

On the Boundaries of Phonology and Phonetics

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In this volume a collection of papers is presented in which the boundaries of phonology and phonetics are explored. In current phonological research, the distinction between phonology, as the study of sound systems of languages, and phonetics, as the study of the characteristics of human (speech) sound making, seems to be blurred.

Consider an example of the phonological process of /l/-substitution as exemplified in the data in Table 1.

Table 1. /l/ substitutions

	/l/	→	[w]
Historical Dutch data:			
	alt/olt		oud 'old'
	kalt/kolt		koud 'cold'
	schoo[l]		schoo[w] 'school'
First Language Acquisition data (Dutch):			
	hallo		ha[w]o 'hello'
	lief		[w]ief 'sweet'
	blauw		b[w]auw 'blue'

In phonology, the substitution segment is expected to be a minimal deviation from the target segment. For example, *boat* 'boat' could be realized as [pɔt], but not as [lot], since the target /b/ and the output [l] differ in too many dimensions. In other words, sound substitutions should be characterized more commonly by single feature changes than by several feature changes. The widely attested substitution of /l/ by [w], however, cannot be accounted for adequately as a minimal deviation from the target based on articulatorily defined features, as shown in Figure 1.

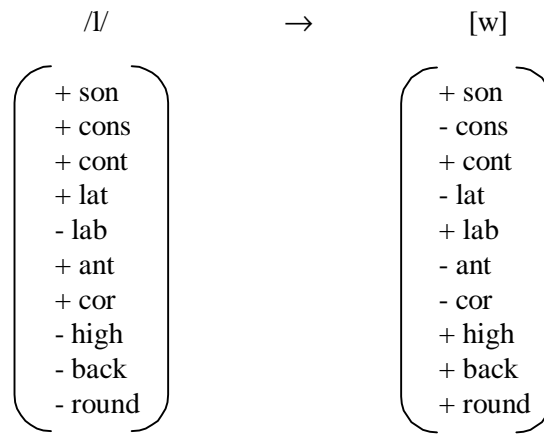


Figure 1. /l/-substitutions

From an acoustic point of view, liquid-glide alternations can be described as minimal changes. The differences between the individual glides and liquids can be related to their relative second and third formant locus frequencies. Ainsworth and Paliwal (1984) found that in a perceptual-identification experiment liquids such as [l] having a mid F2 locus frequency were classified as [w] if they had a low F2 locus frequency and as [j] if they had a high F2 locus frequency.

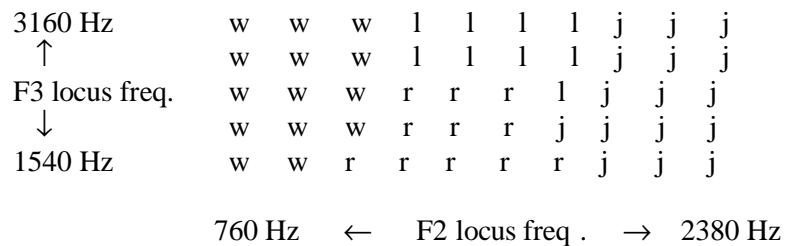


Figure 2. Typical set of responses obtained from listening to glide/liquid-vowel synthetic stimuli (after Ainsworth & Paliwal, 1984 (simplified))

Based on these acoustic characteristics, liquid-glide substitutions can be described as a minimal change from the target, which cannot be done in the

phonological representation of these sounds. Obviously, phonology needs phonetic information to explain a phonological process of this kind (cf. Gilbers, 2002).

Now consider the Dutch process of schwa insertion as exhibited in Table 2.

Table 2. schwa insertion in Dutch

<i>helm</i>	[hɛləm]	'helmet'	<i>darm</i>	[dɑrəm]	'intestine'
<i>half</i>	[hɑləf]	'half'	<i>durf</i>	[dœrəf]	'courage'
<i>melk</i>	[mɛlək]	'milk'	<i>hark</i>	[harək]	'rake'

not in: *vals* 'out of tune', *hals* 'neck', *hart* 'heart', *start* 'start'

Schwa may be inserted between a liquid /l,r/ and a non-homorganic consonant (i.e. a consonant that differs in place of articulation with /l,r/) at the end of a syllable. Therefore, schwa may be inserted between coronal /l/ or /r/ and non-coronal /m/, /f/, /k/, etc. Schwa is not allowed, however, between /l/ or /r/ and a coronal obstruent /s/ or /t/. Now, Dutch has at least two different varieties of /r/: an alveolar [r] and a uvular [ʀ]. Since there is no functional difference between realizations such as [ʀat] and [rat] for *rat* 'rat', however, there is only one phoneme /r/ in the Dutch system with its allophones [r] and [ʀ]. Interestingly, even Dutch speakers with a uvular [ʀ] do not show schwa insertion between their [ʀ] and non-homorganic coronal obstruent /s/ or /t/. The process of schwa insertion, apparently, takes place before the phonetic level of actual realization of segments, i.e. on the abstract phonological level, where /r/, /s/ and /t/ share their place feature [coronal]. Synchronically, the process can only be described in a phonological way, even though it may have had a phonetic - articulatory - base originally. We assume that uvular [ʀ] is a later variant of Dutch /r/ than coronal [r], just as the even younger, recently observed allophonic variant [ɹ] in Western Dutch dialects: *raar* 'strange' realized as [ra:ɹ]. These allophones date from times when the process of schwa insertion between non-homorganic, syllable-final liquid-consonant clusters was already 'fossilized' in the Dutch system.

The above-mentioned two accounts of phonological processes indicate the way many phonologists approach their research objects nowadays. More and more the distinction between phonology and phonetics is challenged in attempts to provide adequate accounts of the phonological

phenomena. In this way, the phonologists of the so-called *CLCG Klankleer group* in Groningen study the phonology-phonetics interface, whereas other members of the group cross the boundaries of phonology and phonetics by combining the study of sound patterns with dialectology, computational linguistics, musicology, first language acquisition or ethnolinguistics.

The *Center for Language and Cognition Groningen (CLCG)* is a research institute within the Faculty of Arts of the University of Groningen. It comprises most of the linguistic research that is being carried out within the Faculty of Arts. One of the research groups of CLCG is this 'Klankleer' group (Phonology and Phonetics), which focuses on the structure and contents of the sounds of language.

This volume of papers by members of the Klankleer group is dedicated to Tjeerd de Graaf, who was the coordinator of this group from 1999 until 2003. It does not mean that Tjeerd no longer participates in the group, because he still supervises two PhD projects. These projects by Hidetoshi Shiraishi and Markus Bergmann combine phonetics and phonology with ethnolinguistics. As mentioned above, the research of most members of the group involves combinations of different (linguistic) areas. Wilbert Heeringa, Charlotte Gooskens and Roberto Bolognesi apply phonetics to the study of dialectology. Nanne Streekstra is one of the first linguists in our group who was interested in the phonology-phonetics interface. Wouter Jansen's work is exemplary for this so-called 'laboratory phonology'. He provides acoustic studies of voicing assimilation in obstruent clusters in Germanic languages. Maartje Schreuder and Dicky Gilbers combine phonetics and phonology with areas beyond linguistics, such as music theory. Former member Klarien van der Linde and Angela Grimm study first language acquisition, whereas Wander Lowie studies second language acquisition. Finally, Tjeerd de Graaf started his academic life as a researcher in theoretical physics, switched to phonetics, whereas his main interest is now in ethnolinguistics. This *homo universalis* also plays piano and oboe and speaks nine different languages. This Festschrift, however, is dedicated to the *phonetician* Tjeerd de Graaf. The papers cover a wide range of topics varying from ethnolinguistics to computational linguistics and from first language acquisition to dialectology. The common denominator is that all researchers work on the boundaries of phonology and phonetics.

Vincent van Heuven, as a guest writer from University of Leiden, asks the question whether certain distinctions in the speech signal are phonological or phonetic. He investigates whether different prosodic

boundary tones form a continuum or whether they are categorical. He finds a categorical division between low (declarative) and non-low tones, but within the non-low category the cross-over from continuation to question is rather gradual.

Charlotte Gooskens and Wilbert Heeringa measured linguistic distances between Frisian dialects and the other Germanic languages in order to get an impression of the effect of genetic relationship and language contact on the position of the modern Frisian language on the Germanic language map. Wilbert is a member of the CLCG group 'Computational Linguistics'.

Tamas Biro, who is also a member of 'Computational Linguistics' and interested in phonology, claims that the types of interactions between languages can be extremely diverse, depending on a number of factors. The paper analyses three case studies, namely the influence of Yiddish on Hungarian, Modern Hebrew and Esperanto.

John Nerbonne participates as head of CLCG. His paper with Ivilin Stoianov explores the learning of phonotactics in neural networks, in particular the so-called Simple Recurrent Networks (SRNs). SRNs provide a valuable means of exploring what information in the linguistic signal could in principle be acquired by a very primitive learning mechanism.

Toshi Shiraishi discusses phonological asymmetries between nominal and verbal stems of Nivkh, a minority language spoken on the island of Sakhalin. These asymmetries are observed in two phonological phenomena: consonant alternation and final fricative devoicing. Though the asymmetries themselves look very different on the surface, Toshi's paper makes explicit that they are subject to a common generalization, Base-Identity.

Angela Grimm discusses a number of empirical and theoretical problems with respect to two models of prosodic acquisition: a template mapping model and a prosodic hierarchy model. Both models assume that the acquisition of word prosody is guided by universal prosodic principles.

Maartje Schreuder and Dicky Gilbers wondered whether the influence of a higher speech rate leads to adjustment of the rhythmic pattern, as it does in music, or just to 'phonetic compression' with preservation of the phonological structure. An example of an item they examined is the Dutch word *perfectionist*, which can get the rhythmic structure *pèrfectionist* in fast tempo. The results indeed showed a preference for restructured rhythms in fast speech.

With this very diverse collection of papers, we hope to present the phonetician Tjeerd de Graaf a representative selection of the current activities of his CLCG-Klankleer group.

In the 1970's and 1980's Tjeerd's phonetic research stood miles away from the feature geometries and grid representations that were customary in phonology. He used to make sonagrams, i.e. visual displays of sound spectrograms, of e.g. [pa], [si] and [rɔ]. But when the violin string of his sonagraph broke, he wasn't able to do phonetic research anymore and that is when ethnolinguistics stole his heart. Nowadays, it is much easier to do phonetic analyses on the computer using programs, such as PRAAT (Boersma and Weenink, 1992-2003). Whereas phonetics and phonology grew apart from each other since they were installed as two distinct disciplines of linguistics at the First International Congress of Linguists (The Hague 1928), current laboratory phonological research may even suggest that phonetics and phonology coincide. However, as shown in the two examples in this introductory paper, /l/-substitution and schwa-insertion, the role of both disciplines is still distinguishable. That does not alter the fact that co-operation between phoneticians and phonologists must be an integral part of the study of sound patterns. Some sound phenomena, such as ethnolinguistic and dialect differences or acquisition data, can only be explained adequately if both phonological and phonetic characteristics of sounds are considered.

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