

Workshop: Discovering and Representing Phonological Patterns

Under the auspices of SFB 471, Projects D8 (Grijzenhout) and D9 (Kabak)

Themes: Laboratory Phonology, Theoretical and Historical Phonology with particular attention to mental representations, Phonetics with particular attention to featural mapping in language acquisition or processing.

Description: The workshop will deal with phonological patterns, their representation and their acquisition. We also welcome contributions in relation to the interlanguage mapping of phonetic features onto phonological structures as well as contributions in relation to diachronic developments that determine the nature and dynamics of mental representations (e.g., the evolution of vowel harmony; lexical accent genesis; typological implications and the consequences of such diachronic developments for mental representations).

Local Organizers: Janet Grijzenhout, Barış Kabak, Muna Pohl

When: Thursday 10 – Saturday 12 April 2008

Where: University of Konstanz, Building V, Room 1001

Preliminary Schedule

Thursday, 10 April 2008

9.45 – 10.00	Introduction
10.00 – 10.50	Nivedita Mani (Oxford University) <i>Specificity of vowels and consonants in early words: segmental and subsegmental detail</i>
coffee & tea	
11.20 – 12.10	René Kager (Utrecht Institute of Linguistics) <i>Inducing abstract phonotactic constraints from connected speech</i>
12.10 – 13.00	Thomas Mayer (University of Konstanz) <i>Algorithmic Syllabification</i>
lunch	
14.30 – 15.20	Kazumi Maniwa & Barış Kabak (University of Konstanz) <i>Psychoacoustic, phonetic and phonological factors in non-native speech perception</i>
15.20 – 16.10	Paul Iverson (University College London) <i>Effects of first-language vowel systems on second-language vowel learning</i>
coffee & tea	
16.40 – 17.30	Verena Felder (University of Konstanz) <i>The underspecified mental lexicon – investigating segmental and suprasegmental representations</i>

17.30 – 18.20 Astrid Kraehenmann (University of Konstanz)
Voice to Length: one-way

reception

Friday

9.45 – 10.00 Intro

10.00 – 11.00 John Goldsmith (University of Chicago)
Optimization is the answer. Now, what is the question?

coffee & tea

11.20 – 11.45 Barış Kabak & Eva Kasselkus (University of Konstanz)
Vowel co-occurrence patterns in Turkish: A corpus study

11.45 – 12.10 Janet Grijzenhout (University of Konstanz)
Stricture Theory

12.10 – 13.00 Anthi Revithiadou (University of the Aegean)
Endogenous and exogenous factors in the emergence of novel phonological patterns: A case study from Greek and its dialects

lunch

14.30 – 15.20 Mathias Scharinger (University of Konstanz)
Changing features or changing exemplars? A perspective on New Zealand English vowels

15.20 – 16.10 Heidi Altmann (University of Konstanz)
Asymmetries in L2 stress perception and production

Coffee & tea

16.40 – 17.30 Nina Kazanina (University of Bristol)
Use of phonological regularities in online tasks

Conference 'Buffet'

Saturday

9.45 – 10.00 Intro

10.00 – 10.50 Heather Goad (McGill University, Montreal)
Laryngeal allophony without laryngeal features

Coffee & tea

11.20 – 12.10 Muna Pohl (University of Konstanz)
The perception of stop contrasts by German infants and their parents

12.10 – 13.00 Nicole Altvater-Mackensen & Paula Fikkert (Radboud University Nijmegen)
Phonological detail and the developing lexicon

Abstracts:

Asymmetries in L2 stress perception and production Heidi Altmann (University of Konstanz)

Second language phonology involves not only the learning of segments and features, which has been the focus of interest for quite a while, but also of suprasegmental properties, which is still relatively understudied. In the present talk, I will report results from crosslinguistic perception and production studies that focused on L2 English word stress. The studies employed nonce words and involved highly proficient learners from a select variety of L1s (Arabic, Chinese, English, French, Japanese, Korean, Spanish, Turkish). The findings support that predictable stress L1s perform significantly lower on stress perception than others (popularly dubbed ‘stress deafness’). These same L1s, however, perform better on L2 stress production than others. This presents the following asymmetries: (1) Learners who have no problems perceiving the location of stress in English words do not produce native-like stress patterns for L2 nonce words. (2) Learners who do have problems perceiving stress produce more native-like stress patterns for L2 nonce words. Thus, not only does good perception not necessarily lead to good production, but bad perception may also lead to good production, which requires a more detailed look into the properties of the languages involved.

Independent of theoretical models but rather based on binary surface-observable facts which can easily be extracted by a language learner (e.g., predictable or non-predictable word-level stress, stress language or tonal language, etc.), languages are classified in accordance with a hierarchical typology of stress properties (Stress Typology Model) and compared to the classification presented in the ‘Stress Deafness’ (Peperkamp&Dupoux 2002) account. It will be shown that not all the predictions made by the Deafness classification for the perception of stress can be supported but that the Stress Typology Model can account for the current perception and production results as well as the asymmetries.

Phonological detail and the developing lexicon

Nicole Altvater-Mackensen & Paula Fikkert (Radboud University Nijmegen, CLS-M)

In their first year of life infants attune to the phonology of their mother tongue: they become less sensitive to non-native sound contrasts and more sensitive to native sound contrasts (e.g., Kuhl 2004). However, infants seem to show decreased sensitivity to the very same native contrasts in a word-learning task (Stager & Werker 1997). Stager and colleagues proposed that this decrease in sensitivity is caused by high task-demands. Yet, in a mispronunciation task using known words a similar effect of loss of phonological detail is observed (v.d.Feest 2007).

In this talk we will discuss recent findings on the perception of laryngeal features as well as Place and Manner of articulation features in infants. It will be shown that the perception of phonological contrasts in word recognition follows an asymmetric pattern: certain contrasts are maintained while others are ignored. This behavioral data will be couched in a framework of phonological un(der)specification of early lexical representations (Lahiri & Reetz 2002, Fikkert *to appear*).

The underspecified mental lexicon – Investigating segmental and suprasegmental representations

Verena Felder (University of Konstanz)

Speech is a challenge for the human brain. In contrast to written language, the acoustic signal is affected by speaker variability, coarticulation, assimilation or deletion of segments, etc. The model of the featurally underspecified lexicon (FUL, Lahiri & Reetz, 2002) makes an approach to coping with this variability in a parsimonious way. It assumes that segments are stored in terms of their hierarchically ordered, abstract features. Further, only features that are contrastive in the language and cannot be derived elsewhere are assumed to be specified.

These assumptions were set to test in several behavioral and electrophysiological studies. One EEG experiment tested the underspecification of the feature [coronal] in German consonants in a crossmodal fragment priming study. According to FUL, a coronal segment – because it is not specified in the mental lexicon – should be activated not only by itself but also by segments differing in place of articulation. A visual target was either preceded by its own first syllable (e.g. *mon*-Monster, “monster”; *drach*-Drache, “dragon”), by a syllable with different place of articulation in the onset (e.g. *non*-Monster; *brach*-Drache) or by a completely unrelated fragment. The P350, an event related potential reflecting lexical activation, indicated priming for the condition with identical syllables in fragment and target word (*mon*-Monster; *drach*-Drache) as well as in cases with a non-coronal onset in the prime and a coronal onset in the target (*brach*-Drache). In contrast, a coronal onset was not able to activate a word starting with a non-coronal segment (*non*-Monster).

The FUL model postulates underspecified lexical representations not only for segments, but also for suprasegmental entities. This was tested in Swedish, where two different lexical accents occur, called Accent 1 and Accent 2. We postulated that Accent 2 is always unspecified while Accent 1 is sometimes predictable and sometimes needs lexical specification. In a forced choice experiment participants heard a word fragment (e.g. *hum*) and were asked to decide between two visual alternatives with different accent (e.g. *hummer*₁-*humla*₂, “lobster-bumblebee”), one of which the fragment was taken from. The only cue to solve this task was accent information. We tested the prediction, that this decision is fastest for specified Accent 1 words, which was indeed the case. Further, a crossmodal fragment priming study in the EEG revealed that segmental information overrides tonal information in Swedish. The P350 component did not show sensitivity to aspects of lexical specification for tonal information.

Laryngeal Allophony without Laryngeal Features
Heather Goad (McGill University)

Before contrasts emerge in development, not surprisingly, children’s grammars often display allophony. Under most modern views of grammar, allophony indicates that the features in question are active in the grammar, but that their distribution is limited due to positional constraints that must be respected. In this paper, it is argued that certain cases of allophony, namely voicing and aspiration in child English, arise without the features seemingly involved being employed by the grammar. Support for this position comes largely from the surprising distribution of allophones, both the presence of unexpected allophones in certain contexts and the absence of expected allophones in other contexts. It is argued that if a theory of prosodically-determined strong and weak licensers is adopted, coupled with an abstract view of the syllable, an explanation for these unexpected patterns emerges.

The data are principally drawn from Amahl (Smith 1973). Smith observes that at Stage 1 (age 2;2), voicing is neutralized in Amahl’s outputs as in (1). When prosodic constraints on Amahl’s possible word shapes are factored in, the contexts in (1a,b) can be reformulated as in (2a,b). The reformulation of (1c) as (2c) is questionable, as will be discussed below.

- | | |
|---|--|
| <p>(1) a. voiceless unaspirated lenis [B, D, G] wd-initially
 b. voiced lenis [b, d, g] inter-vocally
 c. voiceless fortis [p, t, k] word-finally</p> | <p>(2) a. in foot-edge onset position
 b. in foot-internal onset position
 c. in coda position (?)</p> |
|---|--|

Two puzzling questions arise from the reformulation in (2). Regarding (2c), since codas are weak licensers, why does this position appear to undergo fortition? Conversely, regarding (2a), since foot-edge onsets are strong licensers, why does this position appear to display lenition?

The pattern in (2b), it seems, is the only one that is as expected and so we begin with this. Alternations in Danish are quite revealing of what underlies this process: foot-internal weakening involves sonorantization (*peber* (pé[w]er)_{Ft} ‘pepper’); compare the foot-edge context in *bebude* be([p]úde)_{Ft} ‘to foretell’ (examples from Harris 1997). We can extend this analysis to (2b) as follows: if voiced lenis stops are sonorant stops (Rice 1993), then their restriction to foot-internal position follows

straightforwardly: these segments do not bear laryngeal voicing ([vce]) but sonorant voicing. That is, they acquire [SV] (sonorant voice) from the adjacent vowels.

Turning to the problematic case of (2c), why are voiceless fortis allophones found in what should be a weak position? Fortis release is not an unmarked property of codas; across languages, codas are positions of neutralization where stops prefer to be *unreleased*. Another problem is that all of Amahl's coda stops at this stage occur in word-final position. There are arguably no adult languages where word-final consonants pattern as codas (as opposed to as onsets) and that also lack word-internal codas (Goad & Brannen 2003).

The following proposal accounts for these problems: Amahl's word-final consonants are not codas: *([B]_O[æ]_N[k]_C)_σ 'back'; they are onsets: ([B]_O[æ]_N)_σ([k]_O[∅]_N)_σ. If the onset's features spread into the empty nucleus ∅ that follows, the nucleus can host the fortis release: ([B]_O[æ]_N)_σ([k]_O_N)_σ. Data from other children learning English, French and German (Goad 2002, Goad & Brannen 2003), as well as distributional information from Amahl's grammar, will be shown to support this analysis.

In short, fortition arises not from laryngeal specification (e.g. [spread glottis] or [tense]) but as a consequence of syllabification and (2c) should be revised as follows:

(2) c.' voiceless fortis [p, t, k] in word-final onset position

Turning finally to (2a), if foot-edge onset position is a fortition environment, why do we find voiceless unaspirated lenis stops in this position? Across adult languages, voiceless unaspirated lenis is the unmarked value of voicing: in languages with laryngeal neutralization in coda, this is often the type of segment that results (e.g. German); it is also the realization of stops after [s]. In theories that assume underspecification, this type of segment would be one which is underspecified for a Lar node. In Amahl's grammar, this representation arises for free – if his grammar lacks Laryngeal features.

In sum, laryngeal allophony in Amahl's grammar arises not from particular laryngeal features being restricted to particular positions; rather, it arises from a lack of laryngeal features combined with a theory of prosodically-determined strong and weak licensers and an abstract view of the syllable.

Optimization is the answer. Now, what is the question?
John Goldsmith (The University of Chicago)

My goal in this presentation is to offer a brief introduction to a view of linguistics which is empiricist, and which puts a heavy emphasis on the character of language learning, without being cognitivist. It is a view that says that the goal of the linguist is to understand how language *can* be learned, a goal distinct from that of the psychologist, who aims to understand (in a different sense) how language *is* learned.

On an empiricist account, the goal of the linguist is, first, to develop increasingly refined data regarding language use; second, to develop insightful and compact theories of the data; and third, to evaluate competing models with regard to two criteria: their abilities to *concisely* characterize regularities within and across languages, and their ability to identify *all* the generalizations that inhere in the data.

Probabilistic methods provide an explicit framework in which to accomplish such a task. Probability plays a role at two levels: at the lower, grammatical level, we place a condition on a grammar that it must assign a probability distribution over all the representations it generates (hence, the infinite sum of the probabilities must sum to 1.0). Secondly, probability plays a role at the higher, theoretical level, in that we must establish a "prior distribution over grammars"—which is to say, that a probability is assigned to the infinite class of grammars as well. This latter notion of probability is very similar to the classical generative notion of a simplicity metric (or its inverse, a complexity metric): the complexity of a grammar is closely related to the shortest possible length of the grammar expressed as a program on a universal computer.

For an empiricist account of linguistics, then, the *optimal* grammatical description of a finite set of data is that grammar which minimizes a quantity which is the sum of two terms: the length of the

grammar, plus what is called the optimal compressed length of the data, given the grammar (this “optimal compressed length” of the data is equal to $-\log_2$ of the probability of the data, given the grammar).

What does this mean for morphologists and phonologists? I will give four illustrations: (1) an account of word learning, (2) an account of morphological segmentation, (3) an account of sonority, and (4) an account of vowel harmony.

Effects of first-language vowel systems on second-language vowel learning

Paul Iverson (University College London)

One could imagine that the task of learning second-language (L2) vowels as an adult would differ fundamentally for individuals with large and small first-language (L1) vowel systems. Individuals with larger L1 vowel systems could initially have an advantage at recognizing L2 vowels, because there would be fewer cases of multiple L2 vowels assimilating into the same L1 categories. However, large L1 vowel systems could interfere with additional learning, because there is less “unoccupied” space for new categories. This talk will describe several recent studies on English vowel learning by Spanish, French, German, and Norwegian speakers. The results suggest that individuals with large and small L1 vowel systems actually differ very little in how they learn L2 vowels; individuals with large L1 systems may even have an advantage in training experiments where they are able to recruit their existing vowel categories.

Vowel co-occurrence patterns in Turkish: A corpus study

Bariş Kabak and Eva Kasselkus (University of Konstanz)

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 markedness 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 ([ı, 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., MADNT_{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.

Inducing abstract phonotactic constraints from connected speech

René Kager (Utrecht Institute of Linguistics)

The issue of whether linguistic knowledge is abstract or statistical in nature remains controversial. Proponents of purely statistical models of language claim that results of acquisitional studies and computational interpretations imply a radical reduction of the role of abstract grammatical knowledge. Proponents of abstractness, on the other hand, have argued that although statistical learning may be a major learning mechanism, it pre-supposes a basic representational alphabet, while purely statistical models are not able to account for cases of genuine rule learning. Here I will discuss some recent work from our group suggesting that low-level statistical properties of the language are represented by native listeners in the form of abstract constraints, which indirectly provides evidence for an abstract constraint induction mechanism in the learner. I will focus on a set of constraints which govern the co-occurrence of consonants with identical place of articulation in Dutch. These affect the processing of non-words (Kager & Shatzman 2007), as well as segmentation of artificial languages (Boll & Kager 2008). Finally, I will present preliminary results of a computational model (Adriaans & Kager in preparation) which induces abstract phonotactic constraints from connected speech. This model collects statistics on low-level segment distributions, proposes constraints on the co-occurrence of individual segments, and generalizes from these constraints into more abstract ones. The model will be compared with other models for speech segmentation based on statistics only.

Use of phonological regularities in online tasks

Nina Kazanina (University of Bristol)

I discuss two cases in which phonological regularities are recruited by the parser in order to facilitate efficient speech recognition and lexical retrieval. The first example concerns allophonic variation. I argue on the basis of the results from magnetoencephalographic (MEG) experiments with Russian and Korean speakers that the parser disregards allophonic distinctions at the initial stage of processing, which helps facilitating lexical retrieval. The second example concerns use of stress in online processing of languages with predictable stress, such as French and Turkish. French speakers are known to be 'stress-deaf', as witnessed by their limited ability to distinguish items that minimally differ in the stress location. Despite that, they are capable of using stress as a word boundary cue in speech recognition tasks, thus adding to a high speed of speech segmentation and of lexical retrieval.

Voice to length, one-way

Astrid Krähenmann (University of Konstanz)

How – if at all – perception of unfamiliar sounds is influenced by the phonological system of a borrowing language is a hotly debated issue in loanword literature. In this talk we present and discuss some of the views (e.g. Jacobs & Gussenhoven 2000, Kenstowicz 2001, Paradis & Prunet 2000, Peperkamp & Dupoux 2003, Silverman 1992, Yip 2006).

We illustrate key issues – such as the role of the phonetics of the donor language, borrowing vs. language acquisition, mental representation of new contrasts – with the way loanwords were historically and are synchronically adapted in Swiss German. It can be shown that a voicing contrast in the stops of a donor language was mapped onto the existing length contrast from at least 1000 AD onwards (see (1) & (2)). Borrowings then eventually lead to the emergence of labial and velar geminate phonemes word-initially, such that present-day Swiss German now distinguishes long and short stops in all word positions (see (3) & (4)). This type of voice-to-length mapping in borrowings still continues, but with a twist for initial velars from English and Standard German loanwords: while “voiced” velars are translated into singletons as expected (5), the “voiceless” velars become velar affricates, not stop geminates (6). The current treatment of borrowings in particular highlights the importance of the phonetic input of the donor language.

(1) Middle Low German	<i>sta/p/el</i> ‘stack’	>	<i>sta/pp/el</i>
(2) Middle French	<i>câ/b/le</i> ‘cable’	>	<i>ka/p/el</i>
(3) Old French	<i>/p/alais</i> ‘palace’	>	<i>/pp/alast</i>
(4) Middle Dutch	<i>/b/allast</i> ‘load’	>	<i>/p/alast</i>
(5) Eng. <i>game</i>	[geim]	>	[keim]
(6) Eng. <i>cool</i>	[k ^h ul]	>	[kxuul] *[kkuul]

- Jacobs, Haike & Gussenhoven, Carlos (2000). Loan phonology: perception, salience, the lexicon and OT. In J. Dekkers, F. van der Leeuw & J. van de Weijer (eds.) *Optimality Theory*, 193-210. Oxford: Oxford University Press.
- Kenstowicz, Michael (2001). The role of perception in loanword phonology. A review of “Les emprunts linguistiques d'origine européenne en Fon” by Flavien Gbétou, Köln: Rüdiger Köppe Verlag, 2000. *Studies in African Linguistics* 32, 95-112.
- Paradis, Carole & Jean-François Prunet (2000). Nasal vowels as two segments: evidence from borrowings. *Language* 76/2, 324-357.
- Peperkamp, Sharon & Emmanuel Dupoux (2003). Reinterpreting loanword adaptations: the role of perception. *Proceedings of the 15th International Conference of the Phonetic Sciences*. 367-370.
- Silverman, Daniel (1992). Multiple scansions in loanword phonology: evidence from Cantonese. *Phonology* 9/2, 289-328.
- Yip, Moira (2006). The Symbiosis between perception and grammar in loanword phonology. *Lingua* 116/7, 950-975.

Specificity of vowels and consonants in early words: segmental and subsegmental detail
Nivedita Mani (Oxford University)

20-month-old French infants simultaneously learn two words which differ in only a single consonant, while being unable to learn two words which differ by a single vowel. This finding has been taken to suggest that there may be differences in the roles of vowels and consonants in constraining lexical acquisition. In order to assess the phonological specificity of vowels and consonants in early words, Experiment 1 tests infants' sensitivity to mispronunciations of the vowels and consonants in familiar words. The results confirm that infants, as early as 12-months of age, were sensitive to both kinds of mispronunciations, although there were no differences between their sensitivity to vowel and consonant mispronunciations.

Experiment 2 examines the phonological specificity of vowels further, investigating whether vocalic specification implies specificity of the phonological features defining the vowels of closed, monosyllabic, familiar words. Mispronunciations altered one of the features of the vowel height, backness, or roundedness. The results confirm that English infants' representations encode specification of vowel height and vowel backness, but not of vowel roundedness. We argue that this can either be explained by the redundancy of specification of vowel roundedness in English, or by comparison of the acoustic characteristics of the difference between correctly pronounced and mispronounced labels.

Psychoacoustic, phonetic and phonological factors in non-native speech perception
Kazumi Maniwa and Bariş Kabak (University of Konstanz)

In this talk, we present results from two cross-linguistic speech perception studies that looked at the influence of long-term phonological and phonetic experience on the perception of non-native speech. Our first study investigated the L2 perception of English fricatives (f, θ, s, , v, δ, z,) produced in clear and conversational styles. Using a database of 8800 VCV stimuli (e.g., [asa], [afa]) produced by 20 American English speakers, we measured babble thresholds for identification of fricatives that differ in place or voicing by Standard German, Swabian German, and Castilian Spanish speakers (n=14 each) in each speaking style. These languages exhibit an instructive array of phonological contrasts and allophonic variation that enable us to separate the role of acoustic, phonetic and phonological factors. The different performances obtained in the non-native groups reflect the phonological encoding of

voicing in different L1s, although there also seem to be general perceptual issues due to acoustic similarity for all groups.

The goal of our second study was to determine whether formant frequency discrimination thresholds differ depending on the distribution of vowels in listeners' first (L1) languages. Specifically, we investigated whether the density of phonemic categories in the $F1 \times F2$ space and the temporal regularity within phonological systems (as dictated by vowel harmony) of these categories influence formant frequency sensitivity by different L1 groups. Previous research has investigated discrimination of complex spectral (and spectrotemporal) differences using methods designed to measure categorical perception, involving crude measurements (usually AX discrimination at one or a few difference intervals) in limited regions of the stimulus space. A few studies have used more sensitive techniques to measure formant discrimination thresholds of American English listeners for synthesized English vowels. It is unknown, however, whether the patterns observed would differ depending on the listeners' L1 phonological system, or on the specific regions of the vowel space considered since, to our knowledge, there has been no attempt to measure formant frequency sensitivity crosslinguistically. Employing a Bayesian adaptive procedure to present a continuous range of formant differences in a 4IAX task, we measured F1 and F2 formant discrimination thresholds at 25 reference points across the vowel space, comprising a 5×5 matrix spanning typical ranges across languages. We hypothesized two ways listeners' acoustic perception might be influenced by the organization of their L1: (i) users of languages with front-back vowel harmony become *less* sensitive to F2 changes within front and back regions since changes in F2 within these regions amount to within-category change, and/or (ii) the number of similar vowels in one dimension (or region) of the vowel space positively correlates with sensitivity. We tested two groups, Turkish (n=30) and German native speakers (n=30). Turkish has vowel harmony and contains 8 vowels; German; has 15 vowels (including length distinctions) and no vowel harmony.

Our preliminary results reveal that German listeners are significantly more sensitive to frequency differences than Turkish listeners, deriving mostly from better thresholds for F2 differences, especially for high vowels. We see two possible ways to explain this finding. It could be that Turkish listeners are not sensitive to subtle F2 differences within the grand categories they establish due to the higher-level persistent phonological regularity that systematically separates all front vowels from back ones, resulting in lower sensitivity to spectral changes within regions corresponding to these categories. Since both languages have no height harmony, we saw no dramatic difference in their sensitivity to F1. Alternatively (or additionally), it may have resulted from differences in the two languages' vowel inventories: German involves somewhat more purely F2 distinctions in this region. Thus, notwithstanding various confounds, these results demonstrate that listeners' L1 phonological system can dramatically influence their psychoacoustic decisions even in tasks designed to access low level auditory perception. We will discuss extensions of this study to other languages with few height and backness distinctions (Greek), languages with more F1 distinctions (English) and languages with front-back harmony but with more vowels (Finnish).

Algorithmic Syllabification

Thomas Mayer (University of Konstanz)

Is it possible to discover phonological patterns reasonably well from raw unannotated text in a language without making any language specific assumptions? It will be argued that at least when it comes to the question of syllabification the answer is *yes*. The most important steps of a totally unsupervised syllabification algorithm which mostly assumes typologically motivated cross-linguistic generalizations (such as CV as the unmarked syllable structure, Onset Maximization, etc.) are presented in this talk.

First, the letters of the input text are automatically categorized into vowels and consonants, using Sukhotin's algorithm. Then, each consonant is assigned an inherent sonority value based on its distribution and position in consonant clusters. Consonant clusters at word edges are considered indicative of what are possible syllable boundaries in word medial clusters. Furthermore, vowel clusters

are treated as tautosyllabic (i.e., as diphthongs) when they occur more often next to each other than separated by at least one consonant. Finally, syllable boundaries are calculated by taking all of the aforementioned principles into account.

The algorithm has been tested on medium-sized corpora in a number of languages. The results encourage further investigations in this direction.

*Endogenous and exogenous factors in the emergence of novel phonological patterns:
A case study from Greek and its dialects
Anthi Revithiadou (University of the Aegean)*

In the course of history, certain language-internal (*endogenous*) conditions may lead to the emergence of phonologically deviant behavior from an otherwise predictable/natural phonological rule. This paper explores the development of lexical accents from weight insensitive unbounded stress systems. Following Kabak & Revithiadou (2008), we argue that a possible source for lexical accent genesis in such edgemost systems is: (a) the conflicting directionality of prominence at the word and above the word level, which determines the location of prominence in complex morphological structures such as compounds and compound-like constructions, and (b) morphologization (i.e. prosodic weakening, semantic bleaching), which causes independent lexical items within such constructions to become bound elements. When these two conditions meet in a system, they cause the edgemost default stress to lose its predictability and gradually acquire morphological identity. Such fossilized instances of the default are imprinted as part of the underlying representation of a morpheme, i.e. root or affix, in the form of lexical accents. We also argue that further reduction processes (as well as morphological re-analysis) may lead to accent proliferation and the emergence of more complex accentual patterns such as non-local accents (e.g. pre- and post-accenting) in a system. The proposal put forward here is substantiated on the basis of approximately fifty edgemost stress systems. Pontic Greek will serve as an instructive case study for the proposed developmental path.

Besides language-internal factors that yield deviant phonological patterns, this paper also investigates the effects of language interference (*exogenous conditions*) on reshaping ‘deviant’ phonological behavior and recasting it towards a more regular phonological pattern. We examine a case study from language-induced systems. More specifically, in the Greek dialects of Asia Minor (e.g. Ulaghatsh, Semendere), lexically-imprinted stress subsided under the influence of language contact with Turkish, which has a predictable (rightmost default) stress rule. We argue that this interference was assisted by certain morphological changes that independently took place and transformed the original fusional system of noun morphology into an agglutinative-oriented one.

To account for the emergence and loss of lexical accents, a two-dimensional autosegmental theory for accent representation is proposed which distinguishes between the morphological affiliation of an accent and its locus of pronunciation (Revithiadou 2007, Kabak & Revithiadou 2008). The soundness of this theory is tested not only on the grounds of its explanatory power in capturing the diachronic changes, but also with respect to its ability to make certain predictions with respect to the rise and decline of ‘deviant’ stress patterns without resorting to additional machinery. The analysis will be couched within the theoretical framework of *Colored Containment* (van Oostendorp 2006).

*Changing features or changing exemplars? A perspective on New Zealand English vowels
Mathias Scharinger (University of Konstanz)*

Exemplar models of speech perception have become quite popular, one reason being the experimental findings that both within-category variation and extra-linguistic information can affect speech perception. These models are characterised by extensive storage of words and sounds with fine phonetic detail and indexical information such as speaker identity or social context. Some researchers also use exemplar frameworks to account for diachronic phonological patterns of language change. For instance,

Warren et al. (2008) model the New Zealand English short front vowel raising in assuming dynamic changes in the vowel-exemplar sets. However, since exemplar accounts are based on statistical regularities, genuine phonological patterns are rather neglected and only emerge coincidentally. A model which takes seriously phonological representations in the mental lexicon, and therefore roots language change in the phonology of the respective language, is the Featurally Underspecified Lexicon (Lahiri and Reetz, 2002). A series of experiments with New Zealand English and American English participants suggests that the vowel raising is best analysed in terms of a restructured vowel height, based on tongue height features. Clearly, the findings cannot be explained by acoustic distances between vowel exemplars alone and provide a challenge for exemplar accounts.

LAHIRI, A. and REETZ, H. 2002. Underspecified recognition. *Laboratory Phonology VII*, ed. by Gussenhoven, C. and Warner, N., 637-677. Berlin: Mouton de Gruyter.

WARREN, P., HAY, J. and THOMAS, B. 2008. The loci of sound change effects in recognition and perception. *Laboratory Phonology IX*, ed. by Cole, J. and Hualde, J. I., 88-112. New York: Mouton de Gruyter.

*This is a joint conference of the research projects
D-8 “Acquisition of Lexical Phonological Contrasts” (Janet Grijzenhout) and
D-9 “Phonological Patterns and Subregularities in the Lexicon” (Baris Kabak)
of the SFB 471 “Variation and Evolution in the Lexicon”,
funded by the German Research Foundation (DFG).*