed	[ɐ̯]	[ə̟]	[e̞]	[ə̠]
function word	[ə̯]	[ə̟]	[e̞]	[ə]

Table 1: Average vowel quality in examined environments

'Incursions of the Idiosyncratic' as Faithfulness Optimisation

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There is still no consensus over how to deal with what Prince & Smolensky (1993:111) called 'incursions of the idiosyncratic' in Optimality Theory, i.e. occurrences of seemingly unnatural processes or markedness reversals (e.g. in neutralisations towards the marked value) in individual languages. Although we believe that many alleged examples of unnaturalness can receive a natural explanation in the OT framework, there seems to be genuine residue of cases that are resilient to any kind of reanalysis. Rather than discarding the idea of universal markedness constraints completely, however, and thus abandoning the typological project of OT, we will propose a principled way of accounting for some of the recalcitrant cases, focussing on positional neutralisations to the marked and epenthetic segments.

The key idea here is a reappraisal of segmental underspecification and the role it can play in OT. More precisely, we will examine the impact underspecification (or non-specification) has on the evaluation of both markedness and feature faithfulness.

First, we will argue that feature faithfulness plays a crucial role in determining the choice of epenthetic segments, besides the well-established roles of segmental markedness (e.g. Lombardi 2001) and prominence (e.g. Uffmann 2007). Ceteris paribus, languages will prefer to insert segments which can be argued to bear less feature specifications than other segments (like schwa or glottal segments, which lack place specifications) or insert segments whose features can be derived via spreading. In German, one find both glides and the glottal stop as hiatus breakers in the same position (before a stressed vowel), a glide being inserted after high vowels, despite the fact that these two segments usually occur in opposite contexts, following Uffmann's (2007) observation that they occupy opposite ends of the prominence scale. We will show that the drive towards minimal feature faithfulness violation can successfully account for the alternation: The glottal stop has minimal featural content while glides are faithful copies of adjacent vowels.

Second, we will propose that this observation can be extended to account for cases in which a seemingly marked segment (such as a velar consonant or a mid vowel) is inserted. Again, insertion of the marked can result from spreading or from the fact that what seems to be a *phonetically* marked segment can be *phonologically* unmarked, given a theory of contrastive underspecification: If markedness constraints evaluate the presence or absence of features, an underspecified segment cannot violate the markedness constraint (and nor does it violate a constraint against inserting that feature).

Third, the idea can be extended to cases in which neutralisation seems to go towards a marked value, e.g. in languages which allow only velar or labial segments in codas. In a nutshell, we argue that such cases of neutralisation involve the actual removal of place specifications, leaving the surface place of articulation open to phonetic implementation (in line with Ernestus' 2003 analysis of voicing in Dutch), which may also explain the cross-linguistic tendency towards a preference of velar consonants in coda position, in the absence of contrast. Crucially, we will thus analyse such cases as similar to debuccalisation.

In sum, this proposal enables us to reconceptualise the traditional view of the dual nature of markedness (substantive vs. structural markedness) in OT. Insertion or deletion of a structurally complex segment involves greater feature unfaithfulness than insertion or deletion of a less marked segment. This may explain why such complex segments are avoided as epenthetic segments and at the same why marked segments are also often immune to deletion, contrary to what may be expected in a purely substantive theory of markedness.

"I am derived, therefore I resist" – Diphthongs in Cairene Arabic

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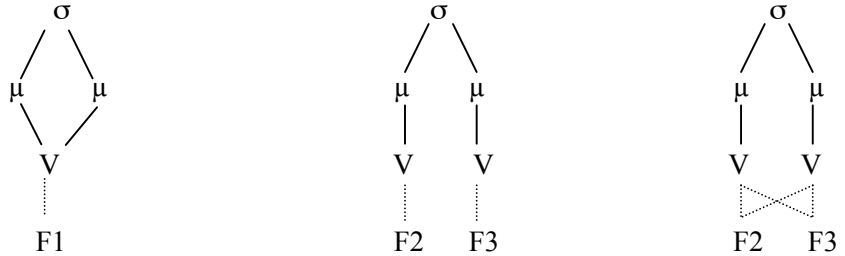
One of the least studied aspects in Arabic phonology involves the development and status of mid vowels and diphthongs in the modern dialects. To take an example, in Cairene Arabic (CA) the long mid vowels [e:] and [o:] are claimed to have historically developed from Standard Arabic (SA) diphthongs [aj] and [aw] respectively through monophthongization (Birkeland 1952, Fischer & Jastrow 1980, Harrell 1957, Holes 1995, inter alia). Furthermore, it is usually claimed that monophthongization is a historical process which no longer applies, and that long mid vowels are underlying in CA (Abdel-Massih 1979, Broselow 1976, Watson 2002). This paper thoroughly examines the synchronic status of CA mid vowels and diphthongs and concludes that mid vowels are only (and still) derived from underlying diphthongs in this dialect (á la McCarthy 2005). In doing so, I argue that monophthongization in CA is a case of an understudied phonological effect known as Derived Environment Blocking (Hall 2006), in which a surface structure is excluded when it is morphologically or phonologically derived, but allowed when it is nonderived.

Data: Three facts stand out as particularly interesting. First is the absence of short mid vowels in CA vowel inventory – long vowels imply short vowels under some theories of structural markedness and vowel length (e.g. Morén 1999). Second are systematic exceptions to CA monophthongization in which diphthongs appear on the surface. Third is the fact that CA contrasts long mid vowels with diphthongs in a specific morphological environment, as in [ʕawza] 'wanting (f.sg.)' vs. [ʕo:za] 'want (N.)' and [ʃajla] 'carrying (f.sg.)' vs. [ʃe:la] 'burden'. By showing the distribution of mid vowels and diphthongs in CA and their correspondents in SA, my data give evidence that CA monophthongization is a synchronic process which applies across the board except in morphologically or phonologically derived environments (diphthongs derived across morpheme boundaries or through shortening of underlying long vowels respectively), some unproductive derivations, or when a geminate glide (onset) is involved – contexts which resist certain phonological phenomena cross-linguistically.

Analysis: The appearance of 'false' long mid vowels in CA is explained as the result of total assimilation of two adjacent vocalic root nodes of an underlying diphthong (b→c). As a consequence, all CA surface forms can be derived from diphthongal underlying forms. While surface diphthongs are readily explained through a series of morphological and/or phonological processes, this is more challenging in a theory that does not have intermediate levels of derivation such as Optimality Theory (McCarthy & Prince 1993; Prince & Smolensky 1993). I formulate these processes through the interaction of general markedness and faithfulness constraints with positional faithfulness (Beckman 1998) and conjoined faithfulness constraints (Smolensky 1993). Significantly, the last type of constraints accounts for the 'morphologically conditioned diphthongs which contrast with mid vowels' without reference to different levels of representation.

(a) *True Long Vowels* (b) *Diphthongs* (c) *False Long Vowels*



Poster papers

Features as speech signal patterns

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Since the time of *SPE* (Chomsky & Halle 1968) segmental structure has been described largely in terms of speech production using articulation-based features. This paper will show, however, that there is little evidence to support the idea that segments should be represented with a bias towards the speaker. After reviewing the arguments against articulatory features, we outline an alternative approach in which features refer to the linguistic information that is shared by speakers and hearers. According to this view, features are based not on articulation but on linguistically significant patterns present in the acoustic signal (Harris & Lindsey 2000, Nasukawa & Backley 2008).

Traditional features provide a rich, powerful vocabulary for describing segments. Moreover, their endurance places them at the core of mainstream phonology. However, their status as legitimate structural units is undermined by the way they reflect aspects of articulation such as tongue position ([±anterior]…), glottal state ([±voice]…) and airflow ([±lateral]…). Of course features are not simply phonetic labels; they are units corresponding to phonological categories that describe lexical contrasts and dynamic processes. Nevertheless, the underlying assumption persists that phonology is motivated by phonetics, and specifically by speech production. Current thinking still centres on the idea that phonology tells you how to pronounce things.

Yet the link between features and speech production is questionable on several fronts. For example, the acquisition facts suggest that infants begin by perceiving adult input forms, and based on this input they form mental representations which serve as the beginning of their native lexicon; then only later do they go on to reproduce these stored forms as spoken language. But while the former (perception) stage is necessary for successful acquisition, the latter (production) stage is not, as demonstrated by the capacity of mutes and those with abnormalities of the vocal apparatus to acquire a native grammar; it seems that the inability to articulate normally is no bar to perceiving speech. Conversely, speech production in the profoundly deaf rarely develops to a native level, apparently because their means of perceiving language lacks the necessary acoustic input from the speech signal.

If phonology is to maintain the original generative goal of modelling the knowledge of an ideal speaker-hearer, then features must ideally be formulated without bias towards the speaker (Browman & Goldstein 1992) or the hearer (Jakobson & Halle 1956). Here we follow Harris & Lindsey (2000) in attempting to model the linguistic knowledge common to both speakers and hearers. This means associating phonological structure with the speech signal, as this is the only aspect of the communication process involving both parties: speakers use their vocal organs to create patterns in the speech signal, while hearers perceive those same patterns in the signal and decode them into meaningful language. Such patterns are not identified by raw acoustic properties such as formant frequency or VOT, however. Instead, we assume that humans instinctively seek out linguistic information, and this allows them to perceive specific information-bearing patterns in the speech signal while ignoring non-linguistic material. We further assume that a mapping exists between each acoustic pattern and one phonological feature.

So although features may be described by physical patterns in the speech signal, they exist primarily as mental, grammatical constructs. We discuss the characteristics of these speech signal patterns, show how they are able to capture certain phonological generalizations that traditional articulatory features can miss, and outline the way they contribute to a more abstract, but entirely linguistic view of phonology.

FOUR ENGLISH GLIDES

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The aim of the paper is twofold: on the one hand, an attempt is made to provide phonological definitions of the notions of glide and syllabic consonant; on the other, in the light of the definitions, a proposal is made to include /l/ in the English system of glides.

A glide (or semi-vowel) is traditionally taken to be a transitional sound which functions as a consonant but is more like a vowel phonetically. It is indeed an (autosegmental) phonological commonplace that semi-vowels and high vowels only differ in syllabic affiliation: the same melodic expression can attach to either a nuclear (henceforth abbreviated to V) or a non-nuclear (onset or coda – henceforth C) position, where it is interpreted as either a high vowel or a (glide) consonant, respectively. Therefore, a phonological definition of glides runs as follows: **a glide is a melodic expression which can occupy both V and C positions**. Crucially, whether it is interpreted as a vowel or a consonant, it *exclusively* occupies its skeletal slot, except when it is a hiatus-filler, in which case the traditional analysis produces a left-headed VC sequence through spreading.

Syllabic consonants, i.e., consonants in a vocalic function, (synchronically or diachronically) arise from the deletion of a vowel and the subsequent spreading of the melody of the following consonant. That is, **a syllabic consonant is a right-headed VC construction**.

In English, traditional phonemic inventories distinguish two glides, /j/ and /w/, which surface as /i/ and /u/, respectively, when placed in a V position; as mentioned above, they regularly take part in hiatus resolution. In addition, it is possible to classify /r/ as the third English glide, based on both phonetic and phonological evidence (see, e.g., Kahn 1976: 149-151, Harris 1994). The primary phonological argument stems from its interaction with schwa – several authors have proposed that schwa is a vocalic allophone/variant of /r/, and r-intrusion (as found in most non-rhotic accents) is glide formation (e.g., Szigetvári 1999: 118 fn.117, Krämer 2005, Heselwood 2006). As for syllabic consonants in English, they are traditionally analysed as emerging from the schwa deletion process affecting schwa+sonorant consonant sequences.

However, a closer look (as taken by Toft 2002a,b) at the syllabic consonants of English reveals a difference between /l/ and /n/: after a consideration of both phonetic and phonological arguments, Toft concludes that the representations of the two syllabic sonorants differ: **syllabic /l/ is only attached to a nuclear position** whereas syllabic /n/ is generated in an onset but spreads to the left. Toft's findings are also supported by facts from /t/-allophony in the so-called tapping dialects of English (cf. Balogné 2006).

Given the definitions of glides and syllabic consonants above, we are led to conclude that **syllabic /l/ is a glide** rather than a "simple" syllabic consonant like syllabic /n/. This claim is supported by independent evidence from accents of English with l-intrusion, where /l/ corresponds to /ɔ/ (e.g., *saw = Saul*) in exactly the same way as /r/ corresponds to schwa (e.g., *tuna = tuner*) in r-intrusion (e.g., Gick 2002); that is, both liquids take part in cross-morpheme hiatus filling in the form of a kind of glide formation. Besides l-intruding accents of English, speech errors also serve as evidence since the replacement of the glide element of diphthongs with /r/ or /l/ is well documented (e.g., Shattuck-Hufnagel 1986: 126-29, cited in Gick 2002).

The above discussion leaves us with **four English glides**: /j/, /w/, /r/ and /l/.

Opacity in European Portuguese: an OT-CC account

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In this paper we propose an account of a European Portuguese (EP) opacity effect in the framework of Candidate Chains Theory (McCarthy, 2007). The interest of the EP data lies in the fact that the process creating opacity interacts in a complex way with other processes. The purpose of our analysis is to show that the Candidate Chains Theory (OT-CC) is able to account for this complex interaction. In this sense it is superior to other proposals of opacity, such as Comparative Markedness (McCarthy, 2003).

In EP, opacity arises from a counterfeeding interaction between /e/ centralization and /s,z/ palatalization in the coda. Centralization is an allophonic process that affects the vowel /e/ when followed by postalveolar and palatal consonants or by the palatal glide, changing it to [ɐ], a back, mid, unrounded vowel.

fecho	[fɐʃu]	'zipper'		mosteiro [muʃtɐjɾu]	'monastery'
cereja	[sɨɾɐʒɐ]	'cherry'		frei [frɐj]	'priest'
telha	[tɐʎɐ]	'tile'		azeite [ɐzɐjtɨ]	'olive oil'

Palatalization applies to the fricatives /s,z/ in medial and final codas, yielding the postalveolar fricatives [ʃ,ʒ]. It is a process of positional neutralization, since [s] and [z] contrast with [ʃ] and [ʒ] in onset position.

pasto	[paʃtu]	'pasture'		paz	[paʃ]	'peace'
Lisboa	[liʒboɐ]	'Lisbon'		Islão	[iʒlɐ̃w̃]	'Islam'

The effects of counterfeeding interaction are shown by a form like *vespa* [veʃpɐ], "wasp". This case of opacity cannot be handled by allomorph listing, since centralization is a productive process in EP grammar.

Besides being counterfed by palatalization, centralization is fed by glide insertion applying in word final VN sequences (Mateus and d'Andrade, p.133), e.g. *ninguém* [nĩgɐ̃j] 'nobody', *homem* [ɔmɐ̃j] 'man'. This leads to a complex, multiple interaction, that can be characterized in the following way: feeding process > opaque process > counterfeeding process.

This is a type of interaction that cannot possibly be accounted for in the framework of Comparative Markedness (CM), the reason being that the two processes - the feeding glide insertion and the counterfeeding palatalization – yield the same markedness violation. The CM ranking scheme $_{Old}$Markedness >> Faithfulness >> $_{New}$Markedness, which accounts for counterfeeding opacity, incorrectly predicts that no new marked structure, violating the $_{New}$Markedness constraint, will be able to defeat the dominating F constraint.

In OT-CC (McCarthy's 2007) candidates are chains of derivational stages from input to output. Chains have to fulfill well-formedness conditions before being submitted to EVAL proper. Special constraints on the sequence of faithfulness violations in a chain (PREC(edence) constraints) explain opacity.

Our analysis successfully accounts for EP counterfeeding opacity by postulating a PREC constraint which militates against centralization applying after palatalization in a chain. In this approach it IS possible to explain the multiple interaction of glide insertion > centralization > palatalization because the faithfulness violations are not the same for glide insertion (DEP) and palatalization (IDENT). The OT-CC analysis fares better than the CM analysis because of its reliance on faithfulness rather than markedness to explain opacity.

Inter-tonic syllables in words ending in <-ation> in English

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Within the English stress theoretical framework introduced by Lionel Guierre, stress placement is not predicted by the vowel quality in syllables but by morpho-phonological and graphematical rules. As a result, vowels in unstressed syllables, although generally reduced to [ə, ɪ or ʊ], can also be realised with a full vowel, i.e. not reduced to one of these vowels.

The aim of the study presented in this paper, which is based on a computerized corpus extracted from pronunciation dictionaries following Guierre's methodology, is to account for the presence of such vowels. It focuses on inter-tonic syllables in words ending in <-ation> (e.g. *coloration*, *participation*). In this specific context, the vowels in the unstressed syllables studied are realised with a full vowel in as much as 20% of the 676 words in <-ation> with this stress pattern. The study shows through statistical tendencies the importance of the combination of constraints in these words, such as morphological and phonological constraints (type of syllable, vowel quality), especially in derived words with a stress shift from the base in words of the type of *expectation* (< *expect*). Vocalic variants as well as stress variants are taken into account as they are signs for conflicts in unstable parts of the system. The results will be compared with what is observed in all inter-tonic syllables, where just above 13% of inter-tonic vowels are realised with a full vowel.

Keywords: unstressed syllables, vowel reduction, morphology, stress, variation, stress shift, conflicts.

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Implementation constraints of parallelism on phonological innovation

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Implementation constraints on parallel OT severely hamper its ability to deal effectively with phonological issues inherent to diachronic change. Specifically, the notion of a One-Step Mapping paradigm, and the fact that OT's objective function, EVAL, is ill-equipped to cope with allophone selection past the word level render parallel OT analyses unproductive at satisfactorily exposing the innovation juncture of phonological change. Our research of the alternating diphthongs in Spanish has led to the development of a basic model of innovation which draws heavily on the robust research program elaborated by Bermúdez-Otero (2007), which seeks to resolve some of these aforementioned impediments by proposing a stratified version of OT.

We commence our theoretical analysis of innovation in the broader context of phonological change, with a scrupulous examination of the diachronic constraint rankings between Hispano Romance and Old Spanish in which a high ranking stress-to-weight requirement initiated a process of vowel lengthening which affected all vowels. Later, a markedness restriction which disfavored vowels marked for [+lax, +long] triggered a nucleus fracture in which /ɛɛ/ and /ɔɔ/ underwent a conversion to [eɛ] and [oɔ] respectively. At a later stage, the initial vowels of the hiatus raised to [i] and [u], lexicalizing as /j/ and /w/.

The problem as we see it lies in the fact that both forms, [eɛ] [oɔ], and, [ɛɛ] [ɔɔ], would have existed in a state of free variation for an undetermined time. Current studies in OT have had little success in determining an optimal output from a set of multiple, attested output forms. Indeed, free ranking (Prince and Smolensky, 1993) remains a good choice to justify how an alternative output is generated, yet offers little more than an *ad hoc* rationalization if there is no operative mechanism hardwired into OT which can determine the fittest output which results from such a paradigm.

Our model, which encompasses some key aspects of the theoretical architecture supplied by Game Theory (von Neumann & Morgenstern, 1944), remedies OT's lack of functional framework by incorporating a set of *Optimization Tendencies* (production and perception) which function at the phrase level and are responsible for establishing a predilection for one outcome over another based on empirically attested linguistic and cognitive principles. The essential tenets of Game Theory present a paradigm which is based on the manifest study of conflict and resolution and provide our prototype with the procedural mechanism required to illustrate that innovation results from interlocutor coordination and not by means of misparsing (*see* Ohala, 1992), as earlier models have claimed.

In our present study, we determine that the preference for one output over another is ultimately dominated by an Optimization Tendency of production which favors the maintenance of the trochaic structure indicative of modern Spanish. Upon being transmitted, the listener, vis-à-vis a set of Optimization Tendencies based on perception, must recognize the benefits of the innovative form. When these tendencies of production and perception constitute a symbiotic relationship, the innovative constraint is incorporated into the constraint hierarchy of the listener. Upon reproduction, the innovative constraint takes effect in a broad range of phonological contexts in a productive way.

Phonotactic Generalizations Condition Alternation Learning

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One of the strongest claims of Optimality Theory (OT, Prince and Smolensky 1993) is that alternations and phonotactics should be accounted for by the same grammatical mechanism. Nonetheless there seem to be substantial differences between the principles that govern generalizations over related word pairs and generalizations that hold over all words in a given language. A substantial amount of work in OT and phonology in general is dedicated to reconciling these differences with a common formalism. This Artificial Grammar (AG) study investigates the precise relation between alternations and phonotactics, and whether this relation warrants the postulation of a single mechanism.

In order to test whether phonotactics have an effect on the learning of alternations, we devised 2 artificial languages with 2 alternations. k→s/_[V;+front] (k/s) and d→z/_[V;+front] (d/z) were chosen because of their similar degree of unnaturalness in order to avoid a possible naturalness effect on learning (Wilson 2003, Peperkamp et al. 2006). The alternations crucially differ with respect to their status as phonotactics of English. The added probability of an English root containing a sequence k[back] and/or s[front] is 2.09 times higher than for k[front] and/or s[back]. For d/z, the inverse holds. d[front] and z[back] are 1.68 more likely than d[back] and z[front]. The AGs were so composed as to mimic either English k/s or English d/z phonotactics for both alternations (see table).

Alternation / Language	k→s/_[V;+front]		d→z/_[V;+front]	
	/k/	/s/	/d/	/z/
English	_[back]	_[front]	_[front]	_[back]
AG 1 (Engl. k/s)	_[back]	_[front]	_[back]	_[front]
AG 2 (Engl. d/z)	_[front]	_[back]	_[front]	_[back]

Phonotactic biases for alternating segments

If the learning of alternations is aided by the presence of a supportive phonotactic generalization, we expect a main effect of *language*, since the phonotactics of AG 1 (Engl. k/s) are consistent with both alternations by banning their structural descriptions and over-representing the goal of the structural change. If learning of alternations is, however, simply dependent on there being some familiar phonotactic generalization about the segments involved rather than whether the generalization is supportive or unsupportive of the alternation itself, we expect an interaction of *language* and *alternation*. In an AG paradigm based on Wilson (2003), accompanied by visual stimuli to ensure correct lexical mappings, 11 subjects were trained on 81 roots once ending in the suffix /u/ and once in the alternation-triggering suffix /i/. Subjects were then tested on 162 novel forms. Learning success for k/s was estimated as the average success of remembering /ki/ as ungrammatical and /si/ as grammatical; this was calculated similarly for d/z.

Participants performed significantly better on d/z than k/s in the AG with English d/z phonotactics for both alternations (16.6 vs. 14.1 correct guesses on average), but worse for d/z than k/s in the AG with English k/s phonotactics (13.4 vs. 16.2) as evidenced by a significant interaction of *language* × *alternation* ($F(1,18)=5.2266, p<.05$). Additionally, 10 out of 11 subjects behave in accordance with the predictions made by their group mean. As predicted, there is no main effect of *language* ($F(1,18)=0.2365, p>.05$). We conclude that the acquisition of alternations is aided by the presence of a familiar phonotactic generalization but not dependent on the form of that generalization. The knowledge of lexical mappings must therefore be computed separately from the knowledge of phonotactics. We take this as evidence that the cross-linguistic correlation of phonotactics and alternations is merely a result of increased alternation learning due to phonotactic generalizations affecting participating segments.

Unity in diversity: sonority sequencing in Welsh

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As noted by Kager (1999), McCarthy (2002) and others, one of the advantages of OT is its ability to show 'unity in diversity' by underscoring the possible diverse effects resulting from the avoidance of highly ranked structural markedness conditions in their interaction with faithfulness constraints. Colloquial Welsh provides an interesting case in point of the 'homogeneity of target/heterogeneity of process' (McCarthy 2002: 25). It has long been observed that final consonant clusters in Welsh may provoke vowel epenthesis (svarabhakti), deletion of one member of the cluster, or metathesis (cf. Morris Jones 1913:17-18). However, final coda clusters are generally permitted in Welsh; it is only when the underlying cluster represents a potential sonority sequencing violation that epenthesis, deletion or metathesis occurs. Moreover, the avoidance strategy invoked in any particular instance depends not only on the potential sonority sequencing violation, but also on considerations of prosodic structure and - in the case of metathesis - specific segmental configurations.

Colloquial Welsh has a number of words which, in citation form, end in an obstruent-sonorant cluster, in violation of sonority sequencing, a universal markedness condition which prefers coda clusters of falling sonority (see Clements 1990, Rice 1992). The pronunciation of these words, however, resolves the violation, in some cases through epenthesis of a copied vowel, e.g. *pobl* 'people' /pobl/ → [pobol], in other cases by means of deletion of the final sonorant, e.g. *ffenestr* 'window' /fɛnɛstr/ → [fɛnast], and in a third case through metathesis, e.g. *ewythr* 'uncle' /ɛwɨθr/ → [ɛwɨrθ]. The data to be accounted for are shown in the following table.

Inputs	Candidates	SONSEQ	*means of resolution*
pobl	*pobl	*	*epenthesis*
	✓pobol		
fɛnɛstr	*fɛnastr	*	*deletion*
	✓fɛnast		
ɛwɨθr	*ɛwɨθr	*	*metathesis*
	✓ɛwɨrθ		

I argue in this paper that these three processes - epenthesis, deletion and metathesis - all arise in order to avoid a sonority sequencing violation. To account for the data at hand, the analysis will rely on the interaction between the constraints DEP-IO (militating against epenthesis), MAX-IO (militating against deletion) and LINEARITY (working against metathesis), to capture the effects of epenthesis, deletion and metathesis in avoiding a violation of the undominated SONSEQ constraint. In addition, prosodic size will be shown to play a role in deciding between epenthesis (which occurs in the case of a monosyllabic citation form), and deletion or metathesis (which occurs when the citation form is bisyllabic). Finally, account will also be given for the fact that the epenthetic vowel is a copy of the stem vowel (rather than simply a 'default' vowel such as schwa) by means of a correspondence relation between the epenthetic vowel and the underlying stem vowel (cf. Kitto & de Lacy 1999).

How does phonological grammar work in lexical diffusion?

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Korean Vowel Harmony (VH) in verbal conjugations continues to evolve, possibly towards extinction, with one form of the verbal suffix ([+ATR] form in (1)) being generalized to contexts where it is disharmonic. This regularization process is not abrupt. Rather, it goes through lexical diffusion (Wang 1969), with tendencies depending on STEM LENGTH and TRIGGER VOWEL (So 1988, Kang 1996 among others). I argue that these 'tendencies' are accounted for by perception-based grammar, in that VH is maintained when harmonized suffix enhances the perceptibility of stems.

(1) Suffix unification

Stem (Trigger)		Suffix (Target)
+ ATR (i, ɯ, u, e, ʌ)	→	**+ ATR (ʌ)**
- ATR (o, a)	⇢	- ATR (a)

(2) Examples - Verbal conjugation

a.	tɕ**a**p-**a**/**ʌ**	- & -/+	to catch-imperative
b.	t**o**p-**a**/***ʌ**	- & -	to help-imperative
c.	tɕ**u**-**ʌ**/***a**	+ & +	to give-imperative
d.	m**ʌ**k-**ʌ**/***a**	+ & +	to eat-imperative

[+ATR] suffixes have begun to be frequently used with [-ATR] stems while [+ATR] stems continue to take [+ATR] suffixes, as the examples in (2) show. So we have both of the harmonic and the non-harmonic forms of [-ATR] stems and we can observe under what conditions the harmonic or the non-harmonic forms are preferred. The first condition is STEM LENGTH: the shorter a stem is, the more likely it is to be harmonic.

The second condition is TRIGGER VOWEL. /o/ is more conservative (harmonic) than /a/. The following examples show that the non-harmonic form of /o/-stem with one syllable is not allowed, while that of /a/-stem is allowed.

These two tendencies are confirmed by the survey, in which 10 native speakers of Korean took part. As stems get longer, the preference values for harmonic forms get lower, while the values for non-harmonic forms get higher. This tendency applies to both /o/ and /a/ stems. In addition, /o/-stems are more likely to be harmonic than /a/-stems by and large.

VH has been understood as a means of enhancing the perceptibility of the triggering element (Kaun 1995). Based on her proposal, I argue that the tendencies are mainly accounted for by the perceptual point of view. First, short stems (in particular, one-syllable stems) have more competitors (or neighbors) than long stems. In addition, there are many pairs of one-syllable stems, where they are distinguished only depending on the trigger vowels (for instance, *mol-* 'to drive' and *mul-* 'to bite'). Second, the acoustic and perceptual distance between /o/ and /u/ is shorter than that between /a/ and /ʌ/. In Lee's (1998) acoustic analysis, the distributions of /o/ and /u/ overlap while those of /a/ and /ʌ/ rarely do. So /o/-stems need the VH more, in order to be distinguished from /u/-stems, while /a/-stems already have sufficient difference from /ʌ/-stems even without the VH.

In conclusion, the tendencies found in the lexical diffusion of non-harmonic forms are explained by perception-based approach to VH. This explanation predicts that harmonic forms will be preserved as long as VH plays an important role in their perception.

From outsider to prototype: The lexical tone contrast in Arzbach (Westerwald)

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In this paper we shed new light on the Franconian dialect of Arzbach that (partially) reverses tonal contours of neighboring dialects. We will show that this dialect that hardly seemed to fit into the typology of the area can in fact be regarded as a more prototypical example of a lexical tone contrast than several other dialects in the area.

In Franconian we find a prosodic opposition of two distinct word accents (Accent 1 vs. Accent 2). The lexical distribution of these accents can be related to the MHG vowel system. The high majority of the Franconian dialects follow the regular "Rule A"-distribution: In these dialects Accent 1 is realized as a falling tone whereas the lexically marked Accent 2 is realized as a level high tone (declarative intonation). The distribution in Arzbach is referred to as "Rule B" (Wiesinger 1970). Following Bach (1921) we see falling tones in Rule B where in Rule A a level high tone shows up and vice versa. This was generalized in a way that "Rule B" traditionally has been regarded as a "mirror image" of Rule A.

„Rule A“, declaration, final (example from Cologne, Peters 2006)		**„Rule B“, declaration, final** (example from Arzbach/Westerwald)	
[kan^1] 'can, bottle'	[kan^2] 'be able (SG)	[kan^1] 'can, bottle'	[kan^2] 'be able (SG)
			

A recent study in Arzbach supported Bach's findings for declarative intonation (Koehnlein 2005). However, our speech recordings surprisingly show that in interrogation and continuation the TAs look in principle like in Rule A respectively non-reversed. Since Bach only took isolated words into account he thus necessarily overlooked this "reversed reversal".

„Rule A“, interrogation, final (example from Cologne, Peters 2006)		**„Rule B“, interrogation, final** (example from Arzbach/Westerwald)	
[kan^1] 'can, bottle'	[kan^2] 'be able (SG)	[kan^1] 'can, bottle'	[kan^2] 'be able (SG)
			

The data from our fieldwork strongly suggest that the viewpoint treating Rule B as a "mirror image" of Rule A cannot be maintained. In our analysis we will show it is very unlikely that in Arzbach Accent 1 (instead of Accent 2 in Rule A) is lexically marked. Instead we propose a phonological analysis showing that in Arzbach the second mora of Accent 2 is marked with a low tone, whereas in the quasi-neighboring Cologne dialect the marker is an unspecified tone that shows up as H in declaration and L in interrogation (Peters 2006). Along the lines of Peters' assumption of an unspecified lexical tone the reversal in declaration (H vs. L) and the non-reversal in interrogation (L vs. L) can be explained. Interestingly, the tonal analysis of the Arzbach dialect that was always regarded as an 'outsider' in the Franconian tone accent area is more straightforward and needs less theoretical assumptions than several tonal analyses of other dialects in the area, making Arzbach a prototypical example of the lexical tone contrast in Franconian.

Faithfulness and Positional Licensing:
The MATCH Constraint in Khalkha Mongolian [ATR] Vowel Harmony

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While Khalkha Mongolian has been cited by many linguists as a classic example of vowel harmony (Steriade 1979; Binnick 1969, 1980; Poppe 1970; Street 1963; among others), previous analyses have failed to correctly describe the phenomenon. The current paper offers an explanatory account based on accurate data, and proposes a new constraint type to handle Khalkha harmony: the Match constraint. The current paper demonstrates that Khalkha exhibits [ATR] harmony, qualified by the behavior of transparent [i]. It also argues that vowel harmony in Khalkha is positionally licensed by the first vowel in the underlying stem.

The formal analysis makes key use of positional licensing (Beckman 1997) in Khalkha via the MATCH constraint, which represents an innovation in terms of Optimality Theoretic constraints (Prince and Smolensky 1993, 2004). MATCH accounts for harmony by requiring that all vowels in the output match the first vowel in the underlying stem in terms of a specified feature. This reference to an underlying representation is typical of a faithfulness constraint, but does so explicitly outside of a correspondence relation. Furthermore, MATCH requires that all vowels in the output agree in the specified feature. In this respect this constraint requires is typical of a markedness constraint. Therefore, MATCH constitutes a hybrid approach to vowel harmony without the complications of a correspondence relation.

The MATCH constraint is formalized in (1) below. MATCH allows for vowel harmony without recourse to ad hoc directional stipulations or underspecification.

(1) **MATCHσ$_1$-[ATR]**:
Within a harmonic domain, the value for the feature [ATR] for any output vowel must match the [ATR] value of the first vowel in the root in the input.

The ranking of traditional faithfulness constraints, IDENT-[HI] and IDENT-[BK] above the MATCH constraint allows for the exceptional behavior of transparent [i]. The use of *[ɪ] disallows for the occurrence of [ɪ] as a [-ATR] alternate of [i]. The tableau in (2) illustrates the MATCH constraint in relation to this ranking to account for the transparency of [i]:

(2) [ATR] harmony with transparent [i]: Summary Tableau
/pɔɮɔɔr/ + /iig/ + Gen.Afx/VV$_{[-Hi]}$/ *crystal*-Acc-Gen. *'This crystal of mine'*

	/pɔɮɔɔr/ + /iig/ + VV$_{[-Hi]}$	*[ɪ]	IDENT-[HI]	IDENT-[BK]	MATCHσ$_1$-[ATR]
☞	a.[pɔɮɔɔriigɔɔ]				*
	b.[pɔɮɔɔrɔɔgɔɔ]		*!	*	
	c.[pɔɮɔɔrʊʊgɔɔ]			*!	
	d.[piɮiiriigii]			*!*	****
	e.[pɔɮɔɔrɪɪgɔɔ]	*!			

In addition, the MATCH approach fares better than three alternative approaches to transparency in vowel harmony: the Stem-Affix Faithfulness approach (Baković 2000, 2003), Alignment by Correspondence (Rose and Walker 2001) and Alignment (Kirchner 1993, Archangeli and Pulleyblank 1985, 1994; among many others). In comparison, the MATCH approach provides an economical theoretical mechanism to account for not only transparency, but also positionally licensed harmony.

Diachronic Evolution and Harmony in Karimojong: A Stratal Optimality-Theoretic Analysis

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Based on internal reconstruction and new analysis of the data contained in Novelli (1985), the complex picture of harmony domains in the language is explained. Three morphophonological levels are identified from the application or absence of ATR harmony: a first level where bidirectional root-controlled harmony and [-ATR] suffix controlled harmony apply, a second level dominated by [+ATR] suffix control, and a third level without ATR harmony processes. These levels are exemplified by the minimal pair derivation examples in (1-a,b). The [ɑ/o] alternating affix, which under root controlled harmony, appears with [ɑ] in the [-ATR] case, and with [o] in the [+ATR] case, as seen in Level 1 of examples (1-a,b). Subsequent affixation of a [+ATR] TAM marker and a suffix –controlled [+ATR] spreading on Level 2 generates different behaviors of Level 1[ɑ/o] suffixes. The [ɑ]-head of the suffix for the [-ATR] verb appears as [ɑ̟], rather than [o], while the [o] head of the [+ATR] suffix remains unchanged. Pronominal prefix [ɛ-] in both examples, unaffected by ATR harmony processes, is affixed on Level 3. The findings of recent ultrasound research (Archangeli, 2003; Gick et al 2006) allow us to interpret [ɑ] in [+ATR] environments as [ɑ̟], providing a new explanation what had been regarded as transparency of the low vowel.

The proposed levels reflect distinct periods in the history of the language. The incorporation of a given affix is tied to its behavior under ATR harmony rules, which assigns its level of affixation. Likewise, affix behavior under harmony brings to light transitional phases of affix incorporation. Three types of affixes in Karimojong demonstrate incorporation processes. Pronominal prefixes, descended historically from proclitics, are largely neutral to processes of harmony. Indicative of historical change are those found in high-frequency narrative forms that alternate under dominant suffix-controlled harmony processes. Neutral first person pronominal prefix [ɔkɔ-] appears in (2-a), and the narrative mood alternating form [oko-] is in (2-b). TAM markers also show both neutral and phonologically active behaviors indicative of their transition. Frequentive suffixes at different historical stages provide evidence for a diachronic model of the genesis and evolution of reduplicated suffixes, which also validate the criteria adopted for the incorporation stages of other suffixes in the language.

Vowel neutrality in bisyllabic affixes is accounted for by a hierarchical headmarking structure with feature percolation (Van der Hulst & Van der Weier, 1995; Van der Hulst & Dresher, 1998), and the recursive prosodic word accommodates both synchronic and diachronic explanation. Harmony domains are defined within an AGREE constraint format, in which the ATR specification of each phonological head agrees with the dominant head. Never previously described are adjacency effects which alter the ATR specifications of surface forms and block harmony processes, for which a constraint family of consonant-generated features is proposed.

(1) a. ɛ-doŋ-ɑkin-jo- ‘he/she is being pinched for’

Level 1 dɔŋ-Akin → dɔŋ**ɑ**kin

Level 2 dɔŋɑkin-jo → d**o**ŋ**ɑ̟**kinjo

Level 3 ɛ-doŋɑ̟kinjo → ɛd**o**ŋ**ɑ̟**kinj**o**

b. ɛ-doŋ-okin-jo- ‘he is being castrated for’

Level 1 d**o**ŋ-Akin → d**o**ŋ**o**kin

Level 2 doŋokin-jo → doŋokinjo

Level 3 ɛ-doŋokinjo → ɛdoŋokinjo

(2) a. **ɔ́kɔ**-rutʃurutʃ-ùì

1s-tie repeatedly, NAR.PST 1s

‘…and I was repeatedly tied’

b. **óko**-rutʃ-itetèì

1s-tie-PASS.NAR.PRS PRF 1s

‘…and I have been tied’

Phonological grammar and the mental lexicon in Dyslexia and Specific Language Impairment

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Developmental dyslexia is associated with a phonological deficit: children with dyslexia are slower at accessing phonological representations from the lexicon, have difficulty retaining phonological material in working memory, and have problems manipulating phonological representations (e.g. in rhyming or spoonerisms tasks). These different facets of the deficit are commonly assumed to stem from degraded phonological representations. A common developmental language impairment, specific language impairment (SLI), overlaps with dyslexia, and is likewise proposed by many researchers to be caused by a phonological deficit. However, the precise nature of the phonological deficit in dyslexia and SLI, and whether it is identical in both disorders, are issues that remain to be resolved. We present a study which represents an initial attempt to address these issues.

Language learners have to acquire the phonological grammar of their native language, including the ability to recognise words even when the phonological form of those words is changed by regular context. For example, native English speakers recognise that the [tem] in [tem pens] is a form of the word *ten*, despite place assimilation of the nasal consonant. We assume that the ability to do this requires well-specified phonological representations of lexical items.

In this study we investigate whether children with SLI and dyslexia have impaired phonological knowledge of place assimilation. Six groups participated: children with SLI and dyslexia, children with SLI-only, children with dyslexia-only, and three groups of typically developing children matched for language, reading and chronological age. In a word detection task participants were presented with words in three assimilation contexts: viable (1), unviable (2) and no-change (3), and asked to press a button every time they heard a target word (in example 1-3, the target word was *clean*).

(1) Please bring me a [cleam pan].
(2) It's important to have a [cleam spoon] when cooking
(3) I'm looking for a [clean fork] in this kitchen, but I can't find one!

Control groups and the dyslexia-only group detected the target word significantly more often in the viable than the unviable condition. Although there were numerical differences in this direction for the two SLI groups, these differences fell just short of significance. Contrary to the degraded phonological representations hypothesis, children with dyslexia-only compensated for assimilation to the same extent as their controls. For the SLI-only and SLI-only groups, there was some compensation for assimilation, but it was masked by a higher bias for detecting a word in both the viable and unviable conditions.

We discuss the implications of our results for models of the phonological grammar and phonological lexicon in dyslexia and SLI, and for models of the overlap between the two disorders.

ATR allophones or undershoot in Kera

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Gendrot and Adda-Decker (2005...) have measured vowel data in several language corpuses and conclude that in all of the languages measured, the F1 and F2 values vary with duration in a gradient relationship, particularly in non-high vowels. They claim that the polygons made by the vowel space in an F1/F2 plot converge as the duration decreases towards a schwa like vowel. The implication is that all languages converge in this way. This paper considers whether the Chadic language Kera supports this hypothesis. Kera has been analysed in the literature (Ebert 1979…) as having 6 vowels, 3 of which have +/-ATR allophones based on the position of the syllable in the iambic foot. [+ATR] vowels appear in non-heads of feet and [-ATR] vowels in heads and elsewhere. Up to now this binary classification has been generally accepted. But acoustic measurements of F1, F2 and duration reveal that the variation in quality may be due principally to duration rather than foot structure (although the foot structure affects duration). This would lead us to suppose that rather than a categorical distinction between the allophones associated with head and non-head syllables, we may have a gradient relationship between the F1 value and the duration. Both increase together until the target F1 value is reached, at which point a further increase in duration no longer affects the quality. The key data for this claim come from vowels in non-footed syllables at the right edges of phrases and vowel initial syllables. In both of these cases, the duration of the vowel is longer than a non-head vowel, but shorter than a head vowel. The F1 value for these vowels is equally between the average head and non-head values. Neither of these cases fits neatly into a binary division of allophones.

So in terms of convergence, Kera supports the Gendrot and Adda-Decker view. However, the convergence in Kera is towards a horizontal line rather than a point. As with French, high vowels are relatively unaffected by duration. But unlike French, the F2 value is also unaffected by duration. Gendrot and Adda-Decker suggest that the explanation for the convergence effect might be partly articulatory. The differences between French and Kera would suggest that this cannot be the full explanation. On the other hand, a categorical phonological explanation does not appear to fit the facts. Another factor to consider is that Kera has a rich vowel harmony system involving height, front, rounding and total harmony over different domains. It could be that the harmony constrains the variation in F1 and F2. Height harmony would effectively raise certain vowels to become high, so for the F1 value, there is no conflict with vowels reducing to a high vowel. However, fronting and rounding give more extreme F2 values which would conflict with a phonetic tendency to reduce vowels towards a central value for F2. This could explain why the F2 value does not seem to converge in Kera.

For a full understanding of the situation in Kera, we need to combine an undershoot account with a consideration of the effects of the metrical structure on duration and the contribution made by the vowel harmony system. This investigation will be supported by data collected in February-April 2008 from other Chadic languages with vowel harmony systems.

Title: *Regional characteristics across different speech styles in L1 and L2*

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Most speakers in today's societies are bilingual or multilingual. The confrontation of two or more competing phonological systems and their phonetic realisation leads to what we generally understand as a "foreign accent" (Flege, Schirru, MacKay, 2003). The majority of second language studies has previously focused on the segmental rather than the prosodic level of speech production and perception (Flege, 1995). Only over the past decades on spoken language research an increased interested in prosody is evident (e.g. Trofimovich & Baker, 2006; Jilka, 2000; Mennen, 1998).

The present study deals with both the segmental and the prosodic level. The study aims to investigate the acquisition of regional characteristics in native speakers of English and second language learners and their variability according to different speech styles. Individuals tend to produce a less regionally marked variety of their accent in more formal speech whilst adapting their speech to their perception of the standard language. This paper examines the regional characteristics of Belfast English produced by native speakers and two groups of German L2 learners of English – immersion L2 learners and conventional secondary school L2 learners – in three different speech styles; read, semi-spontaneous and spontaneous speech.

The study has the following aim:

1. To see whether native speakers of English show differences in the adaptation of less regionally marked variables on the segmental compared to the prosodic level.
2. To investigate differences in the production of regionally marked segmental and prosodic characteristics in L2
3. To examine the ability of L2 speakers to vary their speech production according to the formality of the speech style.

The study consists of a perception test, an acoustic and auditory segmental analysis, and a prosodic analysis of nuclear pitch patterns produced by the three groups of speakers.
The perception test was carried out with 27 native speakers of Northern Irish English to identify native speakers of Belfast English and distinguish the two groups of L2 speakers.
The study provides evidence that:

a) native speakers of Belfast English produce less regionally marked intonational nuclear pitch patterns with increasing formality in speech style.
b) on the segmental level native speakers of Belfast English seem to maintain most of the regional characteristics.
c) L2 speakers of Belfast English acquired regionally marked characteristics on both the segmental level and the prosodic level.
d) both segmental and prosodic characteristics are transferred into L2 regardless the formality of the speech style.

English and Polish morphonotactics in first language acquisition.

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In this report the author will try to show the interface between phonology and morphology on the basis of phonotactics or rather morphonotactics as proposed by Dressler and Dziubalska-Kołaczyk (2006). The authors define morphonotactics as "the area of interaction between morphotactics and phonotactics" (Dressler and Dziubalska-Kołaczyk 2006: 70). The study aims at investigating the behaviour of consonant clusters with and without morphological boundaries (e.g. *passed* vs. *past*) in the process of language acquisition. It is assumed that in languages a given number of clusters will arise at morpheme boundaries. Although these morphologically motivated clusters are often marked, they might not be reduced in production as often as pure "lexical" clusters (i.e. within-a-morpheme clusters). A morphological cluster is more likely to be retained in production as it serves a morphological function (a new semantic or grammatical meaning is conveyed).

Additionally, English and Polish clusters will be analysed from the point of view of markedness. For that purpose, the author will use the Net Auditory Distance (NAD), a tool developed by Dziubalska-Kołaczyk and Krynicki (2007). The NAD between two sounds can be defined in terms of a metric on three-dimensional space spanned by phonetic properties: manner of articulation, place of articulation, and voicing. These three values when added indicate the status of a cluster: preferred or dispreferred. To illustrate the working of the NAD with an example, for initial double clusters the net auditory distance between the two consonants should be greater than or equal to the NAD between the second consonant and the vowel. The notation below captures the condition:

$$NAD\ (C1,C2) \geq NAD\ (C2,V)$$

Similar conditions have been formulated for medial and final doubles (and triples).

To verify the aforementioned claims, spontaneous data from first language acquisition of English and Polish will be presented. The English data come from the CHILDES database (MacWhinney 2000) and cover the period from the age 1;7.7-3;4;15. The Polish data come from recordings of a child, Zosia, and cover the period from the age of 1;7 until 3;2. The author will show what paths of development of morphonotactics the English and Polish children follow. Secondly, all intact and reduced consonant clusters will be analyzed from the perspective of markedness by means of the Net Auditory Distance tool.

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Special session

Phonology and the mental lexicon

The nature of lexical representation: fine-grained* and *abstract
Abigail C. Cohn (Cornell University)

In this paper, I discuss two strikingly different views of the nature of lexical representation: Generative Theory, which assumes that lexical representations consist of only contrastive, unpredictable information, represented in terms of distinctive features and Exemplar Theory, which assumes that lexical representations consist of fine-grained details, the accumulation of memory traces of words. A growing body of work suggests that neither of these views in its strictest form is tenable. I suggest we interpret these as endpoints along a continuum of possible representations and I review evidence for the integration of multiple representations into an adequate theory. I argue that there are several logically separate issues to consider: 1) evidence for fine-grained knowledge, 2) evidence of abstract knowledge, 3) issues of how both sorts of knowledge are acquired, 4) possible views of how multiple dimensions of knowledge are integrated.

I focus in particular on the nature of units of representation, considering the role of features, segments, syllables, and words. I argue that there is compelling evidence for the role of each of these in adult language. However, this evidence alone does not inform us about the source of these structures, as universal or language-specific, as innate or learned.

Movement away from a polarized debate claiming only abstract representations or only fine-grained details are the substance of lexical representations and the development and testing of sufficiently explicit and complex integrated models will lead to a deeper understanding of the acquisition and representation of the rich and multifaceted systems of phonological knowledge characteristic of adult language.

Contributions of phonetic detail to the mental lexicon
Sarah Hawkins (University of Cambridge)

An accumulating body of experimental evidence shows that detailed acoustic patterns systematically indicate linguistic structure in ways that reflect not just the phonological structure of citation-form lexical items, but also a wealth of other linguistic and interactional information. Listeners learn about these cues to meaning, use them to understand meaning in at least some conditions, and can adapt rapidly to their statistical distribution. Such systematic patterns are widespread in normal speech, but some are rarer in standard read "laboratory" speech. Some of the distinctions are easy to hear, others are very hard to hear but nevertheless influence perceptual decisions, especially under adverse listening conditions such as in noise (when, interestingly, they would be expected to be even harder to hear). Some seem to have relatively restricted functions, while others have multiple functions. Many contribute to word segmentation by indicating grammatical status. These and other points raise questions about the status of theoretical constructs such as the mental lexicon. It seems undeniable that phonetic detail contributes to lexical knowledge, and computational algorithms and theoretical accounts of human speech processing can combine episodic and abstract representation. But to account for the plasticity and task-oriented use of phonetic detail, a more fundamental issue may be whether conceptualisation of "static" linguistic structure should be replaced by a function- or process-oriented framework. For speaker-hearers, this may mean that linguistic knowledge is not necessarily distinct from other knowledge, but is essentially embodied, and constantly in flux. For phonologists, it may amount to whether a phonological theory should account for linguistic function beyond that of lexical contrast.

Asymmetry in phonological representations and language comprehension
Aditi Lahiri (University of Oxford)

Language, as all cognitive systems abound in asymmetries. No language system is ever completely balanced; e.g., there are more nouns than verbs in Germanic languages. Nor are systems parallel across languages; there are more prefixes in German than in Turkish, but the latter has more suffixes than the former. Phonological systems are exhibit equal asymmetry. Vowels are deleted more frequently at the end of a word rather than at the beginning. German uses umlaut as a grammatical category, while Dutch has only an underlying phonemic contrast but no grammatical differences. The change in language systems through the ages is also asymmetric. The sound 'n' changes to 'm' often, while 'm' usually remains unchanged. Vowels like German "ü" change to "i" but rarely to "u", while "u" can change to "ü" quite easily in particular contexts. The mental lexicon must cope with the asymmetries from the speech signal to the asymmetries in mental representations. The question we ask is how such asymmetries are represented in the mental lexicon and how they are processed in speech perception. The model proposed here (*Featurally Underspecified Lexicon*) suggests that certain asymmetries can be resolved via sparse lexical representations. Supporting evidence is drawn from feature and tone asymmetries in behavioral and EEG experiments.