TWENTY YEARS OF THEORETICAL LINGUISTICS IN BUDAPEST

A selection of papers from the 2010 conference celebrating the twentieth anniversary of the Theoretical Linguistics Programme of Eötvös Loránd University

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Contents

Twenty years of theoretical linguistics in Budapest

It was the spring of 1990. A group of linguists at the Research Institute for Linguistics of the Hungarian Academy of Sciences decided they felt like teaching linguistics in addition to doing research. They wanted to teach new things and teach them in new ways. They wanted to have disciples of their own; they were eager to see how their knowledge and skills might contribute to the intellectual development of talented young people. The Research Institute supported their ambitions (and has been supporting it ever since) by providing accommodation and infrastructure for the department. The founders had been teaching courses in linguistics at various universities in Budapest, Pécs, and Szeged, but the results of their efforts had been unable to accumulate. The foundation of a department was furthermore felt to be made necessary by the fact that, prior to the political changes of 1990 in this country, contemporary linguistics had not been taught anywhere in Hungarian universities. We envisioned a theoretical linguistics curriculum that was interested not only in describing linguistic phenomena but also in explaining them. Ever since, our curriculum centres on the fundamental disciplines of linguistics (phonology, morphology, syntax and semantics), but the courses we offer include various interfaces and interdisciplinary areas like neuro-, psycho-, and sociolinguistics or computational linguistics, too. The department offers knowledge of a variety of theoretical frameworks but has a homogeneous and coherent view of linguistics: we consider language as a system to be explored and explained, rather than a field of study to be conducted in terms of normative or merely descriptive grammar.

In the spring of 1990, the Soros Foundation started its Higher Education Support Program. We submitted a group grant proposal containing the curriculum and course list of the Theoretical Linguistics Group and were awarded a grant. One of the prerequisites was that a university had to host the project. The Faculty Council of the Faculty of Arts of Eötvös Loránd University accepted a three-year experimental program to start in the autumn of 1990. In 1993, the Faculty Council found the first three years to be a success and endorsed the foundation of the Theoretical Linguistics Programme. The Theoretical Linguistics PhD Programme was then started in 1996, also supported by the Soros Foundation. Students were recruited both from Hungary and from abroad, and the courses were initially given in English. Some of the students coming from other countries subsequently acquired their PhD degrees within this Programme.

The Department has been accommodated by the Research Institute for Linguistics since the very beginning, as per an agreement between the Hungarian Academy of Sciences and Eötvös Loránd University. Up to 1996, the Higher Education Support Program of the Soros Foundation kept sponsoring our work, but since then, the financial background is supposed to be provided by the University. In the fourteen

years that elapsed since 1996, however, the University was merely able to set up a single full professor's position and two part time positions, the latter two soon shrinking into one-fifth positions each (only one of which survives to the present day). In reality, the BA and MA programs and the PhD program that is built on them have been kept going by a community of eight to ten people for the past twenty years. This community has undergone changes only inasmuch as a number of our former students have become our colleagues as time went by. It would be difficult to tell exactly how we were able to maintain teaching for such a long time in the almost entire absence of financial support from the university, yet the fact is that the Theoretical Linguistics Programme became twenty years old by 2010. The success of our work is shown by the fact that both our staff and (former) students have an excellent record of number of publications, citation indices, as well as international reception.

In 2010 we organised a conference to celebrate our twentieth anniversary; we invited our former students and colleagues who contributed to the life of our department by teaching regularly for some time over the past twenty years. The conference was concluded by a fiesta organised by the students of the department. We are glad to present, in what follows, a selection of papers based on presentations at the conference.

Budapest, May 2012.

Ferenc Kiefer and Zoltán Bánréti

1 Changes and variety in the Lovari verbal system

András Márton Baló
Eötvös Loránd University

Abstract

The Romani language, due to the circumstances in which it is used, frequently borrows lexical items, which leads to great diversity within the verbal system of each dialect. The phenomena and the ongoing processes in the verbal paradigms in relation to the adaptation of loan verbs seem to be of particular interest as they strongly influence the classification of verbs. If we look at the analogy-based processes which have taken place and are taking place, the change can easily be made part of the model and the distinction between a diachronic and synchronic approach loses its significance.

1 Introduction

The Romani language, due to the circumstances in which it is used, frequently borrows lexical items, which leads to great diversity within the verbal system of each dialect. Romani is originally divided into dialects on a geographical basis; the rich and variegated world of the dialects established in that manner is split into further varieties through further migration, and thus, for instance, whereas Lovari was originally spoken in western Romania, it is possible to talk about Hungarian and Austrian Lovari, which coexist with the Romungro and the Burgenland Romani varieties, respectively (both belong to the Central dialect group as opposed to Lovari, which is a member of the Vlax dialects), and the verbal systems of which show surprising differences that appear to be independent of the surrounding language but which are possibly connected to the other Romani varieties spoken in the area.

The phenomena and the ongoing processes in the verbal paradigms in relation to the adaptation of loan verbs seem to be of particular interest, as they strongly influence the classification of verbs. The changes that have happened and are happening in the language may make a strictly diachronic approach unnecessarily complicated, whereas, at the same time, it can be difficult to handle them within a traditional synchronic framework, dismissing historical facts. However, if we

look at the analogy-based[1] processes which have taken place and are taking place, the change can easily be made part of the model and the synchronic-diachronic dichotomy loses its significance.

2 Lovari verbal paradigms[2]

One of the crucial questions that arise in relation to the classification of verbs is the exact number of verb classes. The answer to this is not straightforward and depends significantly on the purpose we have in mind and the historical stage we are looking at.

Based on Matras (2002), it can be said that there are two separate, fundamental groups formed in accordance with the final sound of the stem: the consonantal and the vocalic verbs. As for the former one, the third person singular personal concord marker in the present is connected to the stem by the linking vowel /e/, whereas in the case of the latter one this vowel is an /a/; this renders for example the third person singular present tense form *kinel* in the case of the stem *kin-* 'buy, purchase' and *patjal* for the verb *patja-* 'believe', following the assimilation of the vowel of the concordance marker. Assimilation in itself would only result in the form **patjaal*, therefore it will eventually be necessary to postulate that one of the /a/ vowels is deleted: *patja* + *el* > **patja-el* > (after the assimilation of the concord marker vowel) **patja-al* > (after the deletion of the concord marker vowel) *patja-l*. Alternatively, we can assume that only deletion takes place: *patja* + *el* > **patja-el* >

[1] The term analogy will be used in the broad, Saussurean sense throughout the paper: "an analogical form is a form made on the model of one or more other forms" (Saussure 1966: 161). In other words, patterns and exemplars, already existing in our minds, serve as bases for new forms or old ones undergoing some sort of change. Similarity in grammatical function involves similarity in form, or, in other words, "it is natural for related concepts to be designated by related sounds" (Humboldt 1999: 71). Patterns, however, may be functionally independent but formally alike. Analogy rests on statistical evidence; analogical force depends on the frequency of the pattern in question. A pattern with higher type or token frequency is more powerful. On the other hand, less frequent forms are more prone to undergo analogical change. One good example for an analogical model is Analogical Modelling (AM) or Analogical Modelling of Language (AML) devised by Skousen (cf. for example Skousen 2009) where patterns are represented by a dataset of exemplars. For each novel situation (given contexts), the exemplars are arranged into supracontexts to predict the outcome of a given context. Due to a dearth of sufficient amounts of data, as yet, the method has not been tested on the topic of the present paper but there is enough evidence to presume that analogy is at work.

[2] All the data presented in the paper come from either the two informants I have been working with, namely Mária Nagy from Nagykálló and Szilvia Lakatos from Pécs, or from the various sources listed in the bibliography, which comprise the results of extensive researches conducted all over Hungary; in the latter case, the data have been asserted by at least the two informants mentioned above. New and even more extensive, nationwide linguistic and dialectological researches are currently under preparation.

patja-l. These two ways of derivation are valid as long as we accept that the personal concord markers are as follows (the first person forms are linked to the stem with the vowel /a/ in the case of consonantal verbs as well, which gives for instance kinav, kinas):

1ST SG	2ND SG	3RD SG	1ST PL	2ND PL	3RD PL
-av	-es	-el	-as	-en	-en

Table 1: *Personal concord markers (Matras 2002)*

We find the same personal concord markers in Hapsburg (1902). Although he chiefly describes the Romungro dialect, which he divides into several subgroups, there is a category he calls "wandering Gypsy", which is not similar to any of the existing Romungro varieties. Following Vekerdi (1981), we may presume that the data under the heading "wandering Gypsy" derive from Vlax Romani dialects, to which they bear the most resemblance. It seems that he did not postulate different verb classes, as he made mention of only very few vocalic verbs, and they are not called vocalic; they are merely called verbs in which there is an /a/ instead of the /e/ in the second and third persons. The third person SINGULAR forms are listed as follows:

(1) *xal* 'eat'
žal 'go'
daral 'be afraid'
prastal 'gallop'
dromal 'travel'

The latter one, interestingly enough, is not attested in present-day Romani in this form at all. Instead, the form *dromar-* appears in Choli-Daróczi and Feyér (1988).[3] However, several more examples for vocalic verbs with a stem-final /a/ are listed by Vekerdi (2000), for example (*ura-* 'fly', *izdra-* 'tremble', *prasa-* 'mock', *dukha-* 'ache' etc.), many of which come from Sanskrit, suggesting that the list in Hapsburg (1902) was not even complete at that time. As regards the personal concord markers, it appears more economical to say that the /e/ is an epenthetic vowel[4] which is

[3]The derivational marker -ar (which can be *-er* or *-al* in other Romani varieties, cf. a widely quoted example, the verb meaning 'bite', which can be *dandar-* and *dindal-* in Vlax Romani or dander- in Vend) is productive — the semantic content of the derived word is transparent and there are no limitations on the derivation within the given semantic field (cf. Kiefer-Ladányi 2000). Although many of these verbs are listed in dictionaries, they are not lexicalised in the sense that they acquire a genuine meaning by the addition of the marker.

[4]The /e/ being an epenthetic vowel is also justified by the fact that it is deleted optionally or obligatorily in certain other positions. An example for the latter one is the inflexion of nouns of the

inserted when it is necessary (for resolving consonant clusters). Thus, we find the following layout:

1ST SG	2ND SG	3RD SG	1ST PL	2ND PL	3RD PL
-av	-s	-l	-as	-n	-n

Table 2: *Personal concord markers (Baló 2008)*

This renders *patja* + *l* > *patja-l* in the third person SINGULAR, and the deletion of the thematic vowel or the vowel of the marker would only have to be assumed in the first persons of the vocalic verbs. Another solution could be to suppose that each concord marker consists of only one single consonant. This would, however, imply an unjustifiable epenthetic /a/ in the first persons, as opposed to the /e/ of the other persons, which impels us to dismiss the assumption.

When examining the past forms, we find three diverse suffixes in Hapsburg (1902) for the "wandering Gypsy" variety, which is the outcome of an early differentiation of the Proto-Romani perfective marker *-it-* (Matras 2002). Following voice assimilation, it became *-d-* after /ɾ/ , /l/, /n/, /v/.[5] Two more sounds, /z/ and /o/ are also mentioned in Hapsburg (1902) but there are no examples given, although verb stems ending in /o/ would be of extreme interest as they would have indicated the presence of other vocalic stems. In that stage, *-t-* still existed after /s/ and /ʃ/, while all other stems had been reassigned to the suffix *-l-*.[6] By now, the traces of

žukel 'dog' type, where all other cases apart from the nominative lack the /e/ and take on the root form *žukl-*. In another inflexion class, /e/ may replace /o/ as a linking vowel in the oblique cases: nominative *sokro* 'father-in-law' becomes *sokres-* instead of *sokros-*. Yet again, this is likely to be an analogical effect, because as a result, the word will inflect according to the biggest noun class. If we take /e/ as an epenthetic vowel, the analysis of the personal concord markers is made easier in that we do not have to refer to assimilation in the case of vocalic verbs — and the deletion will not take place everywhere either, only in the first persons which do behave slightly differently anyway in many cases, for example in the paradigms of consonantal verbs, too, based on those mentioned above — but to a more general phenomenon, the role of the /e/ as a default vowel. In most cases, whether a stem belongs to the consonantal class is also made clear by the imperative, which is virtually the stem itself in the second person SINGULAR; the form is *patja* 'believe (imperative)' for the vocalic class consisting mostly of verbs with a stem-final /a/.

[5]The sound /v/ is somewhat peculiar if we consider the fact that it is actually deleted when the perfective marker is added, thus giving forms like *thod-* for the present tense stem *thov-*. Moreover, in the case of a derivational marker, it is not the perfective marker *-d-* that appears in its place but the marker *-l-*. This variation may be explained on a historical basis: in Hungarian Lovari, the marker in question has got the form *-ajv*, an equivalent of the marker *-av* coming from the verb *av-* 'come, become', whose irregular perfective form is *avil-*, which developed into *-ajl*. However, it is also possible to explain it in synchronic terms by referring to the affinity between the palatal approximant and the vowel /i/.

[6]The threefold division of perfective markers is still present in certain dialects of Romani (cf. Matras 2002).

the marker *-t-* have completely disappeared from Vlax Romani dialects, its place having been taken by the suffix *-l-*.

Hapsburg (1902) does not even note the existence of vocalic verbs but several phenomena suggest that there is currently not just one, but even more vocalic groups, making the verbal system even more complicated. In a way, the third group of verbs present in the Vlax Romani dialects cannot actually be considered as a real verb class in that they are created through the disappearance or reduction of certain derivational markers on the one hand and through contraction on the other (Matras 2002). Thus, the reduction of the derivational marker — which may apply to loan verbs in general — in the stem *trajisar-*, which originally comes from the Romanian verb *trăi* 'live', leaves us with the form *traji-*. The same thing happens for instance with *prahosar-* 'bury' from *praho* 'dust' (which comes from Serbian прах), leaving *praho-*, or with *muntusar-* from Romanian *mântui* 'save, rescue', leaving *muntu-*; later on, we shall come back to these historical processes, which have, in effect, created new verbal paradigms using practically every element of the basic set of Romani vowels.

At the same time, in accordance with the aforementioned changes, Hungarian descriptions, grammars (e.g. Hutterer and Mészáros 1967), textbooks, as well as dictionaries list five distinct verb classes which, based on the data currently available, look like in Tables 3 and 4.

PRESENT INDICATIVE	consonantal class *kin-* 'buy'	-a- stem verbs *loša-* 'be glad'
SINGULAR	kinav	lošav
	kines	lošas
	kinel	lošal
PLURAL	kinas	lošas
	kinen	lošan
	kinen	lošan

Table 3: *The two basic verb classes (based on Hutterer and Mészáros 1967)*

The first two can be deemed basic verb classes, whereas the other three were created subsequently.[8] Based on the discussion of Burgenland Romani (Halwachs

[7] Based on the data received from the informants, it seems that the second and third person PLURAL forms now appear in the form trajinen. This is a typical case of paradigm levelling; the first person PLURAL form has been extended over the whole PLURAL paradigm. It may also underline the effects of analogy, as the appearance of PLURAL forms containing the marker -in could be the result of the influence of other verbs containing it, or, in a broader sense, of the consonantal class.

[8] At the same time, Matras (2002) gives account of the fact that there are stems ending in -i-; one of these is the verb meaning 'drink', of Sanskrit origin, which cannot, therefore, be called a recent

PRESENT INDICATIVE	-i- stem verbs	-o- stem verbs		-u- stem verbs
	traji- 'live'	*kerdjo-* 'become'	*praho-* 'shake'	*sunu-* 'feel pity for'
SINGULAR	trajij/trajiv/trajisarav	kerdjuvav	prahoj	sunuj
	trajis/trajisares	kerdjos	prahos	sunus
	trajil/trajij/trajisarel	kerdjol	prahoj/prahol	sunul/sunuj
PLURAL	trajinas/trajisaras	kerdjuvas	prahonas	sununas/sunusaras
	trajin[7]/trajisaren	kerdjon	prahon	sunun/sunusaren
	trajin/trajisaren	kerdjon	prahon	sunun/sunusaren

Table 4: *The three additional verb classes (based on Hutterer and Mészáros 1967 and Choli-Daróczi and Feyér 1988)*

1998), Matras (2002) draws the inference that they are best regarded as one single residual class, because the forms are hard to fit into any sort of inflectional paradigm. He justifies this by the fact that the forms vary even within one paradigm; on the other hand, this variation shows a hierarchy: the contraction of the derivational markers (that is, the dropping of the consonant of the derivational suffix and the subsequent merging of the adjacent vowels) most easily takes place in the third person and least easily in the first person. This can be seen for instance in the paradigm of the -o- stem verbs in table 4, where the derived forms in the second and third persons (*kerdjuves*, *kerdjuvel*, *kerdjuven*, *kerdjuven*) are contracted, while the derivational marker is still visible in the first persons. Matras (2002) propounds that the consonant of the derivational suffix is elided, and subsequently, the vowel of the concord marker (that is, the epenthetic /e/) is assimilated to the vowel of the derivational suffix: *-ov-e-* > **-o-e-* > **-o-o-*. Additional deletion or fusion should be assumed to get rid of one of the two identical vowels. As for Hungarian Lovari, where the suffix takes the form *-uv*, Hutterer and Mészáros (1967) use the term "crasis" to refer to the change of the sequence *-uv-e-* to a single *-o-*. As crasis — even in its broadest sense — only involves vowels, the consonant /v/ is either deleted or becomes a vowel or a semi-vowel previously. In any case, the derivational suffix and the epenthetic /e/ merge into the vowel /o/, creating an extra vocalic class.

We might want to posit that the frequency of the first person forms has something to do with the fact that they keep their original shape, but then again the frequencies of the SINGULAR and the PLURAL forms can differ significantly. The irregular behaviour of the first person forms is actually palpable in almost all of the verbal

formation reduced from a derived word at all. Although it has got a consonantal stem, p-, in the Vlax Romani dialects (its third person SINGULAR form is pel, which is pīl in the Vend and pijel in the Romungro dialects), its imperative form (pi) reveals that it belongs to the -i- stem verbs.

paradigms, including the consonantal verb class, so it seems that the grammatical category itself also exerts a significant force, and that is why there is such a striking similarity in the differentiation.

The -o- stem class originally contained verbs formed with the intransitive derivational marker *-(j)o/u(v)*, but the group later expanded to contain verbs like, for example, *ašo-* 'stay', a variation of the consonantal verb *ač-*. The marker presumably derives from the verb *ov-* 'become', which still exists in the Romungro dialects, and it appears in Lovari in the form *-uv*; virtually the /j/ is kept, too, by the palatalisation of the stem-final consonant preceding it (cf. Hutterer and Mészáros 1967). However, the marker, in effect, only appears in the first persons — at least in older derivations, as we could see above — and contraction takes place in the other persons, creating the -o- stem verb class. At the same time, it may still preserve the marker throughout the whole present tense paradigm in recent derivations:

PRESENT INDICATIVE	*kraj* 'king' > *krajuv-* 'rule'	*krujal* 'around' > *krujuv-* 'go round' (in the forms *kruji-* and *krujav-* as well)	*kucuv-* 'whet' (in the form *kuci-* as well)
SINGULAR	krajuvav krajuves krajuvel	krujuvav krujuves krujuvel	kucuvav kucuves kucuvel
PLURAL	krajuvas krajuven krajuven	krujuvas krujuven krujuven	kucuvas kucuven kucuven

Table 5: *Recent derivations with the marker* -uv *(verbal information provided by Szilvia Lakatos)*

The perfective stems of these verbs are actually *krajil-*, *krujil-* and *kucil-*. Considering the analogical effects, this is interesting in several aspects. On the one hand, the past tense is formed following the pattern of the -o- stem verbs, which were also derived by the marker *-(j)o/u(v)* originally, for example *dičo-* 'be visible, appear', perfective *dičil-*, *keco-* 'hang', perfective *kecil-*. On the other hand, the formation follows that of the *-i-* stem verbs (see *gindi-* 'think' for instance, perfective — among other variants — *gindil-*) instead of the expected **krajud-*, **krujud-*, **kucud-*; this leads us to believe that the effects of the contracted forms are presumably felt in the past tense.

However, this is not the only problem with the -o- stem verbs: there is another phenomenon, namely that the drop of the aforementioned derivational marker *-sar* results in the existence of two different types of -o- stem groups. This split can be explained on a historical basis. Traditionally we can say that the ones belonging to

the *praho-* type are of "novel" origin as opposed to the ones belonging to the *kerdjo-* type, which were created through internal derivation and contraction; this, however, does not make it easier to classify them. Moreover, one has to handle the drop of the derivational marker *-sar* with care, in the case of Lovari at least, as the first person forms cannot be traced back to the form containing *-sar*:

(2) 1ST SG *prahoj* >? *prahosarav* ≮ **prahov*
1ST PL *prahonas* >? *prahosaras* ≮ **prahos*

We could presume that the aim of maintaining the paradigmatic contrast triggers a form in the first person plural which is different from the second person singular but why would this be achieved by inserting a /n/ and why would it not happen to the -a- stem verbs? We find something very similar if we consider the -i- and the -u- stem verbs, which may lead us to believe that the processes can be very similar, too.

If we take a closer look at the -i- stem verbs now, we can see that the two variations — the one with the marker *-sar* and the one not containing it — coexist. The picture here is not quite clear either: Hutterer and Mészáros (1967), similarly to Choli-Daróczi and Feyér (1988), only list the forms without the marker *-sar*, although they do note that several verbs have got a variant containing it. Based on the data provided by the informants, however, the forms containing the marker *-sar* do exist at the present time. On the other hand, Cech and Heinschink (1999) say that there is another paradigm in Austrian Lovari, containing another derivational marker, *-in*, while the forms containing *-sar* and the contracted forms are typical of Serbian Kalderaš and seldom appear in Austrian Lovari. This is demonstrated through the example of the verb *gindi-* 'think':

PRESENT INDICATIVE	(Austrian) Lovari		(Serbian) Kalderaš	
	full forms	contracted forms	full forms	contracted forms
SINGULAR	gindinav	gindij	gîndisarav	gîndiv
	gindines	gindis	gîndisares	gîndis
	gindinel	gindij	gîndisarel	gîndil
PLURAL	gindinas	gindinas	gîndisaras	gîndis
	gindinen	gindin	gîndisaren	gîndin
	gindinen	gindin	gîndisaren	gîndin

Table 6: *The possible present indicative paradigms of the verb gindi- 'think' in Austrian Lovari and Serbian Kalderaš (based on Cech and Heinschink 1999)*

Cech and Heinschink (1999), Hutterer and Mészáros (1967) and Matras (2002) all consider the verbs with the thematic vowel /i/ as loan verbs (mostly from Romanian and Hungarian), the paradigm of which, differing both from that of the

consonantal class and that of the vocalic class, was created through contraction. However, it is hard to explain how the form *gindinav* became *gindij* (contrary to the fact that the form *gîndisarav* became *gîndiv*) and why the form *gindinas* was kept in the first person PLURAL while the form *gîndisaras* became *gîndis* in Kalderaš.

There is no doubt that these verbs (for example *gindi-* 'think', *vorbi-* 'speak', *traji-* 'live') are originally loanwords. Moreover, it is also important to note that Cech-Heinschink (1999) list a fair number of loan verbs with a stem-final /i/ (*kereškedil* 'trade', *njeril* 'win', *cipil* 'shout', *pihenil* 'rest', *atkozil* 'curse' etc.), that is, in the form of -i- verbs, rather than in a form containing the derivational marker *-in*, and there are plenty of Hungarian Lovari examples as well (e.g. *indulil* 'leave', *sorakozil* 'have fun'). Verbs can apparently be borrowed directly into the -i- stem class, omitting the phase preceding the contraction, that is the one in which they are supposed to contain a derivational marker. This may lead us to believe that the -i- stem verbs have indeed come to form a verb class in their own right. The question will be discussed in the section on loan-verb adaptation in more detail.

The appearance of the derivational marker *-in* (or *-(V)n*) is indeed a possibility; Baló (2008) also suggests that it can play a role in the first person plural and the whole of the past (in other words, preterite or perfective) paradigm, and not only that of the -i-, but also that of the -o- and -u- stem verbs. (The thematic vowels derive from the vowel component of either the suffix *-(V)n* or the suffix *-(V)sar*.) The forms in question thus begin to look like the parallel forms of the verbs belonging to the consonantal class, so it can be viewed as a means of analogy yet again.

PAST INDICATIVE	*vorbil* 'speak'	*prahol* 'bury'	*sunul* 'feel pity'
SINGULAR	vorbindem	prahondem	sunundem
	vorbindan	prahondan	sunundan
	vorbindas	prahondas	sunundas
PLURAL	vorbindam	prahondam	sunundam
	vorbindan	prahondan	sunundan
	vorbinde	prahonde	sununde

Table 7: *One of the possible past paradigms of the additional verb classes (based on Baló 2008 and Choli-Daróczi and Feyér 1988)*

Nevertheless, the emergence of the derivational marker *-in* is strange, because, among the varieties of Romani spoken in the region, it is more widely used for the adaptation of loan verbs in the Central dialect group; so, following this train of thought, loan verbs are inserted into Austrian Lovari with the help of a loan marker. In any case, it seems that while there is an alternation between the forms containing the marker *-in* and the ones without it in Austrian Lovari, an identical alternation

is present in Hungarian Lovari between the forms containing the marker *-sar* and the forms without it. In addition, it is worth noting that *-in* also seems to appear in Hungarian Lovari as an independent loan-verb adaptation marker, and, as mentioned above, the immediate use of contracted forms is a very productive way of borrowing new verbs.

Following this line of reasoning it seems more justified to surmise that the process is not going the original way, that is, from the *-sar* forms towards the contracted forms, but in the opposite direction: the new verbs are inserted first among the -i- stem verbs with high token frequency, then the consonantal class with high type frequency begins to attract them and consequently the forms with the markers are created. This does not only make it easier to explain why the first person singular form is typically *gindij* etc. — we could say that it is a separate class, which appears to differ from the consonantal and the -a- stem verbs in this respect –, but also why *gindiv* can emerge, too (which cannot occur in Austrian Lovari; the influence of other, surrounding dialects — either Kalderaš or Romungro — possibly plays a role in its emergence in Hungarian Lovari).

Let us take a glance at the various possible forms of this verb in Hungarian Lovari. The paradigms in the table below appear uniformly, but the situation is far from being so clear-cut. Whether the diverse columns can be mixed is uncertain and whether we should talk about intra-speaker or inter-speaker variation is also ambiguous, or, alternatively, whether we would have to say that Hungarian Lovari itself can be divided into several varieties.

INDICATIVE	PRESENT		PAST		
SINGULAR	gindij/gindiv	gindisarav	gindindem	gindilem	gindisardem
	gindis	gindisares	gindindan	gindilan	gindisardan
	gindij/gindil	gindisarel	gindindas	gindilas	gindisardas
PLURAL	gindinas	gindisaras	gindindam	gindilam	gindisardam
	gindin	gindisaren	gindind(in)e	gindil(in)e	gindisard(in)e
	gindin	gindisaren	gindind(in)e	gindil(in)e	gindisard(in)e

Table 8: *Some of the possible present and past paradigms of the verb* gindi- *'think' in Hungarian Lovari (based on Hutterer and Mészáros 1967, Choli-Daróczi and Feyér 1988 and data from the informants)*

If we look at the past tense forms for a moment and consider those mentioned above in connection with *-sar* and *-in*, what we can see is not surprising at all. The fourth column of Table 8 shows the "regular" past forms, that is, the ones with the marker *-l-* after a vocalic stem, whereas the third and fifth columns show the past of derived forms where the derivational markers are *-in* and *-sar*, respectively. It is

interesting to note that the past forms containing the suffix *-in* do not require the existence of the appropriate present forms; present forms formed with that marker were not attested in Hungarian Lovari.

The -u- stem verbs (see table 4 above) also serve as a good argument for the influence of both the -i- stem verbs and the consonantal class. The -u- stem class, similarly to the -i- stem class, is exclusively made up of loan verbs, but it is very small. Apart from the modal auxiliary *trubul* 'must, need', these verbs do not even exist for a lot of speakers, who use -i- stem verbs instead: *mentil* instead of *muntul* 'save, rescue', *senil* instead of *sunul* 'feel pity for' etc. The few -u- stem verbs thus seem to have moved partly towards the -i- stem verbs, partly towards the consonantal class with the appearance of the marker *-sar* (cf. the alternation in the plural).

According to the data, the -i- stem paradigm in the present can go with any of the past paradigms, although the extent and nature of the variation — the question whether a certain speaker, community or variety uses one and the same paradigm, or to put it differently, where variation begins exactly — is again something that awaits clarification. However, now it can clearly be seen, that there are at least two different kinds of analogical forces "competing" in the verbal system — that of the consonantal class and that of the newly formed -i- verbs.

3 Loan-verb adaptation

Loan verbs were originally adapted in such a manner that, by looking at the markers taking part in the adaptation, it could clearly be seen whether the verb in question is part of the core lexicon or borrowed, whether it belongs to the class of "stable" or "mobile" words. These two parts of the lexicon formed two grammatically different layers (cf. Matras 2002 and Choli-Daróczi and Feyér 1988). What exactly can be considered as belonging to the "mobile" class is controversial and arguable. A particularly interesting question is whether the words and grammatical markers which became part of the language during the Roma's lengthy sojourn in Byzantium — before they scattered in Europe and the diversification of dialects began — belong to the inherited lexicon or cannot be deemed equally influential or basic as the Indo-Aryan vocabulary. What seems certain is that they form a layer which is independent from both the earlier Indo-Aryan lexical elements and the words which were borrowed into the language later; they often differ from dialect to dialect but cannot be clearly separated. Psycholinguistic research has yet to establish how these layers are regarded by native speakers and how they are actually stored in the mind, because it may influence the analogical processes at work in the verbal system. It would be extremely worthwhile to map the mental distinction made between the two types of -o- verbs. For the purposes of the present study, and due to a lack of

sufficient evidence, we will disregard the possible differences resulting from the temporal aspects of the lexicon and consider all forms as carrying equal weight.

The origins of the loan-verb adaptation markers go back to the Greek inflection endings; for example in Vlax Romani it is the Greek aorist forms (*-is-*/*-as-*/*-os-*) that appear (Matras 2002 based on Miklosich 1872-80). However, they do not insert the new, borrowed verbs just by themselves: they are linked to the derivational markers *-ar* and *-av*, depending on whether it is a transitive or an intransitive verb. This is where the markers *-sar* and *-sajv* come from, and this is how they can be broken down on a historical basis into a "carrier" derivational marker (*-ar* and *-av*/*-ajv*) and the particle *-(V)s-* which would serve to mark the fact that the verb is borrowed. As the markers themselves end in a consonant, too, all the loan verbs formed by their addition are inserted into the consonantal class which has got the highest type and token frequency.

(3) Hun. *ás* > *ašisar-* 'dig'
Sl. *dosta* > *dostasar-* 'content oneself'
Hun. *indul* > *indulisar-* 'leave'
Rom. *scrie* > *iskirisar-* 'write'
Rom. *ajuta* > *žutisar-* 'help'

Gr. χανω (aor. χασα) > *xasajv-* 'disappear'
Hun. *kezdődik* > *kezdődisajv-* 'begin'
Sl. (or Rom.) *slobod-* > *slobodisajv-* 'be freed'
Rom. *scăpa* > *skepisajv-* 'escape'

The above examples are just a few of the large number of similar instances, quoted to show how frequent and multifarious the pattern is. Another question arises here: is it worth to consider these two markers complex? It would make the description much simpler if we could really say that in actual fact it is the *-s-* element — disregarding the vocalic component for the moment — that is used to insert loan verbs, and if this particle appears on a verb, we will know for certain that it is a borrowed item. However, the two markers take part in internal derivation as well, no matter how we classify the Indo-Aryan and the later elements of the lexicon, as it can be seen from the examples below, where the words *kolo* 'soft', *lolo* 'red' and *phen-* 'say' are of Sanskrit, the adjective *zuralo* 'strong' is of Persian origin.

(4) *kolo* 'soft' > *kolosajv-* 'become soft'
lolo 'red' > *lolosajv-* 'turn red'
phen- 'say' > *phenosar-* 'promise'
zuralo 'strong' > *zuralosar-* 'strengthen'

Moreover, as mentioned earlier, there are other known ways of adapting loan verbs. Most of those listed above have got free variants with the same meaning (what the variation is exactly based on is a question awaiting clarification), which could be contracted forms but might as well have been inserted into the language straight away as -i- stem verbs — whether the two variants were borrowed independently of each other or one is derived from the other cannot be established for certain due to a lack of sufficient historical evidence:[9]

ašisar-	*aši-*
indulisar-	*induli-*
žutisar-	*žuti-*
slobodisajv-	*slobodi-*
skepisajv-	*skepi-*

Table 9: *Loan verbs with the same meaning but with a different form (based on Hutterer-Mészáros 1967, Vekerdi 1985 and and Vekerdi 2000)*

Another similar example is the verb *fajosar-* 'be liked', which exists in the form *fajo-*, too (the same meaning is expressed by the verb *teci-* in Austrian Lovari and Romungro). From our standpoint, it is interesting to note that the verb *trajisar-/traji-* 'live' has got an additional variant, *trajo-* in Hungarian Lovari, the inflection of which follows the pattern of the (-o- stem) verbs containing the marker *-(j)o/u(v)*, which in turn does not take part in the adaptation of loan verbs originally. According to Cech-Heinschink 1999, forms without the marker *-sar* are rare in Austrian Lovari, as opposed to Hungarian Lovari; it has also been mentioned above that another derivational marker, *-in* appears here, which goes back to the Greek present tense inflection markers (Matras 2002), and which places the new verb in the consonantal class, just like the other derivational markers. This is also important due to the fact

[9] A somewhat similar phenomenon can be seen in Daco-Romanian (cf. Costanzo 2008), where loan verbs of Balkan origin mostly fall into the [+sc] subclass of the 4th conjugation, but that is not always the case; it may happen that they fall into the [-sc] subclass or a different conjugation altogether. This variation continues into the contemporary language, as shown by the example of the English verb *blog*, which can be *bloguiesc* but also *bloghez*. Costanzo (2008) adds — and this is true for Lovari, too — that different patterns are employed and that variation is a result of analogical change.

that the marker -in does take part in the adaptation of loan verbs in the Central dialects, and, at the same time, it appears in an identical role in Lovari:

(5) H. *bokszol* > *boksolin-* 'box'
H. *szív* > *sivin-* 'suck'
H. *arat* > *aratin-* 'reap'

4 Summary

It is apparent from the above that it is a difficult question whether it is actually worth postulating more vocalic classes in synchronic terms in Hungarian Lovari. Matras (2002) writes that this may be right for certain dialects, but for Romani as a whole it is more adequate to deem these derivational, rather than inflectional forms. In any event, the variegated examples shown above and the unusual diversity point to the fact that there are several analogical forces working in the verbal system, as shown below through the verb meaning 'live':

PRESENT INDICATIVE	-i- stem variant	variant containing the marker *-in* (Austrian Lovari)	variant containing the marker *-sar*	-o- stem variant
SINGULAR	trajij	trajinav	trajisarav	trajuvav
	trajis	trajines	trajisares	trajos
	trajil	trajinel	trajisarel	trajol
PLURAL	trajinas	trajinas	trajisaras	trajuvas
	trajin	trajinen	trajisaren	trajon
	trajin	trajinen	trajisaren	trajon

Table 10: *The possible present indicative paradigms of the verb* traji- *'live' (based on Hutterer and Mészáros 1967, Cech and Heinschink 1999 and data from the informants)*

The existence of the four different types of inflection patterns may most easily be explained if we presume that — in some form or another — the -i- and -o- stem paradigms are in fact present in the verbal system besides the consonantal and the vocalic (-a-) classes. The (consonantal) verbs, which originally inflected according to the variants in the two middle columns, created a separate class, which then could make its effect felt (cf. the verbs belonging to the *praho-* type mentioned above) and insert loan verbs, while — under the influence of the original derivation

— the derived forms survived or reappeared. It also seems that the group of -o- stem verbs — which were originally derivational, too — became powerful enough to have an analogical effect and attracted the verb to itself, which in turn began to inflect according to the pattern retaining the marker in the first persons. So we do not have to consider the -i- and -o- stem verbs as separate verb classes, as there is no need for well-defined paradigms for the analogical changes to take place; it is enough if there are patterns which are powerful enough to influence the newly inserted forms and those already in existence.

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2 Is /v/ different?

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Abstract

This article presents two acoustic experiments in which we demonstrate that voiced fricatives in utterance-final position in Hungarian are realized unphonated and the preceding vowel plays a crucial role in partial contrast preservation between the phonologically voiced and phonologically voiceless fricative. We also show that despite their very similar behavior in final position, /v/'s articulatory targets considerably differ from those of voiced sibilants in that /v/ is a passively voiced narrow approximant, while /z/ and /ʒ/ are true voiced obstruents. This phonetic difference can explain the differences in their phonological behavior, especially regarding their role in voicing assimilation.

1 Introduction

In recent studies (Kiss and Bárkányi 2006; Bárkányi and Kiss 2010) it has been demonstrated that the double-faced phonological behavior of /v/ in Hungarian can be explained in a model based on the phonetic properties of this segment and its linear context. The analysis is based on the claim that the phonetic targets of /v/ are contradictory on aerodynamic grounds (Ohala 1983) and can only be maintained in phonetically favorable positions. In this paper we explore the phonetic properties of the other two voiced fricatives of Hungarian, /z/ and /ʒ/, and discuss to what extent these properties can explain the differences in their phonology, especially, the different behavior they display compared to /v/ in voicing assimilation.

It is well known that for the articulatory system to target voicing and friction (turbulent noise) at the same time, an uneasy balance needs to be maintained. High-amplitude turbulent noise requires a relatively high volume velocity of the airflow as it blows out from a constriction. In order to achieve this condition, the glottis is widely abducted so that the intraoral pressure equals or approaches the subglottal pressure, and the oral cavity is relatively constricted, creating a pressure drop across the supraglottal constriction (see, among others, Shadle 1985; Stevens et al. 1992; Stevens 1998; Jesus 2001; Johnson 2003: 120–133; Krane 2005).

In contrast, for vocal fold vibration to be initiated the vocal folds must be set into modal phonation mode: they must be adducted; subglottal air pressure must build up below the adducted vocal folds, forcing the lower part of the folds to blow apart (with the consequence that subglottal pressure drops close to zero relative to atmospheric pressure); and the negative pressure that occurs as air passes between the folds must suck the elastic folds together again (Bernoulli effect). If the pressure above the folds builds up so that the pressure difference drops across the glottis, phonation ceases. To overcome devoicing a number of articulatory gestures, which aim at preserving a transglottal difference of pressure, need to be implemented to enlarge the oral cavity volume, e.g., raising the soft palate, advancing the tongue root so that there is an outward movement of the neck surfaces, lowering the larynx, expanding the pharyngeal volume, decreasing the stiffness of the vocal tract walls (reducing vocal tract compliance), or a combination of these gestures (see Stevens 1998: 465–486). These gestures can only be executed within certain limitations, which might have phonological consequences. Bárkányi and Kiss (2010) argue that in certain positions (which they call 'phonetically favorable contexts'), /v/ emerges as a passively voiced narrow approximant (following Padgett 2002) — in this context both phonetic targets of /v/ are maintained (voicing and friction). In other, less favorable positions, /v/ loses one of its articulatory targets, hence either voicing or turbulent noise is preserved, but not both at the same time. As a result of this, two realizations are possible: when /v/ devoices, it becomes a strongly fricated, noisy sound (narrow constriction and wide abduction of the vocal folds) — it is this realization that is implemented in Hungarian, for instance. When /v/'s voicing target is kept, it loses much of its friction (wider constriction), implemented in Slovak, for instance.

The above mentioned conflicting aerodynamic requirements and complex articulatory gestures are expected to hold for the other voiced fricatives as well, not only /v/. Therefore, we hypothesize that /z/ and /ʒ/ in Hungarian in phonetically unfavorable positions are also likely to devoice. One such environment is the utterance-final position. Note that Hungarian is not a final-devoicing language, i.e. there are minimal pairs which contrast due to the the voicing of the word-final obstruents: *mé*[z] 'honey' – *mé*[s] 'lime', *lá*[b] 'foot' – *lá*[p] 'marshland'. The phonetic and phonological literature on obstruents in Hungarian does not mention that this contrast is implemented by other parameters than phonation itself.

In Section 3 we present two acoustic experiments, which investigate whether /z/ and /ʒ/ indeed devoice in utterance-final position; we will pay special attention to other phonetic parameters which make the (partial) preservation of the contrast possible in this position. Section 4 provides a detailed discussion of our results and in Section 5 we discuss in what respects /v/ differs from the voiced sibilants

and whether these phonetic differences can lay the basis of the differences in their phonological behavior.

2 The phonology of voiced sibilants in Hungarian

It is well-known in the phonological literature of Hungarian (see Siptár—Törkenczy 2000, for instance) that /v/ shows a two-fold patterning in voicing assimilation as well as in its phonotactic patterning. Namely, it undergoes voicing assimilation but does not trigger it. As for its static distribution, word-initially it patterns with sonorants, i.e., it can be the second member of a cluster (*tviszt* 'twist'), while word-finally it patterns with obstruents as it can stand after a sonorant (*terv* 'plan'). Voiced sibilants, on the other hand, are true obstruents in the sense that they both trigger and target regressive voicing assimilation just like any other obstruent (1). As for their distribution, they can stand after a sonorant word-finally: e.g., *torz* 'distorted', but they cannot form the second member of an initial cluster like /v/.

(1) a. /zt/ → [st]: e.g., *torz-tól* 'distorted-abl.' (vs. *torzul* 'to become distorted' [z])
/ʒh/ → [ʃh]: e.g., *bézs-hez* 'beige-all.' (vs. *bézsen* 'beige-super.' [ʒ])
/vt/ → [ft]: e.g., *sav-tól* 'acid-abl.' (vs. *savak* 'acid-pl.' [ʊ])

b. /pz/ → [bz]: e.g., *gép zaj* 'machine noise'
/tʒ/ → [dʒ]: e.g., *két zsák* 'two sacks'
/kv/ → [kʊ][1] (*[gʊ]): e.g., *kék vár* 'blue castle'

3 The acoustic properties of voiced sibilants

In this section, we turn our attention to the acoustic properties of utterance-final /z/ and /ʒ/. Experiment 1 focuses on the contrast between /s/ and /z/ in utterance-final position,[2] and in Experiment 2 the acoustic properties of /ʃ/ and /ʒ/ are examined in the same position.

[1] This is the case in Standard Hungarian, the focus of the present paper; in Western dialects, /v/ triggers voicing assimilation (see Kiss–Bárkányi 2006, 182).

[2] Experiment 1 was carried out in collaboration with Katalin Mády, and was presented at the Beszédkutatás 2009 conference, Budapest.

3.1 Experiment 1: Methods

Six women and one man aged 23–38 years participated in the experiment, all were speakers of Standard Hungarian living in Budapest and reported no speaking or hearing impairment. The material was recorded in a sound-proof cabin with a SonyECM-MS907 microphone through an M-AudioMobilePreUSB preamplifier connected to a laptop computer using the software SpeechRecorder. The acoustic analysis was carried out in Praat 5.1.07 (Boersma and Weenink 2009). The data recorded consisted of 11–13-syllable-long sentences and a text. The target sequences were *-ész* [eːs] and *-éz* [eːz] in one- and two-syllable words in utterance-final position, and as a base line, some of the test words were suffixed with a vowel-initial suffix, so they appeared in a sentence-medial intervocalic position. The experiment also contained a text in which test words appeared in word-final but sentence-medial position followed by a vowel-initial word. Some of the test words formed minimal pairs like *méz* 'honey' – *mész* 'lime', others did not, like *vész* 'peril' – *géz* 'gauze' (2). There were 38 test sentences and 6 repetitions, which gave 228 tokens per subject.

(2) a. *A fehér asztalon áll egy bögre* ***méz****.*
'There is a mug of honey on the white table.'
b. *A hátsó udvaron van egy talicska* ***mész****.*
'There is a barrow of lime in the backyard.'
c. *A beteg karján félrecsúszott a* ***géz****.*
'The gause slid aside on the patient's arm.'
d. *A védők feje fölül elmúlt a* ***vész****.*
'Peril is gone from above the defenders' heads.'

The experiment aimed to measure the following phonetic parameters:

(3) a. voicing in the fricative
b. duration of the fricative
c. duration of the preceding vowel

Voicing was measured on the basis of periodicity in the waveform, f_0 in the spectrogram, the presence/absence of voice striations in the spectrogram and Praat's voice report ("unvoiced frames percentage") manually checked on the basis of the spectrogram and oscillogram. We used Praat's default settings (pitch range: 75 Hz–500 Hz, and with the following advanced pulses settings, maximum period factor: 1.3, maximum amplitude factor: 1.6, pitch setting was optimized for voice analysis — see the Praat manual). Segmentation was carried out manually employing the following method. The fricative interval started where the preceding vowel's

formants ceased, the spectrum became noisy, and the intensity level dropped. The end of the fricative was marked at the point where the noisy spectrum ceased, the intensity sharply dropped, and silence ensued.

3.2 Experiment 1 : Results

Figure 1 exhibits the boxplots of unvoiced frames (%) across subjects for /s/ and /z/ in utterance-final and word-medial position, Figure 2 illustrates the realization of *méz* and *mész* for Subject 5.

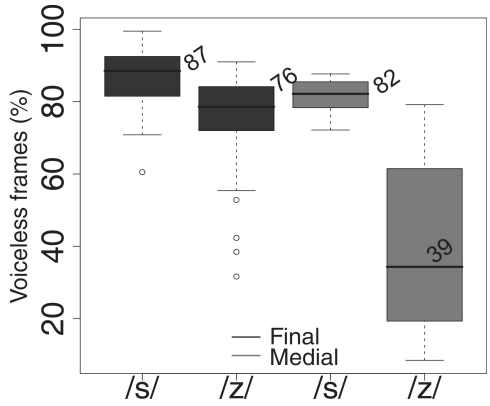

Figure 1: *Boxplots (with outliers) of unvoiced frames of /s/ and /z/ in utterance-final and word-medial position*

According to Figure 1, Hungarian /z/ is realized with over 70% of unvoiced frames in utterance-final position. The difference between utterance-final /s/ and /z/ is significant ($p < 0.001$). We can see that /z/ can devoice even in word-medial intervocalic position. This is in accordance with Gráczi (2010) who examined the voicing properties of Hungarian fricatives with the help of nonsense words of the form *la*C*al* and found that /z/ in this position was unvoiced in 42.1%. There is no statistically significant difference between word-medial /s/ and word-final /z/.

We must mention that considerable individual differences were observed in the voicing of the alveolar fricatives in both word-final and word-medial position. It is also noteworthy that one of our subjects produced /z/ in utterance-final position with more unvoiced frames than /s/ in the same position.

We also observed that the consonant that preceded *é* did not influence the voicing of the word-final fricative. Similarly, stress (whether the target syllable appears in a stressed or unstressed position), or the existence of minimal pairs (whether the

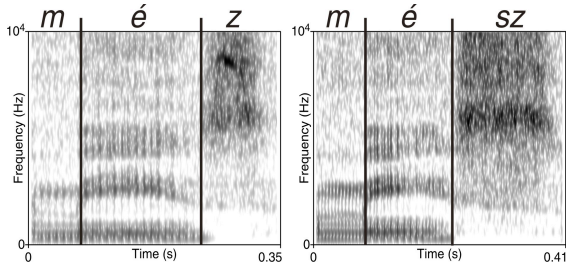

Figure 2: *The realization of* méz *and* mész *for Subject 5*

fricative under scrutiny appeared in a *méz–mész* or *géz–vész* type word pair) did not influence the voicing of the final fricative.

Figure 3 shows the boxplots of the duration of the fricative in utterance-final position, while Figure 4 demonstrates the duration of the preceding vowel.

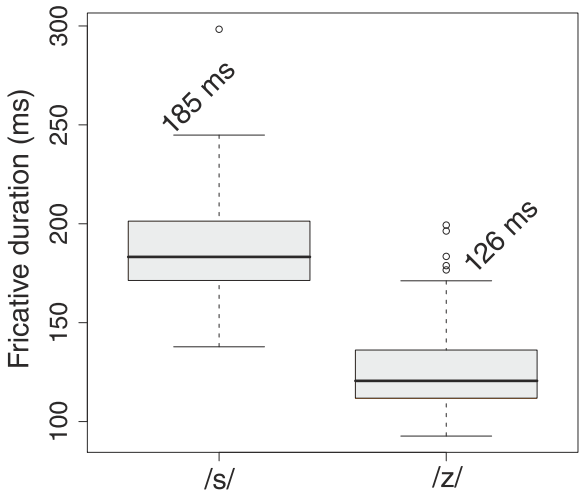

Figure 3: *Boxplots (with outliers) of duration of* /z/ *and* /s/ *in utterance final position*

As expected, /s/ is always realized considerably longer than /z/, the differences are statistically significant ($p < 0.001$), the differences are consistently significant for each subject individually as well. As for the vowel, it is always realized longer before the phonologically voiced fricative, the difference is statistically significant across subjects and for each subject as well ($p < 0.001$).

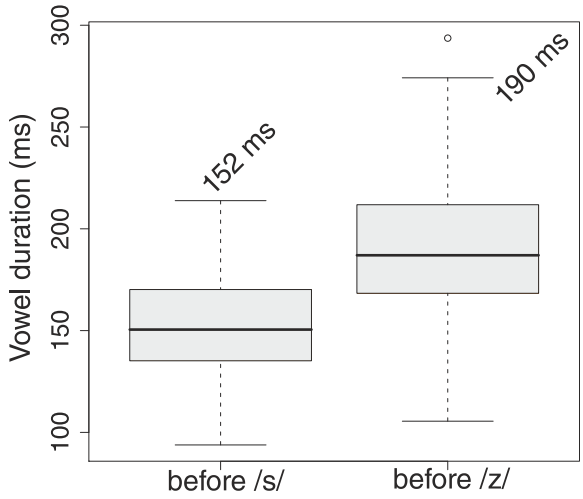

Figure 4: *Boxplots (with outliers) of the duration of the vowel preceding the utterance-final fricative*

In sentence-medial word-final position (in the text) the difference in voicing is statistically significant ($p = 0.047$), standard deviation is considerably larger, especially for some speakers (see Subjects 3, 6 and 7) as displayed in Figure 5.

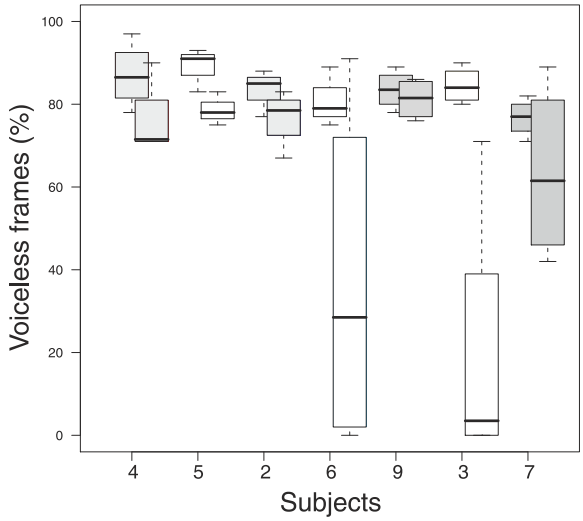

Figure 5: *Boxplots of unvoiced frames for /s/ and /z/ in text, in word-final sentence-medial position, by subjects*

As expected, /z/ in this position is also significantly shorter ($p = 0.0012$); however, vowel length is not significantly different in the two contexts ($p = 0.29$). Figure 6 shows the boxplots for vowel length by subject in word-final sentence-medial position. This is an important difference between sentence-medial and utterance-final position discussed in more detail in Section 4.

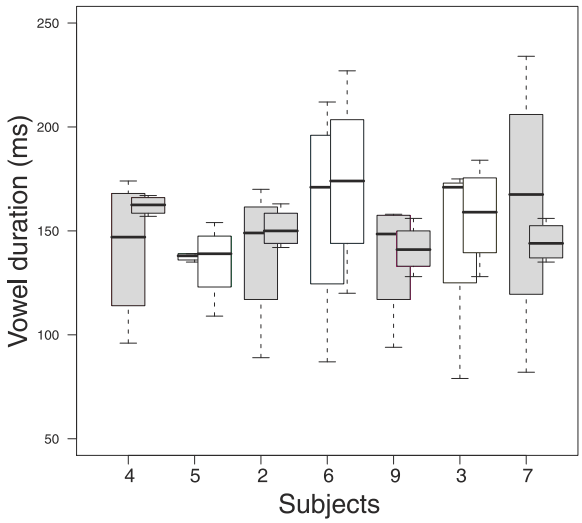

Figure 6: *Boxplots of the duration of the vowel before /s/ and /z/ in text, in word-final sentence- medial position, by subjects*

Let us now turn to the post-alveolar fricatives, /ʃ/ and /ʒ/.

3.3 Experiment 2: Methods

Five women and one man aged 19–30 years participated in the experiment, all were speakers of Standard Hungarian living in Budapest and reported no speaking or hearing impairment.

The material was recorded in a sound-proof cabin with a SonyECM-MS907 microphone through an M-AudioMobilePreUSB preamplifier to a laptop using the software SpeechRecorder. The acoustic analysis was carried out in Praat 5.1.07 (Boersma and Weenink 2009). The data recorded consisted of 11–13-syllable-long sentences and a coherent text. The target sequences were *-ás* [aːʃ] and *-ázs* [aːʒ] in two- and three-syllable words in utterance-final position, and as a base line some of the test words were suffixed with a vowel-initial suffix, so they appeared in a sentence-medial intervocalic position. The experiment also contained a text in

which test words appeared in word-final but sentence-medial position followed by a vowel-initial word. Test words were chosen to contain pairs of identical final syllables which only differed in the voicing of the final fricative (4). There were 34 test sentences and 6 repetitions which gave 204 tokens per subject, two items were discarded due to a technical error.

(4) a. *A telek jobb oldalán áll a ga**rázs**.*
'There is a garage on the right side of the lot.'
b. *A sebesült könyökén van egy ma**rás**.*
'There is a bite on the injured person's elbow.'

The experiment aimed to measure the same parameters as Experiment 1 and, in addition, the harmonics-to-noise ratio in the fricative:

(5) a. voicing in the fricative
b. duration of the fricative
c. duration of the preceding vowel
d. harmonics-to-noise ratio

The harmonics-to-noise ratio (HNR) measures the extent to which friction noise replaces the harmonic structure in the spectrogram. To compare the relation of voicing to friction in /ʒ/, we adopted Hamann and Sennema's (2005) method of what they call the *harmonicity median*, i. e., the degree of acoustic periodicity. The harmonicity median was determined by calculating the average of the harmonics-to-noise ratio with time steps of 0.01 s, a minimum pitch of 75 Hz, a silence threshold of 0.1 and 1 period per window. The interpretation of the median values is the following (see Boersma 1993). A harmonicity median of 0 dB means that there is equal energy in the harmonics and noise signal, whereas a median near 20 dB indicates that almost 100% of the energy of the signal is in the periodic part. Based on this, a sound with a harmonicity median below 3 dB can be regarded as a noisy/fricatival sound.

3.4 Experiment 2: Results

Figure 7 illustrates the realization of *(da)rázs* 'wasp' and *(da)rás* 'semolina-adj.' for Subject 3, Figure 8 exhibits the boxplots of unvoiced frames (%) across subjects for /ʃ/ and /ʒ/ in utterance-final and word-medial position.

Although numerically the voicing of /ʃ/ and /ʒ/ differs from that of /s/ and /z/, as /ʃ/ and /ʒ/ are realized with more phonation, qualitatively the results are very

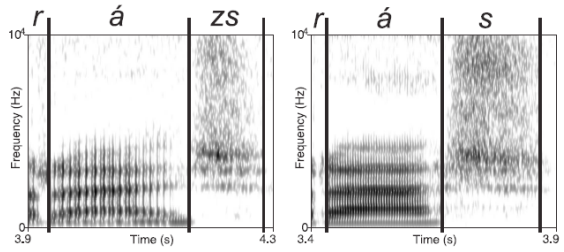

Figure 7: *The realization of* (da)rázs *and* (da)rás *for Subject 3*

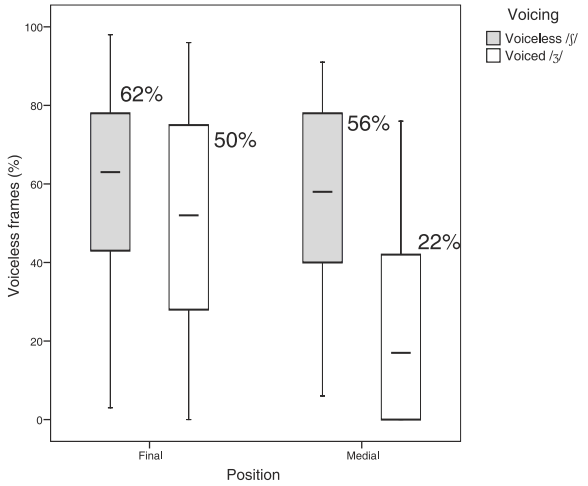

Figure 8: *Boxplots of unvoiced frames of /ʃ/ and /ʒ/ in utterance-final and word-medial position*

similar. Gráczi (2010) also found that /ʒ/ in intervocalic position was realized with more voicing (69.9%) than /z/ (57.9%). The difference between utterance-final /ʃ/ and /ʒ/ is significant, while the difference between final /ʒ/ and medial /ʃ/ are not significant — just like in Experiment 1. As expected, HNR significantly correlates with unvoiced frames (Pearson's correlation coefficient $r = -.779$ $p < 0.001$). This result indicates that the lower the harmonicity median, the higher the percentage of unvoiced frames, and the other way round, the higher the harmonicity median, the lower the percentage of unvoiced frames, i.e., periodicity negatively correlates with noise. This means that the more voiced a sound, the less turbulent or fricative-like it is. Figure 9 exhibits the HNR values for /ʃ/ and /ʒ/ in word-medial and utterance-final position.

In word-final, sentence-medial position the results are not statistically significant across subjects, and for any subject either, except for Subject 6. If, however, we exclude Subject 3 from the analysis, who produced an inverted pattern (she produced the phonologically voiced sibilant with less phonation than the phonologically voiceless one), we get a statistically significant result across subjects ($p = 0.002$).

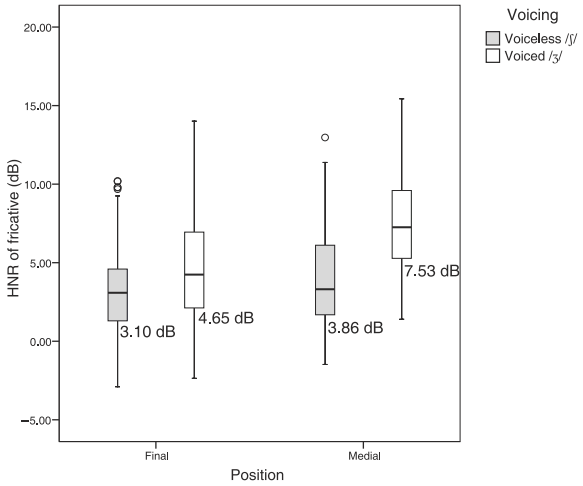

Figure 9: *Boxplots (with outliers) of harmonicity median values for /ʃ/ and /ʒ/ in utterance-final and word-medial position*

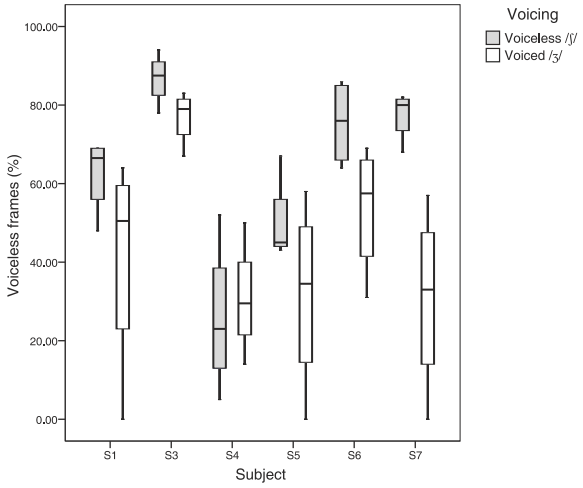

Figure 10: *Boxplots of unvoiced frames for /ʃ/ and /ʒ/ in text, in word-final sentence-medial position, by subjects*

Figure 11 shows the boxplots of the duration of the post-alveolar fricatives in utterance-final position and Figure 12 demonstrates the duration of the preceding vowel.

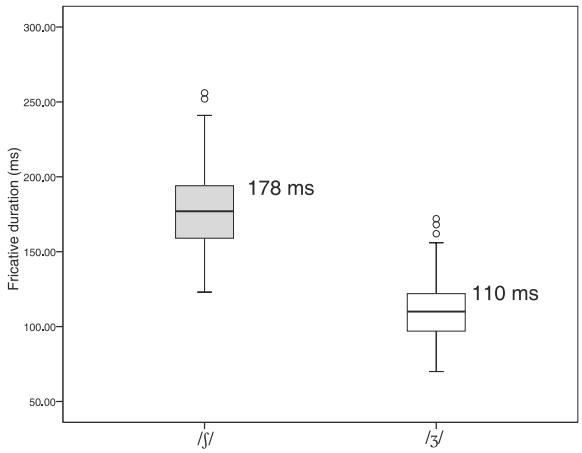

Figure 11: *Boxplots (with outliers) of duration of /ʃ/ and /ʒ/ in utterance final position*

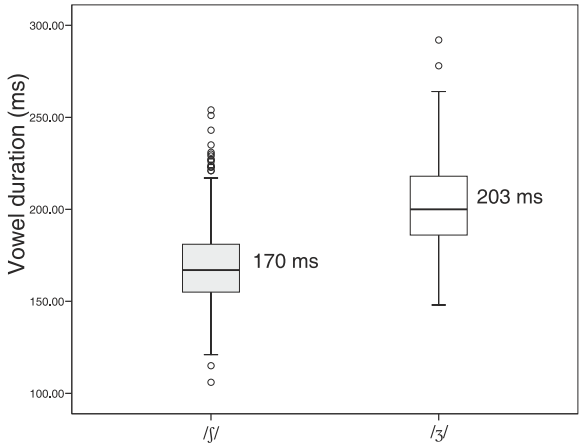

Figure 12: *Boxplots (with outliers) of the duration of the vowel preceding utterance-final /ʃ/ and /ʒ/*

The results are very similar to those in Experiment 1: as expected, /ʃ/ is always realized considerably longer than /ʒ/, the differences are statistically significant ($p < 0.001$), the differences are consistently significant for each subject individually

as well. The preceding vowel is also always realized longer before the phonologically voiced fricative, the differences are statistically significant across subjects and for each subject as well ($p < 0.001$).

In sentence-medial position the results are again very similar. /ʒ/ is realized significantly shorter than its voiceless counterpart. However, the differences in the duration of the preceding vowel are not significant, unlike in utterance-final position (Figure 13), results are in accordance with Experiment 1.

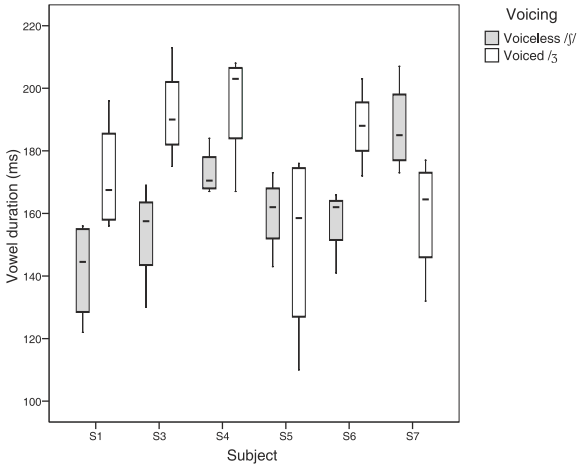

Figure 13: *Boxplots of the duration of the vowel before /ʃ/ and /ʒ/ in text, in word-final sentence-medial position, by subject*

4 General discussion

In accordance with our aerodynamically-grounded hypotheses, /z/ and /ʒ/ in Hungarian also devoice in utterance-final position, but there is no complete neutralization between the phonologically voiced and phonologically voiceless sibilants. (We cannot explain the substantial quantitative difference between the voicing of alveolar and post-alveolar fricatives.) One of the parameters that (partially) preserves the contrast is vowel length, or more precisely the ratio between vowel and fricative length.

It has been long observed that there is a correlation between the voicing properties of obstruents and the duration of preceding stressed vowels (or vowel + sonorant sequences), and the duration of closure or constriction of the obstruent (see, among others, House and Fairbanks 1953, Chen 1970, Lehiste 1970, Kluender et al. 1988). Voiceless obstruents as opposed to voiced obstruents are relatively long, and vowels

(or vowel + sonorant sequences) before them are relatively short. This has been referred to in the English literature as Pre-Fortis Clipping (Wells 1982, Harris 1994). Since speakers typically talk at different rates, the absolute durations of the segments are highly variable. It has been found, however, for English and German for instance (Port and Dalby 1982, Port and Leary 2005) that the ratio of vowel duration to stop closure or fricative constriction remains rather constant in words with the same voicing feature.

Many perception-driven accounts derive the inverse patterning of voiced–voiceless obstruent length and preceding vowel duration as a form of mutual auditory enhancement for the voicing contrast. The idea is that increased vowel duration makes the duration of a following obstruent appear shorter, and conversely that a decrease in vowel duration increases the perceived duration of a following obstruent, and that vowel duration and obstruent duration are therefore integrated into a single percept (Port and Dalby 1982, Port and Leary 2005, Massaro and Cohen 1983, Kluender et al. 1988). This hypothesis has been largely supported by experimental evidence. Thus, listeners pay attention especially to the relative duration of a vowel and the constriction duration of a following obstruent (Javkin 1976, Parker et al. 1986, Kingston and Diehl 1994).

Our results support that Hungarian also shows 'Pre-Fortis Clipping' since the length of the vowel is always longer in voiced tokens — a phonetic effect that seems to be redundant in most contexts, but turns out to be crucial in maintaining the contrast between voiced and voiceless sibilants in utterance-final position, just like in the case of maintaining /f/–/v/ contrast in the same position, as described in Bárkányi and Kiss (2009). The ratio between the duration of the consonant and that of the vowel for voiced fricatives is around twice as much as for their voiceless counterparts: for /s/ it is 0.82, for /z/ 1.51; /ʃ/: 0.97 and /ʒ/: 1.89. In Figures 14 and 15 the duration of the vowel+fricative sequence is shown. The length of the sequence in our study ranges between 322–347ms, which suggests that vowel and obstruent durations are indeed integrated into a single percept. Additional perception experiments are needed to corroborate this idea.

We must add that there are of course other phonetic properties of the preceding vowel that help maintain the contrast between voiced and voiceless fricatives, not only its duration. They include pre-aspiration or various low frequency spectral features. In this paper we do not discuss these properties, but see, among others, Gordeeva and Scobbie (2010).

Based on the above mentioned results we can claim that in the parameters we have examined voiced sibilants do not differ considerably from /v/. This questions the validity of the analyses given in Kiss and Bárkányi (2006) and Bárkányi and Kiss (2010) as they claim that it is the phonetic properties of /v/ (and its linear context) that explain its double-faced phonological behavior. Voiced sibilants, how-

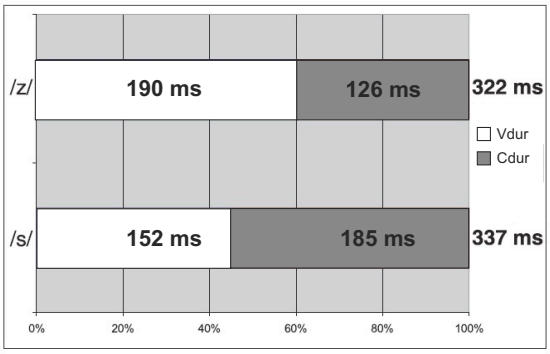

Figure 14: *Duration of the vowel plus /s/–/z/ in sentence-final postion*

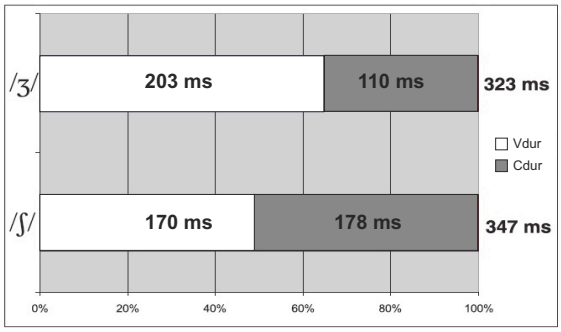

Figure 15: *Duration of the vowel plus /ʃ/–/ʒ/ in sentence-final position*

ever, do not show a peculiar behavior in voicing assimilation, they behave as proper obstruents by both triggering and undergoing voicing assimilation (see Section 2). This might be due to differences in other parameters that have not been measured in these experiments, such as spectral moments (frequency centroids, like the center of gravity and spectral standard deviation) or the intensity of the noise components of the fricative. The spectral center of gravity is a measure of how high the frequencies in a spectrum are on average. It is generally used to distinguish between the various places of articulation of obstruents as in Gordon et al. (2002), but Hamann and Sennema (2005) and Kiss and Bárkányi (2006) argue that it can be used to differentiate between the fricative vs. approximant realizations of labio-dentals in German and Dutch, and Hungarian, respectively. The spectrum of diffuse fricatives like /f/ and /v/ is spread out all through the frequency domain with low intensity, it shows no characteristic peaks, whereas the spectrum of comapct fricatives like

/z/ and /ʒ/ displays cahracteristic intensitiy peaks at various frequency postions, which contributes to their perceptual salience.

Alternatively, we might think that all voiced fricatives behave in a very similar manner in utterance-final position, i.e., they devoice in Hungarian, but the articulatory targets of /v/ still differ from those of /z/ and /ʒ/ in a meaningful way. In Section 5 this line of reasoning will be developed. Before further elaborating on this issue of why /v/ is still different, let us discuss the results obtained from the text.

We must admit that our results concerning the word-final but sentence-medial position are somewhat inconclusive. This position stands between word-medial and utterance-final position as for the voicing of the fricative, which is also explainable on aerodynamic grounds. The difference in the voicing of the voiced vs. voiceless fricative in this context is not as marked as in utterance-final position, but the voiced fricative on average is more phonated for all speakers except for Speaker 3 in the /ʃ/-/ʒ/ experiment, as shown in Figure 5 and Figure 9. We can see that standard deviation is larger and there are considerable individual differences. This means that phonetic voicing is possible but not necessary in intervocalic position. For some speakers probably the domain-final aspect of the context is dominant, while others treat it as an intervocalic position. We speculate that phonetic voicing is better perceived in this context. This phonetic environment exhibited no Pre-Fortis Clipping effect, that is to say, there were no consistent differences in the length of the preceding vowel between the phonologically voiced and phonologically voiceless context. We assume that the reason for this is that there is no need for this secondary cue to implement voicing contrast in this position, as it can adequately be perceived despite the lack of statistically significant differences for some speakers. Note that fricative length is a reliable indicator of phonological voicing for the sibilant fricatives, as mentioned above. Intensitiy—not measured here—is probably also a significant indicator of voicing: i.e., voiced fricatives have less energy at higher frequencies than their voiceless peers.

5 Is /v/ different?

The core of the analyses in Kiss and Bárkányi (2006) and Bárkányi and Kiss (2010) is based on the claim that the articulatory target of /v/ is a labiodental narrow approximant. The authors show that /v/ in utterance-final position is realized as a devoiced fricative, i.e., with little or no phonation and substantial turbulence. In this paper we have shown that /z/ and /ʒ/ are also realized with little or no phonation and substantial turbulence in utterance-final position. We claim, however, that while the articulatory target of /v/ is indeed a labiodental narrow approximant, /z/ and /ʒ/ are true voiced fricatives with active voicing and turbulence at the same time.

Gráczi (2010) shows that while /v/ is realized with 100% phonation (disregarding three extreme cases) in intervocalic position, /z/ and /ʒ/ contain 42.1% and 33.1% of unvoiced frames, respectively. This result is indicative of turbulence during the realization of /z/ and /ʒ/ and no friction during the realization of /v/.

In an additional experiment with two native speakers of Hungarian we examined the voicing and noise (HNR) properties of /z/ and /ʒ/ in contrast to /v/ in utterance-initial position. /v/ is voiced in 99% of the time, while /z/ only in 51% and /ʒ/ 79% in our study. Figure 16 shows the voicing of these sounds in word-initial position.

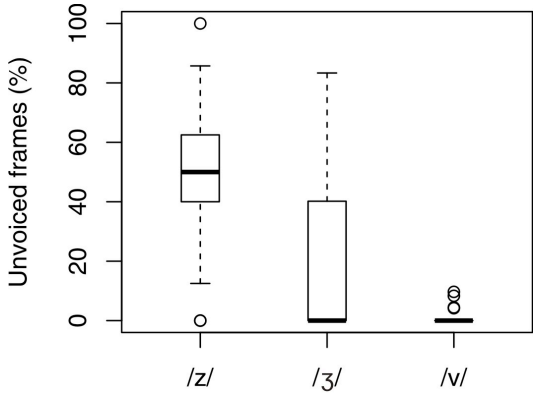

Figure 16: *Boxplots (with outliers) of unvoiced frames for /z/, /ʒ/ and /v/ in utterance-inital postion*

As expected, the HNR values indicate turbulence in the case of the voiced sibilants, but not in the case of /v/. The average HNR for utterance-initial /z/ is 5.37 dB in our experiment and 6.11 dB for /ʒ/. These results suggest a fair amount of noise during the production of the sibilants. Compare these mean HNR values with that of /v/, which is 10.82 dB — this suggests that /v/ is considerably less"noisy" and more approximant-like. Figure 17 shows the realization of word-initial /v/ in contrast to /ʒ/ for Speaker 1. In the case of the post-alveolar fricative substantial prevoicing is also observed (it is highlighted with a circle).

We can therefore conclude that the articulatory target for /v/ is an approximant, and as such, it is passively voiced, therefore its voicing gesture cannot propagate to the neighboring sounds, which means that it cannot trigger voicing assimilation, as described in detail in Kiss and Bárkányi (2006) and Bárkányi and Kiss (2010). On the other hand, /z/ and /ʒ/ are actively voiced obstruents. In order to achieve active voicing several articulatory gestures have to be realized as described in Section 1. This means that although the voiced sibilants devoice in utterance-final position,

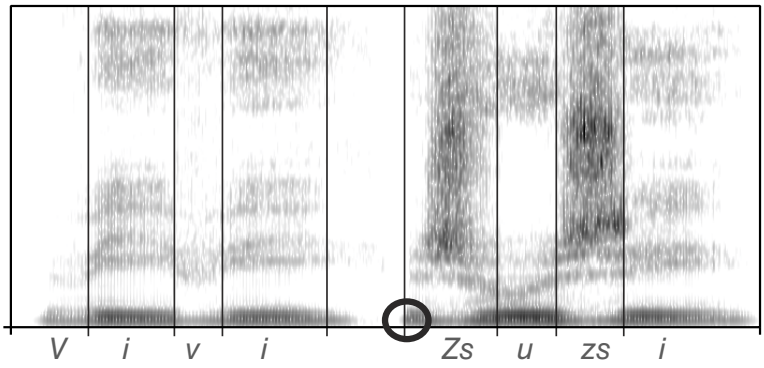

Figure 17: *The realization of* Vivi *and* Zsuzsi *for Speaker 1*

the active voicing quality of /z/ and /ʒ/ in other contexts can spill over to the surrounding sounds and, therefore, these sounds behave as proper obstruents, i.e., they both undergo and trigger voicing assimilation in Hungarian. It is open to further research whether voicing assimilation in Hungarian should be modelled on phonetic grounds, that is to say, it is a process governed by the temporal coordination of articulatory gestures, or it is rather a polarity-switching phonological process, or the combination of the two (as discussed in Jansen 2004, Kiss 2007, 301–307, for instance).

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3 Finite state automatons in information states*

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The aim of this paper is to introduce a certain kind of information state representation in a dynamic system of propositional logic, using finite state automatons and highlight its advantages, including relation to inquisitive semantics and belief revision.

1 Preface

Dynamic semantics offers a very straightforward and plausible theory for modelling dialogues. In dynamic semantics the meaning of a sentence is a function which assigns information states to information states. Sentences change the information in the mind of the hearer. (Veltman 1996: 1)

The aim of modelling a dialogue is at least twofold. One is better understanding the process of interactions in dialogues, the other is simulation (or computational implementation) of a dialogue system. In the latter case it is very important what kind of tools and structures the model relies on. In a theory some structures are plausible and easy to use, but they are unusable in an implemented system. Such structures are the infinite sets. It is better to get rid of them already in the theory.

The simplest dynamic semantic theories are modelling information states as model sets. See for instance (Kálmán and Rádai 2001: 88). An information state consists of models assumed possible by the hearer. Depending on the theory, these sets can be infinite. Of course, we cannot handle them in an implemented dialogue system. We cannot store them, just perhaps give a method to enumerate them. It is unlikely that people have such structures in their mind.

If we switch from model sets to structured information states, because of the poor abilities of the former, the latter can be based upon (parts of) formulae to be able to handle revision. But if the dialogue changes without growing information, the information states (based on formulae) change, what contradicts our intuition that without new information, no information state change should be performed. If

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we model information states by automatons then we can perhaps define information states such a way that old information is accepted by the automaton and causes no change in the information state. So perhaps automatons offer a better approach.

In this article I suggest modelling information states by tables and automatons instead of model sets and I investigate the advantages of this turn. I try to apply as simple automatons as possible: finite state automatons, covering as wide variety of phenomena as possible.

2 The language we are modelling

The definitions in this section are based on (Kálmán and Rádai 2001: 207–209, 88-89), but slightly changed.

2.1 Syntax

Definition 1 *The Language of Propositional Logic*

$$L_0 =_{def} \langle LC, NLC, F \rangle$$

Members: Logical and non-logical constants, formulae respectively.

Definition 2 *Logical Constants of* L_0

$$LC =_{def} \{(,), \neg, \wedge, \vee\}$$

Members: Symbols of opening and closing parentheses, negation, conjunction, disjunction, respectively.

Definition 3 *Non-logical constants of* L_0

$$NLC =_{def} \{p, q, ...\}$$

Members: Symbols of atomic propositions.

Definition 4 *Formulae of* L_0

F is the smallest set satisfying the following conditions:

1. *If* $p \in NLC$ *then* $p \in F$. *A propositional constant is a formula.*
2. *If* $A \in F$ *then* $\neg A \in F$. *A negated formula is a formula.*
3. *If* $A, B \in F$ *then* $(A \wedge B) \in F$. *Conjunctive formulae.*
4. *If* $A, B \in F$ *then* $(A \vee B) \in F$. *Disjunctive formulae.*

2.2 Classical Semantics

For later reference, I define the classical semantics for this language.

Definition 5 *Discourse Universe*
$U =_{def} \{T \cup F\}$ *where* T *is the set of true,* F *is the set of false statements and they satisfy that* $T \cap F = \emptyset$ *and* $T \cup F \neq \emptyset$.

Definition 6 *Interpretation Function*
For an interpretation function ρ *it is true that* $\rho(p) \in U$ *in case of* $p \in NLC$.

Definition 7 *Models of Propositional Logic*
$\mathbf{M} =_{def} \langle T, F, \rho \rangle$ *where* T *is the set of true,* F *is the set of false statements and* ρ *is an interpretation function.*

Definition 8 *Classical Semantic Values for Propositional Logic*

1. $[p]^M =_{def} 1$, *if* $\rho(p) \in T$, *0 otherwise.*
2. $[\neg p]^M =_{def} 1$, *if* $\rho(p) \in F$, *0 otherwise.*
3. $[(A \wedge B)]^M =_{def} 1$, *if* $[A] = 1$ *and* $[B] = 1$, *0 otherwise.*
4. $[(A \vee B)]^M =_{def} 1$, *if* $[A] = 1$ *or* $[B] = 1$, *0 otherwise.*

assuming that the semantic value of the formula A in the model M (of language L_0*) is noted by* $[A]^M$ *and* $p \in NLC$; $A, B \in Form$, *furthermore 1 denotes the true, and 0 the false truth value.*

2.3 Simple Update Semantics

Let's take a look at a simple update semantics for this language.

Definition 9 *Information States in Simple Update Semantics*
The set of information states is Σ_0 *and if* $\mathbf{M}$ *is the class of models of language* L_0, *then* $\Sigma_0 =_{def} \mathscr{P}(\mathbf{M})$, *the powerset of* $\mathbf{M}$.

An information state contains the models assumed possible according to the hearer's knowledge.

Definition 10 *Semantic Values in Simple Update Semantics*
If A is a formula, then its semantic value is $[\![A]\!] : \Sigma_0 \to \Sigma_0$

1. $[\![p]\!](\sigma) =_{def} \{M \in \sigma : [p]^M = 1\}$
2. $[\![\neg A]\!](\sigma) =_{def} \sigma \setminus [\![A]\!](\sigma)$
3. $[\![(A \wedge B)]\!](\sigma) =_{def} [\![B]\!]([\![A]\!](\sigma)) = [\![A]\!] \circ [\![B]\!](\sigma)$
4. $[\![(A \vee B)]\!](\sigma) =_{def} [\![A]\!](\sigma) \cup [\![B]\!](\sigma)$

Assuming that $p \in NLC$; $A, B \in Form$ *and* $[A]$ *is the classical semantic value of A.*

Reverting from Contradictory States is Impossible

Note that according to this simple semantics, all formulae eliminate models from the former information state, keeping no models in the information state after a contradiction. Since there is no method to add models to an information state by any formulae, it is not possible to revert from a contradictory information state.[1] Even if there would be a formula with the ability of adding models to an information state, in the case of such a simple structure as a model set, we have no information about which models to add after revision. So we could not get an adequate result after revision.

3 Automatons In Information States

Let's create automatons accepting model sets! For this purpose we have to slightly change the definition of L_0. The only necessary change affects the set of non-logical constants. Non-logical constants should be ordered. I will use a notation of a letter and a number instead of different letters.

Definition 11 *Nonlogical Constants Revisited*
$NLC =_{def} \{p_i : i \in \mathbb{N}$, $p_1 \in NLC$, *and there is no such* $1 < j \in \mathbb{N}$, *that if* $p_j \in NLC$, *then* $p_{j-1} \notin NLC$, *that is: the elements of NLC are such* p_i*-s, that i starts from* 1 *and continuously increases by 1 (maybe until infinity).* $\mathbb{N}$ *denotes the set of natural numbers.*

Now we can create a code for each model, and use this code as input for the automatons. We use the classical semantics of the models.

[1] In the system proposed in my paper we can have several contradictory states. In the original update semantics in (Veltman 1996: 8) there was only one, and it was called the 'absurd state'

Definition 12 *Coding the Models*
The code of a model $M \in \mathbf{M}$ *is a string on the alphabet* $\Sigma = \{0,1\}$. *The* n^{th} *letter in the code is the value of* $[p_n]^M$.

Automatons will read the codes of the models and accept or reject them as necessary. The intention is that such an automaton should accept the models assumed possible for the hearer in the current information state.

The ordering of atomic propositions seems implausible if we think of human behaviour. People have access to propositions so fast, that a random access seems more probable than a sequential one. This is a shadow on my proposal, but helps defining a simple but powerful representation.

About The Finiteness of the Codes

Depending on the size of *NLC*, codes of the models can be of even infinite length. This will not cause problems in practice, because we will construct automatons such a way, that if the automaton enters an accepting (terminal) state, reading the 'rest' of the code will not be necessary, it will be accepted anyway. This terminal state will be reached after finite steps and no edge will lead to other state from it, it will be a 'tale' of the automaton with loopback edges of all letters of the alphabet.

3.1 Examples

Before the exact definition of building automatons for the information states, I will give examples to show how they work.

The automatons on figure 1 contain exactly one initial state (marked by a short arrow pointing towards them[2]) and one terminal state (marked by a short arrow pointing away from them) in the mentioned 'tale' style. The automaton on the left accepts codes starting with '1' what stands for evaluating p_1 to true. No path to the terminal state for codes starting with '0'. The one on the right will reject codes containing '1' as the second letter, i.e. the codes of the models evaluating p_2 to true.

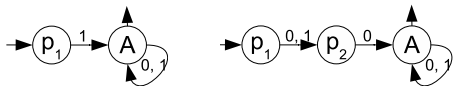

Figure 1: *Two simple automatons: one for* p_1 *and another for* $\neg p_2$

[2]Using the notation of (Eilenberg 1974: 13)

The automaton on figure 2 demonstrates conjunction. There is no edge from the state labelled p_2 to the state labelled p_3 with letter '1', similarly, no edge from p_5 with letter '0'. So this automaton accepts only models evaluating p_2 to false *and* p_5 to true.

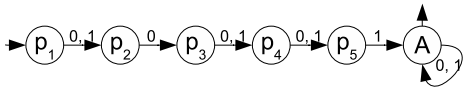

Figure 2: *Automaton for* $\neg p_2 \wedge p_5$

The single(!) automaton on figure 3 has two initial states, and two terminal states. It can be split to two separate branches — each containing one initial and one terminal state. The branches can be treated as separate automatons accepting formulae standing on the sides of the disjunction. First branch accepts models evaluating $(\neg p_2 \wedge p_5)$ to true, the other accepts models evaluating $(p_1 \wedge p_3)$ to true. Finally, the automaton with the two branches accepts models acceptable by the first *or* the second branch.

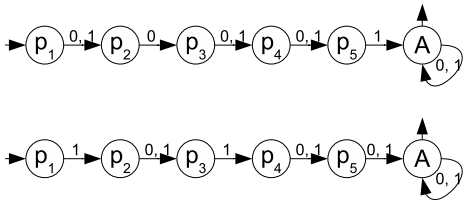

Figure 3: *Automaton including disjunction* $(\neg p_2 \wedge p_5) \vee (p_1 \wedge p_3)$

3.2 Towards Technical Specification

Now it is time to define how we can build these automatons. We have to give exact specification of adding states, edges and how to label them. The last example showed that labelling the states is not so easy. The automaton contained states with similar labels. If we assume several branches, we can get unreadable or confusing, perhaps ambiguous labels. Somehow we have to specify which state we are talking about. This can be achieved by labelling or by some other technique. I choose the latter and introduce a rich description of automatons by tables or spreadsheets. This is defined in the next chapter. I will offer a way for deriving the automatons from these tables.

4 Spreadsheet Semantics for Dialogues

The tables used for representing dialogues are designed for containing a bit more data than necessary for the construction of automatons. They store the whole history of the semantics of the dialogue.

I assume that the table has a header which is not treated as a data row. A table will have some 'administrative' columns additional to the ones containing data for edges. Because of the small alphabet used, tables will be completely different from the usual transition matrix representation. See (Eilenberg 1974: 14). The administrative columns are the following:

Definition 13 *Administrative Columns of the Tables*

Number*: A sequence number for identifying the rows. Topmost row has the number 1 and each row has the number we get by adding one to the number of the row right above it.*

Parent*: The number of the row which was the immediate ancestor of the row.*

Alive*: A value indicating if this row is 'alive' or 'dead' (is participating in the creation of the automaton or not). This value can be 1 (true: alive) or 0 (false).*

The rest of the columns will belong to constants of *NLC*. They will contain nothing or '0' or '1' or both, depending on the edges starting from the state. See definition later.

Now I define the empty table which corresponds to the original, ignorant information state of the hearer.[3]

Definition 14 *Table for the Empty Information State*

It contains only the three administrative column headers, no data rows, no other columns.

Definition 15 *The Effect of an Atomic Formula p_i on the Table*

1. *Changing the Columns*

   We have to achieve to have data columns with header containing p_1 ... p_i from left to right. If there is no column with header p_i, we have to add columns(s) and insert p_n in the header of the header of the n^{th} data column.

2. *Changing the Rows*

   If the table contains only the header row, then we have to add a new row under the header. Its number will be 1, parent 0, alive: 1. In all non-administrative

[3]This state is called 'minimal' in (Veltman 1996: 2)

columns we should write '0, 1'. Finally we have to remove '0' from the column of p_i, keeping only the '1' there.

If the table contained data rows, then we have to copy all of them which are alive, and paste under the last row of the table. We have to change the number of the newly inserted rows to the number which is the result of adding 1 to the number of the row one above the new row. Their parents will be the rows which were copied, and the parent rows should be marked as not alive. Now we have to modify the living rows of the table. If they contain no data in the column of p_i, then we have to fill all the new empty cells of the row by '0, 1'. Finally, we remove '0' from the column of p_i (if it contains '0' at all).

Note that it might happen that a cell in a living row of the table is empty. This means that the branch of the automaton created by using this row is cut into two disconnected parts. The rightmost part will be unreachable, and left hand part will not lead to a terminal state. This case shows that the branch is contradictory.

Definition 16 *The Effect of a Negated Atomic Formula $\neg p_i$ on the Table*
We do the same as in case of an atomic formula, but we remove'1' instead of '0' where appropriate.

Definition 17 *The Effect of a Conjunctive Formula $(A \wedge B)$ on the Table*
First we apply A, then B on the result of the previous operation.

Definition 18 *The Effect of a Disjunctive Formula $(A \vee B)$ on the Table*
If the table does not contain data rows, then we add rows by processing A, then we fill another empty table by processing B. If they contain different number of columns, we add columns (and fill their headers) to the table which contains fewer columns, to get tables with the same number of columns. During this addition we fill the new cells in the living rows of the table by '0, 1'. Finally we merge the two tables by inserting the rows of the table of B under the rows of the table of A. We also have to increase the numbers in the inserted rows by the count of the original rows of the table of A in the columns 'Number' and 'Parent' (except if column 'Parent' contains 0).

If the table already contained data, we have to do the same, but we have to keep the currently living original rows of the table as rows not alive, above the rows generated by A, which will be also above the rows generated by B.

Definition 19 *The Effect of a Negated Conjunctive Formula $\neg(A \wedge B)$ on the Table*
We use De Morgan's law and proceed with processing $(\neg A \vee \neg B)$.

Definition 20 *The Effect of a Negated Disjunctive Formula $\neg(A \vee B)$ on the Table*
We use another law of De Morgan and proceed with processing $(\neg A \wedge \neg B)$.

Definition 21 *The Effect of a Double Negated Formula $\neg\neg A$ on the Table*
We drop the double negation and process A.

#	Parent	Alive	p_1	p_2	p_3	p_4	p_5	*Comment: Header*
1	0	0	0, 1	0				$\neg p_2$
2	1	1	0, 1	0	0, 1	0, 1	1	$(\neg p_2 \wedge p_5)$
3 (*1*)	0	0	1					p_1
4 (*2*)	3 (*1*)	1	1	0, 1	1	*0, 1*	*0, 1*	$(p_1 \wedge p_3)$ + *2 cells!*

Table 1: *The table representation of $(\neg p_2 \wedge p_5) \vee (p_1 \wedge p_3)$ with additional comments*

We defined the effect of all kind of formulae on the tables — but our goal is to have automatons. Now I define how to generate automatons from the tables.

Definition 22 *Generating Automatons Based on Tables*

1. *We care only for the 'living' rows.*
2. *Let's add an automaton state for all cells of the table in the non-administrative columns of data rows.*
3. *Let's mark the states belonging to the first data column as initial states.*
4. *Let's add one more state on the right of the state belonging to the last data column of each data row, marked as terminal state.*
5. *Let's add edges to the automaton. The numbers '0' and '1' in the cells are to be labels for the edges between the cell's automaton state and its right neighbour. If the cell contains both of them, two edges are necessary, but if the cell is empty, we do not have any edges between the two states.*
6. *Let's add edges beginning at the terminal states of the automaton. We need two for each. One with the label '0', and one with '1', both ending also at this state.*

To see the relation between the table representation and the automaton generated from it, compare figure 3 and the table above.

Notes

Note that we use finite state automatons.

If the automaton has only one living row, then the automaton is deterministic, but if it has more than one living rows, then it is non-deterministic. Non-determinism is due to disjunction.

The difference between the table representation and the automatons is the lack of dialogue history in the latter.

The algorithm of automaton generation from the tables is simple. Almost reversible — except the data in the administrative columns and in not living rows — so we cannot reconstruct the history of the dialogue based on the automaton of the information state.

5 Central Semantic Concepts

We have to define a few semantic concepts to be able to say something about the logical properties of the system. We need at least the following:

Definition 23 *Compatibility*

An information state σ is compatible with the formula A if by applying the formula to σ we get an information state with an automaton in which there is at least one path from at least one of the initial states to at least one of the terminal states.

Definition 24 *Incompatibility*

An information state σ is incompatible with a formula A if by applying the formula to the information state we get an information state with an automaton in which there is no path from any of the initial states to any of the terminal states.

Definition 25 *Support*

An information state σ supports a formula A if in the table representation of the information state we get by applying A to σ, every living row of the original table will be a parent of at least one of the new rows of the new table.

Definition 26 *Consequence*

A formula B is consequence of the formulae $A_1, A_2, ..., A_n$ iff for every information state σ it is true that by applying A_1 to σ, and then A_2 on its result etc. until A_n, the resulting information state supports B.

6 Outlook

6.1 Inquisitive Semantics

Inquisitive semantics (Groenendijk and Roelofsen 2009) makes difference between the informative and the inquisitive content of sentences. Informative content can eliminate some of the still possible models, while inquisitive content creates (perhaps overlapping) groups of them, called alternatives. The traditional semantics of questions (Groenendijk and Stokhof 1997) uses disjunct partitions of the models — overlapping of the alternatives is the real new light in inquisitive semantics.

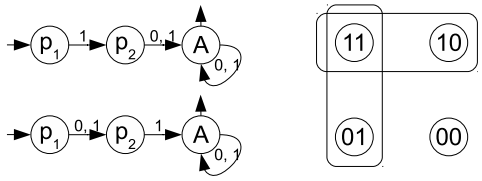

Figure 4: $(\neg p_1 \vee p_2)$ *by an automaton and in inquisitive semantics*

Besides questions, disjunction also bears inquisitive content. In a simple $p_1 \vee p_2$ case inquisitive semantics assumes two alternatives: one in which p_1 is true and another, where p_2 is true. They overlap: p_1 and p_2 can be true at the same time. We can see in figure 4, that the automaton has two branches — they are logically equivalent to the alternatives of inquisitive semantics.

This example is very simple. If we consider more complex alternatives by more complex formulae, then we will have more branches then alternatives. But we can make groups of the branches. Parents of the branches (more precisely: the rows of the table from which we derived the branch) can create the real alternatives from branches. If all the branches have the same parent, a branch alone represents an alternative. If there are more then one branches, and they have (at least some) different parents, then the parents determine the alternatives.

6.2 Belief Revision

The simple update semantics for propositional logic, which represents information states as model sets, is not able to get out of a contradictory information state, because it is represented by an empty set and we do not know which models to add, moreover we do not have operators which can add models to the set (just eliminating rules).

We can define contraction and revision by the table and the automaton representation of information states. The most important application of revision is perhaps to get out of a contradictory information state. A contradictory information state is represented by an automaton in which there is no path from any initial state to any terminal state — or represented by a table which has at least one empty cell in each of its living rows.

In my approach, revision (Alchourrón, Gärdenfors, and Makinson 1985) of an atomic formula or its negation is quite straightforward, because we have to add a '0' or a '1' into each cell in the column which has this atomic formula in its header. (Or in a more complicated way: adding new rows, and making changes there.) This approach enables to get out of the contradictory state by a sequence of some (can be more than one) steps.

Contraction or revision of compound formulae is a bit more difficult. If we want to enable contraction of only those formulae which were part of the dialogue, we need the table representation (opposed to the automaton representation), because it preserves the whole history of the dialogue.

I cannot define the exact steps of contraction here, but it is necessary to note, that the structured information state described in this article make it possible to define contraction at all, which is important.

I also note that questions can make it possible to determine which propositions to contract, and the information state representations described here make it possible to handle questions and answers in general (similarly to disjunction, using the concept of alternatives of inquisitive semantics) and to propose appropriate question for contraction.

7 Summary

In this article I suggested tables for the representation of information states in a dynamic propositional logic system. These tables can store historical data about the dialogue and serve as base for the derivation of finite state automatons which can accept model sets by reading their codes.

I also stated relations to other theories (inquisitive semantics and belief revision) emphasizing that this kind of representation is powerful enough for defining the semantics of questions in line with inquisitive semantics, and for defining contraction and revision, two important operations of belief revision.

Future stories

The system I suggested was sketched briefly and could be defined in a more exact formal way, including the semantics of questions and answers, handling contradiction, contraction and revision. The most useful improvement of this approach would be to extend the theory to predicate logic in which dynamic semantics brings its very natural and impressive power of handling existential quantification and binding of discourse referents.

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4 Towards an LFG analysis of discourse functions in Hungarian*

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1 Introduction

This paper investigates a possible analysis of the syntax-discourse interface in Hungarian in the non-derivational framework of Lexical-Functional Grammar (LFG). In the mainstream literature on Hungarian syntax, discourse functions are integrated into a hierarchical syntactic structure, which thus amalgamates syntactic, semantic and discourse information. In the proposed analysis, discourse functions are dissociated from syntactic positions. To achieve this, the parallel but interrelated representational levels of the LFG framework are exploited. The present paper can only sketch the most important assumptions of the analysis, while other details remain to be worked out later. The paper is structured as follows. The next section examines the basic distributional patterns in the Hungarian sentence in a topological and framework-neutral way. In the next step, these distributional patterns are associated with discourse contexts in which the particular sentences are uttered. In the third section, the LFG approach to information structure is presented, which consists of a separate i(nformation)-structure dissociated from syntax and its correspondences with the other levels of representation. After considering the i-structure adopted in the mainstream LFG framework, I will argue for an alternative one that could account for the presented data more adequately. Then a possible syntactic structure will be proposed for Hungarian in the LFG framework along with its correspondences with the i-structure.

2 The basic syntactic structure

Schematically, the Hungarian sentence can be divided into two fields: the *topic* and the *comment*, and the comment can be further divided into four subfields: the

*I would like to express my gratitude to András Komlósy, Jean-Marie Marandin and Mary Dalrymple, whose comments and suggestions were invaluable in the completion of the present study. Many thanks go to the anonymous reviewers as well. The errors and inconsistencies remain my own.

pre-comment, the *prominent preverbal position*, the *finite verb*, and the *postverbal part*. This is illustrated in Figure 1:[1]

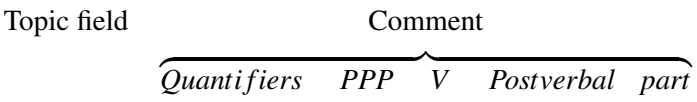


Figure 1: *The schematic representation of the Hungarian sentence*

Although the names (topic, comment, prominent preverbal position, etc.) are of semantic/pragmatic nature, there are also syntactic (distributional) and prosodic arguments for this division of the Hungarian sentence into these fields and subfields. However, they reflect the assumption that the structure of the Hungarian sentence does not encode grammatical functions, like in configurational languages, but the way the sentence and its parts relate to the discourse in which the sentence is uttered. This section is based on Kiefer (1992), Kálmán (2001) and É. Kiss (2002).

2.1 Distribution

Concerning the distribution of the elements in these fields and positions, we can observe that some positions can be freely filled by elements, whereas others are more restricted. The topic field is usually reserved for definite or specific indefinite noun phrases, referential (time and place) adverbials (individualizable elements), whose order is free in the topic field. However, the rightmost position of certain sentence adverbials, like *tegnap* (yesterday), *idén* (this year) indicates the right frontier of the topic field itself as well. These adverbials are interpreted as sentence adverbials in the topic field (1), but as referring only to the immediately following constituent in the comment (2).[2]

(1) *A 'vonaton 'tegnap sok 'gyerek 'utazott.*
the train.SUPERESS yesterday a lot of child travel.PST
'Yesterday, there was a lot of children travelling on the train.'

(2) *A vonaton ''tegnap utazott sok gyerek.*
the train.SUPERESS yesterday travel.PST a lot of child
'It was yesterday that a lot of children were travelling on the train.'

[1] Note that 1 is a schematic, topological representation, and not a syntactic structure proposed in a particular framework.

[2] ' indicates a main stress, '' a so-called eradicating stress.

However, even a larger set of elements can appear in the topic field, such as infinitives, adjectives, bare nouns, quantifiers, verbal modifiers, and adverbs (other than the ones mentioned above), provided that they carry a certain type of pitch accent (often referred to as *eradicating stress* in the literature), which can only be followed by another eradicating stress, otherwise the rest of the sentence is deaccented, or all other main stresses are reduced. The eradicating stress in the topic field is usually followed by another one, possibly in the precomment, but typically in the *prominent preverbal position*. This topic type is called *contrastive topic* in the literature.

In the precomment part, we find the various distributive quantifiers that follow a given order. Kálmán (2001) classifies them based on their order into the *IS (also)-group*, the *MINDEN (all)-field* and the *SOK (a lot)-position*.

The prominent preverbal position (henceforth PPP), which is between the precomment and the finite verb, can also be occupied by a wide range of elements. Some of them appear in the PPP in level-prosody sentences and can receive an eradicating stress *in situ*. However, they must follow the verb if there is another element that carries an eradicating stress. The explanation is that only one of them can precede the verb, thus when there is more than one potential element that can occupy the PPP in a sentence, the others appear in postverbal positions (except for some questions in which there is also a focused constituent).

Kálmán (2001) refers to these elements as *verb carriers*, referring to the fact that the element in that position always bears main stress and the verb following it is destressed and cliticizes on the preverbal element. Let us now enumerate the possible elements in that position (based on Kálmán (2001)):

- Verbal Modifiers (VM)

  Verbal modifiers include verbal particles, bare nominal complements and secondary predicates. Verbal particles (3)–(4) can have an adverbial or a lexicalised aspectual meaning. When there is no other potential verb carrier, they precede the verb, otherwise they follow it:[3]

  (3) *'János '**ki**olvasta a 'könyvet.*
  John VM.read.PST the book.ACC
  'John finished the book.'

  (4) *'János ''egy hét alatt olvasta **ki** a könyvet.*
  John one week under read.PST VM the book.ACC
  'John finished the book in one week.'

[3] Verbal particles are written as one word with the noun when they precede it, but as two words when they follow it.

About a classification and analysis of verbal particles, see for instance Surányi (2009) and Laczkó and Rákosi (2011) (in LFG). Another type of verbal modifiers is bare nominal complements, illustrated by the following example:

(5) *'János '**levelet** ír.*
John letter.ACC writes
'John is letter-writing.'

Finally, secondary predicates co-occur with some (other) argument of the verb, about which they state something. They often express a goal (6) or a result (7), and appear in the immediately preverbal position:

(6) *'János '**Szegedre** utazott.*
John Szeged.SUBL travel.PST
'John travelled to Szeged.'

(7) *'János '**pirosra** festette a 'kerítést.*
John red.SUBL paint.PST the fence.ACC
'John has painted the fence red.'

Infinitives often play the role of such secondary predicates and they can also occupy the PPP, for instance when they complement an auxiliary (8), or when they express the oblique goal (or some other) argument of the main verb (9).

(8) *'Mari '**kirándulni** akar.*
Mary to hike wants
'Mary wants to go hiking.'

(9) *'János '**kapálni** indult.*
John to hoe set out.PST
'John set out to go hoeing.'

- The Hocus

The hocus (introduced by Kálmán (1985a,b); Kálmán et al. (1986), and also referred to in Kálmán (2001)) is a noun phrase (and possibly a negative adverb or a monotone decreasing quantifier), expressing some participant or circumstance in the event denoted by the predicate. Such elements/phrases can bear main stress and appear in the prominent preverbal position when the event denoted by the verb is not particularly newsworthy, or it is a regular event, apart from the circumstance or participant denoted by the hocus. In

these cases, the main proposition of the sentence is the identification of this participant or circumstance.

(10) *János 'tegnap **'vonattal** 'utazott 'haza. (NP)*
John yesterday by train travel.PST home
'Yesterday John took the train to go home.'

(11) *'Ma a **'feleségem** 'vitte az 'óvodába a 'gyerekeket. (NP)*
today the wife.POSS.1SG take.PST the kindergarten.ILL the children.ACC
'Today my wife took the children to the kindergarten.'

(12) *'**Kevesen** 'jöttek el a 'bulira.*
few come.PST VM the party.SUBL
(monotone decreasing quantifier)

'Only a few people came to the party.'

(13) *'János '**ritkán** 'megy el 'kirándulni. (negative adverb)*
John seldom goes VM to hike
'John seldom goes hiking.'

Example (10) implies that John usually does not take the train, according to (11) it is usually not his wife, but someone else that takes the children to the kindergarten, in (12) more people were expected to come to the party, and in (15) John goes hiking less often than it would be expected.[4]

In identificational sentences, the subject appears as the hocus, preceding the verb (copula):

(14) *'**János** volt az 'igazgató.*
John was the director.
'John was the director.'

(15) *A 'nyomozó '**a sógorom** volt.*
the inspector the brother-in-law.POSS.1SG was
'My brother-in-law was the inspector.'

[4]Note that contrary to monotone decreasing quantifiers, monotone increasing quantifiers appear in the precomment.

In the mainstream linguistic literature on Hungarian, sentences containing a hocus are rarely discussed, and they are not clearly distinguished from narrow-focus sentences. This is a problem, since the *hocus* clearly differs from focused constituents, both formally and semantically (see below).

- The Focus

  The focused constituent differs from the above mentioned verb carriers in that it bears sharp falling pitch accent, also called *eradicating stress*, referring to the fact that no main stress (only another eradicating stress) can follow it in the rest of the sentence. In Hungarian, the main function of focus is the implication of contrast, *i.e.* it identifies the entities about which the predicate holds and restricts the validity of the predicate to only these entities by excluding the other members of the relevant set. Sentences with focus cannot be uttered *out of the blue*. In most cases, they are answers to questions (16), reactions or corrections (17):[5]

  (16) Answer:

  a. *Q: -**Ki** hívta meg Marit a bulira?*
  who invite.PST VM Mary.ACC the party.SUBL
  'Who invited Mary to the party?'

  b. *A: -''**JÁNOS** hívta meg (Marit a bulira).*
  John invite.PST VM (Mary.ACC the party.SUBL)
  'It was JOHN who invited her (to the party).'

  (17) Correction:

  a. *S1: -Mari tegnap kiolvasta a Háború és békét.*
  Mary yesterday VM.read.PST the War and Peace.ACC
  'Mary finished yesterday *War and Peace*.'

  b. *S2: -Nem, a ''**BŰN ÉS BŰNHŐDÉST** olvasta ki.*
  no, the Crime and Punishment.ACC read.PST VM
  'No, she finished *Crime and Punishment* yesterday.'

  It is important to note that the focus is a semantic, and not a lexically defined category (like verbal modifiers, for instance). This means that elements/constituents of different categories can be focused: verbal modifiers can bear an eradicating stress in their immediately preverbal position *in situ* (19), whereas other elements cannot be focused in their canonical position, but must appear in a preverbal position. This position is the PPP in most cases (and then verbal modifiers must appear postverbally), but even elements in

[5] Capitals indicate the focused constituent, carrying an eradicating stress

the precomment can be focused (for instance, when they follow a contrastive topic in the topic field):

(18) *János "**MEG**ette a levest.*
John VM.ate the soup.ACC
John DID eat the soup.

(19) *János "**LEVELET** ír.*
John letter writes
John is writing a LETTER (and not a diary).

(20) */A csillagok háborúját **MINDENKI** megnézte.*[6]
the star wars.ACC everyone VM.watched
'Star wars was seen by everyone (but the other films were not).'

In (18), the truth value of the sentence is contrasted to the falsity of the sentence and focused, which is referred to as *verum focus* in the literature. In (19), the letter-writing activity is contrasted to other potential writing activities, and in (20), *A csillagok háborúja (Star Wars)* is contrasted to other films, implying that there is at least one other film that was not seen by everyone, only by a certain number of people. Semantically, the universal quantifier is the focus in the sentence, which precedes the PPP (occupied by the verbal modifier *meg*).

Although focus is defined here at the semantico-pragmatic level, we should note that in Hungarian (and in other languages as well), it is also formally highlighted: it appears in salient syntactic positions, and/or carries a pitch accent. The set of salient syntactic positions varies from language to language. In Hungarian, the PPP (16)-(17) and the right periphery (21) of the sentence count as salient with respect to the focus (although, as we have seen, if the focus in a universal quantifier, it has to appear in the precomment (20)).

(21) *A "**LÁNYOK** nyerték meg tegnap a "**KAJAKVERSENYT**,*
the girls won VM yesterday the kayak contest,
*a "**FIÚK** pedig a "**KENUVERSENYT**.*
the boys and the canoe contest
'It was the girls who won the kayak contest yesterday, and the boys who won the canoe contest.'

In (21), the clauses are parallel structures: what is common in them (the verb and the time adverbial) undergoes ellipsis in the second clause, whereas what

[6] / indicates the rising intonation of the contrastive topic

is different is focused. Both clauses contain two foci, one in the PPP, the other on the right periphery.

In order to see the differences between them more clearly, let us now compare the *hocus* and the *focus*. Considering the formal (prosodic) difference, as we have seen, the focus is prosodically distinguished, carrying a sharp pitch accent or eradicating stress (followed by the deaccenting or reduced stress of the post-focal material), whereas the hocus is not more prominent prosodically than the other lexical elements of the sentence (except for the verb which cliticizes on it). Turning now to the semantic difference, consider the following examples (based on Kálmán (2001)):

(22) *ˈEzen a héten a* ***ˈMecsekben***
this.SUPERESS the week.SUPERESS the Mecsek.INESS
raboltak ki egy ˈpénzszállító autót.
rob.PST.3PL VM a money transport car.ACC
'This week it was in the Mecsek (mountains) that a money transport vehicle was robbed.'

(23) *ˈEzen a héten a* ***ˈˈMECSEKBEN***
this.SUPERESS the week.SUPERESS the Mecsek.INESS
raboltak ki egy pénzszállító autót.
rob.PST.3PL VM a money transport car.ACC
'This week it was in the Mecsek (mountains) that a money transport vehicle was robbed.'

A Mecsekben is hocus in (22) and focus in (23). The only formal difference between them is the stress they bear (main stress or eradicating stress). The formal difference also corresponds to semantic differences between the two sentences, which can be illustrated by the different contexts in which they can be used. In the first case, robbing a money transport vehicle counts as a usual event. The hocus identifies the place where the event happened this week. The location counts as non-canonical, unusual and surprising at the same time, either because this happens less often in mountains, or because the Mecsek is not known for such crimes. In (23), robbing a money transport car is not necessarily a usual event. The focus identifies the place where it happened, contrasting it to other locations, where it could have potentially happened, or correcting a previously proposed other location.

The hocus and the focus are thus both identificational elements, but they are compatible with different discourse contexts. In addition to identification, the

focused constituent presupposes that the proposition cannot be true simultaneously with another, in which the focused element is changed to an alternative to its denotation (the robbery cannot take place at two locations at the same time). To illustrate this, consider the possible continuations of (22) and (23):

(24) a. *ˈEzen a héten a* ***ˈMecsekben***
this.SUPERESS the week.SUPERESS the Mecsek.INESS
raboltak ki egy ˈpénzszállító autót.
rob.PST.3PL VM a money transport car.ACC
'This week it was in the Mecsek (mountains) that a money transport vehicle was robbed.'

b. *Nem, nem csak ott. A Bakonyban is kiraboltak*
no not only there the Bakony.INESS too VM.rob.PST.3PL
egyet.
one.ACC
'No, not only there. One was robbed in the Bakony too.'

(25) a. *Ezen a héten a* ***ˈˈMECSEKBEN***
this.SUPERESS the week.SUPERESS the Mecsek.INESS
raboltak ki egy pénzszállító autót.
rob.PST.3PL VM a money transport car
'This week it was in the Mecsek that a money transport vehicle was robbed.'

b. #Nem, nem csak ott. A Bakonyban is kiraboltak egyet.

The main semantic difference between the two is thus the fact that in addition to identification, the focus has an exclusive/exhaustive meaning that the hocus lacks.

- Question words

Finally, question words typically in the immediately preverbal position as well. In the presence of a question word not only verbal modifiers (26) and other verb carriers, but elements of the precomment (27) also occupy postverbal positions:

(26) ***Kit*** *hívott meg János a bulira?*
who.ACC invite.PST VM János the party.SUBL
'Who did John invite to the party?'

(27) ***Kire*** *szavazott mindenki?*
who.SUBL vote.PST everybody
'Who did everybody vote for?'

To sum up, the verbal modifiers in (3)–(9) are in complementary distribution with each other, *i.e.* a verb cannot appear simultaneously with a verbal particle and a secondary predicate, even if one of those followed the verb. They can all receive an eradicating stress *in situ*, in the PPP. However, in the presence of the elements in (10)-(27), they have to follow the verb.

2.2 The role of discourse structure

Considering the diversity of elements that can occupy the prominent preverbal position, how are their common properties to be determined? Should all these elements be assigned to the very same position? As we have already seen in the case of secondary predicates, these elements contribute to the meaning of the sentence with a secondary/independent proposition that can sometimes modify the proposition formulated by the comment. According to É. Kiss (2006), not only verbal modifiers can be considered as resultative, locative or terminative secondary predicates, but structural focus can be reanalyzed as a *specificational predicate* (similarly to English cleft sentences) as well. Komlósy (1994) also showed that preverbal bare nominals function as predicates that predicate of an existentially bound variable incorporated into the verb. In this paper I argue that apart from the common grammatical function (secondary predicates), the common properties of some of the elements in the PPP are related to the information structure and to the discourse the sentence is uttered in.

To see this last point more clearly, an important remark is due here. Some of the above mentioned elements can never appear in the same sentence, since the discourse types they can be part of are different. In Hungarian, based on formal, interpretational and discourse factors, two types of sentences can be distinguished: *"neutral"* (sometimes referred to as all-focus[7]) and *"non-neutral"* (narrow-focus) sentences (see Kálmán 1985a,b). Formally, non-neutral sentences contain an eradicating stress (28) in the PPP (and possibly also in the topic field), whereas neutral sentences have level-prosody and can contain several main stresses (29):

(28) *'Tegnap "**MARIT** láttam a városban, (nem **JÁNOST**).*
yesterday Mary.ACC see.PST.1SG the city.INESS (not John)
'Yesterday I saw MARY in the city, not JOHN.'

(29) *'János 'tegnap 'vonattal utazott 'haza. = (1)*
John yesterday train.INSTR travel.PST home
'Yesterday John took the train to go home.'

[7]These sentences cannot be analyzed as *all-focus* in Hungarian, although they are answers to questions such as *What happened?*, since they can contain topics.

The two types of sentences are used in different contexts. Neutral sentences, present mostly in narrative contexts, only convey information (answering questions of the type *What happened?*) and/or continue the narrative, whereas non-neutral sentences are used for asking questions, answering questions, corrections and confirmations, disagreement, and for highlighting parallels. If we analyze the discourse as the hierarchy of topics and subtopics (Roberts 1996; Büring 1997) (or, a question under discussion, subquestions and the possible answers), we can see that both sentence types contain two prominent preverbal parts (the topic field and the PPP), and a set of (in the sense of Jacobs 1984) prominent element types that can fill these positions. Elements in the topic field relate to the discourse in a way that they thematize it by selecting the subtopic/subquestion with respect to which the given sentence adds new information to the common ground. On the other hand, elements appearing in the PPP (or possibly in the precomment), constitute the most informative, prominent part of the sentence. In some cases, this can be new information, or the part that answers a question, or the unexpected or unusual part of the meaning (as we have seen in the case of the *hocus*).

Concerning the topic field, the elements occurring there have different properties in non-neutral and neutral sentences. I distinguish between two types of topics: *thematic shifters* and *contrastive topics*. It is common in the two cases that they introduce subtopics/subquestions. In a neutral context, there is no topic in the sentence if the sentence continues the previous subtopic. However, when a sentence changes the subtopic, the element in the linearly first position indicates the topic shift. This is why this type of topic is often called *thematic shifter*. In the following examples the subtopic is not changed in the second sentence with respect to the subtopic of the discourse topic introduced in the first. This is why the repetition of the subject even with a subject pronoun is pragmatically anomalous, unless the pronoun is interpreted contrastively (based on Erteschik-Shir 2007).

(30) *János szeret olvasni. (#Ő) Intelligens, szorgalmas és sokra*
János likes to read (he) intelligent, hard-working and much.SUBL
fogja vinni.
will reach
'John likes reading, he is intelligent, hard-working and he will achieve a lot.'

(31) *Van egy új lány az osztályban, akit nagyon szeret a tanár. (#Ő)*
is a new girl the class.INESS, whom very likes the teacher (she)
Mindenre tudott válaszolni, amit a tanár kérdezett.
all.SUBL could answer, that the teacher ask.PST
'There is a new girl in the class, whom the teacher likes very much. She could answer all the questions the teacher asked.'

On the other hand, subjects which are the thematic shifters have to be present in the following example, since the subtopic is changed in each clause.

(32) *Mesélek neked a barátaimról, Jánosról, Paliról*
tell.PRS.1SG you.DAT the friends.POSS1SG.DEL, John.DEL, Paul.DEL
és Mariról. János egy régi iskolai barátom, Palit a
and Mary.DEL. John an old school friend.POSS.1SG, Paul.ACC the
főiskoláról ismerem, Marival pedig együtt dolgozom.
college.DEL know.1SG, Mary.INSTR and together work.PRS.1SG
'I'll tell you about my friends, John, Paul and Mary. John is an old friend of mine from school, Paul, I know him from college, and Mary and I work together.'

The other type of topic, which appears only in non-neutral sentences, (indicated prosodically with eradicating stress and a rising tone) is closely related to the contrastive property of these sentences and is called *contrastive topic* in the literature. The contrastive topic restricts the domain of the validity of the focused constituent to some element of a set, implying that the focused constituent does not hold to other elements of the relevant set (see also example (20)):

(33) a. *Q: -Mit hoztak a vendégek a bulira?*
what bring.PST the guests the party.SUBL
'What did the guests bring to the party?'
b. *A: -/**Mari CSOKITORTÁT** hozott.*
Mary chocolate cake bring.PST
'As for Mary, she brought a chocolate cake.'

According to Büring (2003), in the example (33b) the contrastive topic (Mari), indicates *the strategy* of answering a question: the decomposition of the set of guests into its elements, the individual guests, and associates each of them with an answer (*i.e.* a focused constituent). This association means at the same time that as opposed to *Mary*, there is at least someone else who did not bring a chocolate cake. In this respect, the two topic types have a similar function: they decompose the main question into subquestions, relating the sentence to the discourse in which in is uttered. Although *contrastive topics* appear only in non-neutral sentences, *thematic shifters* are not restricted to neutral sentences. When contrastive topics co-occur with thematic shifters, the sentence is linked both to a more general discourse topic and to a more restricted one:

(34) *[$_T$János] [$_{CT}$a levest] $_F$megette(, de a [$_{CT}$húst] [$_F$nem]).*
John the soup.ACC VM.eat.PST but the meat.ACC not
'As for the soup, John did eat it (, but he did not eat the meat).'

(Gyuris 2002: p. 23, 15)

In (34), the thematic shifter is *János*. The sentence contains a contrastive topic (*a levest*), which is implicitly or explicitly contrasted to *a húst*. In the two parallel clauses, the focus values are also different, since different contrastive topic values have to be mapped on different focus values (Gyuris 2009). The different focus values are verum and falsum foci, respectively.

Concerning the PPP, the elements appearing there in neutral sentences are the hocus and verbal modifiers, whereas non-neutral sentences contain a focused constituent in this position (or possibly in the precomment).

The two types of sentences are schematically represented below. The square brackets indicate the two main parts of the sentence (the topic, as we mentioned above, is not obligatory, and sentences can even start with the finite verb when there is no quantifier or focus). The round brackets indicate that the position of ordinary topics with respect to the contrastive topic is optional.

(35) Neutral sentence
[THEMATIC SHIFTER] [COMMENT: precomment, hocus/verbal modifiers, finite verb, other constituents]

(36) Non-neutral sentence
[(THEMATIC SHIFTER), CONTRASTIVE TOPIC, (THEMATIC SHIFTER)] [COMMENT: precomment, focus in PPP/ focused verbal modifiers, finite verb, (verbal modifier), other constituents]

3 The LFG approach

LFG is a non-transformational framework that (according to most analyses) contains no traces or empty categories (however, see Bresnan (1995) for an alternative view). It consists of parallel levels of representation that are interrelated via correspondence functions. A detailed description of the LFG framework can be found in Bresnan (2001); Dalrymple (2001); Falk (2001) and Komlósy (2001) (in Hungarian). The level of syntax is represented in two structures: c(onstituent)-structure, which is a tree diagram, based on flexible X-bar principles (no binary-branching constraint, constituents can be exocentric) representing dominance and linear precedence relations; and f(unctional)-structure, a feature matrix encoding grammatical functions

and predicate-argument relations. Since the beginning of research in the LFG framework, many other levels of representation have been proposed that encode other aspects: *argument structure*, *prosodic structure*, *semantic structure*, *morphological structure* and *information structure*. In the present analysis, the constituent-, and the information structure will play an important role, but we will make references to the prosodic structure as well.

3.1 Information structure

In earlier versions of the LFG framework, discourse functions were integrated into the functional structure, via functional uncertainty (one syntactic unit was associated with two functions at the same time, for instance *topic* and *subject*). The projection of the information structure as a separate level of representation was motivated by the following problems.

First of all, King (1997) argued that encoding discourse functions in the f-structure leads to circularity, in case it is only the verb, without its arguments, that is focused. Let us look at the following Russian example:

(37) *Ona PROČITALA knigu.*
she read.PST book
She READ the book.

(King 1997: p. 5, 9)

The f-structure corresponding to (37) is illustrated in Figure (2).

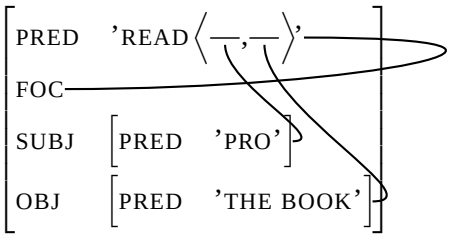


Figure 2: *F-structure: Ona pročitala knigu.*

As can be seen in this structure, it is impossible to focus the predicate without its arguments. This is why King (1997) proposed an independent level of representation encoding discourse functions with their bare predicate value (without their arguments).

Another reason why a separate level of information structure is necessary is that syntactic constituents do not correspond systematically to constituents of information structure:

(38) a. Q: -What happened to the dishes?
b. A: -JOHN WASHED them.

(Erteschik-Shir 2007: 1, 2b)

(39) It was the RED shirt that John wore at the party.

In (38), the focus (the answer to the question) is *John washed*, which does not constitute a syntactic constituent. (39), the focus is the colour *red*, but syntactically the whole constituent (*the red shirt*) is clefted (focused). The semantic-syntactic difference can be captured if clefting and focusing (*RED*) are represented at different levels.

Butt and King (1996) propose that the information structure consists of 4 sets, which are defined by the combination of two features: *new +/-* and *prominent +/-*. The *TOPIC* set contains elements that are prominent, but not new, the *FOCUS* set contains new and prominent elements, whereas old and not prominent elements belong to *BACKGROUND* and new but not prominent ones to *COMPLETIVE INFORMATION*[8]:

	Topic	Focus	Background Information	Completive Information
New	−	+	−	+
Prominent	+	+	−	−

Figure 3: *I-Structure units (Butt and King 1996)*

3.2 I-structure: an alternative analysis

The architecture of the information structure, as proposed by Butt and King (1996), King (1997) and Choi (1999), contains *topic* and *focus* as i-structure primitives. There are a number of problems with this architecture, which are enumerated in this section. Then an alternative architecture is proposed, which is not fundamentally

[8]The authors observe that there are discourse-new constituent in Hindi-Urdu, which do not constitute the answer to the question (they are not focused), but they are not part of background information either, which is obligatorily postverbal in the language. In the information structure, such constituents are referred to as *completive information*.

different from the one presented above, but it could capture the problematic facts more adequately. The main problem concerns the fact that the set of elements with different discourse, semantic and prosodic properties is larger than the above architecture could accommodate without simplifying these properties. Let us now enumerate a list of these elements, introduced in the previous section:

- Thematic shifters:

  This type of topic was defined as the element that links the sentence to the discourse, by introducing a new subtopic of the discourse topic. In Hungarian, a thematic shifter is present in the sentence only if it does not continue the previous subtopic. As we have seen, not all sentences contain a thematic shifter (for instance, those that contain the previous subtopic of the discourse topic).

- Focus:

  The focus is the semantically (and also prosodically and syntactically) prominent part of answers to questions, corrections, contrastive and parallel structures. There are sentences without a (semantically/prosodically) focused constituent, for instance in narrative contexts. In Hungarian, neutral sentences exhibit level prosody, where no element stands out carrying a pitch accent. The preverbal position is occupied by verbal modifiers or such lexical elements that form a prosodic and lexical unit with the verb (the verb cliticizes on them).

  Since the focus appears only in non-neutral sentences, this part of the information structure cannot be called *focus* in every sentence. In questions, this element is the question word itself, in answers and corrections the focus (itself an NP, a quantifier or a verbal modifier), and in neutral sentences the hocus or a verbal modifier. Our task is then, either to propose a different architecture of information structure for neutral and non-neutral sentences, or, to propose a general and more abstract structure that can be filled in different ways by the different sentence types, taking into consideration the context as well. This paper is an attempt to propose such a general architecture.

- Contrastive Topic:

  Contrastive topics are similar to foci in that they do not appear in *out of the blue* utterances. Both Büring (2003)'s and Gyuris (2009)'s model express that contrastive topics carry the presupposition that there is a focus value (different from and not entailed by that of the sentence) associated with an alternative to the denotation of the contrastive topic. This explains the fact that contrastive

topics always co-occur with a focused constituent. Contrastive topics appear in answers to subquestions of the main question, linking the partial answers to the discourse topic (modeled as the Question under discussion).

- Hocus:

  The hocus is an argument or adjunct appearing in the preverbal position in neutral sentences in Hungarian. It lacks the pitch accent and the contrastive-exclusive reading of focused constituents in non-neutral sentences. It follows from the facts presented above that the hocus is not a subtype of focus, and thus it would be difficult to integrate it into Butt and King (1996)'s model of information structure.

- Question words:

  Question words are often argued to constitute a subclass of focus, based on similarities in prosody, syntactic position, semantics and, in some languages, morphology. Despite the apparent similarities, it would be too hasty a generalization to collapse question words into foci in Hungarian. Let us examine if there is conclusive evidence to claim that question words are obligatorily focused.

  – Syntax
    It has been observed that question words and focused constituents often occupy the same syntactic position in various languages. This seems certainly the case in Hungarian, since it is commonly accepted that the preverbal position is a focus-position in Hungarian. Nevertheless, most analyses dealing with the syntax of Hungarian ignore the fact that it is not an exclusive focus position (it can host the hocus, question words, negative adverbs and monotone decreasing quantifiers, and, depending on the syntactic structure adopted, verbal modifiers), and focused constituents can appear in different positions in the structure as well (on the right periphery, or preverbally, preceding immediately preverbal question words). In addition, the cumulation of question words is possible in the preverbal domain in Hungarian, whereas in the case of foci it is strictly forbidden:[9]

    (40) ***Ki kivel*** *ment moziba?*
    who who.INSTR go.PST cinema.ILL
    'Who went to the cinema with whom?'

[9]Nevertheless, it is often assumed that only the immediately preverbal question word is focused, the other has also been analyzed as a universal quantifier (É. Kiss 1992), or even as a type of topic (Gazdik 2010).

(41) ****JÁNOS*** *(és)* ***TEGNAP*** *ment moziba.*
John and yesterday go.PST cinema.ILL
Intended: 'It was John who went to the cinema and it was yesterday that he went there.'

– Prosody

As far as prosody is concerned, in a Hungarian multiple question like (46), only the immediately preverbal question word has the same prosody (pitch accent) as the focus in the same position (Mycock 2006). Non-sequence-final question words are pronounced at a higher tone, different from the sequence-final one. This makes them similar to the intonation pattern of thematic shifters and not to foci.

– Semantics

The common formal properties of foci and question words are reflected in their semantics as well. According to Rooth (1992), both define a set of alternatives (that are subject to certain restrictions in the case of a congruent question-answer pair). Nevertheless, this does not prove that interrogative words are a subclass of focus. Eckardt (2007) observes that some question words can be focused (in their metalinguistic use):

(42) *(Azt kérdeztem, hogy) "****MIVEL*** *ment, (nem azt, hogy "****HOVA****).*
(that asked, that) what.INSTR went.PST.3SG, (not that, that where)
'I asked HOW he went there, and not WHERE he went.'

In addition, if we considered *wh*-words as a subclass of focus, we could not distinguish (semantically) multiple questions, and single questions containing a focused element:

(43) ***JÁNOS*** *mit evett?*
John what eat
'What did JOHN eat?'

(44) ***Ki mit*** *evett?*
who what eat
'Who ate what?'

Another problem is the treatment of polar questions. If question words are supposed to be focused, what would be the focus in polar interrogatives, like in the following example:

(45) *Megetted a levest?*
eat.PST.2SG the soup.ACC
Have you finished the soup?

Approaching from the pragmatic side, it is also unclear how question words can introduce new information (which was supposed to be the role of focus in certain approaches). Erteschik-Shir (1986) mentions this problem as well:

"[w]hy is it then that some linguists believe that wh-phrases do function as focus or new information? The main reason seems to be a confusion between the function of the wh-phrase in the question and the function of the constituent which replaces it in the answer." (p. 119)

- Completive information: see above

To sum up, the representation of all the variety of different elements enumerated above in an information structure, which explicitly contains three of them as its primitives (topic, focus and completive information) seems to be a difficult task. Contrastive topics are different from thematic shifters, question words are different from foci, although they share some properties.

There are three possible ways to solve this problem. Firstly, we can employ Butt and King (1996)'s labels (TOPIC, FOCUS, BACKGROUND INFORMATION, COMPLETIVE INFORMATION), with a loose semantic interpretation. Belonging to the topic set, in this case, would mean that an element links the sentence to a discourse topic by introducing a subtopic (which can mean the answer to a subquestion), covering both thematic shifters and contrastive topics. Belonging to the focus set would mean that the element is the highlighted and distinguished constituent of the sentence, covering foci, question words and the hocus. The interpretation of completive and background information is, in this respect, less problematic. The exact difference between the different types of elements (question words - foci, contrastive topic - thematic shifter) would follow from two things: from the semantic description of the individual elements included in the i-structure, and from the role the sentence plays in the discourse (question-answer pair, correction, narration, etc.). This means, for instance, that the element in the focus set would have a different semantic content depending on the role of the sentence in the

discourse structure, *i.e.* if it is a question, or an answer. However, why should the sets in the i-structure have exactly these labels (which prove to be only labels), if the semantic content of the elements in them can be different?

A second solution (László Kálmán, p.c.) would suppose that there is no general i-structure that would suit all sentence types. This means that the i-structure has many different architectures, depending on the discourse-context and the particular sentence. One would be {CONTRASTIVE TOPIC, FOCUS, BACKGROUND INFORMATION}, others would include {THEMATIC SHIFTER, HOCUS, BACKGROUND INFORMATION}, {QUESTION, BACKGROUND INFORMATION}, etc. Although this is a viable option, in this paper I opt for a third type of analysis. The main reason for this choice is the observation that the different discourse functions do share some important common properties (such as linking the sentence to the discourse topic, or representing the most informative part of the sentence, etc.), and these generalizations would be lost int he case of the separate i-structures posited for the individual sentences.

The third solution would emphasize these common properties of the different discourse functions. Thus a set would include elements based on a common property, without claiming that these elements must be semantically and discourse-wise identical. The exact semantic and discourse properties would follow, as said above, from the meaning constructors of the individual elements and the discourse structure the sentence appears in. In what follows, I present the proposed i-structure architecture. It keeps some aspects of Choi (1997)'s features, but also deviates from it in others.

First of all, we have seen that certain elements are semantically prominent and formally (syntactically or prosodically) highlighted. These elements will be referred to as +PROMINENT, and the others as −PROMINENT. Semantic prominence, as shown above, cannot be equated with focusing. For instance, the prominent part of questions is the question word, which is not analyzed here as a subtype of focus. Nevertheless, questions can contain foci. Semantic prominence can be defined (based on Jacobs (1984)) with respect to the illocutionary operator associated with the given utterance. Each utterance type (*assertion, question, command*, etc.) is associated with an illocutionary operator: ASSERT, QUEST COMMAND, respectively. Prominent elements are the ones specially affected by the illocutionary operator. These elements are different in reactive (focus, contrastive topic) and out of the blue sentences (thematic shifter, hocus, question words), but constitute the prominent set at i-structure. This distinction defines two sets in the i-structure. Furthermore, we have seen that among prominent elements we find such that link the sentence to the discourse (by introducing a subtopic of the discourse topic or reshaping the discourse topic), and others which do not. The first set is called D-LINKED, and the second ¬D-LINKED. This way, the focus is not necessarily supposed to represent new information (the focus does not always introduce new information in the sense of introducing a new discourse referent). The the -PROMINENT set can also be

divided into a D-LINKED and a ¬D-LINKED subset, the first corresponding to background, the second to completive information. The proposed architecture hosts the above mentioned elements as shown in Figure (4).

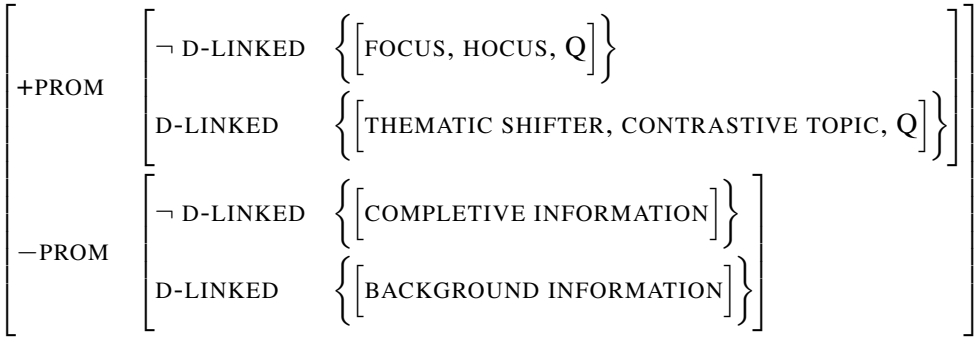


Figure 4: *Proposed i-structure*

Note that question words (Q) are represented in two subsets at the level of information structure. As shown in example (46), not all question words behave the same way in a multiple question. In Hungarian, the linearly first question word is often argued to be *D-linked*, i.e. to refer to a contextually determined set of entities (see Pesetsky (1987); Comorovski (1996)). Such question words determine the structure of the answer, since it is with respect to these question words that answers are expected, based on the linearly last question word:

(46) a. *Q:* ***Ki kivel*** *ment moziba?*
who who.INSTR go.PST cinema.ILL
'Who went to the cinema with whom?'

b. *A: János* ***MARIVAL,*** *Péter* ***ZSUZSÁVAL*** *és Zoli* ***JULIVAL***
John Mary.INSTR Peter Sue.INSTR and Zoli Julie.INSTR
ment moziba.
went cinema.ILL
'John went to the cinema with Mary, Peter with Sue, and Zoli with Julie.'

At the level of i-structure, thus, D-linked and non-D-linked question words are represented in two different subsets.

3.3 Constituent structure

In LFG, constituent structure corresponds to a flexible X-bar theory representation, in which no node, not even the head is obligatory, and exocentric constituents are permitted (there is no binary-branching constraint). The question is, what kind of c-structure should be associated with Hungarian. To my knowledge, there has been two proposals in the LFG literature for the c-structure in Hungarian, but they concentrated mostly on the problem of the preverbal position and the elements it can host: focus and question words.

In the first analysis (Börjars et al. 1999), the immediately preverbal constituent is sister to the verb in an extended verbal projection, which is supposed to host also all the elements of the preverbal domain (topics and quantifiers). The discourse functions are associated with syntactic positions via functional annotations. This analysis does away with the set of functional projections (TopP, CTopP, DistP/QP) of the derivational analyses, whose head position is usually empty, since they are only postulated for accommodating one type of element in their specifier position. FocP is an exception to this, since the verb is supposed to move into its head position, leaving behind the verbal modifier. However, according to Börjars et al. (1999), even a FocP is superfluous in a theory in which no Foc feature is supposed to be assigned or checked. The authors assume OT-type constraints as well, which account for word-order and the immediately preverbal position of the focus. The second analysis to be mentioned here is that of Mycock (2006), who assumes that the focus and the question words are in Spec,VP, thus obligatorily sister to the verb.[10]

According to Dalrymple (2001), functional categories vary from language to language, and each of them has to be motivated for each language. According to this, the I head position can be occupied by a finite verb or an auxiliary, like the C position (in inversion contexts). Thus King (1995) assumes that in Russian, only non-finite verbs reside in the VP, finite verbs occupy the I position, the topic and the contrastive focus the Spec,IP and interrogative words the Spec,CP position. Dalrymple (2001) also mentions that positing a VP projection is motivated only if it contains only the verb and its complements (except for the subject) and these constituents can appear together at other parts of the sentence as well. On the other hand, if the subject can appear as sister to the V, the VP projection is unmotivated. Now, the syntactic structure of non-configurational languages is represented with the help of the non-configurational S node, which does not necessarily contain a CP or an IP projection. It is also possible that one part of the sentence is hierarchical and

[10]Laczkó and Rákosi (2011) also assume a VP projection in Hungarian, in which the verbal modifiers occupy the specifier position.

the other exhibits a free word order, flat structure, in which case the tree diagram contains both CP/IP and S nodes. Such languages are Warlpiri and Welsh.

These considerations about the VP undermine Mycock (2006)'s (and Laczkó and Rákosi 2011's 2011) c-structure, since in Hungarian, the subject can be postverbal, appearing as sister to the verb, between the verb and the direct object:

(47) *Marinak adta oda János a könyvet.*
Mary.DAT give.PST VM John the book.ACC
'John gave the book to MARY.'

Moreover, Mycock assumes that two question words (interrogative foci in her analysis) can jointly occupy the Spec,VP position, which is (presumably) not possible in the case of non-interrogative foci. (Mycock posits a distinction between interrogative and non-interrogative foci based on the Hungarian data, in order to account for the very same data). On the other hand, Börjars et al. (1999)'s architecture does not deal with the postverbal section in details, and neither of the analyses account for the fact that only one focus can precede the verb. Since neither of the structures proposed so far can account for all the necessary data, a new structure is proposed in this section, which aims to capture these data and to correspond to the above mentioned LFG assumptions better than the previous ones.

In Hungarian, as we have seen, the preverbal and postverbal parts of the sentence differ in that in the preverbal section, the position and the order of the elements depend on their role in the information structure. This can be directly represented in LFG via the functional annotations. The question is now, if a hierarchical preverbal section is motivated even in the LFG framework. In the transformational frameworks, two factors motivated the hierarchical preverbal structure: the obligatory binary branching in the tree diagrams and the fact that the linear order of the elements determines their relative scope as well. As opposed to this, the postverbal part of the sentence exhibits free word-order (obeying, supposedly, certain phonological factors, such as heavy elements tend to follow lighter ones). According to András Komlósy (p.c.), in LFG, neither of these factors necessitate a hierarchical structure, since the linear order of elements can in itself reflect the scopal relations, thus there is no reason for positing a hierarchical sentence structure in Hungarian. As was pointed out above, a VP projection is not motivated. The question is now how to accommodate the PPP and the elements immediately preceding the verb into the structure. One option is to assume one PPP, which accounts for the complementary distribution of the hocus, the focus, question words and verbal modifiers. The other way is to assume two positions, the PPP for the focus, the hocus and question words, and another for verbal modifiers, which would account for the prosodic and lexical unit of verbal modifiers and the verb (for instance, verbs undergo nominalization

together with verbal modifiers). In this case, the verbal modifier and the verb constitute a complex predicate under the V' node. However, this necessitates the introduction of additional rules that exclude the co-occurrence of the PPP and the V' projection. In this paper I opt for the second possibility, keeping in mind, that the first cannot be excluded, either.

In the LFG c-structure, annotations under the nodes indicate the grammatical and discourse functions. The annotations including grammatical functions (GF) relate to the f-structure, whereas those containing discourse information relate to the i-structure. With the annotations, thus, we can express and formalize the observation that the preverbal part of the Hungarian sentence is determined by the information structure.

Based on the above observations, Hungarian sentences can exhibit two basic syntactic structures: one of them contains a PPP (Figure 5), but no VM position (and consequently no V'), whereas the other contains a PPP, followed by a verb (Figure 6):

S	→	XP*	XP*	
		$\uparrow_\sigma \in (\uparrow_{\sigma\iota}$+PROM \$ D-LINKED)	$\forall$	
		XP (= PPP)	V	XP*
		$\uparrow_\sigma \in (\uparrow_{\sigma\iota}$+PROM \$ ¬D-LINKED)	$\uparrow=\downarrow$	$(\uparrow$ GF$)=\downarrow$

Figure 5: *PPP rule*

S	→	XP*	XP*	V'	XP*
		$\uparrow_\sigma \in (\uparrow_{\sigma\iota}$+PROM \$ D-LINKED)	$\forall$	$\uparrow=\downarrow$	$(\uparrow$ GF$)=\downarrow$
V'	→	VM	V		
		$(\uparrow_\sigma \in (\uparrow_{\sigma\iota}$+PROM \$ ¬D-LINKED$))$	$\uparrow=\downarrow$		

Figure 6: *VM rule*

Both neutral and non-neutral sentences can exhibit both of the above structures. In neutral sentences the PPP can be filled by the hocus (+PROM and ¬D-LINKED element), and then the VM is obligatorily absent from the sentence. In the other case, the VM position is filled and the PPP is absent. In non-neutral sentences, either the PPP or the VM position is filled by a +PROM and ¬D-LINKED element. The bracketed annotations under the VM node in 6 indicate that verbal modifiers do not have to be +PROM and ¬D-LINKED: this characterizes only focused verbal

modifiers in non-neutral sentences, and certainly not verbal modifiers in neutral sentences.

This is schematically illustrated in Figure 7.

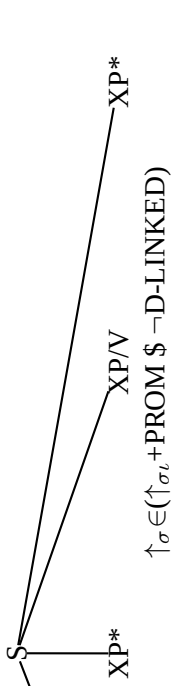
A few remarks are due here concerning this structure:

- The annotation $\uparrow_{\sigma} \in (\uparrow_{\sigma\iota}$+PROM) refers to the language-specific fact that in Hungarian the left peripheral and the preverbal positions are prominent. This has to be indicated, since most semantically prominent elements are also syntactically highlighted in Hungarian, which means that they are placed into one of these positions. The set of prominent positions is constant in a given language. The D-LINKED/¬D-LINKED parts refer to the respective subparts of the +PROM and −PROM parts in the information structure. D-LINKED elements are usually placed on the left periphery, whereas ¬D-LINKED ones in the prominent preverbal position.

- Although we have seen above that postverbal foci are also possible (21), there are only annotations referring to the f-structure in the postverbal part. As we have seen, those elements can fill any grammatical function (even that of the subject). The i-structure annotations of postverbal prominent elements are not indicated, since they are prosodically, and not syntactically highlighted (for a detailed description of prosodic representations and prosodic highlighting, see Mycock (2006)). This means that the information about their prominent status comes from the prosodic and not from the syntactic structure. Such elements are not limited to right peripheral foci, but include contrastive topics, completive information and some question words as well. The representation of the prosodic structure is beyond the scope of the present paper.

- The annotation $\uparrow_{\sigma\iota}$ needs to be clarified as well. This annotation is proposed by (Dalrymple and Nikolaeva 2011: Chap. 4) and refers to the discourse function and semantic description of an element at the level of i-structure. The authors assume the following LFG architecture:

  As this architecture indicates, the information structure projection is linked to the semantic projection via the mapping function ι. The basic assumption of this framework is that the meaning constructors of all the members of a clause are associated with a discourse function (information structure set), represented in the semantic description of their lexical entry. This way, the meaning constructors are categorized according to their information structure role. The information about the particular i-structure role the meaning



Neutral sentence	thematic shifter(s)	universal quantifiers	hocus	verbal modifiers	other constituents
Non-neutral sentence	thematic shifter(s) contrastive topics question words	universal quantifiers	focus (NP, negative words) question words	focus (VM)	

Figure 7: *Annotated C-structure*

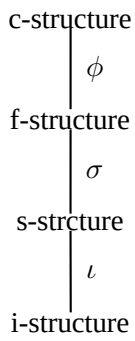


Figure 8: *Dalrymple and Nikolaeva (2011)'s architecture*

constructor takes on can come from various sources: syntactic position (in English, for instance, the Spec,IP is the default *topic* position), agreement, casemarking, word order, intonation, etc.

- According to this, the first block of constituents can be thematic shifters and contrastive topics (or, eventually, non-sequence-final interrogative phrases in multiple questions). They come in a block, since more than one topic is possible in a sentence and they constitute an undividable unit.

- Quantifiers are best assigned to a position via annotations with the help of their lexical properties, *i.e.* that they are, for instance, universal quantifiers ($\forall$). Just like in the case of topics, there can be more than one preverbal quantifier in the sentence.

- An important issue is the right order of the constituents. The order of constituents and their scopal relations are intrinsically encoded in a (more) hierarchical structure, and the question emerges how a flat structure can account for the right order of constituents. The order in the preverbal domain is indicated by the i-structure annotations. Since all positions are optional in the LFG constituent structure, and are present in a given structure only when needed, it is not a problem for the present framework either, if some of the positions is not filled: it will simply not be present. Nevertheless, there are cases, in which some positions must not be filled. For instance, a universal quantifier cannot precede a preverbal question word in a single question (48) or appear between the preverbal question words in a multiple question (49):

(48) a. **Mindenki kire szavazott?*
everybody who. voted

b. *Kire szavazott mindenki?*
who. voted everybody
'Who did everybody vote for?'

(49) a. **Mit mindenki hova rakott?*
what everybody where put?
b. *Mit hova rakott mindenki?*
what where put everybody
'What did everybody put where?'

Such phenomena can be accounted for by individual constraints regulating the relative positions of question words and universal quantifiers, which can only be alluded to in the present paper, due to space limitations.

- Neutral and non-neutral sentences are essentially distinguished by prosody. This means that although thematic shifters and contrastive topics, and the hocus and the focus appear in the same position and belong to the same information structure set, the stress pattern they bear is different. This information is supplied by prosodic structure.

Finally, let us see illustrate the proposed LFG analysis on a neutral and a non-neutral sentence in Hungarian. The first example is a neutral sentence containing a hocus.

(50) *Ma a* ***feleségem*** *vitte az óvodába a gyerekeket.*
today the wife.POSS.1SG take.PST the kindergarten.ILL the children.ACC
'Today my wife took the children to the kindergarten.'

The c-structure is illustrated in Figure (9), whereas the i-structure in Figure (10). The next example illustrates a non-neutral sentence:

(51) *'Ezen a héten a ''****MECSEKBEN*** *raboltak*
this.SUPERESS the week.SUPERESS the Mecsek.INESS rob.PST.3PL
ki egy pénzszállító autót.
VM a money transport car.ACC
'This week it was in the Mecsek (mountains) that a money transport vehicle was robbed.'

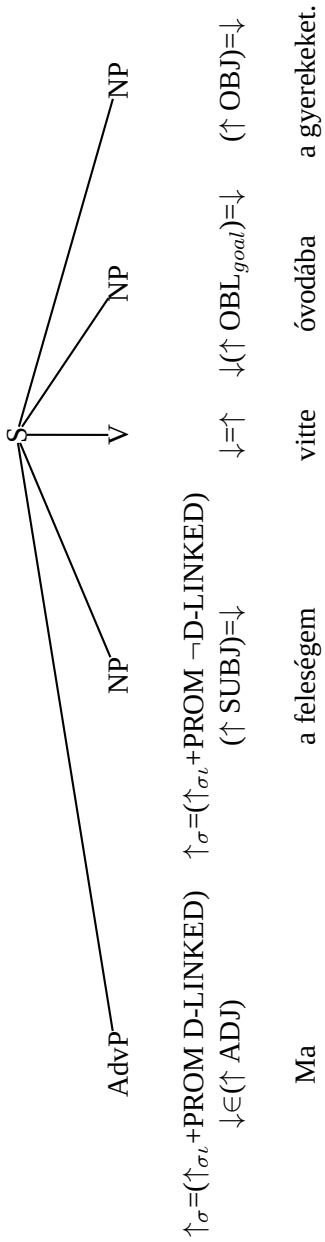


Figure 9: *C-structure*

$$\begin{bmatrix} +\text{PROM} & \begin{bmatrix} \neg\ \text{D-LINKED} & \left\{\left[\text{A FELESÉGEM}\right]\right\} \\ \text{D-LINKED} & \left\{\left[\text{MA}\right]\right\} \end{bmatrix} \\ -\text{PROM} & \begin{bmatrix} \neg\ \text{D-LINKED} & \left\{\left[\right]\right\} \\ \text{D-LINKED} & \left\{\left[\text{`VITTE ÓVODÁBA A GYEREKEKET'}\right]\right\} \end{bmatrix} \end{bmatrix}$$

Figure 10: *I-structure*

$$\begin{bmatrix} +\text{PROM} & \begin{bmatrix} \neg\ \text{D-LINKED} & \left\{\left[\text{A MECSEKBEN}\right]\right\} \\ \text{D-LINKED} & \left\{\left[\text{EZEN A HÉTEN}\right]\right\} \end{bmatrix} \\ -\text{PROM} & \begin{bmatrix} \neg\ \text{D-LINKED} & \left\{\left[\right]\right\} \\ \text{D-LINKED} & \left\{\left[\text{`RABOLTAK KI EGY PÉNZSZÁLLÍTÓ AUTÓT'}\right]\right\} \end{bmatrix} \end{bmatrix}$$

Figure 11: *I-structure*

4 Conclusion

This paper proposed a possible LFG representation of the syntax-discourse interface in Hungarian. After examining the distribution of elements with respect to discourse functions in the various domains of the Hungarian sentence (topic field, precomment, PPP, verb, postverbal field), I concluded that the set of possible elements/constituents appearing in these fields/positions is to varying degrees reflects the discourse the sentence is uttered in. The basic difference was identified between neutral and non-neutral sentences: the former is typical in narrations, whereas the latter in question-answer pairs, corrections, contrast, and parallel structures. I proposed a discourse-neutral, flat syntactic structure, in which the preverbal positions are associated with information structure roles. After considering the i-structure of the mainstream LFG analyses, which contains *TOPIC, FOCUS, BACKGROUND*

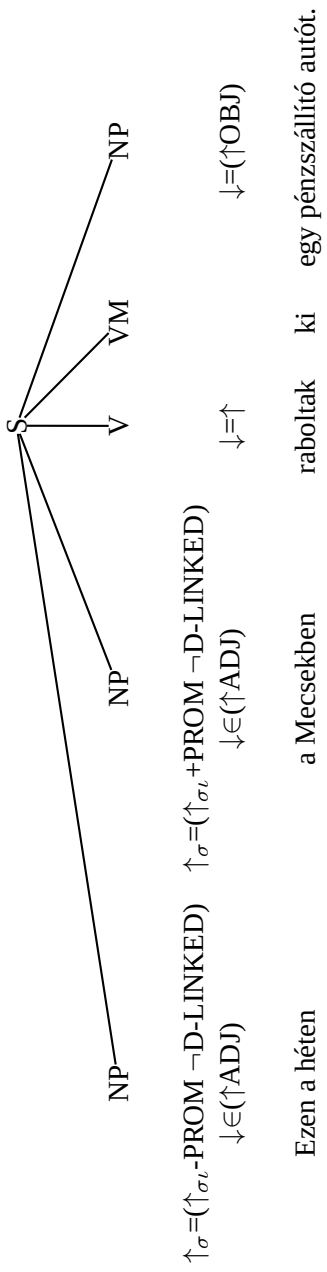


Figure 12: *C-structure*

INFORMATION and *COMPLETIVE INFORMATION* as its basic sets/primitives, I argued for an alternative one, which does not contain some of the discourse roles to account for (*thematic shifter, contrastive topic, hocus, focus, question words, background information, completive information*) as its primitives, but builds on their common properties, *i.e.* on the fact that some of them are (semantically) prominent (and formally highlighted), whereas others are not, and some of them relate the sentence to the discourse by introducing a subtopic of the discourse topic, whereas others do not. These properties are formalized by the i-structure sets: +/−PROMINENT and +/−D-LINKED. Concerning the syntax-discourse interface, it is assumed that the topic field and the PPP are associated with *prominence* in Hungarian, the topic field hosting *D-LINKED*, whereas the PPP ¬*D-LINKED* elements. Needless to say, more details of the proposed analysis, for instance on the syntax-prosody interface, or on a possible discourse structure, have to be elaborated by future research.

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5 The role of granularity in event semantics

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In the past decade, the role of scales in the semantics of gradable adjectives became more pronounced, and an increasingly wider range of phenomena involving vagueness came to be analysed in a scalar semantics. In the present article, I will argue that the adoption of a scalar semantics, and in particular, the introduction of a granularity parameter in event semantics, can be advantageous in the analysis of a number of phenomena. After a review of scalar semantics and the analysis of scalar vagueness by granularity functions, I will briefly describe three issues in event semantics where granularity functions can be expedient: the minimal parts problem of activities, the progressive form of achievements and a pragmatic phenomenon I will call commensurability.

1 Scales and granularity functions

One of the most established analyses of gradable adjectives like *hot* is couched within a scalar approach, wherein a gradable adjective determines a scale and maps entities to degrees on this scale.[1] Thus, *hot* maps entities to the degree of heat they have. Formally, a scale is a linearly ordered set of degrees with a dimension (such as temperature, weight, etc.).

A distinction is made between so called *relative gradable adjectives* (like *large*) and *absolute gradable adjectives* (like *open*), which will be of some importance to us in the discussion of the temporal scale below. In the case of relative gradable adjectives, there is a contextually determined standard of comparison that needs to be reached for the positive form of the adjective to be true of an entity: trivially, for example, a large mouse is smaller than a small elephant. In contrast, in the case of absolute gradable adjectives, this standard is generally either the maximal or the minimal element of the scale (as captured by the "interpretive economy" of Kennedy 2007). This helps in accounting for some entailment differences between

[1] The exact compositional implementation to adopt is of no concern to us at present. Depending on one's analysis, a gradable adjective can be of type $\langle e,d\rangle$ or $\langle d,\langle e,t\rangle\rangle$, where d is the type of degrees. We will also not be concerned with the question of adopting an interval-based or a point-based analysis. Kennedy (2001) and Schwarzchild and Wilkinson (2002), for instance, argue for an interval-based semantics, but I will here assume the more common point-based analysis for simplicity, while noting that nothing hinges on this choice in relation to the issues discussed in this paper.

relative and absolute gradable adjectives, and in particular, that the negated form of an absolute, but not a relative adjective entails the positive form of its opposite (see, e.g., Kennedy 2007).

Introducing scales into the formal machinery is advantageous because a number of their characteristics are useful in accounting for various phenomena. For instance, if the scale has a maximal element, then, as mentioned above, this will by default constitute the standard to be reached, rather than a contextually determined degree. Also, Hay et al. (1999) noted that the telicity of so called degree achievements depends on the boundedness of the scale defined by the base adjective. Finally, Beavers (2008) argued that whether a scale is binary or multi-valued determines if the predicate will function as a gradable predicate or not. I will argue that the granularity level of a scale can play an analogously important role in some phenomena.

Sauerland and Stateva (2007) propose to handle a form of vagueness (what they call scalar vagueness) through granularity functions, which are contextual parameters of interpretation. A granularity function γ maps each point of a scale to an interval containing it, and satisfies the following restrictions (where S is the scale over which the granularity function γ is defined):

(1) a. $\forall s \in S : s \in \gamma(s)$
b. $\forall s \in S : \gamma(s)$ is convex
c. $\forall s, s\prime \in S : \max(\gamma(s)) - \min(\gamma(s)) = \max(\gamma(s\prime)) - \min(\gamma(s\prime))$

(1a) says that the set to which a granularity function γ maps a point has to include the point as element. (1b) states that the range of γ includes convex sets, i.e., intervals. (1c) requires the images of all points by γ to be of the same size (i.e., a granularity function defines a unit on the scale).

In addition, Sauerland and Stateva (2007) define a *finer than* relation over granularity functions, which is a partial order satisfying the following criterion for all scales S and granularity functions: γ is *finer than* $\gamma\prime$ if and only if

(2) $\forall s \in S : \max(\gamma(s)) - \min(\gamma(s)) < \max(\gamma\prime(s)) - \min(\gamma\prime(s))$

In other words, a granularity function γ over scale S is finer than $\gamma\prime$ over S if and only if the size of its units is smaller than the size of the units of $\gamma\prime$.

An example we can find in Sauerland and Stateva (2007) is the following: On the scale of distance, they define three granularity functions, a fine, an average and a coarse granularity, which map the expression *5 meters* to the following intervals:

$\text{gran}_{\text{fine}}(5\text{m}) = [4.95\text{m},\ldots, 5.05\text{m}]$
$\text{gran}_{\text{mid}}(5\text{m}) = [4.75\text{m},\ldots, 5.25\text{m}]$
$\text{gran}_{\text{coarse}}(5\text{m}) = [4.5\text{m},\ldots, 5.5\text{m}]$

As can be seen, the unit of the fine granularity function is the smallest, and the image of a particular point is properly included in the image thereof by the coarser granularity functions. In anticipation of our discussion of the role of granularity in event semantics, let us introduce the concept of a minimal interval:

Definition 27 *We will call the interval size defined by* $\max(\gamma(s)) - \min(\gamma(s))$*, or equivalently,* $|\gamma(s)|$*, the* minimally distinguishable interval *(*mdi*, for short) by granularity function* γ*, where* s *is an arbitrary point of the scale on which* γ *is defined.*

A final point to be noted in connection with the granularity functions of Sauerland and Stateva (2007) is that apparently, they assume a *finite* set of granularity functions. They thereby cut short the potential problem of higher level vagueness, involving which granularity function(s) to choose, as it is usually not possible to determine how big intervals a scale is structured into in a particular situation. Taking the interpretation of 5 meters, Sauerland and Stateva (2007) assume that the finest granularity divides the scale into 10cm-intervals, while the next finest one into 50cm ones, when obviously, in most scenarios, speakers would not be able to decide whether they assume, for instance, 5cm or 10cm intervals. The number of granularity functions can be increased, but this would not alter the fact that the units of granularity have a precise size, which is rather counterintuitive.

This is thus a serious shortcoming of this analysis of scalar vagueness: it assumes precise minimal units while there is as equal imprecision in this as in the degree to which a gradable property can be said to hold of an entity (say, whether a rod can be said to be 5 meters long). Consequently, this analysis assumes that although some points are not distinguishable at a given granularity (those that map to the same interval by that granularity function), some nearby points belonging to different intervals are. With the granularity parameter set to "mid" in the 5 meter example, for instance, a 4.74m-long rod would not qualify as 5 meters long, while a 4.75m one would. However, another well-known theory of vagueness, that of supervaluations, also suffers from an analogous problem, and apart from introducing continuous distribution into semantic analysis, there appears to be little hope of overcoming this obstacle. I shall therefore adopt the granularity functions of Sauerland and Stateva (2007) and assume a finite set of these, while acknowledging the limitations of this assumption.

2 The temporal scale

Time is straightforwardly a scale, being a set of linearly ordered points. Its scalar aspect is enforced by gradable adjectives and adverbials like *late* and *early*. Time

adverbials like *for α time* can then be thought of as measure phrases, denoting the intervals of $\alpha\prime$ size.

However, in having *no upper or lower bound*, the time scale is quite special. (Indeed, apart from the mathematical domain, it might be the case that only scales associated with time and space are like this). As noted above, having a minimal or maximal element, as well as having an upper or lower bound are features of a scale that are relevant and have various consequences. For instance, open scales associated with adjectives are always associated with a standard of comparison, while in the case of closed scales, the standard is generally their maximal/minimal element; additionally, Hay et al. (1999) argue that boundedness of a scale associated with an adjective will render its corresponding degree achievement telic.

Although some of the scales associated with adjectives and studied at length in the literature are open, and some of them are unbounded in one direction, none of them is unbounded in *both* directions. There are a number of consequences which follow from this feature of time scale. Firstly, we can explain why it is customary to divide the time scale into *closed subscales*, such as days or years based on different measure phrases measuring out degrees: In absence of a stable reference point, it would be difficult to make sense of the "degrees" of the scale, since they cannot be measured from a zero point.

Second, it is also easy to see that with an unbounded scale, what can be expressed meaningfully is *i)* the size of the intervals denoted by measure phrases (which I here mean to include the temporal extent of events, not just simple measure phrases like *for an hour*), *ii)* the relative positions of degrees on the scale (which is needed for the interpretation of *later than*, as well as *before / after*) and *iii)* distance from a given reference point (corresponding to the "measuring-from-a-reference point" divergent interpretation of adjectives in Kennedy 2001: p. 65).

Accordingly, it is expected that the precedence relation, reference points and the sizes of intervals will play the most important role in phenomena related to the temporal scale. In what follows, however, I would like to inspect, instead, the role that *granularity* plays in the semantics of time and events.

There is of course an obvious way in which granularity plays a role in temporal and event semantics, namely, in the way it does in the case of vague predicates in general. Thus, we can employ the Simplicity of Expressions, Simplicity of Representations principle of Krifka (2007) to temporal expressions, according to which, a conceptually simpler numeric or quantity interpretation tends to have a simpler realization in language than a more complex one, and a simple expression will tend to receive an approximate interpretation, while a complex expression a precise interpretation. This, of course, holds in the temporal domain, as well: an expression like *at six A.M.* is conceptually simpler and displays greater vagueness than an expression like *at 5:58 A.M.*.

As such, temporal expressions such as *at 6 A.M.* exhibit the same scalar vagueness that Sauerland and Stateva (2007) discussed and handled with granularity functions: *Jane arrived at six A.M.* can be true if Jane, in fact, arrived at 5:58. In line with Krifka's observation, the account of scalar vagueness through granularity functions also predicts that an expression like *at 5:58* will be true by default at a smaller interval than an expression like *at six*. The reason for this is that in evaluating a scalar expression, the coarsest granularity is chosen such that it is the shortest (or simplest) expression that denotes the interval to which it is mapped. Since *at 5:58* and *at six A.M.* are mapped to the same intervals by several granularity functions up to one which distinguishes, say, minute-long intervals, the expression *at 5:58* will introduce this latter granularity, and will thus denote an interval of about one or two minutes minutes in length. By contrast, for the same reason, *at six A.M.* can even, under some circumstances, denote an interval of half an hour, ranging from 5:45 to 6:15.

However, the foregoing discussion only shows that the temporal domain is no different in terms of scalar vagueness than any other domain discussed in the literature. I propose, however, that granularity functions can be of more pronounced importance in event semantics, over and above the vagueness exhibited by temporal expressions. It is expected that in the semantics of events, the scale assumed is the temporal scale, although scales relating to space and spatial extension could also play an important role. However, the focus will be on the role granularity plays in certain phenomena, rather than the well-known, strictly scalar characteristics.

3 The role of granularity in the semantics of events

3.1 The question of minimal parts

Activities, one of the four great Vendlerian verbal categories, are traditionally assumed to be *homogeneous* (see, e.g., Dowty 1979; Verkuyl 1989; Rothstein 2004), that is, if a homogeneous predicate is true of an eventuality, then it is also true of its parts. Thus, if *X Ved for α time* is true, then *X Ved* is true at all times during that interval. However, it is a long-standing view since Dowty (1979) that activities are homogeneous only to *minimal parts*:

> "Thus a cumulative predicate such as *run*, although intuitively homogeneous, has non-homogeneous minimal parts: there are parts of running events which are just too small to count as events of running."
>
> (Rothstein 2004: p. 11)

In fact, this is held to be a distinguishing point between activities and states, states being homogeneous down to instants, while activities only "down to small parts" (Rothstein 2004: p. 11). It is not a trivial question, as, for instance, the semantics of measure adverbials like *for* α *time* can depend on this:

> "As different activities may involve minimal subintervals of different sizes to be performed, we need to assume that the universal quantification in the translation of durational *for* is implicitly restricted to subintervals of the appropriate size."
>
> (Zucchi and White 2001: p. 232)

Thus, as mentioned in the quotation by Zucchi and White, *for*-adverbials are normally assumed to involve universal quantification over an interval, but – because of the minimal parts issue of activities – quantification is restricted to a contextually given set of relevant subintervals, as in Dowty (1979); Moltmann (1991).

However, it is worthwhile delving into the question of whether there is indeed enough ground to distinguish states and activities in terms of minimal parts. The main reason activities are assumed to have minimal parts is that it is counterintuitive to think of, say, a running event taking place for a few milliseconds, and there would not be enough evidence in that small stretch of time to establish that the event in fact falls under the predicate run (this is more pronounced in the traditional example of waltzing).

The crucial point, I suggest, is that it would be counterintuitive to assume that a *maximal* event of a few milliseconds in duration could be categorized as a running event, but once there is a maximal running event, all of its parts can be categorized as running events, as well, including instants. Indeed, Rothstein (2004: p. 186) observes that while semelfactives like *jump* have natural atoms, the atoms of activities like *run* have no such clear and straightforward delimitation, and can overlap, in contrast to atoms of semelfactives. Thus, the atoms or minimal parts of activities appear more to be an artefact rather than an ontological necessity. I therefore suggest that the minimal parts criterion only applies to *maximal activities*: to be categorized as falling under an activity predicate A, an eventuality has to be of either a minimal length (this length being dependent on the predicate), or has to be a proper part of an activity of type A.

On the other hand, it is true to say that when talking about activities, speakers do not normally consider subevents thereof with an extremely small duration. Without sacrificing the above hypothesis that infinitely small parts of an activity can fall under the same predicate, we can account for the intuition of minimal parts with the help of the granularity functions introduced above.

If we assume a granularity parameter of the time scale, we can assume that each event type introduces a default granularity function (akin to expressions like *at six A.M.* discussed above, but in a more complicated and roundabout way), which in turn defines the minimally distinguishable unit of time (the mdi). Parts of an event can then only be at least as long in length as the mdi *at that particular level of granularity*. In this way, the minimal parts problem disappears: an eventuality of a great magnitude will not have as its parts events whose size can be measured in, say, nanoseconds, except in very special cases involving switching to a finer granularity, which is generally indicated explicitly or apparent from the context (this might happen, for instance, in a physics study). Thus, if there is a switch in the granularity parameter, an event will have more or less parts (depending on the direction of the switch: from coarser to finer or vice versa). Importantly, the granularity parameter of Sauerland and Stateva (2007) is essential to enable an eventuality to have a different number of parts under different circumstances. In this way, an activity like *run* would not have parts smaller in length than, say, a second.

The question, however, remains to be settled how exactly an event defines the default granularity function to be assumed in its evaluation. This depends to a great extent on our decision concerning the number of granularity functions associated to a scale. As mentioned above, Sauerland and Stateva (2007) appear to assume (though do not address the issue explicitly) that there is a finite, and even limited number of granularity functions under consideration in each case. Though we have mentioned above the difficulties inherent in such a decision, we will for the present adopt this view, as it simplifies the question of which granularity function a given event introduces by default.[2] We could say that there is granularity function γ_{everyday} which is used in the evaluation of all "normal", "everyday" events like *running into the house*, *pushing the cart*, etc. Coarser or finer granularity functions would be used in scientific scenarios, but essentially, granularity functions under discussion differ by an order of magnitude from each other. We could thus distinguish, among others, the following types of granularity functions which can be introduced by events:

$$\gamma_{\text{microphysics}} < \gamma_{\text{microbiology}} < \gamma_{\text{electronics}} < \gamma_{\text{everyday}} < \gamma_{\text{geography}} < \gamma_{\text{geology}} < \gamma_{\text{astrophysics}}$$

Such levels of granularity have been, in fact, argued to play a role in the semantics of states, as well, by Varasdi (2010), who showed that a given eventuality

[2] If there were a by far greater, not to mention infinite number of granularity functions, this question would be much more complex. We would, for instance, have to give an algorithm which would pair minimally distinguishable intervals with the mean length of eventualities falling under a given predicate, but this would only be a partial and rather rough solution to the problem. For one thing, this would mean that an eventuality would introduce different granularity functions under different descriptions, which is not very intuitive.

might be a state at one granularity, but an activity at another. For our purposes, such a limited number of granularity functions might prove to be too few, and can perhaps entail that eventualities which intuitively differ in this respect have minimal parts of the same size (or more precisely, have a same lower bound on the size of their parts). On the other hand, as we will see below in the discussion of the commensurability principle in section 3.3, the choice of a limited number of granularity functions can actually prove useful in some other respect. For the present, therefore, I will stay with this conception and leave the study and precision of this issue for further research.

3.2 Achievements

There are two main issues related to achievements and punctual events I will discuss. Firstly, I shall examine the two-faced nature of non-durative events, and argue that for a truth-conditional analysis, the interpretation had best make use of the granularity parameter as described in Sauerland and Stateva (2007). Next, I will discuss the progressive form of achievements and propose a semantic analysis based on the notion of a minimally distinguishable interval introduced above.

Achievements and punctual events in general display a two-faced behaviour: they generally appear to be instantaneous, but in some contexts, they do appear to have duration. This point was, for instance, argued by Verkuyl (1989), who went as far as suggesting on this basis that achievements and accomplishments do not, in fact, differ essentially, contrary to what is commonly held. Without taking sides in this question at present, let us inspect this two-faced issue, and consider the following pair of examples from Kearns (1991: p. 60):

(3) a. Just as Mary read the note, the meeting ended.
b. #Just as Mary read the paper, the meeting ended.

Kearns argues that the first part of (3a) appears to describe a momentary event, and not the end of an extended one, as shown by the unacceptability of (3b). She goes on to add that there are no truly durationless events, and this momentariness is "partly a matter of »grain size«", which is a "problem [. . .] for truth-conditional semantics" (p. 61).

However, if we assume a granularity parameter of interpretation and the notion of a minimally distinguishable interval, the problem can be tackled within truth-conditional semantics: at a suitably fine granularity, achievements have duration (and thus have an internal structure, which – at least in most of the cases – is analogous to that of accomplishments, as argued for by Verkuyl), while at a coarser granularity, their length is smaller than the minimally distinguishable interval, and

is consequently mapped to the zero-sized interval, i.e., an instant. The inclusion of a granularity parameter of interpretation and the assumption that the minimally distinguishable interval functions as a dividing line make it possible to tackle the problem of an event being able to have both an extended and an instantaneous temporal trace.

Turning to the progressive form of achievements, we should note that *a)* there is a difference between achievements proper and truly punctual events, in that only the former may (under normal circumstances) appear in the progressive, and that *b)* there is a well-known immediacy component of progressive achievements (see, e.g., Kearns 1991; Rothstein 2004), meaning that a progressive achievement is roughly similar in meaning to a construction with *about to*.

One of the standard ways to analyse achievements in the progressive is to assume some form of coercion (cf., e.g., Moens and Steedman 1988; Rothstein 2004) and say that the progressive coerces the non-durative achievement into an extended activity or an accomplishment. Such analyses, however, have difficulty in accounting for the constraint of immediacy, that is, that a progressive achievement signals that its (potentially unrealised culmination) is close. Moreover, we could also raise the question Rothstein (2004) does, namely, exactly how long before arriving at the station the progressive *Mary is arriving at the station* can be true.

While it might not be possible to give an answer to the latter question, as the location of the point where a progressive achievement becomes true is essentially vague, we can nevertheless make some approximation. The hypothesis I will propose is the following: an achievement that can appear in the progressive (with a meaning component of the culmination being imminent) is the culmination of a greater event, which I will call a *cover event*. The cover event defines a default granularity function to be used in its evaluation, which in turn defines the minimally distinguishable interval (mdi) at that granularity. I suggest that the progressive form of the relevant achievement is true at the final mdi of the cover event. Figure 1 illustrates how the interval at which a progressive achievement like *arrive at the station* is true is determined.

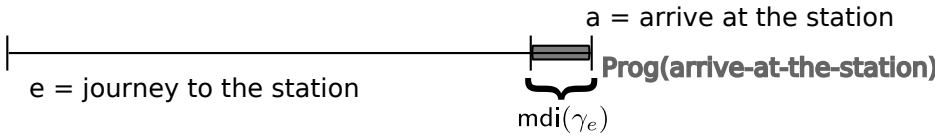

Figure 1: *Illustration of the computation of the interval at which a progressive achievement like* arriving at the station *is true. The cover event is the journey, whose final* mdi *is the interval at which the progressive achievement is true.*

Naturally, the hypothesis in its present form is too strong: it predicts that there is a well-defined point at which a progressive achievement becomes true, while our intuition is that the location of this starting point is underdetermined. There are a number of ways to overcome this problem, which, however, I shall leave for further research. For instance, if we choose to assume a great, perhaps infinite number of granularity functions over a scale, we can adopt and adapt the suggestion of Kennedy (2007) (who aimed to account for the vagueness of gradable adjectives while assuming a precise degree of standard) and say that there is a precise point where a progressive achievement becomes true, but due to epistemic uncertainty about it, judgements of speakers vary in these cases. Another option we could take is to say that the starting point of the relevant interval may be anywhere $\gamma(\mathsf{mdi}(\gamma))$ before the culmination, that is, we could put to use granularity functions for their original purpose, and account for this scalar vagueness thereby.

Barring the too exact characterisation of the interval in question, this analysis of progressive achievements interestingly predicts that the homomorphism between the event and its incremental argument (see Krifka 1998) plays an important role in the computation of the progressive form of achievements. When speakers evaluate a progressive achievement, they are not in the position to determine the culmination point (not to mention the case where the culmination is not, in fact, realised), and thus cannot count backwards from it to determine the interval at which the progressive is true. Thus, they can make use of the incremental argument of the cover event and determine the final mdi based on the change observed in the incremental argument. Accordingly, it is not surprising that an achievement like *die* is much less definite intuitively in the question of when the progressive can be said to become true: there is no incremental argument, save the deterioration of the patient's health we can rely on, but the latter is much less easy to gauge than, say, a distance covered.

A final point to be examined concerns different types of achievements or momentaneous events, which behave differently with respect to the progressive. Although the original Vendlerian category of achievements appears to be homogeneous with respect to the temporal extent of these eventualities, several authors have argued for the need to set apart achievements proper or culminations from punctual events or happenings (see, e.g., Bach 1986; Moens and Steedman 1988; Dini and Bertinetto 1995). One of the several reasons for this is that, as opposed to achievements like *reach*, punctual events such as *recognize* cannot appear in the progressive. With our reference to the final minimal interval of a cover event in the semantics of the progressive of achievements, we are able to explain why truly punctual events fail to appear in this construction. Since they have no preparatory phase (see, e.g., Kearns 1991; Dini and Bertinetto 1995), there is no cover event that they form a final part of, at which point the analysis described above cannot proceed further.

Thus, to summarise, with our granularity-based analysis of the two-faced nature of punctual events and of progressive achievements, we can:

- make it possible for an eventuality to be durationless in one context and durative in another while staying within truth-conditional semantics,
- show how achievements are, indeed, like accomplishments as argued by Verkuyl (1989) (at a fine granularity, at which they are durative, they are structurally like accomplishments), while showing that they differ from accomplishments, as argued by Piñón (1997); Rothstein (2004), among others (at the default granularity, they are instantaneous, and consequently, the semantic analysis of their progressive form differs from that of accomplishments),
- explain why a progressive achievement implies that the culmination (if reached) is imminent,
- capture the difference that achievements and punctual events show with respect to the progressive (punctual events having no cover event, the progressive cannot apply to them).

3.3 Commensurability

Consider the following pairs of sentences:

(4) a. When Susan walked in, Peter left. (Partee 1973)
b. When the Earth cooled, . . .

Although Partee's (1973) pronominal account of tense will be able to relate the times of the two clauses in sentence (4a), it cannot explain why speakers will consider this true even if the time of Susan walking in and Peter leaving do not coincide exactly (or do not overlap). There is an amount of time-lag tolerated, the size of which is dependent on the granularity functions generally used with walking-ins and leavings. In (4b), the hearer will assume a much coarser granularity function over the time scale than in the case of (4a), and will tolerate a greater time-lag. This phenomenon can be explained if we assume that this time-lag is subject to the following constraint:[3]

Principle 1 Commensurability of granularity: *During the evaluation of a sentence, do not change the granularity parameter of a scale without explicit indication thereof.*

[3]It remains to be checked how granularity can change in discourse. For the time being, I will concentrate on stand-alone sentences.

Since the first part of the sentence in (4b) introduces a much coarser granularity than the one in (4a), the pause tolerated will also be evaluated at this coarser granularity, and the minimally distinguishable interval (and consequently, the tolerated length of the pause) thereof will thus be much greater.

In the discussion of minimal parts in Section 3.1, we have already argued that events introduce a default granularity function to be used in their evaluation (which can, naturally, be overridden in a specific context). The present analysis shows the advantage of assuming a finite, limited number of granularity functions for a scale: for two events to be commensurable, they only need to introduce the same default granularity. On the other hand, assuming even an infinite number of granularity functions would still make it possible to have a reasonable constraint on commensurability: a relation over the set of granularity functions could be defined to relate granularity functions that are "close" enough to count as commensurable. And, in fact, as we will see, such a relation is necessary in any case, to define commensurability of granularity functions over different scales.

With the requirement on commensurable granularity in place we can also explain the oddity of speaking of events for the interpretation of which generally (very) different granularity functions are used, as shown by the oddity of sentence (5a). This is a general phenomenon, not restricted to the temporal scale, as shown by the humorous nature of the quotation from Douglas Adams in (5b).

(5) a. #Pierre studied geography for two years in Paris, then he moved to New York, graduated from NYU, and then drank a cup of coffee.
b. ☺Space is big. [. . .] I mean, you may think it's a long way down the road to the chemist's, but that's just peanuts to space. (Douglas Adams)

This requirement, moreover, does not even appear to be restricted to granularity functions of a single scale, but seems to apply to granularity functions of *different* scales, as well. Compare the following sentences:

(6) It took me 30 minutes 57 seconds and 2 ms to reach N48.86611 E2.35528.

(7) It took me half an hour to reach N48.86611 E2.35528.

(8) It took me 30 minutes 57 seconds and 2 ms to reach the middle of the field.

(6) is quite well-behaved with respect to the Simplicity of Expressions and Simplicity of Representations account of Krifka (2007): both *30 minutes 57 seconds and 2 ms* and *N48.86611 E2.35528* are complex expressions and are evaluated with respect to a fine granularity. (7), on the other hand, is surprising, because *N48.86611 E2.35528* is evaluated with respect to a coarser granularity than in (6), which essentially forces an *imprecise* interpretation of a *precise* number word. This

can only be due to the coarser granularity function introduced on the temporal scale by the first vague expression in the sentence, which then seems to carry over to the granularity function assumed for the interpretation of the spatial coordinates.

It could be reasonable to suppose that in a sentence, the coarsest (rather than the first) granularity is the one determining the overall granularity, considering that the sentence *I reached N48.86611 E2.35528 in half an hour* receives exactly the same interpretation as (7). However, the picture is slightly more complicated, as the granularity in (8) is determined by the finer-grained expression, rather than *the middle of the field*. Perhaps some expressions, such as *the middle of the field*, are *underspecified* for the granularity function to be used, and do not force a coarse or a fine interpretation, and will only be evaluated at a coarse granularity unless specified otherwise.

The important conclusion to be drawn from the above data is that there appears to be a general requirement that granularity functions within a sentence be commensurate: that is, if we apply a fine/coarse granularity function in one domain (say, in the temporal domain in example (7)), then we should likewise apply a fine/coarse granularity in all other domains (in (7), the spatial domain). For this, we need to define a commensurability relation $\div$, which relates all granularity functions (even those defined over different scales) which are of the same magnitude.

Definition 28 Commensurability relation*:* $\div \subseteq G \times G$*, where* G *is the set of* all *granularity functions.* $\div$ *is reflexive, transitive and symmetric.*[4] *Two granularity functions,* γ_1 *and* γ_2 *are* commensurable *iff* $\gamma_1 \div \gamma_2$.

How exactly the commensurability of two granularity functions is established remains at present an open question.[5] However, with the help of this relation, we can extend our former principle of commensurability to apply to granularity functions of different scales:

Principle 2 Extended commensurability of granularity: *During the evaluation of a sentence, the granularity parameters of all scales should be commensurable, unless there is explicit indication to the contrary.*

Such a requirement is intuitive and might be cognitively motivated, as these granularity functions play an important role in being able to describe and categorise

[4]Thus, $\div$ is an equivalence relation. However, if we decide on assuming a much greater, perhaps even an infinite number of granularity functions over a scale, then $\div$ should not be transitive, and would have to be defined instead as a tolerance relation.

[5]One option could perhaps be to employ a case-based approach and gradually learn from attested examples which granularities can co-occur.

the world.[6] Of course, this principle of commensurability of granularity is not exceptionless, and constitutes a more general, but on occasion violable constraint. Thus, this constraint might lend itself readily to a formalisation within the framework of bi-directional optimality theory in the long run (cf. the account of Krifka 2007).

4 Conclusions

In the present article, I argued that the account of scalar vagueness with the help of granularity functions developed in Sauerland and Stateva (2007) on the basis of Krifka (2007) can be adopted in the domain of events to assist the analysis of various phenomena. An important assumption lies behind all of these suggestions, which is that events introduce a default granularity function over the temporal scale which is used in their evaluation. In all of the analyses proposed in this article therefore, it is necessary to have explicit reference to the granularity parameter.

The issue of the minimal parts of activities was discussed and a solution suggested, which involved a new conception of parts: namely, an event can have different parts at different granularities. This, I proposed, could answer to the qualms about the unbounded homogeneity of activities while not requiring activities to have a lower bound on their parts. I also addressed the question of point-like events and achievements, focussing on their two-faced behaviour with respect to durativity and on the problematic issue of achievements in the progressive. I put forth an analysis thereof based on the minimally distinguishable interval at a given granularity. This analysis, I claimed, can address several well-known issues about progressive achievements, such as, notably, their meaning component of the imminency of the culmination. Finally, I argued for a general pragmatic principle of commensurability not restricted to the semantics of events, which constrains the granularity functions used in the evaluation of different expressions in a sentence. I proposed that such a principle can account, among others, for the oddity of some sentences involving expressions "of different magnitude", as well as the fine or coarse interpretations of some expressions. The latter issue uncovered a need to explore how the definitive granularity parameter is in fact established: whether the finest or the first granularity function is to be used, or perhaps some other, more complex algorithm determines the granularity parameter.

During the discussion of these phenomena, I have also drawn attention to some shortcomings of the analysis based on granularity functions. Most importantly, there

[6] Drawing on Wittgenstein's words, "Let us imagine a white surface with irregular black spots. We now say: Whatever kind of picture these make I can always get as near as I like to its description, if I cover the surface with a sufficiently fine square network and now say of every square that it is white or black." (Wittgenstein 1922: 6.341).

are various problems with, as well as advantages of assuming both an infinite, and a finite number of granularity functions for a given scale. For the present purposes, I decided that a finite and even limited number of granularity functions will be appropriate, but all of the analyses in this paper can be adapted to an infinite number of granularity functions.

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6 Salience in sociophonetics — a case study of Hungarian hiatus resolution

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In sociolinguistics, salience is commonly interpreted as a trait that renders a variable more apparent to language users. This paper offers an empirical definition of salience, based on the probability distributions of the realisations of a variable across different dialects. The example used to illustrate this operationalisation of salience is hiatus resolution in Hungarian. I will show that a likely source of salience is that the difference between the probability distributions of its realisations across dialects causes it to be more unfamiliar, and, consequently, surprising for the speakers of one dialect *vis à vis* another one. The method advocated here is most applicable to phonological variables, though adaptation to other language domains is not impossible.

Section 1 overviews the concept of salience in sociolinguistics and introduces its interpretation which is espoused in the rest of the paper. Section 2 discusses Hungarian hiatus resolution, Section 2.2 looks at its social evaluation, based on an attitude test performed with native speakers, Section 2.3 investigates the potential relationship between speaker sensitivity to hiatus resolution and its distributions in language use. Section 3 provides brief conclusions.

1 Salience in sociolinguistics

Salience in sociolinguistics refers to a property or set of properties that cause a language variable to be more prominent, more conspicuous to the language users. The concept is most readily interpreted in the context of the dichotomy between *indicators* and *markers*, introduced by Labov (1972). These concepts are used predominantly when talking about phonological variables. Indeed, salience as such is almost always discussed in the context of phonology — it will not be otherwise in the present paper.

Indicators are variables which vary with social stratification, but have no social interpretation. If we have a standard and a substandard dialect, an indicator variable will be realised differently in the two. Yet, substandard speakers will not try to use the standard realisation when approximating the standard dialect, and this will not be noticed by the standard speakers. That is, indicators do not show style-shifting,

and their use by speakers does not invoke value judgements from the members of the language community. They are not subjects of naïve linguistic awareness either. One example is [aː] in Norwich (Trudgill 1986). This vowel is more fronted than the standard variety, but the speakers seem to be unaware of this difference.

Markers are variables which correlate with sociolinguistic identity. If a marked realisation attaches to a substandard dialect, speakers will try to avoid it in more formal style settings and will regard its use as *base* or *erroneous*. An example for a marker could be the Northern [ɑ] (Wells 1982). In the North of England, this sound is restricted to a set environments indicated by a following <r> in the orthography (e.g. *carton*, *bar*). In words like *dance*, *fast*, a fronted [a] is used instead. This realisation of the variable is a strong marker of Northern speech, and Northerners will try to avoid it if conforming to the Southern standard.

Labov et al. (2009) show that if listeners identify a marker realisation as low prestige, this will affect their judgement of speech input even when the realisation is relatively rare in the input. This suggests that the 'detection' and evaluation of markers is independent of the frequency of realisations. (Stuart-Smith 2003 makes a similar observation on Urban Scots in Glasgow.)

The concept of *salience* is discussed, among others, by Trudgill (1986) and Kerswill and Williams (2002). In the interest of brevity, I will not explore these papers in detail. Essentially, they argue that one possible interpretation of salience is to regard it as a cognitive-perceptual property that separates markers from indicators. If salience is, in fact, a property that language users rely on to tell apart indicators and markers, it can have two possible sources. We can either attribute it to speaker dynamics, that is, the organisation of the social space in which language is used, or to a special characteristic that salient markers share but non-salient indicators do not.

The first possibility means that salience is mandated by the language community. That is, any linguistic variable could theoretically be chosen to mark social indexation, independent of the variable's properties. This is the view embraced in Labov (1972). All variables start out as indicators, and later become markers, when the linguistic change gains enough momentum to be noticed by the community, and, as a result, become a vessel of social indexation. This view can be inferred from Labov's Martha's Vineyard study. According to the study, the local residents at Martha's Vineyard picked up on a shift of the realisations of the diphthongs [aw] and [ay] to separate themselves from the summer residents. The small difference between the local and the New England dialect became amplified to mark social identity. At the beginning of this phase, the diphthongs are only indicators of this difference, later, as they start to be used in asserting the local identity, they become markers.

Labov (1994) discards this simple approach to the relationship of indicators and markers, pointing to the fact that some variables never seem to become markers at all. If the basis of salience is not only social dynamics, one ought to find a general, perceptual frame, that prefers some variables to others. Both Trudgill (1986) and Kerswill and Williams (2002) point to general cognitive capacities as possible sources of sociolinguistic salience. The supposition is reasonable: some variables might be picked up because they are more highlighted in the course of acquisition or auditory perception.

The nature of the perceptual and cognitive properties that go with salience are not clearly established by any of these authors. In this paper, I will claim that the salience of a variable comes from its patterning in use: *some variables are more surprising for speakers of a different dialect, and, consequently, carry social indexation easier*.

Assuming a strictly segmental approach, surprisal can be measured explicitly relying on the notion of transitional probabilities (TP-s). The transitional probability of a segment Y following segment X is the chance that we find Y immediately following X in a given corpus (cf. Table 1).

$$p(\mathrm{Y}|\mathrm{X}) = \frac{\text{likelihood of pair XY}}{\text{likelihood of X}}$$

Figure 1: *Probability of Y following X*

The use of TP-s in linguistics was first suggested by Harris (1955), who proposed that a field linguist can rely on them when transcribing an unknown language. Since the ordering of segments within a word is constrained, but (almost) any pair of segments can occur with an intervening word boundary, some patterns (the ones permitted in words) will occur more frequently than others (the ones only occurring at boundaries). A low TP, in turn, hints at a word boundary.

A large body of research suggests that not only field linguists but also language users are capable of using such statistical information in locating word boundaries (Jusczyk et al. 1994; Saffran et al. 1996; Cairns et al. 1997; Pierrehumbert 2003; Hay 2000). The question of how listeners find word boundaries in the speech signal is not uncontroversial. Still, probability-based statistical learning seems to play a prominent role in it, both in the case of infant and adult learners. Though listeners certainly rely on other distributional cues, such as word stress, pauses in the signal, or simply the recognition of words previously heard in isolation, transitional probability between the segments remains the most abundant and reliable cue (Saffran et al. 1996; Jusczyk et al. 1999).

If we accept the role of transitional probabilities in segmenting the speech signal into words, it is straightforward to assume that this type of statistical information is, to an extent, available for language users. Consequently, a variable realisation that strongly alters the TP-s will be salient for language users. In this reading, salience comes into play when comparing two dialects or idiolects, in which the distributions of a particular variable realisation are notably different. In the following section, I give an example on the relationship of salience and low transitional probabilities, hiatus resolution in Hungarian.

2 Hiatus resolution in Hungarian

In this section, I discuss two types of hiatus resolution in Hungarian. I give the results of an attitude test which support that one of these types is salient for the language users, while the other one is not. Finally, I give an approximation of the transitional probabilities of the two types, linking the difference in salience to the difference in TP-s.

2.1 Types of hiatus resolution

Educated Colloquial Hungarian (ECH) has hiatus resolution in two distinct environments. The first sort is obligatory and non-salient in the standard, while the second occurs to a much smaller extent — if at all — and is subject to variation, as well as distinctly salient (Siptár and Törkenczy 2000). It is present in many other Hungarian dialects, but that is beyond our scrutiny.

The phonetics and phonology of hiatus resolution has been extensively covered (Kálmán and Rebrus 2010; Siptár and Törkenczy 2000; Siptár 2003), but its social evaluation has been scarcely discussed in any depth. Siptár and Törkenczy (2000), whose description I mainly rely on, only mention the issue in *passim*. The basic state of affairs is as follows: Hungarian has lexical and post-lexical hiatus resolution. Our focus is post-lexical hiatus resolution (cf. Table 1).[1] It occurs obligatorily in vowel clusters containing [i] and it is quite common in clusters containing [eː]. The inserted segment is the glide [j]. These are the two close front vowels of Hungarian. The close [i], like all Hungarian vowels, has a long pair [iː]. However, in ECH, the realisation of close vowels is subject to variation, and they generally show

[1]The morphological make-up of the hiatuses is not relevant for the present discussion: vowel clusters with [i] have obligatory hiatus filling without respect to the presence of a boundary, while clusters with [eː] and [ɛ] are relatively rare in mono-morphemic words, dwarfing the effect of this factor in a corpus study.

a tendency to be shortened in all positions except the initial syllable. This bears no importance on the present discussion. The short pair of [eː] is also different qualitatively, and it is realised as an open mid [ɛ].

Vowel clusters containing [ɛ] but *not* [i] or [eː] also show hiatus resolution, it is, however, realised less frequently, and, in any case, is subject to variation. There is no data on the extent of hiatus resolution in the three environments, namely, in clusters involving [i], [eː], and [ɛ], respectively, but it is commonly assumed that, in Conservative ECH, hiatus resolution is obligatory in the first, variable in the second, and avoided in the third environment. However, as Siptár and Törkenczy point out, Innovative ECH has hiatus resolution in the third environment, although to a limited extent.

It has to be noted here that hiatus resolution with [eː] and [ɛ] is not only variable in its occurrence but also in its extent. Certain realisations are likely to be, for instance, longer in duration than others. This is an issue that I will not take into consideration here, but which is certainly relevant for further study.

fiú	[fijuː]	'boy'
női	[nøːji]	'female'
ráér	%[raːjeːr]	'to be at leisure'
büféasztal	%[byfeːjɒstɒl]	'buffet table'
tea	%%[tɛjɒ]	'tea'
beakad	%%[bɛjɒkɒd]	'gets stuck'

Table 1: *Post-lexical hiatus resolution in Hungarian*

I will argue that, compared to the first two environments, the third one is salient for the speakers of ECH. I am going to underpin my argument by discussing the results of an attitude test on the perception of this variable. The test provides empirical evidence on the pattern's salience.

2.2 Salience and hiatus resolution

Methods

The test included ten ECH speakers, five female, five male, with a mean age of 22. Eight were from Budapest, and two from the surrounding Pest county. The participants listened to a recording of 30 sentence pairs, 10 with vowel plus [ɛ] clusters, 10 with [ɛ] plus vowel clusters, and ten control sentences, featuring V[i]/[i]V and

V[eː]/[eː]V equally. The recordings were mono audio waveform files, sampled at 44100Hz. The participants were not paid for the experiment.

The test sentences were read by a trained phonetician, also a native speaker of ECH, once with a hiatus filler [j], once without one. The control sentences were all read with a realised hiatus filler. The background information given to participants was that a Hungarian male in his twenties is looking for their help in general linguistic and stylistic issues, as he is going to a job interview in Budapest and is unsure about the quality of his Hungarian. The participants had to evaluate the sentence pairs (with the implication that the sentences are different) on a Likert-scale from 1 to 10, depending on whether they found the first or the second sentence better (or they were unsure, etc.). The participants listened to the pairs in a random order, both in the sense that the order of pairs was randomised and that the order of the *marked* sentence (the one with hiatus resolution) and the *unmarked* sentence (the one without it) was randomised: half the pairs had the marked sentence first. The listening test was followed by a small discussion with the participants.

The experiment has two conditions: (i) whether the marked sentence comes first or second and (ii) whether the judgements on the test sentences differ from judgements on the control sentences. The hypothesis is that hiatus resolution with [ɛ] is a salient variable that will be rejected, whereas hiatus resolution with [i] and [eː] elicits no listener attitudes. This should show up in condition (i) as a larger score on the scale if the first sentence is marked in the pair and *vice versa*, and in (ii) as a score more divergent from the mean in the case of test sentences versus control sentences, as participants are not expected to show explicit preference for any sentence in a pair of control sentences.

Results

The results show a strong preference for the unmarked pattern in condition (i) and more divergent scores in condition (ii), which confirms the hypothesis that hiatus resolution in [ɛ]+V clusters is rejected, hence, salient for ECH speakers.

The results were weighted between participants. For condition (i), the resulting scores were modified in such a way that a higher score means a preference for the *marked* pattern. Condition (ii) is needed in the first place because condition (i) relies on the order of sentences within the pairs. Therefore, the results can be influenced not only by which sentence was marked, but also by the order itself: if the first sentence is marked, chances are, people become more aware of it. Since condition (ii) compares all the test sentences with the control sentences, the problem of ordering disappears.

The scores are shown in Figure 2 for the first condition and Figure 3 for the second one. In Figure 2, the first column is the control, the second is where the marked sentence came first in the pair, and the third is when it came second. Higher scores indicate a stronger overall preference for the second sentence. As can be seen, if the first sentence is marked, scores are higher, and if the second sentence is marked, they are lower than in the control case.

Figure 3 compares control and test sentences. Higher scores generally indicate a stronger overall preference for the marked sentence. Of course, the control pairs did not have a marked sentence. Scores are again weighted, which resulted in a higher score than the expected 0 for the control case. What is visible, however, is the existence of a deviation from the mean in the test case, which is absent in the control case. That is, while there was a preference for one member in the pair in the test case, this preference was absent in the control case.

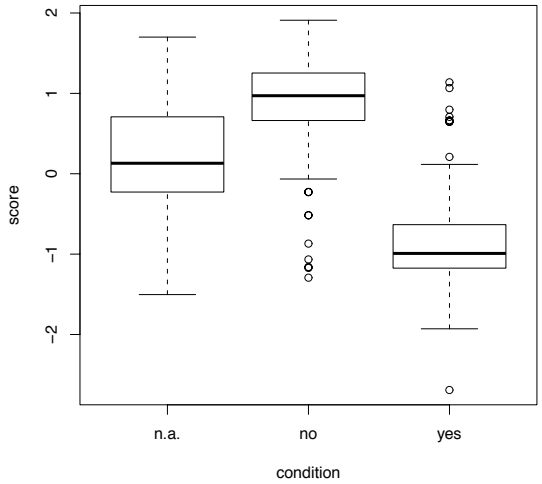

Figure 2: *Weighted scores for condition (i)*

The significant difference between answer rates, visible on the plots, is supported by a fitted linear mixed model for both conditions, with speakers (`subject`) and read sentence pairs (`sentence.id`) as a random effect. The lme4 package (Bates 2005), implemented in R (R Development Core Team 2009), was used for the mixed-effects modelling. The summary of the model for condition (i) is in (1) and the summary of the model for condition (ii) is in (2). We can see that in

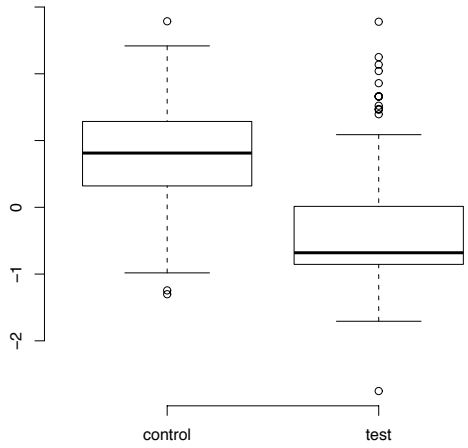

Figure 3: *Weighted scores for condition (ii)*

condition (i), whether the first or the second sentence was marked in the pair (`2nd_markedno/yes`) is a significant predictor of the weighted score (`score`), with a strong correlation of the fixed effects. In condition (ii), whether the sentence was a condition or a test sentence (`conditiontest`) is again a strong predictor of the weighted score (`alt.score`), with an observable strong correlation again.

(1) Summary of the model for condition (i)

```
Linear mixed model fit by REML
Formula: score ~ 2nd_marked + (1 | subject) + (1 | sentence.id)
   Data: dat
   AIC   BIC logLik deviance REMLdev
 749.9 772.1 -368.9    730.1   737.9
Random effects:
 Groups      Name        Variance Std.Dev.
 sentence.id (Intercept) 0.054274 0.23297
 subject          (Intercept) 0.000000 0.00000
 Residual                 0.633746 0.79608
Number of obs: 300, groups: sentence.id, 30; subject, 10
Fixed effects:
                 Estimate Std. Error t value
(Intercept)         0.7434     0.1085   6.854
```

```
2nd_markedno   -0.9542     0.1576  -6.055
2nd_markedyes  -1.2466     0.1499  -8.318

Correlation of Fixed Effects:
             (Intr) X2nd_s_mrkdn
2nd_mrkdn -0.688
2nd_mrkdy -0.724  0.498
```

(2) Summary of the model for condition (ii)

```
Linear mixed model fit by REML
Formula: alt.score ~ condition + (1 | subject) + (1 | sentence.id)
   Data: dat
   AIC BIC logLik deviance REMLdev
 749.5 768 -369.7    733.7   739.5
Random effects:
 Groups      Name        Variance Std.Dev.
 sentence.id (Intercept) 0.065188 0.25532
 subject          (Intercept) 0.000000 0.00000
 Residual                 0.633746 0.79608
Number of obs: 300, groups: sentence.id, 30; subject, 10
Fixed effects:
              Estimate Std. Error t value
(Intercept)     0.7434     0.1134   6.556
conditiontest  -1.1151     0.1389  -8.030

Correlation of Fixed Effects:
            (Intr)
conditintst -0.816
```

In sum, the results confirm speaker awareness of the Innovative hiatus resolution pattern *vis-à-vis* the Conservative pattern. For a Hungarian linguist, this is hardly surprising, as the pattern is overtly discussed, and some forms like *teja* are used playfully by speakers who otherwise eschew Innovative hiatus resolution. It is, however, important to stress that the pattern's social evaluation was not empirically tested before.

2.3 Salience and TP-s in Hungarian hiatus resolution

This section looks at the correlation between salience and transitional probabilities in Hungarian hiatus resolution. The procedure is the following: I take a written corpus of Hungarian, and modify it in such a way that it includes [j]-s resulting from standard hiatus resolution, not marked in the orthography. I extract the frequencies

of [ij] and [ji] clusters in order to gain the transitional probabilities (TP-s) of [j]|[i] and [i]|[j] in the corpus. I also extract the frequencies of [ɛj] and [jɛ] to gain the TP-s of [j]|[ɛ] and [ɛ]|[j].

The hypothesis is that pairs of [j] and [i] are much more frequent than pairs of [j] and [ɛ], that is, the TP-s of [j]|[i] and [i]|[j] are larger than those of [j]|[ɛ] and [ɛ]|[j], respectively. Consequently, the former are more familiar to the listeners, so when these occur as a result of hiatus resolution, the pattern is not salient. In comparison, the latter are much less familiar, so when these result from hiatus resolution, the pattern becomes salient. Again, the key point is that clusters of, for instance, [ɛj] are not illicit and occur in Hungarian, their salience in hiatus resolution comes from the frequency difference.

The data are drawn from the Hungarian Webcorpus (Halácsy et al. 2004), a corpus of 1.48 billion words from 18 million pages downloaded from the .hu Internet domain, which gives the best representation of written language, and is the most faithful corpus of present-day Hungarian. A sample of 17 million words was used to establish TP-s. Hungarian orthography is relatively consistent, at least when it comes to the representation of [j], [i], and [ɛ]. It does not mark hiatus resolution, so I inserted [j]-s into vowel clusters including [i]. This step is valid inasmuch as hiatus resolution is obligatory in these clusters. It assumes, however, that hiatus filler [j]-s are equal to contrastive [j]-s in the language. This assumption is supported by authors like Kálmán and Rebrus (2010), who argue that the intrusive segment in hiatus resolution is phonologically equal to the one in the possessive. This, in turn, means that all intervocalic [j]-s are interpreted equally, as the possessive [j] is virtually indistinguishable from the contrastive 'lexical' one. An example to this is given in Table 2.

Environment	Process
zoknija [zoknijɒ] 'sock-POSS3SG'	Possessive suffixation
szoknia [soknijɒ] 'accustom-INF3SG'	Hiatus resolution before infinitive *-a*
kijavít [kijɒviːt] 'fix-3SG'	Contrastive [ijɒ] sequence

Table 2: *[j] in Hungarian*

Even if we take the ontology of [j] as granted, the analysis has to cope with another difficulty, the lack of reliable data on hiatus resolution. In Conservative ECH, it is agreed to be obligatory in vowel clusters with [i] and variable in clusters containing [eː]. There are no estimates on Innovative ECH. In order to tackle the scarcity of the data, I take up the approach of looking at transitional probabilities in one dialect instead of comparing two.

This dialect, Conservative Educated Colloquial Hungarian, is assumed to be represented by the Webcorpus. It has obligatory hiatus resolution with [i], but has none with [ɛ] (since it is conservative). Nonetheless, it also has 'lexical' instances of vowel clusters with [i]/[ɛ] and [j]. This is illustrated in Table 3.

Lexical sequence	Hiatus
kijárat [kijaːrɒt] 'exit'	*kiárad* [kijaːrɒd] 'flow-3SG'
Tejút [tɛjuːt] 'Milky Way'	*szemleút* [sɛmlɛuːt] 'field trip'

Table 3: *Conservative ECH*

With these presumptions, we can look at the frequency differences of non-salient and salient hiatus resolution in the corpus. The frequency of the relevant string in the corpus is given in Table 4. (Both word-internal clusters and clusters including a word boundary were included.) The TP-s are given in Table 5 (numbers are rounded to the third decimal place).

String	Frequency
ɛj	103024
jɛ	230857
ij	480943
ji	391069
i	4424703
j	2367677
ɛ	10892098

Table 4: *String frequencies in the corpus sample*

The results show that there is a frequency difference of one order of magnitude between the TP of [j] following [i] versus that of [j] following [ɛ]. There is no difference, however, when we look at the pattern the other way around, that is, between the TP of [i] following [j] versus [ɛ] following [j]. This asymmetry can be probably blamed on the possessive suffix, which is *-jɛ* after vowel-final front vowel stems.

Environment	TP
j|ɛ	0.009
ɛ|j	0.098
j|i	0.109
i|j	0.088

Table 5: *TP-s in the corpus sample*

What the corpus study tells us, then, is that the salience of the innovative hiatus resolution pattern shows a correlation with the relative low frequency of the string [jɛ] (when compared to [ji]), itself part of the realisation of the resolved hiatus. This supports the hypothesis that the salience of the innovative hiatus resolution pattern, confirmed by the attitude study, springs from a difference in transitional probabilities, which difference renders the pattern less familiar to the listeners. (The grapheme <í>, indicating a long vowel that often undergoes shortening in the spoken language, was not included in the counts. All other things being equal, this should not affect the results.)

Two questions should be addressed at this point. First, it has to be stressed that there is no data available on the Innovative ECH dialect assumed here, apart from its existence. The extent of hiatus resolution in vowel clusters with [ɛ], as well as its origin and correlation with innovative realisations of other variables remain subject to a future study. Second, one might argue that if, based on the corpus data, instances of [j] following [ɛ] are unfamiliar, we should expect the salience of any [ɛj] sequence, not just the ones arising through hiatus resolution. To put the question differently: why is *teja* salient, but *bejárat* 'entrance' apparently not? In my view, the difference lies in the patterning of the two types of clusters. Lexical, contrastive clusters show no variation in ECH. In this sense, one cannot talk about conservative and innovative use, or, indeed, about a linguistic variable. The rarity of [ɛj] clusters is relevant where these clusters occur variably.

3 Conclusions

In this paper I looked at salience in sociolinguistics, and defined it as a perceptual property separating indicators from markers, in the sense of Labov (1972). (For a different interpretation of salience, see for instance Trudgill 1986.) The salience of a variable was operationalised as a by-product of the different transitional probabilities

of its realisations in two dialects, causing its patterning in dialect B to be surprising or unusual for a speaker of dialect A.

The approach was explicated by a look at hiatus resolution in Standard Colloquial Hungarian. It was argued that speaker awareness of hiatus resolution in [ɛ]+vowel sequences stems from the different distributions of the resulting sequences in Innovative ECH, where this pattern is present, as opposed to Conservative ECH, where it is mostly absent. A vital point to make is that while the relevant sequences can be found in both dialects, their probability of occurrence is different. Speaker awareness of the variable was supported by an attitude test, which gave hitherto lacking empirical support to the salience of the variable. The differences in distributions were calculated based on corpus data. This view of salience favours the study of phonological variables, but it can be extended to account for other variables as well.

Tackling salience in such a way is empirically fruitful as it gives well-defined, testable tools in the investigation of variable behaviour. Though the rigid segmental approach employed implies a perhaps unwanted level of abstractness, and does not permit the investigation of all phonological variables, such as differences in vowel quality, it is a step forward from intuitive formulations on salience and its influence on the social life of linguistic variables.

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7 Morphology in the extreme: echo-pairs in Hungarian*

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1 Introduction

Echo-pair formation is a cross-linguistically well-attested process, which consists in the creation of a word-like unit composed of two nearly identical parts, only differing in their initial consonants and/or their vowels (see Southern 2005 for a similar use of the term). Some examples are *itsy-bitsy*,[1] *fancy-shmancy*, *splish-splash* (English), *Schorle-morle* 'spritzer' (German), *et-met* 'meat or something' (Turkish; Southern 2005: 60), *paampu-kiimpu* 'snakes and other such creatures' (Tamil; Keane 2001: 1). As can be seen from the examples, echo-pair formation encompasses a broad range of morphological, phonological and semantic patterns. Thus, such formations can be created through reduplication of a base form (e.g. *fancy-shmancy*), compounding (e.g. *rumble-jumble*), borrowing (e.g. *füle-müle* 'nightingale' in Hungarian < *Philomela* in Greek) and spontaneous invention (e.g. *plick-plock*; Thun 1963: 50). As for the phonological makeup of echo-pairs, the component forms sometimes differ only in their initial consonants, sometimes only in their vowels and sometimes in both (forms where the two components are identical do not count as instances of echo-pairs under the present definition). The semantics of these constructions also varies widely: the most common functions associated with echo-pairs include diminutive, hypocoristic, and dismissive. Moreover, the wide range of variation in the function and form of echo-pairs is often attested not just cross-linguistically, but even within a single language.

Somewhat surprisingly, echo-pairs — in Hungarian and in general — have received very little attention in the phonological and morphological literature. In particular, there is a complete lack of works discussing the possible theoretical consequences of the phenomenon, and there are hardly any treatments that offer a systematic analysis of the data that they present. For example, Thun (1963) provides

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[1]Throughout this paper, the two components of echo-pairs will be separated by a hyphen both in spelling and in phonetic transcriptions, regardless of the spelling conventions of the source language.

an extensive set of examples from English taken from a range of different periods and dialects, but does not make any broader generalisations regarding the form of the observed variants. Similarly, Apor (1906), Simonyi (1907) and Szikszainé Nagy (1993) present an impressive array of cross-dialectal data from Hungarian, but do not identify and analyse the various phonological trends observable in their data sets.

I believe that the reason for the shortcomings of previous treatments of echo-pairs is to be found in the nature of the data. As it has been noted above, echo-pairs tend to exhibit an unusually wide range of variation, which is likely due to the fact that the morphological pathways leading to such formations tend to be only partially conventionalised. As a result, the data sets from various languages often seem rather chaotic, with few clearly identifiable tendencies. This makes them unsuitable for analysis in traditional descriptive and theoretical frameworks based on categorical phenomena. Moreover, the descriptive works referred to above collapse data from several different dialects into a single data set. Since most theoretical approaches focus on the competence of a single speaker (cf. generative approaches such as Chomsky and Halle 1968 and Prince and Smolensky 1993) or the language use of a given community (cf. sociophonetic approaches such as Labov 1994), it is not clear what conclusions could be drawn from such a mixed set of variants. Therefore, it is clear that echo-pairs call for a different approach both in terms of data collection and analysis.

This paper focusses on a relatively small and well-defined subset of the problems described above, namely the phonological and morphological aspects of echo-pairs in Hungarian. Importantly, forms involving vowel changes are not dealt with, and the semantics and cross-linguistic aspects of the pattern will also not be discussed in any detail. As it will be seen, Hungarian echo-pairs exhibit the full range of variation described above. However, it is possible to isolate a smaller group of words in Hungarian which behave more systematically both in phonological and morphological terms: echo-pairs with a labial-initial second component. Here are a number of representative examples: *cica-mica* ‘cat.DIM’, *csiga-biga* ‘snail.DIM’, *Ancsi-Pancsi* ‘Anna.HYPO’.[2]

The paper endeavours to answer the following three questions related to echo-pairs:

[2]Hungarian examples are presented in standard orthography. The following letter-to-sound correspondences should be noted: <c> [ts], <cs> [tʃ], <gy> [ɟ], <ny> [ɲ], <s> [ʃ], <sz> [s], <ty> [c], <zs> [ʒ]. The rest of the consonants have their standard IPA values; IPA transcriptions will be provided when the quality of the vowels is relevant.

1. What types of methods can be used to collect data about echo-pairs in Hungarian? (methodology)
2. What phonological tendencies can be identified in echo-pairs? (description)
3. What theoretical implications does echo-pair formation have? Is it possible to go beyond the level of description? (theory)

This three-part distinction is also reflected in the general layout of the paper. Thus, in Section 2, I take up a number of methodological issues: I show how a large set of echo-pairs can be extracted from a corpus of Hungarian and how these forms can be arranged to allow for more in-depth analysis. Then, in Section 3, I use a variety of statistical and computational methods to identify phonological trends in the resulting data set, providing a more general description of the phenomenon through an analysis of the distribution of initial consonants in the second component of echo-pairs. Finally, in Section 4, I look at the theoretical implications of echo-pair formation, and propose that the observed trends can best be described as the result of the productive use of morphological schemata in the sense of Bybee (2001). Section 5 concludes the paper with a summary of its main points.

2 Data collection

The analysis presented in this paper relies on a set of forms extracted from the 600 million word Hungarian Webcorpus (Halácsy et al. 2004). The main reasons for choosing a corpus search over other methods of data collection are as follows. Controlled elicitation tasks are necessarily restricted to a set of forms preselected by the experimenter; this makes them unsuitable for the purposes of the present paper, which intends to explore the full range of variation in echo-pair formation in Hungarian. Traditional informant-based methods would also result in a skewed data set, as they encourage the production of forms that the informants consider interesting or peculiar, and which do not necessarily represent their competence. A corpus search, on the other hand, is likely to yield examples of actual language use, and a reasonably large corpus can also be expected to contain a representative sample of the echo-pairs that occur in Hungarian.

The Hungarian Webcorpus is particularly well-suited to the study of echo-pairs, since all the material in the corpus comes from the Internet and is therefore often written in a relatively informal register. Echo-pairs are usually restricted to playful and intimate contexts due to the semantics of the template, and are therefore more likely to occur in a corpus containing informal text samples than in a corpus

consisting mainly of relatively formal ones. The size of the corpus also ensures that it exemplifies the full range of variation in echo-pair formation.

It should be noted that the Hungarian Webcorpus contains text samples from speakers of a variety of different dialects, which means that the corpus-search method does not solve the problem of collapsing different language varieties into a single data set. However, since the source of the material is the Internet, it can be assumed that the speakers address themselves to a regionally non-specific audience. It has been observed that the speech style of a given speaker is affected by the audience (see e.g. Bell 1984), which means that it is unlikely that dialect-specific forms dominate in the corpus. Moreover, the corpus-search method also provides information about the token frequency of individual items. Since expressions specific to a given dialect are likely to have a lower frequency, they will have a relatively weaker influence on the results of the analysis (provided that it is based on token-frequency, or that infrequent forms are excluded).

Since the Hungarian Webcorpus does not currently have a phonetically transcribed version, the corpus search had to be based on written representations, which might be seen as a problem given that this paper focusses on the phonological aspects of echo-pairs. However, Hungarian spelling is relatively predictable in most cases, and the majority of the graphemes are in a one-to-one correspondence with their phonemic values, which means that written forms can be used where phonemic representations would normally be required. Indeed, the decision to rely on written forms has not caused any difficulties either during data collection or analysis.

The template used for the corpus search can be described as follows:

(1) $O_1\{\dots\}_i O_2\{\dots\}_i$, $O_1 \neq O_2$
O: a string of consonant characters (an onset; O_1 might be null)
$\{\dots\}_i$: a string of at least three characters starting with a vowel

That is, a corpus search using this the template returns all strings consisting of two identical parts where only the initial onsets differ. It was necessary to impose a lower limit on the length of the individual parts, as a corpus search without this restriction would return too many irrelevant forms (including all disyllabic words where the syllable rhymes are the same, such as *Miki* 'Nick' < *Miklós*, *lámpám* 'my lamp' < *lámpa* + *-(V)m*). To illustrate the scope of the template, here are a few examples for matching and non-matching forms:

(2) match: *cica-mica*, *Isti-Pisti*, *blicc-hicc*
no match: *ciróka-maróka*, *izeg-mozog*, *nyam-nyam*

Note that the template requires full identity of the characters following the onset, which means that forms showing vowel changes are excluded from the data set (see some of the examples in (2)).

The raw data set produced by the corpus search initially contained more than 4,000 word forms. However, more than half of these forms turned out not to be useful for the purposes of the present paper: some of these were foreign words (e.g. *backpack*), some suffixed forms (e.g. *ásatása*) and some snippets of code and unintelligible sequences that have not been removed from the original corpus (e.g. *mdashdmdash*). This left an overall 2,048 word forms, which were collapsed into 1,446 types (keeping an overall frequency count for each type).

These forms can be divided into four major groups on the basis of the word formation processes they exemplify: reduplicated forms (e.g. *cica-mica* 'cat.DIM'), rhyming compounds (e.g. *csillog-villog* 'is very clean' from *csillog* 'glistens' and *villog* 'flashes'), iconic formations where no base form can be identified (e.g. *csiri-biri* 'hocus pocus', where neither *csiri* nor *biri* exist as independent words)[3] and loanwords (e.g. *blackjack* [blɛgdʒɛkk]). A simple criterion can be applied to tease these different morphological formations apart from each other: forms where only one of the component parts occur independently in the language are likely to be the result of reduplication, whereas forms where both or none of the component parts occur independently are cases of compounding and iconic formation/borrowing, respectively (see Thun 1963: 10 for a similar criterion). Table 1 illustrates this grouping, and introduces a further distinction within the group of reduplicated forms based on the order of the base and the reduplicant.

PART 1	PART 2	MECHANISM	EXAMPLE	GLOSS
+	−	reduplication	***cica***-*mica*	'cat.DIM'
−	+	reduplication	*ici*-***pici***	'very small'
+	+	compounding	***csillog*-*villog***	'is very clean'
−	−	iconic formation	*dumm-bumm*	'rumbling sound'
−	−	borrowing	*black-jack*	'blackjack'

Table 1: *Types of word-formation processes based on the criterion of independence. Columns 1 and 2 indicate whether the first/second element of the formation appears as an independent stem in Hungarian. The forms typeset in bold occur independently in the language.*

Table 2 shows a few sample entries from the resulting database.

[3]The term 'iconic' is used since the relationship between the meaning and the sound shape of these forms is usually not entirely arbitrary. See Jakobson (1965) for a similar use of the term.

SPELLING	MORPHOLOGY	SYLLABLES	INIT	FREQ
cica-mica	reduplication	[ts,i,=] [ts,ɒ,=]	[m]	366
nyuszi-gyuszi	compound	[ɲ,u,=] [s,i,=]	[ɟ]	2
ecc-pecc	iconic form	[=,ɛ,tsː] [=,=,=]	[p]	28

Table 2: *Sample entries from the echo-pair database*

Note that the forms are stored in a syllabified form, where each syllable consists of an onset, a nucleus and a coda (thus, [ts,i,=] corresponds to a syllable with [ts] as its onset, [i] as its nucleus and no coda). Since the present study focusses on the distribution of initial consonants in the second component of echo-pairs, the onset of the second component is represented separately (this is indicated in the fourth column of Table 2). The database also contains the token frequency of each form.

3 Data analysis

This section presents a phonological analysis of the data set described in the previous section. The main emphasis is on the predictability of the initial consonant of the second component, which is henceforth referred to simply as the *behaviour* of the echo-pair (e.g. *cica-mica* exhibits behaviour [m] and *csiga-biga* behaviour [b]). The behaviour of echo-pairs is studied as a function of two main classes of variables: the phonological makeup of the rest of the word (cf. the third column in Table 2) and the morphological type of the echo-pair (cf. the second column in Table 2). It will be shown that these two classes of variables are strongly interrelated with each other, in the sense that the behaviour of certain morphological types shows clearer phonological conditioning. This observation serves as the basis of the structure of the section. Thus, I first investigate the behaviour of echo-pairs created through reduplication and find that a number of relatively clear phonological patterns can be identified within this group (3.1). In the second part of the section, I show that while some of these phonological tendencies can also be observed in echo-pairs created through other word formation processes, they have a much weaker effect outside the group of genuine reduplicated forms (3.2).

3.1 The behaviour of reduplicated forms

Echo-pairs created through reduplication (e.g. *cica-mica* and *ici-pici*) have a number of special properties which make them particularly well-suited to the study of the

phonological conditioning of echo-pair formation. This is mainly due to the fact that this is the only case where echo-pair formation comes close to more pedestrian morphological processes: reduplication takes a base-form and modifies it in a given way to create a form that fits the general pattern of echo-pairs, similarly to more familiar cases of affixation and templatic morphology. The reduplicant does not exist independently in the language (e.g. the string *mica* in *cica-mica* is not a Hungarian word), and the resulting echo-pair does not have any iconic properties, which means that it is unlikely that this morphological process is affected by any factors other than the phonological makeup of the base. This is clearly not the case for either compounding, where the choice of the two components is likely to be affected by semantic considerations as well, or iconic formations, where the iconicity of the echo-pair might impose additional constraints on its behaviour.

As it has been noted in Section 2, there are, in fact, two different patterns of reduplication that can result in echo-pairs. One of these consists in the addition of phonological material at the right edge of the base (as in the case of *cica-mica*, where *mica* is added to *cica*) and the other in the addition of phonological material at the left edge of the base (as in the case of *ici-pici*, where *ici* is added to *pici*). Although these two word formation processes could, in principle, differ in terms of phonological conditioning, the present analysis collapses them into a single group. While this might be seen as problematic, the results presented below demonstrate that the class of reduplicated forms exhibits a high degree of phonological conditioning as a whole, despite the fact that the directionality of reduplication is ignored.

Before turning to the effect of the phonological composition of the base on the behaviour of reduplicated echo-pairs, it will be useful to take a closer look at the distribution of behaviours within this morphological class. As it has been noted in Section 1, echo-pairs with a labial-initial second component have a special status in Hungarian. This is particularly clear within the reduplicated class, where a remarkably high proportion of the forms shows a labial behaviour: more than 98% of all the reduplicated tokens belongs to this behavioural class.[4] This is to be expected in light of the remarks above: if reduplicated forms reflect the phonological tendencies in echo-pair formation without any distortions resulting from non-phonological factors, and forms with a labial behaviour enjoy a privileged position among echo-pairs, we should not be surprised to find a high number of such forms within the reduplicated group. Figure 1 shows a more detailed summary of the distribution of behaviours

[4]The following discussion focusses on token frequency to the exclusion of type frequency. The reason for this restriction is as follows. The data set contains a relatively high number of *hapax legomena* and other infrequent forms, many of which exemplify slightly unusual production patterns (e.g. *ejnye-nejnye* 'tut-tut' which occurs only once in the data set, as opposed to *ejnye-bejnye*, which occurs 4,087 times). The use of token frequencies results in infrequent forms receiving less weight in the analysis, which prevents them from significantly skewing the results.

among reduplicated forms (behaviours occurring less than 50 times in the corpus are omitted).

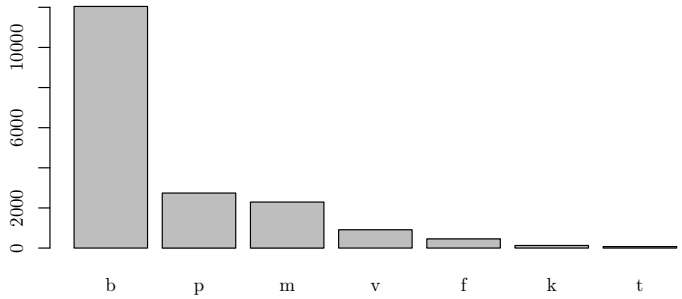

Figure 1: *The distribution of behaviours among reduplicated forms.*

The five most frequent behavioural patterns are all labial (which exhausts the range of labials in Hungarian) and [b], [p] and [m] together account for almost 91% of all the behaviours within this group. Therefore, the rest of this section focusses mainly on the latter three behaviours.

Further analysis of the patterns proceeded as follows. A preliminary inspection of the data set revealed a number of suggestive tendencies, which were used to formulate hypotheses about the phonological conditioning of the behaviour of reduplicated echo-pairs. These hypotheses were then tested through a combination of machine-learning and statistical methods to be described below. The hypotheses are listed below:

(3) THE FIRST ONSET:

a. [m]-initial first component → behaviour: [b]
b. [p]/[b]-initial first component → behaviour: [m]
c. vowel-initial first component → behaviour: [p]/[b]

(e.g. *mogyi-bogyi*, *puszkó-muszkó*, *Ancsi-Pancsi*)[5]

(4) THE SECOND ONSET:

a. voiced second onset → behaviour: [b]
b. voiceless second onset → behaviour: [m]/[p]

(e.g. *édi-bédi*, *cica-mica*)

The hypothesis testing procedure was based on the following basic principles. The data set can be divided into several subsets based on the values the features listed in the third column of Table 2 can take on. For example, it is possible to induce a partitioning of the data set based on the first onset of its first component

(henceforth referred to simply as 'the first onset'), which will result in several groups including [ts]-initial forms, [tʃ]-initial forms, [t]-initial forms, and so on (e.g. *cica-mica*, *csiga-biga*, *tündi-bündi* 'lovely'). Each of these groups will show a particular distribution of behaviours, and — if the hypotheses are correct — these distributions will be at least partly predictable on the basis of the feature values the partitioning is based on.

In principle, these distributions could be compared directly and the results used to confirm or reject the hypotheses above. As an illustration, consider Table 3, which only shows a small subset of the possible behaviours and the feature values.

x	$P([\text{m}]\|x)$	$P([\text{b}]\|x)$	$P([\text{p}]\|x)$
O_1=[k]	0.58	0.16	0.04
O_1=[t]	0.27	0.27	0.04
O_1=[tʃ]	0.29	0.47	0.07

Table 3: *The distribution of behaviours* [m]*,* [b] *and* [p] *among echo-pairs with* [k]*,* [t] *and* [tʃ] *as their first onset. $p(y|x)$ stands for the conditional probability of a given behaviour within a given group, which is calculated as its proportion within the group.*

The table shows that while [k]-initial forms attract a [m]-type behaviour, [tʃ]-initial forms favour [b]; [t]-initial forms seem to be intermediate in this respect (these tendencies are not related to the ones listed in ((3)) and ((4))). When looking at the full range of feature values and behaviours, this method requires the inspection of approximately 10-20 values and the comparison of the proportions of 10-20 possible behaviours for each of them. Since this procedure is exremely time-consuming and not sufficiently illuminating, a different method will be used for analysing the data set.

The groups can also be compared on a more abstract level by using a distance function to obtain a numeric measure of how different they are in terms of their behaviour. Ideally, such a measure would place [k] and [tʃ]-initial forms relatively far from each other and [t] somewhat closer to each of them. One possible way of calculating these distances is by using the Modified Value Difference Metric (MVDM) as described in Daelemans et al. (2007). The MVDM uses the following formula to calculate the distances between individual groups (where v_1 and v_2 are different feature values, B_i is a given behaviour and n is the total number of behaviours):

$$(5) \qquad d(v_1, v_2) = \sum_{i=1}^{n} |P(B_i|v_1) - P(B_i|v_2)|$$

That is, the MVDM simply computes how different the two groups are in terms of each possible behaviour and sums the results. In the present case, the MVDM was used to create a matrix of distance values for each pair of groups.

The most straightforward interpretation of these distance values is to imagine a space of behaviours in which the different groups occupy different locations. The hypotheses in (3) and (4) could be tested by comparing the locations of the relevant groups in this space (since forms that behave similarly will be close together and forms that behave differently will be far apart). Such a set of locations can be constructed and visualised with the help of a method called *multidimensional scaling* (Cox and Cox 2001), which maps a distance matrix to a set of low-dimensional coordinates (two-dimensional in the present case). It may be easier to understand the principles of multidimensional scaling through a somewhat less abstract example. Imagine a set of cities (e.g. Edinburgh, Budapest and Tromsø), where the exact location of the cities is not known, only the distance between each pair (1786 km for Edinburgh-Budapest, 1873 km for Tromsø-Edinburgh and 2467 km for Budapest-Tromsø). Multidimensional scaling can be used to create a set of coordinates which specify the actual location of the three cities on a map of Europe (after rescaling and rotating the coordinates). Exactly the same operation can be performed for a given partition of the set of reduplicated echo-pairs.

Figure 2 shows a two-dimensional visualisation of the distribution of behaviours among reduplicated echo-pairs as a function of their first onset (based on types; forms with a token frequency of less than 5 were excluded to avoid the distorting effects of low-frequency items).[6]

The figure also uses colour to visualise an additional type of information, namely the proportion of behaviours [m], [b] and [p] (which are represented by red, blue and green, respectively). Intermediate hues represent feature values which attract a mixed behavioural pattern. The degree to which these two types of representation (colour and location) are correlated is remarkable: the values of the first onset are arranged in a triangle whose three corners are each associated with one of the three colours; intermediate locations also correspond to intermediate hues. Since the calculation of the coordinates involves all the behaviours (as opposed to the colours, which represent only [m], [b] and [p]), this suggests that the result of the multidimensional scaling is mostly determined by the three most frequent behaviours.

A quick look at Figure 2 is enough to confirm all the three hypotheses about the influence of the first onset on the behaviour of reduplicated echo-pairs in (3).

[6]The characters t', d' and n' stand for [c], [ɟ] and [ɲ], respectively. The rest of the characters have their standard SAMPA values; the equality sign indicates a null onset.

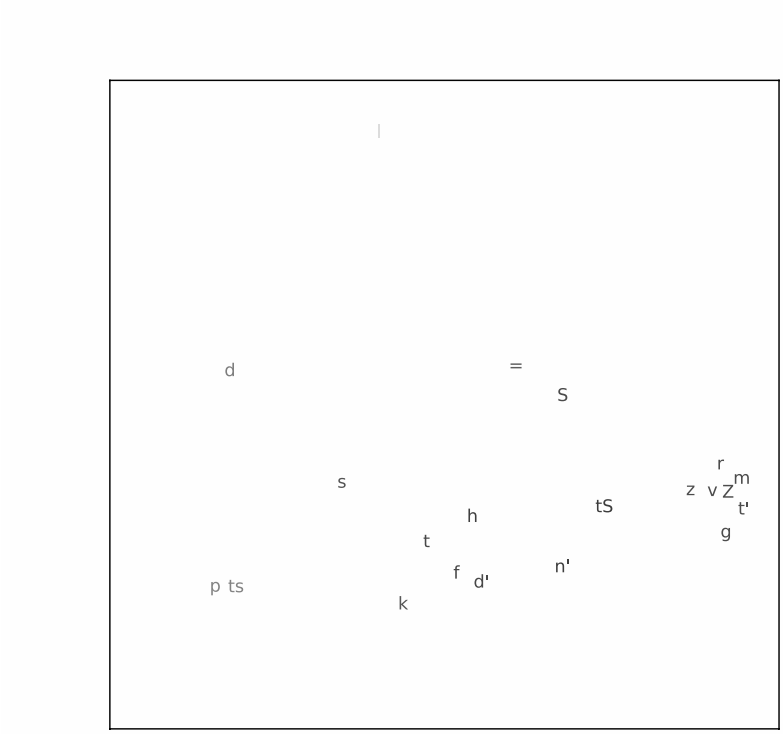

Figure 2: *The distribution of behaviours among reduplicated echo-pairs as a function of their first onset.*

First, [m] is in the lower right corner of the triangle, which is clearly associated with behaviour [b] (cf. (3a)). Second, [p] is in the lower left corner of the triangle, where forms with behaviour [m] reside (cf. (3b)).[7] Finally, vowel-initial forms (represented by the equality sign) are located between the two corners corresponding to behaviours [b] and [p] (cf. (3c)). The first two of these tendencies can also be interpreted as examplifying a more general pattern of dissimilation: labial-initial forms tend to have a second component that starts with a different labial consonant. It could be objected that the data set does not actually contain forms where the two components are identical due to the structure of the search template, and is thus not suitable for investigating patterns of dissimilation (as evidence against dissimilation is excluded by definition). However, it is quite telling that the patterns noted above seem to be conventionalised: [m]-initial forms are only found with behaviour [b] but

[7] Unfortunately, no [b]-initial forms were left after the removal of infrequent forms, which means that this part of the hypothesis cannot be tested.

not [p], and [p]-initial forms only with behaviour [m] but not [b]. The fact that each different type of labial-initial echo-pair in the data set selects a single behaviour — together with the informal observation that forms where the two components are identical do not seem to have the same semantic properties as forms where they differ — suggests that dissimilation is a valid interpretation of the observed tendencies.

The influence of the second onset on the behaviour of reduplicated echo-pairs is illustrated in Figure 3.

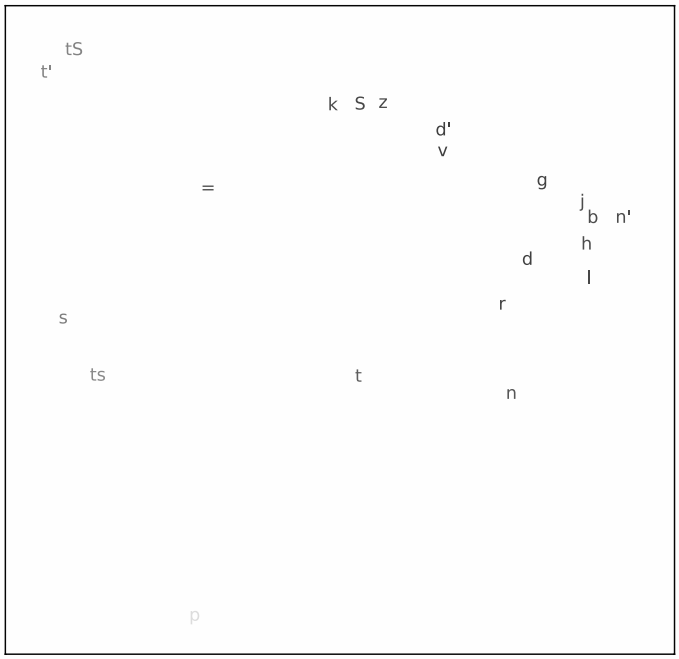

Figure 3: *The distribution of behaviours among reduplicated echo-pairs as a function of their second onset.*

Once again, the feature values are arranged in a triangle whose corners correspond to the three most frequent behavioural patterns. Interestingly, the position of the different consonantal values along the x-axis seems to be correlated with their voicing: voiceless consonants are found on the left hand side of the diagram and voiced consonants on the right hand side. This supports the hypotheses in (4): voiceless consonants in the second onset attract behaviours [p] and [m], as

opposed to voiced consonants, which attract behaviour [b]. It should be noted that this tendency is not as strong as those observed for the first onset: there are quite a few values which occupy an intermediate position and cannot be clearly associated with a single behavioural pattern. However, the values closer to the corners of the triangle all behave in accordance with the hypotheses in (4). The only exception is [h], which, however, has long been noted for its ambiguous behaviour with respect to voicing: it is the only voiceless obstruent that does not undergo voicing before a voiced obstruent (see e.g. Siptár and Törkenczy 2000). The relationship between the voicing of the second onset of the echo-pair and its behaviour can also be interpreted as a case of assimilation: forms with a voiced consonant exhibit a voiced behaviour, as opposed to forms with a voiceless consonant, which exhibit a voiceless or passively voiced behaviour.[8] It should be noted that such patterns of assimilation are extremely rare: the acoustic cues of voicing hardly extend beyond the consonant they belong to, and therefore do not typically trigger patterns of long-distance assimilation (Hansson 2004; Blevins and Garrett 2004).

3.2 Compounds, iconic forms and loanwords

The investigation of echo-pairs formed through reduplication has shown that echo-pair formation is subject to a relatively high degree of phonological conditioning when there is no interference from non-phonological factors. However, the methods used in the analysis of reduplicated forms cannot be straightforwardly extended to compounds, iconic formations and loanwords. The reasons for this are as follows. Semantic considerations play an important role in the choice of the two components of echo-pairs in compounds, and can be expected to override the phonological patterns observed in the previous section. Similarly, the sound symbolic aspects of iconic formations are likely to interfere with the behaviour of these forms, although these interactions are less transparent than the semantic effects in compounds, which may allow for a slightly greater amount of phonological conditioning within this group. Finally, echo-pairs borrowed from other languages are unlikely to exhibit the patterns observed in Hungarian due to their foreign origin.

These arguments receive support from the proportions of labial forms within different morphological classes, which are shown in Figure 4.

While both compounds and iconic formations exhibit a higher proportion of forms with a labial behaviour than would be expected on the basis of the baseline

[8]The voicing of nasals is traditionally described as passive, mainly because of the fact that the maintenance of voicing in sonorants does not require any extra articulatory effort as opposed to obstruents (see e.g. Chomsky and Halle 1968). Passively voiced consonants do not normally exhibit a voicing contrast.

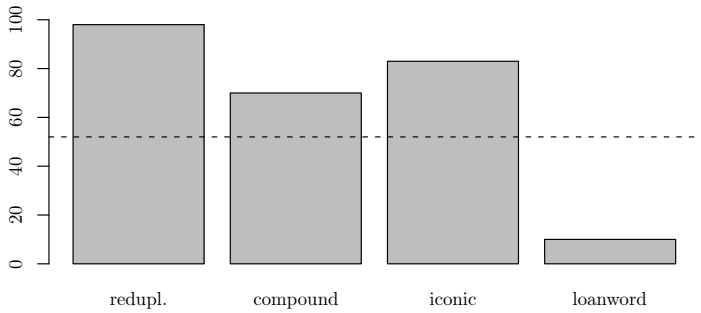

Figure 4: *The proportion of labials in classes of echo-pairs created through different morphological processes. The dashed line indicates the baseline, that is, the overall frequency of labial-initial forms in Hungarian on the basis of the Hungarian Webcorpus.*

frequency of labial-initial forms in Hungarian (indicated by the dashed line), these proportions are considerably lower than that observed among reduplicated echo-pairs.[9] Unsurprisingly, loanwords show a very different pattern: the proportion of labials is significantly lower than the baseline (for this reason, they will be excluded from the analyses presented in the rest of this section). These results suggest that the general pattern observed for reduplicated echo-pairs (i.e. the prevalence of labial forms) is present in compounds and iconic formations as well. The question is whether the more fine-grained patterns of phonological conditioning described above extend to these groups as well.

Since the combination of the MVDM and multidimensional scaling presented in the previous section does not yield any easily interpretable results for compounds and iconic formations, a different approach is taken. Instead of trying to isolate each of these tendencies within these groups, they are compared to the group of reduplicated forms in a more indirect manner. More specifically, an artificial learner is used to extract the tendencies among reduplicated forms and is then tested on compounds and iconic formations to see whether its knowledge of the phonological patterns in the former group can be successfully applied to the latter two groups. The rationale behind this strategy can best be understood through an analogy. Consider a native speaker of Danish trying to learn Norwegian and Hungarian. It is almost certain that they will be more successful at acquiring Norwegian than they will be at acquiring Hungarian (although, of course, these differences might diminish over

[9] All of the differences reported here are statistically significant at a level of $p < 0.01$ according to chi-squared tests with Yates' correction for continuity (standardly used for the comparison of proportions).

time). The reason for this is that many of the patterns in their native language can also be found in Norwegian but not in Hungarian. Similarly, an artificial learner trained on reduplicated forms will be more successful when tested on compounds or iconic formations if the latter two groups also contain some of the phonological patterns typical of reduplicated forms.

The artificial learner used for the purposes of this experiment is based on Nosofsky's (1986) Generalised Context Model (GCM). The basic principles of the GCM are as follows. Since the GCM is an exemplar-based model, the patterns in the training set are not learnt explicitly; instead, the GCM simply stores a feature representation of all the tokens in the training set along with their behaviour (the features in this case are the syllabic constituents in the third column of Table 2). These stored forms can all be accessed during the testing phase, when the model has to make predictions for forms whose behaviour is not known. The prediction of the behaviour of a given form is based on a token from the training set selected stochastically as a function of its similarity to the given form: the outcome of the prediction is simply the behaviour of this form.

The crucial step in the process described above is the selection of the token which serves as the basis of the prediction. As it has been noted above, the probability that a given token is selected is proportionate to its similarity to the form whose behaviour is not known. Similarity is calculated as a monotonically decreasing function of the distance between the two forms. The distance value is obtained by going through the feature representations of the two forms and keeping a tally of matching feature values. Features that are more important in the prediction can be also weighted, in which case they have a relatively higher influence on the distance value.[10] To give an example, the non-weighted distance between the forms *csicsa* [tʃ,i,=][tʃ,ɒ,=] 'kitsch' and *cica* [ts,i,=][ts,ɒ,=] 'cat' will be equal to the the distance between *csicsa* [tʃ,i,=][tʃ,ɒ,=] and *csacsi* [tʃ,ɒ,=][tʃ,i,=] 'donkey.*dim*' (the distance value is 2 in both cases). However, if the first and the second onset are more heavily weighted, *csicsa* and *csacsi* will be closer to each other than *csicsa* and *cica*. It should be noted that there are several important details about the similarity metric and the calculation of probabilities that have been omitted from the present discussion; the interested reader is referred to Nosofsky (1986) for a more detailed description of the GCM.[11]

[10] Thus, the first and the second onset were weighted more heavily than other features in the present experiment, since they were found to be relatively reliable predictors of the behaviour of echo-pairs in Section 3.1.

[11] Since the purpose of this experiment is to compare the performance of the same learner on different data sets, all the parameters in the model are kept constant. The specific values of the parameters are not particularly important for the present discussion, as they seem to affect the behaviour of the

Three simulations were run to test the performance of the artificial learner on the different data sets. The task in each simulation was to predict a behaviour for all the items in the test set. The training set was the same in each of these simulations: the set of reduplicated forms. The test set was varied between the simulations: the set of reduplicated forms was used in the first one, the set of compounds in the second one and the set of iconic forms in the third one. The motivation for testing the learner on the training set as well was to see how well it could learn the patterns within the group of reduplicated forms. Both the training set and the test set contained tokens rather than types, which means that the same forms often occurred several times within the same data set. Moreover, since the prediction mechanism in GCM is based on stochastic principles, tokens of the same word sometimes differed in their predicted behaviour.[12]

The results of the simulations are presented in Figure 5.

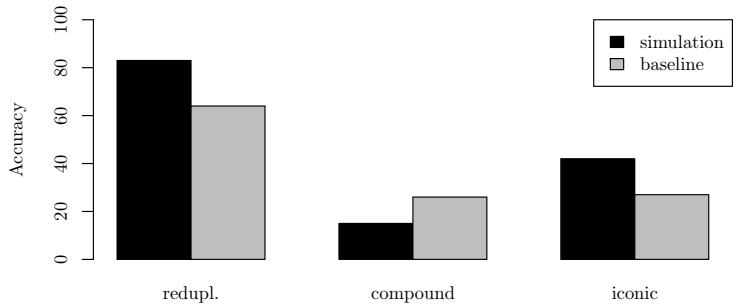

Figure 5: *The accuracy of the GCM compared to a baseline accuracy that could be achieved without using any of the fine-grained generalisations among reduplicated forms.*

The accuracy results for the simulations are obtained simply by dividing the number of correct predictions by the total number of forms in the test set. The baseline accuracy is defined as the accuracy that could be achieved by predicting the most frequent behaviour within the test set for all the items (i.e. the proportion of the most frequent behaviour within the test set). Unsurprisingly, the performance of the model is the highest when tested on reduplicated forms, surpassing both the baseline performance and the performance of the model for the other two data sets. While there can be no doubt that this is largely due to the fact that the training set

model similarly regardless of the data set it is tested on, and thus do not have a crucial effect on the comparative success of the model in the three different conditions.

[12]The artificial learner could not use different tokens of the given form to predict its behaviour, as this would have led to a nearly 100% success rate in the case where the training set and the test set were the same.

and the test set were identical, the difference between the baseline accuracy and the accuracy of the GCM corroborates the assumption that the phonological makeup of reduplicated forms can be used to predict their behaviour. The accuracy of the GCM is extremely low for compounds in comparison to both the baseline accuracy and the other two data sets. This suggests that the fine-grained phonological conditioning present among reduplicated forms is not found in this group. Finally, the performance of the GCM exceeds the baseline for iconic forms, but is markedly lower than its performance for reduplicated forms, which means that the phonological tendencies observed among reduplicated forms are present within this group, but have a weaker effect.

To sum up, it appears that both compounds and iconic forms show some of the general tendencies within the reduplicated group, but only iconic forms exhibit fine-grained phonological conditioning. This is compatible with the tentative claim made at the beginning of this section according to which semantic effects may interfere with the phonological patterns underlying echo-pair formation to a greater extent than sound symbolic considerations.

4 Discussion

This section presents a discussion of a number of theoretical points related to echo-pair formation. I begin by providing a brief summary of the observations made in the preceding sections. It will then be argued that the evidence about echo-pairs can best be explained if we assume that these forms are the result of the productive use of a product-oriented schema in the sense of Bybee (2001).

Let us review the evidence presented so far. There are several different word formation processes that can give rise to echo-pairs, including reduplication, compounding, the creation of iconic forms and borrowing. These processes appear to show a considerable degree of variation in the extent to which they are conventionalised. Thus, reduplication is geared specifically towards the creation of echo-pairs and exhibits a high level of systematicity in phonological terms. The creation of iconic forms is not restricted to echo-pairs and seems to be much less systematic as a means of echo-pair formation, although such forms also exhibit some of the phonological tendencies present in reduplicated forms. Compounding is an even more general morphological mechanism, which shows only the most general tendencies observed among reduplicated echo-pairs. Finally, loanwords do not seem to fit into any of the patterns discussed in the previous sections, which is likely to be a result of their foreign origin. It should also be noted that the phonological tendencies in Section 3 are all specific to echo-pair formation. The high proportion of labi-

als, the dissimilation of initial consonants and the pattern of long-distance voicing assimilation described for echo-pairs are not found anywhere else in Hungarian.

It is clear that models based on the application of symbolic morphological rules (see e.g. Katamba 1993) are incapable of capturing the regularities (or, rather, irregularities) described above. Several separate morphological rules would have to be posited to account for the different morphological processes described above, despite the fact that echo-pair formation clearly exhibits a number of shared properties that are seen in all of these classes. It is also difficult to see how non-conventionalised processes such as the creation of echo-pairs through compounding could be captured in any insightful way in such a framework. Moreover, the variability inherent in echo-pair formation also cannot be straightforwardly represented in a model based on categorical morphological rules.

Therefore, I believe that the evidence presented above calls for a different approach. I propose that echo-pair formation can best be explained as the result of the productive application of a morphological schema. A *schema* can be defined as a collection of phonological generalisations describing a set of forms sharing a similar set of functions (cf. Bybee and Slobin 1982; Bybee 2001). Whether such schemas are represented explicitly in the form of phonological statements or emerge from patterns among stored forms is immaterial to the present discussion: echo-pair formation is compatible with both views and the evidence reviewed above does not favour either of them. Some of the phonological generalisations associated with echo-pair formation are as follows: altered repetition of the same phonological sequence, labial-initial second component, dissimilation between the initial consonants of the two components and voicing assimilation between the second onset and the initial consonant of the second component. The set of shared functions include diminution, hypocorism and connotations of 'playfulness' more generally. Since the phonological tendencies above are directly associated with the semantic functions of echo-pairs, it is not surprising that they are not found elsewhere in the language.

Echo-pairs can best be described through a product-oriented schema (see Bybee 2001), which does not prescribe the way a particular morphological construction is assembled. A form that conforms to the phonological generalisations pertaining to echo-pairs will automatically be associated with the range of functions typical of echo-pairs regardless of the morphological pathways through which it is created (thus, both *csillog-villog* and *cica-mica* have connotations of playfulness and informality despite the fact that one of them is created through compounding and the other through reduplication). Product-oriented schemas can be contrasted with source-oriented schemas, which also determine the way a given form is constructed. For instance, a form such as *lens* in English will not normally be interpreted as

plural due to the absence of a corresponding singular form *len* and the implied impossibility of *lens* being derived from a base form.

Importantly, product-oriented schemas do not have to be completely categorical: a form that only satisfies a subset of the phonological generalisations embodied in a schema can still be associated with the relevant meanings. Thus, *cica-mica* satisfies all the phonological constraints on echo-pairs, while *Tapsi-Hapsi* 'Bugs Bunny' only the most general of them; however, they both have playful, diminutive associations. It could be further assumed that forms that fit more of the phonological patterns seen among echo-pairs will be associated with more prototypical functions within this group. Unfortunately, the present data set does not provide any means of testing this hypothesis.

In conclusion, morphological schemata provide a straightforward way of capturing the phonological and morphological properties of echo-pairs in Hungarian. We can account for the fact that echo-pairs can be created through several different morphological pathways through the assumption that this phenomenon is based on a product-oriented schema. The variation in the behaviour of echo-pairs can be interpreted as a consequence of the non-categorical nature of schemata. Finally, the observation that the phonological tendencies in echo-pair formation are not found elsewhere in Hungarian follows from the inclusion of these tendencies in the morphological schema describing echo-pairs.

5 Conclusion

In this paper, I have presented a phonological and morphological analysis of echo-pair formation in Hungarian. It has been shown that even such a highly variable and unconventional pattern can be investigated systematically through the use of modern computational and statistical methods. Thus, a corpus search has been used to compile an extensive data set consisting of echo-pairs, which has been analysed through a variety of computational techniques. Several phonological tendencies have been identified, including an unusually high proportion of labial forms, a pattern of dissimilation between the initial consonants of the two components of echo-pairs and a pattern of long-distance voicing assimilation. It has also been demonstrated that these tendencies can be found in all three classes of echo-pairs created language-internally, although their strength has been found to vary across these classes. Finally, I argued that the evidence related to echo-pairs supports a non-symbolic approach to morphological patterns, where the creation of novel word-forms is potentially guided by product-oriented schemata.

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8 Toward a quantitative semiotics?*

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Mikata Kft.

Abstract

This paper will demonstrate that the lack of quantitative, data-based research about nonlinguistic symbol sets that still have internal structure is already adversely affecting linguistics itself. We will survey recent attempts to distinguish between written languages and nonlinguistic inscriptions using information-theoretic, physical and usage-based metrics. We will also provide a list of nonlinguistic corpuses used in current research alongside their shortcomings. Finally, we will propose a possible new framework and a continuum-based concept of language-ness.

1 Introduction and Scope

The aim of this brief theoretical paper is to point out a curious lack, namely that semiotic problem sets are usually not handled using the tools of linguistics. Nonlinguistic symbol sequences that still have some internal structure (henceforth: NSSs) are most often disregarded, even though many such symbol sets exist in all kinds of cultures, dating back to ancient ages. From pottery markings to traffic signs, from Sumerian deity symbols to medieval heraldry, the examples are almost endless. These symbol sets can have all sorts of uses, from the mundane to the religious and even the magical. Some have little internal structure, while others have a relatively complex syntax. They permeate our lives - many readers of this article probably have at least one item on their bodies which features a tag printed with textile care symbols! Yet there is a lack of discussion about the features of these systems in linguistics.

This lack is probably due to two main reasons. First, linguists normally do not concern themselves with NSSs, possibly assuming these symbol sets have no

*Thanks to all participants of the conference for the interesting discussion and pertinent questions, which no doubt led to the improvement of this paper, and which have also inspired a followup related to semiotic universals, currently in preparation. Further thanks to Szymon Pawlas, a similarly inspiring source of visual symbols of all kinds. The paper also benefited from the comments of an anonymous reviewer.

interesting features from a linguistic standpoint. Second, semioticists tend to have an approach that is more closer in spirit to the humanities than to the sciences. Therefore, the usual tools employed in linguistic problems are seldom applied to issues related to NSSs. This especially holds true for quantitative linguistic methods.

We do not propose a sort of theoretical imperialism where the scope of quantitative linguistic methods is widened until it becomes senselessly broad. We also do not consider more hermeneutic, qualitative, "soft" approaches inferior. Not everything should — and could! — be handled using quantitative methods. However, the fact that semiotic content is seldom investigated with quantitative linguistic methods is already adversely impacting conventional linguistics itself, as we will seek to demonstrate using a recent example: an approach using computational methods to find linguistic structure in undecoded ancient inscriptions, especially the Indus Valley symbols and the Pictish symbols.

2 The Linguistic Nature of Symbol Sets

Recently, researchers have stumbled across problems which are generally considered to be beyond the purview of theoretical linguistics. How is it possible to tell if a given symbol sequence is linguistic in nature? Can an algorithm or heuristic be provided to estimate "language-ness"?

The debate has been ignited by Rao et al. (2009a) who titled their paper published in Science "Entropic Evidence for Linguistic Structure in the Indus Script". The title itself is significant, because the paper contains no claims of conclusive evidence, only possibility ("our results increase the probability that the script represents language" — Rao et al., 2009a), and even the authors have pointed this out in the subsequent discussion ("we do not claim to have "proved" any statement regarding the Indus script—our work presents evidence that is supportive of the linguistic hypothesis (in an inductive framework), but does not prove it" — Rao, 2010a). Despite these facts, the paper is still often quoted as the source of "evidence" in the conclusive sense of the term, especially in the popular press (for example, see Mahadevan, 2009).

The goal of Rao et al. (2009a) was to demonstrate that the Indus Valley signs left beyond by the ancient Harappan civilization were of a linguistic nature, as opposed to the theory that the signs were nonlinguistic (Farmer et al., 2004) and possibly used in agricultural rituals (Farmer, 2004). Indus Valley signs tend to be very brief: the average length is just 4.6 symbols, with less than 1% of strings containing over 10 symbols. Furthermore, there are many unique symbols, with estimates ranging from 27% to 50% depending on the method of classification used - some unique symbols seem to arise from combinations of simpler symbols. The symbol inventory

is quite large, with estimates approximately in the 400–600 range (Farmer et al., 2004). These features are highly unusual and have been used to argue both for and against their linguisticity.

Rao et al. (2009a) claimed that the conditional entropy of the Indus Valley symbol sequences was similar to that of natural languages, but not to that of other symbol sequences like Fortran code or DNA base pairs. They also used two artificial datasets for comparison, a practice that drew criticism (Farmer et al., 2009). Conditional entropy was chosen because it quantifies "the amount of flexibility in the choice of a token given a fixed preceding token" (Rao et al., 2009a); it was hypothesized that languages behaved differently from NSSs in this respect. Relative conditional entropy — "conditional entropy relative to a uniformly random sequence with the same number of tokens" (Rao et al., 2009a) — was also used, for the same ends. While these concepts have been used in information theory for over half a century, as the authors themselves mention, this was the first time they were used to tackle the Indus Valley issue.

Critics (Shalizi, 2009; Liberman, 2009; Sproat, 2010) immediately generated symbol sequences which had conditional entropies similar to natural languages, but which were provably not linguistic in nature. Moreover, they provided scripts in multiple programming languages to allow immediate replication. The debate soon got very heated, with Sproat (2010) even proposing that the original authors submitted to a general science journal to avoid the paper being peer reviewed by computational linguists!

A similar approach has been used by Lee et al. (2010) to demonstrate that Pictish stone carvings were in fact a written language. (This paper had an even less ambiguous title: "Pictish symbols revealed as a written language through application of Shannon entropy".) They used a two-parameter decision tree where one parameter was entropy-based and the other was related to bigram repetition; they claimed that with this tree it was possible to differentiate between nonlinguistic data, letter-based, syllable-based and word-based writing systems. This paper seemed to attract less attention, though it was discussed by Sproat (2010) and Fournet (2011).

3 Examining the Controls

From our standpoint, the most important problem with these papers is that of nonrepresentative control nonlinguistic corpuses. These controls are supposed to be representative of NSSs in order for us to be able to say that the proposed methods can differentiate between written languages and NSSs. Unfortunately, some of the controls are completely artificial, some are transcribed in a manner that might make them more language-like, and some encode a natural language. The Appendix

contains a list of relevant quotations about the corpus generation methods used in each paper and the corresponding supplementary material; here we will briefly discuss said methods.

Farmer et al. (2004) only made a brief comparison of Indus signs, various natural language scripts, and Scottish heraldic blazons using cumulative frequencies. The choice of blazons was criticized by Vidale (2007) in his thorough critique of the paper, for being culturally inappropriate to serve as a comparison. We would add that depending on the corpus used, the rigidness of blazon texts can vary to the point of them being essentially natural language. While this particular corpus (see the Appendix) seems to be quite rigid, it is not described exactly how the descriptions were separated into units.

Rao et al. (2009a) used two types of artificial datasets in some of the comparisons ("Type 1 and 2"), and DNA base pair sequences, amino acid sequences, and Fortran source code in addition to Type 1 and 2 in other comparisons. While the biological sequences undoubtedly contain information, they are not the output of human cognitive activity and are thus not very useful if we are trying to differentiate between datasets that are undoubtedly human-produced and used to communicate meaning. Fortran as a programming language is probably better-suited to serve as a control.

Another issue is whether the artificially constructed symbol sequences are similar to actual real-life NSSs. In Rao et al. (2009a), whenever real symbol sets were used, there was much less of a difference in relative conditional entropy. In some cases, the difference is less than that between different natural languages (see their Figure 1B). Either we exclude Sanskrit — one of the examples used — from the set of natural languages, or we include Fortran!

Rao et al. (2010) used the same datasets, with the addition of a relatively small music sample from Schmitt and Herzel (1997) — a study estimating block entropies of DNA sequences where written language, Fortran source code and a Beethoven sonata from Ebeling and Nicolis (1992) was used as a comparison. Schmitt and Herzel (1997) only used control samples to demonstrate the high entropies of the DNA sequences (their main focus), not to distinguish between languages and NSSs.

Lee et al. (2010) used "heraldic sematograms, code characters and repetitive lexicographic characters". The issue here is that the "code characters" encode English text, and English is a natural language. The fact that natural languages can be encoded in a manner that significantly changes their relevant parameters is strong evidence that these parameters are not useful in differentiating between full-fledged languages and NSSs. These parameters could still possibly be used in differentating languages encoded in a variety of ways, for example to differentiate between alphabets and syllabaries (as in the original article). Still, one needs to note that the two different systems used in transcribing the Pictish stones give different

results in the authors' system: with one set, characters are classified as syllables, with the other, as words. (The authors argue that one of the transcription systems is wrong.) Sproat (2010) also mentions that his corpus of die tosses — quite obviously not language, and for our purposes, not even a NSS — is classified by the Lee method as a writing system composed from letters.

Fournet (2011) pointed out that Pictish symbols were forcibly linearized by Lee et al. (2010), which can add artifacts to the analysis. The heraldic controls were also similarly linearized; Sproat (2010) noted that the method used in the latter did not follow established conventions. Lee et al. (2011) responded by claiming that directionality is implied in the Pictish corpus. (In the Indus corpus, the general convention is to assume right-to-left directionality; this was challenged by Farmer et al., 2004, without much apparent impact.)

4 Defining Relevant Concepts

A general characteristic of these papers seem to be that broader meanings of "language", "writing" and "syntax" seem to be used than the common usage of these terms in linguistic discourse. Lee et al. (2010) defined writing in a way that also included "semasiographic characters" = elements of NSSs. This was reiterated in Lee et al. (2011): "Writing communicates information via markings". Language apparently also included animal communication (mentioned as "animal language" in Lee et al., 2010).

There are multiple papers aiming to find syntactic structure in the Indus Valley symbols (Rao et al., 2009a, Yadav et al., 2010, Sinha et al., 2011). Again, syntax seems not to refer to linguistic syntax, but rather internal structure: "Text beginner and ender distributions are unequal, providing internal evidence for syntax." (Yadav et al., 2010) "The script exhibits distinct language-like syntactic structure including equivalence classes of symbols with respect to positional preference, classes of symbols that function as beginners and enders, symbol clusters that prefer particular positions within texts, etc." (Rao et al., 2010) But symbols have preferred positions in many NSSs as well, even in non-linearized ones like vexillology.

The ambiguity stems from "syntax" having a broader and a narrower meaning: in the broader sense, it is used to refer to "a set of rules which govern how the signs are consecutively strung together to form a sequence" (Sinha et al., 2011), as in programming language syntax etc., and in the narrower sense, it is used to refer to linguistic syntax. In linguistics papers, the latter is expected, so the former would ideally be followed by clarifications that syntax as used is not full-scale linguistic syntax. Of the three cited papers, only Sinha et al. (2011) mentioned the broader and narrower meanings of syntax, evidenced by putting "grammar" in scare quotes and

providing their own definition for syntax. (Yadav et al., 2010 contains an explicit discussion of this issue in an arXiv preprint, which surprisingly did not make it into the final published article: "This indicates that the script can certainly be considered as a formal language, but it remains to be seen if these features imply an underlying natural language.")

Strangely, Sinha et al. (2011) also stated that the hypothesis that "the signs are ritual or religious symbols" [...] "implies the absence of any syntactic structure". Many magical or divinatory systems — ostensibly covered under "ritual" — have features which would certainly fall under this broader interpretation of syntax. While we are cautious to bring examples before their structure has been investigated in a similar manner, alchemical symbols would probably qualify, just as various Eastern and Western astrological diagrams.

5 Proposed Metrics of Linguistic Structure

It is probably unlikely that we will have a single metric to differentiate between languages and NSSs, as Rao et al. (2009a) intended and their critics were quick to point out. Even Rao's research group moved away from that approach in their more recent work (Rao et al., 2010; Yadav et al., 2010) and they now aim to use a variety of metrics to provide convergent validity to the notion that Indus Valley inscriptions encode language: "it would be highly unusual for a nonlinguistic system to exhibit a confluence of all of these properties." (Rao et al., 2010) Alas, we do not actually know if this statement is true, since no one has taken the trouble of examining a large amount of nonlinguistic systems along these dimensions.

Lee et al. (2011) used two parameters and a decision tree to quantify the way these parameters are scored to arrive at the final categorization; Yadav et al. (2010) and Rao et al. (2010) used a larger amount of parameters, but they did not provide a way of summarizing them beyond listing them. This is understandable since they do not seek to come up with a general method of categorization, their goal is only to prove that Indus Valley inscriptions are linguistic. But it is probably impossible to reach the latter goal without working on the former problem.

There is a further interesting avenue: there have been attempts to provide validity to the notion that a script encodes natural language using computational modeling. If the model manages to discover regularities in the inscriptions sufficiently to guess missing characters (which are known to researchers), we can say that it managed to capture some of the underlying structure. Rao et al. (2009b) and Yadav et al. (2010) provided the first results.

Every researcher seems to agree that there is at least a possibility that we could use a quantitative method to distinguish between written languages and NSSs. Even

Sproat (2010), the most vocal critic of the current attempts, made this clear: "I must stress that I do not wish to argue that it is impossible that one could come up with a sound statistical argument to show that a particular symbol system is not linguistic."

We have chosen to divide the proposed metrics into information-theoretic, physical and usage-based categories. The metrics are listed with the original authors' spelling and naming conventions, which leads to minor discrepancies and ambiguities; this was intended, we refer readers to the original papers for more detail. References with asterisks refer to the supplementary material.

Information and related metrics:

- Bigram probability (Yadav et al., 2010)
- Block entropies (Ebeling and Nicolis, 1992; Schmitt and Herzel, 1997; Rao et al., 2009a*, 2010; Rao, 2010b)
- Conditional entropy (Rao et al., 2009a; Rao, 2010b)
- Conditional probabilities of text beginners and text enders / Syntactic structure (Yadav et al., 2010; Rao et al., 2010; Rao, 2010b)
- Connectivity analysis (Sinha et al., 2011)
- Cumulative frequency distribution of signs (Farmer et al., 2004; Yadav et al., 2010)
- Degree and strength distribution analysis (Sinha et al., 2011)
- Di-gram entropy [with adjustments] (Lee et al., 2010)
- Di-gram repetition factor (Lee et al., 2010)
- Directed network construction and comparison with random sequences (Sinha et al., 2011)
- Entropy (Rao et al., 2009a*; Yadav et al., 2010)
- Log-likelihood significance test (Yadav et al., 2010)
- Mutual information (Yadav et al., 2010)
- Network of significant links (Sinha et al., 2011)
- Percentage of unique and rare signs (Farmer et al., 2004)

- Perplexity (Rao et al., 2009a* — only to justify the model used –; Yadav et al., 2010)
- Segmentation tree construction (Sinha et al., 2011)
- Sign-repetition rates (Farmer et al., 2004)
- Zipf-Mandelbrot law (Farmer et al., 2004 — only to reject –; Rao et al., 2009a*, 2010; Rao, 2010b; Yadav et al., 2010)

Physical characteristics of writing:

- Linearity (Rao et al., 2010; Rao, 2010b)
- Directionality (Rao et al., 2010; Lee et al., 2011; Vidale, 2007 also mentions this in passing)
- Use of diacritical marks or ligatures (Rao et al., 2010; Rao, 2010b; Vidale, 2007)

Usage-based characteristics:

- Diverse usage (Rao et al., 2010)
- Use in foreign lands (Rao et al., 2009b, 2010 — also tested foreign inscriptions with a log likelihood test; Rao, 2010b)

Many of these metrics are not satisfied for every writing system used to encode natural language, and there are also NSSs which satisfy many of these criteria. The question is exactly how many.

We would also like to propose a set of metrics of our own that we are currently working on; results will be presented elsewhere. A visual-complexity metric for individual signs could probably not only distinguish between writing and NSSs, but also among various sorts of writing systems, and among different groups of NSSs. For instance, while this remains to be substantiated, religious and magical systems could have different visual complexity. In the literature, there are probably as many ways of quantifying visual complexity as of quantifying linguistic structure, ranging from user reports of perceived complexity (Harper et al., 2009) to compression-based methods (Székely et al., 2000), so current approaches will need to be surveyed first. Many of these studies and their results will not be directly applicable to language and similar NSSs, as they often have to do with the visual complexity of natural scenes (Oliva et al., 2004).

To allow us to make statements based on empirical evidence, we are also planning on creating both vectorized and raster corpuses of signs. This avenue could lead to practical application in user interface research as well; as mentioned in the discussion, another area where there seems to be a need for quantitative semiotic approaches.

6 Discussion and Further Possibilities

Unfortunately we do not know enough about NSSs. The real opposition is not between natural languages or random sequences — we can isolate these two groups quite handily, for instance using cryptographic methods (Rao et al., 2009a). Instead we probably have a continuum of language-ness at hand: at the maximum we have natural languages, at the minimum, completely nonlinguistic sequences, and inbetween we have various NSSs which still have some sort of internal structure that may have some linguistic characteristics. Right now we are interested in the middle of the continuum.

Are there various different dimensions of language-ness? How could we formulate these? We need to get a lot of descriptive work done simply to assess various NSSs and build corpora. Sproat (2010) points this out quite strongly: "nobody has done the legwork of putting together the needed corpora of ancient linguistic and non-linguistic symbol systems, and demonstrated that one can in fact use such measures to do a better than chance job of classifying systems." But we also need to reach beyond this to see if we can make predictions about NSSs using the tools of linguistics, or the tools of other sciences.

The work described above has aimed to produce a method which sorts symbolic systems into categories. But do we even need sharply-defined categories? In most cases, they have served us quite well, but in borderline cases — which are the most interesting for us here — they have led to extremely heated debates. This conceptualization has also led to a general neglect of said borderline cases in linguistics. A parallel could be brought from inside linguistics, a classic syntax debate: the syntax of idioms and regular constructions was neglected for a long time and considered peripheral to core syntax, and when people devoted effort to investigating them (as in the classic paper of Fillmore et al., 1988), this led to several new and fruitful approaches, and the general Construction Grammar paradigm.

We also need to consider the case that what we are looking for already exists. In fact there are multiple approaches which label themselves as quantitative or — especially — computational semiotics, mostly in user interface design and intelligent systems design, but there the "computational" refers not to a way of analysis, but rather to semiotic processes involving a computer (for example see Mehler, 2003).

Similarly, there also existed the Computational Semiotics (COSIGN) conference series, running from 2000 to 2004, whose aim was "to explore the way in which meaning is understood by, or produced with, computers." (http://www.cosignconference.org/). There are probably countless papers using some form of quantitative analysis on NSSs, in a variety of fields from archeology to anthropology, but these generally do not tend to use the tools of (computational) linguistics. Because at present there is no overarching paradigm, the commonalities go unnoticed.

At the outset, corpuses which have known purposes would be more useful than corpuses whose purposes are unknown. It serves for great publicity to investigate Indus Valley signs, Pictish stones, undeciphered codices like the Voynich manuscript or the Rohonc codex, and similar unsolved historical mysteries; but before we have a reliable baseline of diverse NSS corpuses for comparison, we are only shooting in the dark. Vidale (2007) listed no less than ten corpuses which could serve as good comparisons to the Indus Valley signs in particular: "graphic non-linguistic systems of symbols from Central and South Asia of the 3rd–2nd millennium B.C." Unfortunately, no systematic quantitative comparison was provided by the author beyond a simple "number of signs" column and a brief description of each corpus; though it was noted that many of these inscriptions consisted mostly of isolated marks or repetitive designs. The recent Indus Valley studies have not attempted to use these NSSs as controls, either, even though Rao et al. (2010a) cited Vidale (2007), so we can assume this research group was familiar with the paper's contents. Some of the listed corpuses in Vidale (2007) seem to be of low quality ("the signs are not copied with the necessary detail"), or hard to access, which can cause difficulty. So far, the control corpuses used by all research groups seem to have been chosen not for their comparative value, but for their ease of access.

Protolinguistic corpuses should also be used, especially when investigating ancient systems. Protolinguistic writing has characteristics that probably differentiate it from more developed writing systems and nonlinguistic systems alike. Ancient undecoded scripts could be similar to either! (Fournet, 2011 also points out that "it is typologically probable that an archaic writing system will be defective in one way or another. " Both linguistic corpuses and NSSs as comparisons might miss the point in different ways.)

Now that Fortran has been used in studies, it would also be interesting to see a comparison between various programming languages; more low-level languages would be expected to score lower on languageness metrics than more high-level languages. The border between high-level programming/scripting languages and natural languages is increasingly blurred; some domain-specific languages like Inform 7 (Nelson, 2011) are essentially subsets of natural language.

Human linguists can make reasonably accurate guesses as to whether particular symbol sequences represent written language, hotly-debated examples like the Indus

Valley symbols notwithstanding. This is also one of the reasons linguists seem to view Lee et al. (2010) with strong skepticism, as evidenced in Fournet (2011) and the general online discussion: linguists (and archeologists!) tend to find the claim that Pictish stones represent writing highly counterintuitive. If that intuition could be quantified somewhat, everyone would benefit.

Appendix: Control samples used in the referenced studies

Farmer et al. (2004):

Scottish heraldic blazons:
"2,069 coats-of-arms, encoded as blazons, from the Mitchell Rolls, the Heraldic Society of Scotland, http://www.heraldry-scotland.co.uk/index.htm (838 distinct terms in a corpus of 18,300 total terms)."

Rao et al. (2009a) / Rao (2010b):

Type 1 nonlinguistic system (e.g., Vinča system):
"[They] involve signs that may occur in groups but the ordering of signs is not important (as it appears to have been, for example, in the Vinča system (5)). To enable comparison with the Indus texts, we assumed a Type 1 nonlinguistic system with the same number of signs as in the Indus corpus above and created a dataset of 10,000 lines of text, each containing 20 signs, based on the assumption that each sign has an equal probability of following any other."

Type 2 nonlinguistic system (e.g., Sumerian deity symbol system on kudurrus):
"[They] exhibit ordering of signs but the order is rigid. For example, in the Sumerian deity sign system found on boundary stones (kudurrus) (6), the ordering of deity signs appears to follow the established hierarchy among the various deities. As in the case of Type 1 systems above, we assumed a Type 2 nonlinguistic system with the same number of signs as in the Indus corpus above and created a corpus of 10,000 lines of text, each containing 20 signs, based on the assumption that each sign has a unique successor sign (variations of this theme where each sign could be followed by, for example, 2 or 3 other signs produced similar results)."

DNA — Sequence from human chromosome 2:
"We used the first one million nucleotides in human chromosome 2 obtained from the Human Genome Project (http://www.ncbi.nlm.nih.gov/genome/guide/human/), made available as a text file by Project Gutenberg (http://www.gutenberg.org/etext/11776).

Roughly similar values for conditional entropy were obtained when sequences from other chromosomes were used." [...] "The tokens were the 4 bases A, T, G, and C."

Protein — Sequences from Escherichia coli:
"The entire collection of amino acid sequences for the bacteria E. coli was extracted from the E. coli genome obtained from the NCBI website
http://www.ncbi.nlm.nih.gov/entrez/viewer.fcgi?val=U00096.2. This yielded a dataset containing a total of 374,986 amino acids comprising the sequences." [...] "The tokens were the 20 amino acids."

Programming language:
"We used a representative computer program in the programming language FORTRAN for solving a physics problem (fluid flow) using the finite element method. The program contained 28,594 lines of code (including comments). We removed the comments and used for our analysis the remaining code sequence containing 55,625 occurrences of tokens (examples of tokens include: if, then, else, integer, x, =, 50, etc.) " [...] "The tokens were the various programming language constructs (if, then, else, write, call, etc.), operators (=, +, -, etc.), and user-defined variables and constants (maxnx, maxny, reynld, len, 80, 17, etc.). For the analysis, we used the top 417 most frequently occurring tokens."

Rao et al. (2010):

As in Rao et al. (2009a), with the addition of "Music" from Schmitt and Herzel (1997): "Beethoven Sonata no. 32" [...] "The piece of music was encoded by Ebeling & Nicolis (1992) using a dynamic partitioning: the symbols were attributed to the change in pitch (lower or higher than the previous note or constant)."

Schmitt and Herzel (1997) also used Fortran source code, but did not specify the sampling method. Rao et al. (2010) apparently used a different Fortran corpus.

Lee et al. (2010):

Heraldic sematograms:
"A normal distribution of arms from the Heraldic Arms of British Extinct peerages (1086–1400) was used (Burke 1962). The charges (symbols) on the shield were used as characters for analysis. The colour of the charge was also used for analysis. A simplified set of characters was also generated using only the base symbols, e.g. (i) all the different lion charges such as rampant or passant are classified as a 'lion' character and (ii) all different cross charges such as bourdonny and fleuretty

are classified as 'cross' in the base-symbol categorization. Each arms was read as observed symbols from bottom to top. Text size was 400–1200 symbols."

Code characters:
"A range of English texts was transposed using morse code and a three-character code for the letters. Text size was 400–75 000 characters."

The repetitive sequences are not discussed in similar detail beyond "non-concordant letter, syllable and word character texts that are repetitive".

References

Since the Indus Valley debate is very recent, many of the authors also participated in online discussion beyond their publications in peer-reviewed venues. In addition to papers from those venues, we also use these online references to represent the authors' position and their response to criticisms more accurately. All hyperlinks were current as of March 30 2011.

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9 Rhythmical Variation in Hungarian revisited

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1 Introduction

In this article I revise my earlier views on Rhythmical Variation (RV) in Hungarian (Varga 1998; 2002: 149–177). Hungarian RV is a short name for the rhythmically motivated variability in the stressing of double-accented Hungarian compounds, in connected speech.

By accent I mean the presence of a pitch accent on a stressed syllable. The prominence of an accented syllable is caused not only by extra intensity but also by the melodic (= intonational) conspicuousness of that syllable, stemming from the presence of a pitch accent on it.[1]

Following this Introduction, in Section 2 the facts of Hungarian RV are presented and illustrated with plenty of new examples. Section 3 offers a revised analysis of Hungarian RV, and refutes the alleged role of precompiled lexical rules (see Hayes 1990) in Hungarian RV, on which my earlier analysis has been based. Finally, Section 4 is a short conclusion.

2 The facts of rhythmical variation in Hungarian

2.1 Possibility of initial and final accent loss

In contrast to the overwhelming majority of Hungarian words, which have one single accent on the first syllable of the word, double-accented compound words have two accents in their isolated pronunciation. Such words are e.g. *ütött-kopott* 'battered' or *tizenegy* '11', see (1a). The isolated accentual patterns of these words are similar to those of double-accented phrases, e.g. *magas hegy* 'high hill', see (1b). The star over certain syllables in the examples indicates accent on those syllables.

[1] Because of the ambiguity of the term *pitch accent* Ladd (2008: 49) suggests that a distinction be made between *lexical pitch accent* and *intonational pitch accent*. In the present article the term pitch accent is used in the latter sense. In Hungarian linguistic literature accented syllables can also be called *primary stressed syllables* or *main stressed syllables* (Kálmán and Nádasdy 1994; Varga 1998; 1998–99).

(1) a. **Double-accented compounds:**
* *
ütött-kopott 'battered' (*lit*. 'beaten-worn'),
* *
tizenegy '11' (*lit*. 'one on ten')
b. **Double-accented phrases:**
* *
magas hegy 'high hill'

In isolated double-accented Hungarian compounds and phrases the first accent is typically stronger than the second (the Hungarian Nuclear Stress Rule is the reverse of its English counterpart), and so their accent-patterns are typically trochaic, i.e. stronger-weaker (É. Kiss 1987–88; 1992). However, this phonetic difference between the strengths of the accents does not always exist (Fónagy 1998: 340), and in any case it is irrelevant from the point of view of Hungarian RV. Therefore I will ignore it and consider the two accents of a double-accented compound or phrase as being phonologically equal. In this respect I follow Gussenhoven (1991) and Kálmán and Nádasdy (1994: 410).

When put *in suitable contexts*, many (though not all) double-accented Hungarian compound words display the phenomenon of RV, consider the examples in (2). In the examples the bracketed letters A and B represent the two, potentially accented syllables of the double-accented compound, while Y represents the accented syllable, external to the double-accented compound. (2a) shows the isolated pronunciation of the word *tizenegy* '11', with two accents. In (2b) the word *tizenegy* occurs in a phrase in which there is an accent *before* it, on the first syllable of the word *negyed* 'quarter', and so the word *tizenegy* loses its initial accent. This can be called *Initial Weakening (IW)*.[2] By contrast, in (2c) there is an accented syllable *after* the word *tizenegy*, on the first syllable of the word *játékos* 'player'. So here it is the final accent of the word *tizenegy* which is lost. This is the phenomenon of *Final Weakening (FW)*.[3]

(2) a. **Isolated pronunciation** (of the word *tizenegy*):
* *
tizenegy '11'
[A B]

[2]In Varga (1998) I used the term "Trochaic Reversal" for what I now call "Initial Weakening". The new term is better because it does not refer to an irrelevant (and often non-existent) phonetic difference between the strengths of the two accents.

[3]As we shall see below, Final Weakening can occur also when there is no accent after the double-accented word.

b. **Initial Weakening** (on the word *tizenegy*):

*	*	*		*	*
negyed	tizenegy			negyed	tizenegy
[Y	[A	B]]	→	[Y	[A B]]
			opt.		

‘quarter past 10’
(*lit.* ‘quarter 11’)

c. **Final Weakening** (on the word *tizenegy*):

*	*	*		*	*
tizenegy	játékos			tizenegy	játékos[4]
[[A	B]	Y]	→	[[A	B] Y]
			opt.		

‘11 players’

Initial and Final Weakening are *the two kinds of Hungarian RV* because, by cancelling one of the accents that are too close to each other, they increase the eurhythmy of the phrase in which the double-accented compound occurs. The RV processes are optional, but are very likely under certain conditions, which we shall discuss below.

Of the two processes, Initial Weakening is the more radical and noticeable change, because the compounds undergoing it will be in contrast with the overwhelming majority of Hungarian words, which have their accent on their first syllable. Final Weakening is a less radical and noticeable change, because it brings the originally double-acccented compounds into line with the general Hungarian tendency of words having a single accent on their first syllable.

It is to be noted here that Rhythmical Variation exists in other languages, too. In English, for instance, it exists to a much greater extent than it does in Hungarian, because it is not restricted to certain groups of words. *English RV* systematically affects all double-accented words (disregarding a few lexical exceptions) and phrases. Thus the processes of English RV affect the word *sardine* just as they affect the phrase *Monday morning*, see (3a, b, c):

(3) a. **Isolated pronunciation** (of *sardine* and *Monday morning*, respectively):

*	*	*	*
sardine,		*Monday*	*morning*

b. **Final Weakening** (on *sardine* and *Monday morning*, respectively):

*		*		*	
sardine	*sandwiches,*	Monday	morning	*blues*	

c. *Initial Weakening* (on *sardine* and *Monday morning*, respectively):

	*	*	*		*
we love	sardines		*early*	Monday	morning

[4] Acute accents on certain vowel letters in Hungarian orthography (e.g. ”é” ”and á ”in” játékos”) indicate phonological vowel length and have nothing to do with pitch accent or stress.

As the accentual pattern of English double-accented words and phrases is typically iambic (rather than trochaic, as in Hungarian), it is Final Weakening, better known as "Iambic Reversal", which is the more radical change in English. By accepting an iambic underlying accentual pattern, the majority of English descriptions assume that the accents are of different strengths, which necessitates the application of metrical trees and grids in the analysis of English RV (Liberman and Prince 1977; Kiparsky 1979; Prince 1983; Selkirk 1984; Hayes 1984; Giegerich 1985; Halle and Vergnaud 1987; Halle 1998; etc.). However, Gussenhoven (1991) argues convincingly that, at least from the point of view of rhythmical variation, the phonetic differences in strength between the accents is irrelevant and should be ignored. Thus Gussenhoven (1991) accounts for the processes of English RV not by means of metrical trees and grids but by positing an elegant accent-deleting rule, the English Rhythm Rule, which is able to produce both Initial and Final Weakening, and which, according to Gussenhoven, works in the postlexical stratum of phonology.[5]

2.2 Rhythmically variable compounds

Let us now return to the discussion of Hungarian RV. I shall call those double-accented compounds that are capable of both kinds of Rhythmical Variation (i.e. capable of both Initial and Final Weakening) *rhythmically variable compounds*, or *RV compounds*, for short. The subgroups of RV compounds can be seen in (4):

(4) **Subgroups of rhythmically variable compounds:**

(i) A subset of inherently double-accented numeric compounds:
e.g.

* *		* *		* *	
ötvenhárom '53',		*ötvenháromezer* '53000',		*ötszázhárom* '503',	
50 -3		50 -3000		500 -3	
* *		* *	* *		
öszázharminc '530',		*ezeröt* '1005',	*ezerötven* '1050',		
500 -30		1000-5	1000-50		
* *		* *			
ezerötszáz '1500',[6]		*negyvennegyedik* '44th',			
1000-500		40 -4th			

[5]For a detailed study of the various models that have been suggested for the analysis of English RV, see Varga (2005).

[6]The Hungarian numerals *száz* '100', *ezer* '1000', *millió* '1000000' are not accented when they are preceded by an accented numeral, functioning as a multiplier, as in e.g. *ÖTszáz* '500', *HATezer* '6000', *HÁrommillió* '3000000'. Two-digit numerals ending in zero (i.e. multiples of 10) are accented

(ii) *Ugyan*-compounds (these are composed of the bound stem *ugyan-* 'the same' and a demonstrative stem):
e.g.
* *
ugyanannyi 'the same amount' (*annyi* = 'that much'),
* *
ugyanaz 'the same' (*az* = 'that'),
* *
ugyanott 'the same place' (*ott* = 'there'),
* *
ugyanolyan 'exactly like that',
* *
ugyanakkor ' at the same time' (*akkor* = 'then'), etc.

(iii) Dual first names:
e.g.
* * * *
Ferenc József 'Francis Joseph', *János Pál* 'John Paul', etc.

2.3 Initial Weakening

Let us first consider examples of Initial Weakening. The largest subgroup of RV-compounds comprises double-accented cardinal and ordinal numeral compounds. Which numerals exactly belong to this subgroup is still an unsettled question, requiring further research. All I want to do here is to show with a few convincing examples that there exist such numerals. In (5) we can see *inherently double-accented numerals*. In the italicised parts of the right-hand versions of the examples the initial accent of the numerals is deleted.

(5) **Initial Weakening in inherently double-accented numerals:**

a. * * * * *
B-*tizenkettő* → B-*tizenkettő* 'B-12'
B-10-on-2

b. * * * * *
negyed *tizenkettő* → negyed *tizenkettő* 'a quarter past 11',
quarter 10-on-2 *lit.* 'quarter 12'

c. * * * * *
a piszkos *tizenkettő* → a piszkos *tizenkettő* 'the dirty 12'
the dirty 10-on-2

---

on their initial numeral, functioning as a multiplier, see e.g. *ÖTven* '50'. All digits that are added, rather than multiplied, are accented, see e.g. *HATszázÖTvenHÁrom* '653'.

d. déli *tizenkettő* → déli *tizenkettő* '12 noon'
noon 10-on-2

e. plusz *harminchárom* → plusz *harminchárom* 'plus 33'
plus 30 -3

f. péntek *tizenhárom* → péntek *tizenhárom* 'Friday the 13th',
Friday 10-on-3 *lit.* Friday 13

g. Club *kilencvenkilenc* → Club *kilencvenkilenc* 'Club 99'
club 90 -9

h. több, mint *nyolcvanhat* → több, mint *nyolcvanhat* 'more than 86'
more than 80 -6

i. október *huszonharmadika* → október *huszonharmadika* 'October 23rd'
October 20-on-3rd

j. Híradó *huszonegy* → Híradó *huszonegy* 'News 21'
newsreel 20-on-1

k. hat egész *harminckettő* → hat egész *harminckettő* '6.32',
6 wholes 30 -2 *lit.* '6 wholes 32'

l. négy óra *huszonöt* → négy óra *huszonöt* '25 minutes past 4',
4 hour 20-on-5 *lit.* 4 hours 25

m. IL- *tizennyolcas* → IL- *tizennyolcas* 'IL-18',
IL 10-on-8

n. B- *ötvenkettes* → B- *ötvenkettes* 'B-52'
B 50 -2

o. Tu- *száznégyes* → Tu- *száznégyes* 'Tu-104'
Tu 100 -4

p. * * * * *
Vas utca *harminchat* → Vas utca *harminchat* '36 Vas Street',
Vas street 30 -6 *lit.* 'Vas Street 36'

q. * * * * *
mind a *tizenötezer* → mind a *tizenötezer* 'all the 15 thousand'
all the 10-on-5000

r. * * * * *
D *kétszázkilences* → D *kétszázkilences* 'D-209'
D 200 -9

s. * * * * *
pont *száztíz* → pont *száztíz* 'exactly 110'
exactly 100 -10

t. * * * * *
pont *hatszáznyolc* → pont *hatszáznyolc* 'exactly 608'
exactly 600 -8

u. * * * * *
E- *háromszázharminc* → E- *háromszázharminc* 'E-330'
E 300 -30

It also often happens that numerals with three accents turn into *derivatively double-accented numerals* when they lose their medial accent, i.e. when, under the influence of the accented first digit, the double-accented two-digit sub-unit in them (containing the second and third digits) undergoes Initial Weakening. These are exemplified by the italicised parts of the right-hand examples in (6). In (6f) a derivatively double-accented numeral (*SZÁZtizenNÉgyes* = '114') undergoes further rhythmical variation and loses its initial accent, too.

(6) **Initial Weakening on the last, double-accented sub-unit of numerals with three accents (i.e. producing derivatively double-accented numerals):**

a. * * * * *
száz*harmincnégy* → száz*harmincnégy* '134'
100 -30 -4

b. négyszáz*ötvenhárom* → négyszáz*ötvenhárom* '453'
400 -50 -3

c. kilencszáz*hetvenhatban* → kilencszáz*hetvenhatban* 'in 976'
900 -70 -60-in

d. hétszáz*harmincötezer* → hétszáz*harmincötezer* '735 thousand'
700 -30 -5000

e. kétezer*tizenhárom* → kétezer*tizenhárom* '2013'
2000 -10-on-3

f. száz*tizennégyes* → száz*tizennégyes* = *száztizennégyes* '114'
100 -10-on-4

száztizennégyes → Tu-*száztizennégyes* '114'

Subgroup (ii) of RV-compounds contains *ugyan*-compounds. These are combinations of the stem *ugyan-* 'the same' and some demonstrative pronoun. Their Initial Weakening is illustrated by the italicised parts of the right-hand examples in (7):

(7) **Initial Weakening in *ugyan*-compounds:**

a. pont *ugyanott* → pont *ugyanott* 'exactly in the same place'

b. mindig *ugyanaz* → mindig *ugyanaz* 'always the same'

Finally, subgroup (iii) of RV compounds consists of double first names. These are two-member first names acting as wholes. They are collocations that, for certain speakers, have become fixed and behave like single syntactic words consisting of two smaller words, i.e. as syntactic compounds. These double first names can undergo Initial Weakening, see the italicised parts of the right-hand examples in (8).

(8) **Initial Weakening in double first names :**

a. Első *Ferenc József* → Első *Ferenc József* 'Francis Joseph I,'
lit. 'First Francis Joseph'

b. * * * * *
Második *János Pál* → Második *János Pál* ‘John Paul II,’
lit. ‘Second John Paul’

c. * * * * *
Lázár *Armand Péter* → Lázár *Armand Péter* ‘Armand Peter Lázár,’
lit. ‘Lázár Armand Péter’ [7]

d. * * * * *
N. *Viktor Gábor* → N. *Viktor Gábor* ‘Victor Gabriel N.,’
lit. ‘N. Victor Gabriel’ [8]

The notion of *word* is used here not in a lexical but in a syntactic sense: “a formation [. . .] whose internal structure cannot be referred to by any syntactic rule is a syntactic word” (É. Kiss et al. 2003: 191; cf. Kiefer 2000: 78, 519). Accordingly, the italicised parts of the examples enumerated in (5)–(8) are all syntactic words, though not lexical words (not lexemes).

Initial Weakening is never strictly obligatory, but sometimes it is very likely. It is favoured if the number of syllables between the surviving accents in the phrase is low, and if the tempo of speech is fast (which can be a feature of informal style). This connection between the number of interaccentual syllables and tempo of speech is expressed in (9):

(9) **Five-or Six-Syllable Constraint:** The distance between two consecutive accented syllables which is created by deleting the accent between them by Initial Weakening, can be no more than five syllables at a normal tempo, and six syllables at a fast tempo (including the first accented syllable).[9]

This is why (10a) below sounds all right even at a slow tempo, while (10b) is acceptable only if the tempo is faster, and (10c) is unacceptable even at a fast tempo, because the 9-syllable interaccentual distance is too great. (The numerals below the examples indicate the interaccentual syllables. The **!** before a sentence shows total unacceptability, while **?** before a sentence shows unacceptability at a normal tempo but acceptability at a faster tempo.)

[7] Hungarian surnames precede “first” names. The word *Lázár* in (8c) is a surname, followed by a double first name (*Armand Péter*).

[8] *N.* in (8d) is the initial letter of a surname.

[9] Earlier I ignored the role of tempo and spoke only of a Five-Syllable Constraint. Moreover, I thought this constraint worked for Initial and Final Weakening alike, see Varga (1998: 237). Since then I have become convinced that the Five- or Six-Syllable Constraint is relevant only for Initial Weakening but not for Final Weakening.

(10) a. Acceptable even at a normal tempo:
* *
Vas utca *tizenkettő* '12 Vas Street', *lit.* 'Vas Street 12'
1 2 3 45

b. Acceptable at a fast tempo:
* *
?Lajos utca *tizenkettő* '12 Lajos Street', *lit.* 'Lajos Street 12'
1 2 3 4 56

c. Unacceptable even at a fast tempo:
* *
!Pacsirtamező utca *tizenkettő* '12 Pacsirtamező Street', '
1 2 3 4 5 6 7 89 *lit.* 'Pacsirtamező Street 12'

2.4 Final Weakening

In (11) below we shall now examine examples of the less radical change, Final Weakening. This change can be observed on the italicised parts of the right-hand versions of the examples.

(11) **Final Weakening**
<u>In double-accented numerals:</u>

a. * * * * *
száztíz jelentkező → *száztíz* jelentkező '110 applicants'
100-10 applicant

b. * * * * *
tizenkét pont → *tizenkét* pont '12 points'
10-on-2 point

c. * * * * *
huszonöt ötvenért → *huszonöt* ötvenért 'for twenty-five, fifty'
20-on-5 50-for

d. * * * * *
ezerötszáz vagonnal → *ezerötszáz* vagonnal 'with 1500
1000-500 wagon-with wagons'

e. *kétezertizenhárom végén* → *kétezertizenhárom végén*[10] ‘at the end of 2013’
2000-10-on-3 end-on

f. *Huszonharmadik János* → *Huszonharmadik János* ‘John XXIII’
20-on-3rd John *lit.* ‘23rd John’

Ugyan-compounds:

g. *ugyanaz tökben* → *ugyanaz tökben* ‘it’s just the same’
same marrow-in

h. *ugyanolyan minőség* → *ugyanolyan minőség* ‘the same quality’
same quality

Dual first names:

i. *Ferenc József idejében* → *Ferenc József idejében* ‘in Francis Joseph’s time’
Francis Joseph time-in

There are several comments to be made at this point. First: Final Weakening is not restricted to RV-compounds, but is possible in all kinds of double-accented compounds. In (12) the words *ütött-kopott* ‘battered’ and *ugrál-bugrál* ‘is jumping about’ are double-accented compounds and so Final Weakening is possible in them, see (12a), but they are not RV-compounds because they do not accept Initial Weakening, see (12b).

(12) **Double-accented non-RV-compounds: Final Weakening is possible, Initial Weakening is impossible:**

a. *ütött- kopott* tragacs ‘battered jalopy’
ugrál- bugrál a kertben ‘is jumping about in the garden’

[10] *Kétezertizenhárom* ‘2013’ is a derivatively double-accented numeral (see *KÉTezertizenHÁrom*, (6e)), which undergoes Final Weakening in (11e).

b. * *
!nagyon *ütött-kopott* ‘very battered’
* *
!hülyén *ugrál-bugrál* ‘is stupidly jumping about’

My second remark is that Final Weakening can take place without a trigger, i.e. when there is no accented syllable after the double-accented compound in the same phrase, as in (13a), and also when there is nothing after it at all, as in (13b):

(13) **Final Weakening without a trigger:**

a. From radio news:
* *
“. . . *tizenegy* embert megöltek” ‘11 people were killed’
[[A B]]Y

b. From a dialogue:
– Speaker A: Hány óra van? ‘What’s the time’, *lit.* ‘How many hours are there?’
*
– Speaker B: *Tizenegy* ‘11’
[A B]

Final Weakening without a trigger can be explained by *analogy* (i.e. by the force of similarity). Final Weakening can happen spontaneously because it makes double-accented compounds similar to the overwhelming majority of Hungarian words, by leaving a single accent on their initial syllable. But this is only possible if the environment of the compound does not favour Initial Weakening, see (13a, b). If the environment favours Initial Weakening, then it is Initial Weakening that will be or can be carried out, as in (14a), and Final Weakening is forbidden, as in (14b).

(14) a. * (*) *
negyed *tizenegy* ‘quarter past 10’, *lit.* ‘quarter 11’

b. * *
!negyed *tizenegy*

My third remark is that the Five- or Six-Syllable Constraint, which I set up in (9) in connection with Initial Weakening, is not relevant in the case of Final Weakening. This means that the number of syllables between the accented syllables which survive Final Weakening can be more than five even at a normal tempo, see e.g. (11e).

2.5 Year numbers and hour-minute time indications, with four inherent accents

When *year numbers* or *hour-minute time indications* are realised by numerals with four inherent accents, i.e. by numerals composed of four digits, none of which is 0, as in *ezerkilencszázötvenhat* '1956', or *tizenhárom-negyvenöt* '13:45', the numerals have to be restructured as the concatenations of two RV-compounds: [[A1B1] [A2B2]].[11] In contrast to my earlier opinion (Varga 1998; 1998–99), I now think that in these numerals the Final Weakening of [A1B1] can happen first, which can be followed by the Initial Weakening of [A2B2], as in (15). In such numerals both internal accents may disappear, and the number of syllables between the surviving accents is not constrained, i.e. the number of syllables between the surviving accents can be more than five even at a normal tempo.

(15) **Concatenations composed of two RV-compounds, with Final Weakening on [A1B1], followed by Initial Weakening on [A2B2]:**

* * * * * * * *
[[A1 B1] [A2 B2]] → [[A1 B1] [A2 B2]] → [[A1 B1] [A2 B2]]

a. * * * * * * *
ezerkilencszázötvenhat → *ezerkilencszáz*ötvenhat →
1000-900 -50 -6 FW IW

* *
→ ezerkilencszáz*ötvenhat* '1956'
IW

b. * * * * * * *
tizenhárom-negyvenöt → *tizenhárom*-negyvenöt →
10-on-3 -40 -5 FW IW

* *
→ tizenhárom-*negyvenöt* '13:45'
IW

In (16) below, the year number, which originally has four accents, first undergoes Final Weakening on [A1B1], as a result of which it loses the final accent of *ezerkilencszáz*, and then it undergoes Initial Weakening on [A2B2], losing the initial accent of *hatvannégy*, after which the whole word *ezerkilencszázhatvannégy*

[11] The syntactically proper analysis of four-digit numerals with four accents is right-branching: *ezerkilencszázötvenhat*
[Z [Y [A B]]].
But in the case of year numbers and hour-minute time indications this analysis is not satisfactory because it cannot provide the versions *EzerkilencszázÖTvenHAT* or *EzerkilencszázötvenHAT*. Therefore I assume that at the interface of syntax and prosody these numerals in the function of year numbers or hour-minute indications are restructured as: [[A1 B1] [A2 B2]].

undergoes Final Weakening, leading to a loss of the second accent on *hatvannégy*. (The latter operation happens with the help of a Reanalysing Rule, given below as (20).) Thus the distance between the syllables surviving in the last stage (including the first accented syllable as well) is ten syllables and it still sounds all right.

(16)

* * * *	*			
ezerkilencszázhatvannégy	nyarától		→	
1000-900 -60 -4	summer-from		FW	
* * *	*			
ezerkilencszázhatvannégy	nyarától	→		
		IW		
* *	*			
ezerkilencszázhatvannégy	nyarától	→		
		FW		
*	*			
ezerkilencszázhatvannégy	nyarától	'from the summer of 1964'		

Although the stressing of numerals still requires research, it would be beyond the scope of the present paper to pursue this issue further here.[12]

3 Analysis of Hungarian rhythmical variation

3.1 The old Split Analysis

As we have seen, the two kinds of Hungarian RV work asymmetrically. Whereas Final Weakening may affect any double-accented compounds, Initial Weakening is "choosy" and may affect only the RV-compounds described in (4) above. Therefore an account of both kinds of Hungarian RV requires a Split Analysis, consisting of two separate rules, one dealing with Initial, the other with Final Weakening.

In Varga (1998; 1998–99) I proposed that we should regard Hungarian Initial Weakening as a precompiled rule belonging to lexical phonology, and Hungarian Final Weakening as a P1 rule belonging to postlexical phonology. Kaisse (1985; 1990) had divided postlexical phonology into a P1 and a P2 stratum, and claimed that English RV belonged to the P1 stratum. P1 rules are postlexical but are closer to lexical rules than P2 rules, because they share more characteristics with lexical rules (Kaisse 1990, 128). For instance, P1 rules are sensitive to nested compound and syntactic bracketing, which is also true of the rules of Rhythmical Variation

[12] For an analysis of the stressing of German numerals see Sarah Creer (2002).

(Kaisse 1990: 135–137). On the other hand, P2 rules are the classical postlexical rules, which have no direct connection with syntactic or lexical information.[13]

Hayes (1990), however, did not recognise the separate existence of a P1 stratum and thought that what Kaisse called postlexical P1 rules were in reality "precompiled rules", forming a subset within lexical phonology. These precompiled rules work pre-syntactically within the lexicon in such a way that they produce the diacritically-marked allo-versions of lexical items in advance, and then, at the interface of syntax and phrasal phonology, they insert the appropriate allo-versions into the relevant syntactic environments (Hayes 1990: 87). According to Hayes' logic, English RV, which Kaisse regards as a P1 phenomenon, is in reality a precompiled lexical phenomenon. For instance, precompiled rules produce the initially-accented and finally-accented allo-versions of the word *sardine* in the lexicon, with the attached information that the initially-accented variant suits a phrase in which there is an accent *after* it, and the finally-accented variant suits a phrase in which there is an accent *before* it. By contrast, Kaisse (1990) believed that P1 rules and precompiled rules were both necessary, because they were different. She thought that "[p]recompiled rules might be partly diagnosable by their having lost even more phonetic motivation than P1 rules" (Kaisse 1990: 130).

This is why in my old analysis (Varga 1998) I thought that Hungarian Final Weakening was a P1 rule, and Initial Weakening was a precompiled rule, because the latter was phonetically less motivated (less natural) than the former. (Initial Weakening is less in conformity with structure preservation than Final Weakening, because it produces accentual patterns that are, in a sense, "abnormal" in Hungarian, see the examples in (5)–(8) above.) At the same time, my earlier analysis expressed the close connection between Initial and Final Weakening: P1 rules are those rules of postlexical phonology that are closest to the precompiled subset of lexical phonological rules.

This earlier analysis, however, needs revision. Its component which relies on precompilation theory (i.e. which is relevant to Initial Weakening) is tied to a condition which is not satisfied in the case of RV-compounds. As we have seen, according to precompilation theory the allo-versions that display the effects of Rhythmical Variation are produced in advance and stored in the lexicon. The problem is that we can only talk about allo-versions stored in the lexicon if they are the versions of listed *lexical words*, i.e. *lexemes*, but most of the Hungarian RV-compounds are not lexemes. With the possible exception of *ugyan*-compounds, Hungarian RV-compounds and their allo-versions are not stored in the lexicon. The accentual variants of dual first names and of double- or multiple-accented

[13]For instance, the final devoicing of Turkish continuants, which takes place blindly before every pause, is a P2 rule.

numeric compounds cannot be stored in the lexicon because they are words only in a syntactic sense but not in a lexical sense.

Simple first names and lexicalised instances of double first names (such as e.g. *Marianna* 'Marianne') can be stored in the lexicon, but their *ad hoc* combinations in double first names (e.g. *Nóra Katalin* 'Nora Catherine') cannot. Although the latter, too, are rightfully considered as wholes in a sense and thus, as compounds, i.e. as syntactic words, nevertheless they cannot be considered as lexemes. Similarly, from the infinitely long list of numerals we store only a few items in the lexicon. We do store the words naming the one-digit numerals (1, 2, 3, 4, 5, 6, 7, 8, 9), and the two-digit numerals *tíz* '10', *húsz* '20', *harminc* '30', and from the greater numerals the words *száz* '100', *ezer* '1000', *millió* '1000000', *milliárd* '1000000000'. (Mathematicians may know and store even more numerals in their idiolectal lexicons.) However, as for the rest of the possible numerals, they are *not stored* in the lexicon but *are produced freely as the need arises*, each with a predictable meaning. As Initial Weakening can be applied recursively, (see (6f) above), our intuition, too, favours the explanation that — like Final Weakening — Initial Weakening, too, takes place in the P1 layer of postlexical phonology.

To sum up this section: precompilation theory is unsuitable for explaining Hungarian Initial Weakening. This is why the Split Analysis proposed in Varga (1998), relying on precompilation theory, cannot be maintained and needs revision.

3.2 The revised Split Analysis

My new proposal is this. The RV-compounds produced (but not stored) in the lexicon come from the lexicon with two (or more) accents and arrive at the P1 layer of postlexical phonology, where, depending on the context, they are submitted to optional Initial or Final Weakening. Thus *both Initial and Final Weakening are rules belonging to the P1 layer of postlexical phonology*. This is the essence of the *Revised Split Analysis*. Reformulation of the two rules is given in (17) and (18) below. The tall brackets indicate syntactic structure. The small round brackets include optional elements.

(17) says that the initial accent of an RV-compound can be optionally deleted under the influence of an accent Y before the compound:

(17) **Initial Weakening = IW** (postlexical rule)

$$* \rightarrow 0 / \underset{\text{opt.}}{} \left[\begin{array}{cc} * & \\ {\scriptstyle XP/RV}\text{Y}\,(\ldots) & \left[\begin{array}{cc} — & * \\ {\scriptstyle RV}\text{A}\,(\ldots) & \text{B}(\ldots) \end{array} \right] \end{array} \right]$$

where Y = the syllable that carries the last accent preceding the embedded RV-compound,
... = syllable(s) not containing an accent,
XP = phrase,
RV = RV-compound

Constraint: Initial Weakening is to be avoided if the distance between the accents remaining after Initial Weakening is greater than 5-6 syllables (including the first accented syllable).

On the other hand, (18) says that optional deletion can affect the final accent of a double-accented compound (which can be an RV-compound as well), and this deletion is either triggered by an accent Y standing after the compound, or it happens spontaneously, without a trigger. Final Weakening applies to all kinds of double-accented compounds and the only restriction on its context is that there cannot be an accented syllable before the compound.

(18) **Final Weakening = FW** (postlexical rule)

$$* \rightarrow 0 / \underset{\text{opt.}}{} \left[\begin{array}{ccc} {\scriptstyle XP}(\ldots) & \left[\begin{array}{cc} * & — \\ {\scriptstyle DA}\text{A}(\ldots) & \text{B}\,(\ldots) \end{array} \right] & \begin{array}{c} * \\ (\ldots)(\text{Y})(\ldots) \end{array} \end{array} \right]$$

where Y = the syllable that carries the first accent following the embedded double-accented compound,
... = syllable(s) not containing an accent,
XP = phrase,
DA = double-accented compound, which may be an RV-compound as well

In the course of the derivations it can happen that a numeral which has three inherent accents becomes derivatively double-accented, and becomes the starting point of another instance of Rhythmical Variation, see (6f) and (11e), reproduced here for the reader's convenience as (19a, b):

(19) a. = (6f)

* * * * * * *
száz*tizennégyes* → száz*tizennégyes* →Tu-*száztizennégyes*

b. = (11e)

* * * * * * *
kétezer*tizenhárom* → kétezer*tizenhárom* →*kétezertizenhárom* végén

To enable a derivatively double-accented numeral to be involved in further Rhythmical Variation, its form has to be changed to [A B⟩ by means of a Reanalysing (relabelling) Rule. This is formulated in (20):

(20) **Reanalysing Rule = RR** (postlexical rule)

$$\begin{bmatrix} * \quad * \\ {}_{RV}\text{ACC1}\ldots\text{ACC2}(\ldots) \end{bmatrix} \rightarrow \begin{bmatrix} * \quad * \\ {}_{RV}\text{A}\ldots\text{B}(\ldots) \end{bmatrix}$$

where ACC1 = first accented syllable,
where ACC2 = second accented syllable,
... = syllable(s) not containing an accent,
XP = phrase,
RV = RV-compound

Note: The Reanalysing Rule first deletes all the internal brackets and former labels (A, B or Y) within the RV-compound.

Let us finally consider (21), which shows the steps of a concrete derivation, producing the accentual pattern of the phrase *mind a száztizenhárom utas* 'all the 113 passengers'. In (21f) the Reanalysing Rule changes the [Y [A B]] structure of a derivatively double-accented RV-compound (*SZÁZtizenHÁrom*) into [A B].

(21) **A sample derivation: *mind a száztizenhárom utas* 'all the 113 passengers'**

a. Compounding-1:
* *
tizenhárom
[RV A B]

b. Compounding-2:
* * *
száz -tizenhárom
[RV Y [RV A B]]

c. Phrasing-1:
* * * *
száz -tizenhárom utas
[RV [RV Y [RV A B]] Y]

d. Phrasing-2:
* * * * *
mind a száz -tizenhárom utas
[XP Y [XP [RV Y [RV A B]] Y]]

e. IW:
* * * *
mind a száz -tizenhárom utas
[XP Y [XP [RV Y [RV A B]] Y]]

f. RR:
* * * *
mind a száztizenhárom utas
[XP Y [XP [DA A B] Y]]

g. FW: * * *
mind a száztizenhárom utas
[XP Y [XP [DA A B] Y]]

h. IW: not applicable.

i. RR: not applicable.

j. FW: not applicable.

(21d), (21f) and (21g) are all possible outcomes of the derivation.

4 Conclusion

In this study I have re-examined the two kinds of Rhythmical Variation observable in some double-accented Hungarian compounds (e.g. *TIzenHÁrom* '13'). These are: Initial Weakening (e.g. PÉNtek *tizenHÁrom* 'Friday the 13th', where the initial accent of *tizenhárom* is deleted) and Final Weakening (e.g. *TIzenhárom* SZÉK '13 chairs', where the final accent of *tizenhárom* is deleted). I have revised my earlier view (Varga 1998; 1998–99; 2005), according to which Initial Weakening belonged to the precompiled layer of lexical rules, a layer distinguished by Hayes (1990), and Final Weakening belonged to the P1 layer of postlexical rules, a layer distinguished by Kaisse (1990).

This revision has been necessary because it has become clear that the explanation of Initial Weakening based on precompilation theory was tied to a condition which most RV-compounds did not satisfy. According to precompilation theory the alloversions showing Rhythmical Variation are made and stored pre-syntactically in the lexicon. But this cannot be true of double-accented numerals and double first names in Hungarian, because these are words only in a syntactic rather than in a lexical sense, and consequently should not be looked upon as being stored pre-syntactically in the lexicon. Therefore in my new proposal, the Revised Split Analysis, I claim that *both Initial and Final Weakening belong to the P1 subset of postlexical phonological rules*. Out of the two, Initial Weakening is more specific. Initial Weakening can affect only a subset of double-accented compounds, viz. RV-compounds, if their context contains a preceding accent in the same phrase. By contrast, Final Weakening can affect all double-accented compounds, if their context does not contain a preceding accent in the same phrase. So with every RV-compound we first have to see whether its context allows Initial Weakening or not. Final Weakening is only possible if Initial Weakening is impossible in that context.

The question might arise whether we could perhaps regard Final Weakening as belonging to P2 rules, rather than to P1 rules. If we chose this solution, both rules would move "one step further up" in comparison with the old analysis: Initial Weakening would move from the precompiled layer of lexical phonology to the P1

layer of postlexical phonology, and Final Weakening from the P1 layer of postlexical phonology to the P2 layer of postlexical phonology. This solution would be in conformity with the asymmetry between the two rules. We still cannot choose this solution because Final Weakening has features which characterise P1 phenomena. For instance, (a) Final Weakening is also sensitive to nested compound and syntactic bracketing (even if only indirectly, i.e. through the necessity to filter out contexts favourable for Initial Weakening), (b) Final Weakening can be lexicalised (*limlom* 'lumber', *eszem-iszom* 'feasting', etc.), (c) Final Weakaning is structure-preserving in the sense that it leaves one single accent on the first syllable of the compound, whereby the originally double-accented compound acquires the *normal* accentual pattern of the majority of Hungarian words.[14]

Although the Revised Split Analysis is about Rhythmical Variation in Hungarian, it sheds light on the fact that the precompilation-based account cannot be fully upheld for Rhythmical Variation in English, either. Precompilation as an explanation is *feasible in the case of many double-accented lexemes in English*, such as e.g. *sardine*. These may be stored in the lexicon in different accentual allo-versions suiting different syntactic contexts. But the precompilation account *breaks down in the case of double-accented phrases*, such as e.g. *Monday morning*, and *of double-accented numerals from* twenty-one *upwards*. These are produced postsyntactically and so their accentual allo-versions cannot be produced and stored in the lexicon presyntactically, from which it follows that they cannot be accounted for by precompilation theory. Consequently, it is more ecomomical to consider all cases of English RV, too, as belonging to the P1 layer of postlexical phonology.

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[14]For these and other features characterising the P1 layer see Kaisse (1990).

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10 A Gricean rearrangement of epithets*

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Grice's *Studies in the Way of Words* (1989) — which turned twenty years old around the same time as the Theoretical Linguistics Program in Budapest did — included Grice's seminal 1967 William James lectures entitled "Logic and Conversation", thus bringing together Grice's theory of communication — about conversational implicatures — and his theory of meaning side by side for the first time, as parts of a unified picture. The connections between the two proposals have, since then, been extensively discussed and diagramed ("arranged") — we've seen the binary tree: the label ("epithet") 'implicature' branching into 'conventional' and 'conversational', the latter branching into 'particularized' and 'generalized'. Meanwhile, curiously, very little attention has been devoted to the issue of making room for the full range of commitments that a speaker undertakes in making an utterance. These commitments include unusual instances like slips of the tongue, to which Davidson called attention in his 1985 paper "A Nice Derangement of Epitaphs". When Mrs. Malaprop exclaimed: "Sure, if I reprehend any thing in this world it is the use of my oracular tongue, and a nice derangement of epitaphs!"[1], by reprehend/oracular/derangement/epitaphs, she meant what speakers of English commonly mean by comprehend/vernacular/arrangement/epithets. We might doubt whether Mrs. Malaprop does in fact fully comprehend her vernacular tongue, but regardless, as her audience, we can comprehend her utterance. And what's more pertinent for our purposes and is an issue Davidson does not discuss, is that Mrs. *Malaprop unwittingly commits herself* to something quite bizarre about tombstone inscriptions — epitaphs. Likewise, when Mrs. Malaprop calls someone "the very pineapple of politeness"[2] (intending to say 'pinnacle of politeness'), she commits herself to a claim relating to an extraordinarily exotic kind of fruit even though she

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[1] In R. B. Sheridan's 1775 play The Rivals, Act III Scene III.

[2] Sheridan: The Rivals, Act III Scene III.

had absolutely no intention of saying or conveying anything fruit-related. Slips of the tongue represent special cases of an otherwise far more widespread phenomenon: commitments undertaken by the speaker that aren't part of what the speaker intends to convey. Such unmeant commitments, as I shall call them, do not have a natural place in the traditional Gricean arrangement of epithets: the framework relating the various implicatures as well as other notions.

In this paper, I aim to develop an extended version of the Gricean framework that allows us to locate all aspects of commitments, unmeant ones included. There is hardly any reference to unmeant commitments in Grice's papers. Still, I will argue that we can glean quite explicit textual evidence from his work supporting my proposal. The traditional framework features a key notion of Grice's theory of communication: what is said. This notion bears intimate ties to Grice's theory of meaning: what-is-said is, according to Grice, a species of utterer's meaning (what the speaker intends to communicate). This notion of what-is-said has come under attack from various directions, including minimalism, which construes what-is-said as potentially widely deviating from utterer's meaning. I will first delineate the disadvantages accrued by the alternative minimalist what-is-said. I will then go on to argue that this minimalist notion, introduced in large part to provide a superior account of nonliteral discourse (including metaphor and irony) and unmeant sayings (including slips of the tongue) ultimately fails to deliver on its promise. I will use the minimalist polemic as a foil for exploring features of an extended Gricean framework that handles unmeant commitments.

I begin by outlining Grice's unified theory of communication and meaning (Section 1), emphasizing the theoretical role that the notion of what-is-said plays in it. Crucially, on Grice's special sense of 'say', speakers always mean what they say. We might call this an illocutionary sense of 'say' tantamount to 'assert'. I will then explore and critique Kent Bach's alternative: a locutionary sense of 'say' such that speakers often do not mean what they say (Section 2). The problems facing Bach's what-is-said might potentially be tackled by bringing on board a superficially similar but actually quite different locutionary notion of 'say', recommended by Elisabeth Camp; I'll discuss the prospects of her proposal briefly in Section 3. In Section 4, I'll return to the sorts of phenomena that, according to Bach, motivate the choice of a locutionary sense of 'say' over Grice's illocutionary sense of 'say'. In Section 5, I will use these phenomena, particularly slips of the tongue, as a springboard for extending the traditional characterization of Grice's theory of meaning and communication in a way that makes room for unmeant commitments. Ultimately, my aim is to show that the advantages of going minimalist evaporate in the light of the extended framework: "a Gricean rearrangement of epithets".

1 Grice on communication, meaning, and what is said

Even though Grice did not think of himself as a linguist,[3] his theory of communication — without its connection to his theory of meaning — has been foundational within the field of pragmatics. Based primarily on Neale (1992), let us take a look at Grice's views on communication set against the context of his 1967 William James lectures. This will allow us to reveal some crucial connections the theory of communication bears to the theory of meaning.

The starting point for Grice's *theory of communication*[4] is a simple observation: what we communicate/suggest/imply on a given occasion often outstrips what we say. Imagine the following conversation in front of a pet shop:

> PET-SHOP EXAMPLE
> daughter: Dad, can I have a rabbit?
> father: Rabbits favor country life over city life.
> what the father said: Rabbits favor country life over city life.
> what he conversationally implicated: The daughter cannot get a rabbit.

The father is talking about the residential preferences of rabbits; yet with the words he uttered on the given occasion, he managed also to suggest/imply that he will not buy a rabbit for his daughter. As Grice put it: on the given occasion, the father said something (where the level of what-is-said is "closely related to the conventional meaning of the words ... uttered", Grice 1989, 25),[5] and thereby produced a conversational implicature to the effect that his daughter cannot get a rabbit. Accounting for the nuances and variations in everyday language use requires us to identify conversational implicatures, which are due to general norms of communication, expectations that are independent of the meanings of the specific words used. For example, we expect our conversation partner to pay heed to the goals and topic of the conversation and cooperate with us: provide responses that are informative, relevant. This expectation embodies an overarching norm about conversations, considered as instances of rational activity in which participants expect cooperation from one another: this overarching norm is the *Cooperative Principle* (in conversational settings, "make your conversational contribution such as is required ... by the accepted purpose or direction of the talk exchange", 26). Grice subsumes a nonexhaustive list of conversational maxims under the Cooperative Principle: the maxim of *Quantity* ("Be as informative as is required", 40); the

[3] See Chapman (2005: 7, 186–187).

[4] Described primarily in Essays 2 and 3 of Grice (1989) ("Logic and Conversation"; "Further Notes on Logic and Conversation"); for a precursor, see the subsequently omitted parts of Essay 15 (Grice 1961, 126–132).

[5] In what follows, all "bare" page references are to Grice (1989).

maxim of *Quality* (don't lie; "have adequate evidence for what you say", 61); the maxim of Relation or *Relevance* ("be relevant", 27); and the maxim of *Manner* or Style (be clear, brief, orderly).

Crucially, according to Grice, conversational implicatures call for a pragmatic explanation (concerning norms of communication) rather than a semantic explanation (concerning the conventional meanings of expressions).[6] In the pet-shop example — plausibly enough — we are supposed to get a pragmatic explanation for the conversational implicature. From the expectation that the father is observing the Cooperative Principle and the maxims, including the maxim of Relevance, his listeners are in a position to infer the conversational implicature, even though the implicature is not encoded in the conventional meanings of the words used.

Consider another example in which what-is-said and conversational implicature diverge:

> SOME/NOT-ALL EXAMPLE
> utterance: Some rabbits relish city life.
> what the speaker said: There is at least one rabbit that relishes city life.
> conversational implicature: (For all the speaker knows,) there is at least one rabbit that does not relish city life.

Again, following Grice's lead, we can maintain that the conversational implicature is not the result of what 'some' means (whose meaning amounts to 'at least one', which is compatible with 'all'). Instead the listener arrives at the conversational implicature on pragmatic grounds. Based on the expectation that the speaker is obeying the Cooperative Principle and the maxims, including the maxim of Quantity, she would have given more information, to the effect that "All rabbits like city life", had she had that information. From the fact that she said the weaker "Some rabbits like city life" instead, her listeners can infer the conversational implicature in question. To get the inference to the conversational implicature, there is no need to posit that 'some' (sometimes at least) means 'at least one and not all'; it suffices to posit that 'some' unambiguously means 'at least one'.

In the first, pet-shop example, we are imagining a specific conversational setting in which rabbit-acquisition is at issue. It is the specific details of the context that give rise to the conversational implicature — Grice calls these *particularized conversational implicatures*. In the second, some/not-all example, there is no need to outline the details of specific conversational situation to illustrate that the speaker commits herself to the contents of the conversational implicature, which is the result of

[6] Although Grice did not put it this way: in the William James lectures: the founder of pragmatics never used the word 'pragmatic', and apart from a handful of places, mentions conventional meaning/significance/force rather than 'semantic/semantics'.

general considerations about communication, quite independently of the particular details of the conversational context. Grice calls these *generalized conversational implicatures*.[7]

According to Grice, cases of *conversational implicature — particularized and generalized alike — can be defined based on what the speaker says*. The aim is also to allow for making principled distinctions about what is and what is not part of the conventional meaning of an expression like 'some'.

> GRICE'S ANALYSIS OF CONVERSATIONAL IMPLICATURE BASED ON WHAT-IS-SAID (based on Neale 1992, 527–9):
> in saying *p*, the speaker has conversationally implicated that *q* if and only if
> (1) "[the speaker] is to be presumed to be observing the conversational maxims, or at least the Cooperative Principle;
> (2) the supposition that he ... thinks that *q* is required in order to make his saying ... *p* (or doing so in *those* terms) consistent with this presumption;
> (3) the speaker thinks (and would expect the hearer to think that the speaker thinks) that it is within the competence of the hearer to work out, or grasp intuitively, that the supposition mentioned in (2) is required" (30–31);
> (4) *q* is intended by the speaker (Grice 1961, 130)
> (5) *q* is calculable from *p* (31, 39);
> (6) *q* is cancelable (39, 44);
> (7) *q* is (usually)[8] nondetachable (39, 43–44).

Let us illustrate these seven conditions on the already familiar examples. When I say "Some rabbits relish city life", for *any* conversational implicature to emerge, my audience and I must presume that I am obeying the norms of communication (1); maintaining this presumption calls for a requirement: it *must* be supposed that I am thinking that (as far as I know), not all rabbits relish city life (2); I also believe that my audience can work out that she must suppose that I am thinking this (and is in a position to realize that I believe she can work this out) (3). Further, I

[7] To account for such cases of generalized conversational implicature as having default interpretations, neo-Griceans like Horn (1989) and Levinson (2000) proposed to restructure the conversational maxims.

[8] A notable exception: conversational implicatures that exploit the maxim of Manner *are* detachable: consider Grice's example of someone making the verbose remark: "Miss X produced a series of sounds that corresponded closely with the score of 'Home Sweet Home'" (instead of the "nearly synonymous" rendition "Miss X *sang* 'Home Sweet Home'"), in order to conversationally implicate that it was a lousy performance (37, see also 43). Because of this exception, Neale (1992, 529, fn. 26) excludes nondetachability in his definition.

intend to convey to my audience that (as far as I know), not all rabbits relish city life (4). *Calculability* (5): it is possible to calculate the conversational implicature from the level of what-is-said based on background knowledge and assumptions along with the norms of communication. Switching to the pet-shop example, given the context of the conversation (with rabbit-acquisition at issue) and the norms of communication, including the maxim of Relevance, we are able to infer from the father's remark about the residential preferences of rabbits the implicature that the daughter cannot get a rabbit (this is how the remark becomes relevant in the light of the purposes of the conversation). *Cancelability* (6): we can explicitly (or contextually) deny the conversational implicature without contradicting ourselves. For example, "Some rabbits relish city life. In fact, all of them do." *Nondetachability* (7): had we tried to say the same thing differently (so what-is-said would remain the same: for example, "Not all rabbits oppose city life" uttered instead of the original sentence), the conversational implicature would still be present (after all, the speaker would generate the implicature the same way as before via the norms of communication, and the listener would calculate it the same way based on the level of what-is-said).

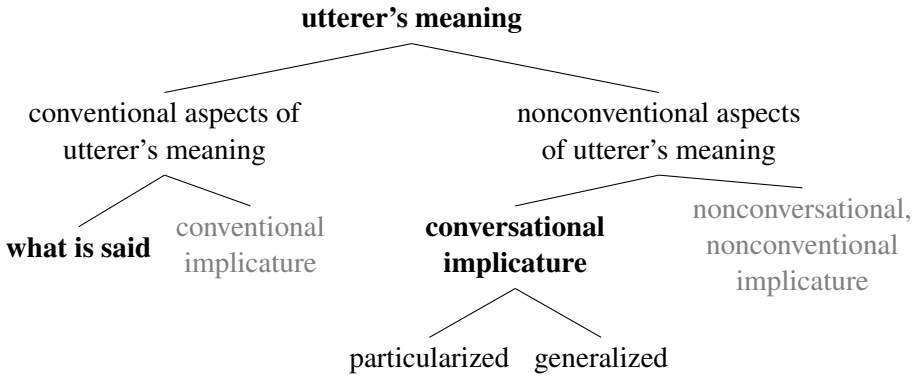
These seven conditions are supposed to fit all and only conversational implicatures. For example, what-is-said is not cancelable. (Presuppositions, entailments and so-called conventional implicatures also fail one or another of the conditions; I won't go into these here.)

The seven-clause definition of conversational implicature based on what-is-said constitutes Grice's theory of communication — almost. Before arriving at a complete answer, we need to ask how all this fits into a broader picture. What more can we say about what-is-said? To answer this question, it is helpful to consider a diagram of notions:[9]

[9]The grey labels are not covered in this section but are included in the diagram for the sake of completeness. As for nonconventional, nonconversational implicatures, Grice leaves room for this category without saying much about it beyond acknowledging that there are "all sorts of other [nonconversational] maxims (aesthetic, social, or moral in character), such as 'Be polite,' that are also normally observed by participants in talk exchanges, and these may also generate nonconventional implicatures." (28, see also 41). As for conventional implicatures—to be explored in detail in Section 5—the following is an example in a Gricean vein:

> utterance: Rabbits move around on the tips of their toes and are, therefore, quiet animals.
> what the speaker said: Rabbits move around on the tips of their toes and they are quiet animals.
> what the speaker conventionally implicated: The quietness of rabbits follows from their moving around on the tips of their toes.

It is certainly plausible to think that the meaning of the word 'therefore' goes beyond that of 'and'. But Grice thinks the conventional implicature is not part of the truth-conditions of the utterance.



(based on Neale 1992)[10]

The three notions in boldface occupy center stage: utterer's meaning, what-is-said, and conversational implicature. We have so far covered the definition of the last notion and still need definitions for the first two. Let us use the label 'utterer's meaning' for what an utterer means on a given occasion of utterance, whether it be a linguistic or nonlinguistic utterance (for example, a vigorous headshake instead of saying 'no' would constitute a nonlinguistic utterance).[11]

In Grice's *theory of meaning*,[12] (i) utterer's meaning is the most basic notion, analyzed in terms of certain audience-directed intentions of the utterer. Grice then uses this notion to (ii) analyze utterance-type meaning (the conventional meaning of sentences, and more generally, words) in terms of regularities in utterer's meaning. And finally, he (iii) analyzes what-is-said in terms of the previously defined two notions: utterer's meaning and utterance-type meaning. Following Neale's (1992, 550), we can define (i), utterer's meaning as follows:

Though Potts (2005) does not think we have a case of a conventional implicature above, he argues that we still need this category for examples like the following:

> utterance: Rabbits, which are shy animals, relish city life.
> conventional implicature (which is not part of what-is-said): Rabbits are shy animals.

[10]Neale's diagram emphasizes the distinction between conventional and nonconventional aspects of utterer's meaning, which is one of Grice's ultimate goals. I therefore prefer it to the far more common version — which follows Grice's presentation more directly — proposing to split 'utterer's meaning' into 'what is said' and 'what is implicated', splitting the latter further into 'what is conventionally implicated' and 'what is nonconventionally implicated' (see, for example, Horn 1992, 165; Carston 2002, 112).

[11]In the case of linguistic utterances, 'speaker meaning' is commonly used for 'utterer's meaning' (for example, in Bach 2005).

[12]Essays 5, 6 and 14 in Grice (1989). The last of these, Grice's article "Meaning", originally written in 1948, contains the first formulation of the views subsequently developed in the William James lectures.

By uttering x, U meant that p iff for some audience A

(1) U uttered x intending A actively to believe the thought that p (or the thought that U believes that p),
(2) U uttered x intending A to recognize that U intends A actively to believe the thought that p,
(3) U does not intend A to be deceived about U's intentions (1) and (2).

This way, Grice's overarching project is far more ambitious than what has been apparent from his theory of communication in isolation: he selects as his starting point a fundamental notion, that of utterer's meaning, defines it in psychological terms (in terms of intentions), and then analyzes all other semantic notions on its basis, including the notion of what-is-said, which is then deployed in the analysis of conversational implicature.

We have already encountered one of Grice's constraints on what-is-said — that it is closely related to the conventional meaning of the words used. The diagram reveals another crucial aspect of what-is-said (a technical term: "a certain favored, maybe in some degree artificial sense of 'said'," 118): that it is part of what the utterer meant. One cannot, in this Gricean sense, say something one does not mean. This commitment about saying emerges in Grice's theory of meaning (also explored in the William James lectures), in the context of which Grice writes that "(1) 'U (utterer) said that p' entails (2) 'U did something x by which U meant that p'" (87).[13] That is, when one says something, one means it, too.

Given this constraint on what-is-said, when someone makes an ironic remark: "The boss is in a great mood today", meaning that the boss is in a grumpy mood, she does not, in Grice's sense *say* that the boss is in a great mood; she merely pretends to say it — makes as if to say it. According to Grice, instances of nonliteral language use — among others, metaphor and irony — constitute cases of making as if to say something (without saying it) (33–34, 53). He generalizes conditions (1)–(3) in the definition of conversational implicature above to include cases of making as if to say as well (30–31), so our ironic speaker makes as if to say (but does not mean and hence does not say) that the boss is in a great mood, and she thereby generates the conversational implicature that the boss is in a grumpy mood, something she does mean.

2 The minimalist's locutionary sense of 'say' at a disadvantage

Let us summarize the two key constraints we have seen Grice impose on the notion of what-is-said:

[13] See also 119–120.

> CONVENTIONAL: what-is-said is closely related to the conventional meaning of the words used.
> MEAN: what-is-said is also meant. When I say something, I mean it, too — or else I did not say it (in the relevant sense of 'say') in the first place.

Contextualism is a view variously characterized as holding that "meaning underdetermines truth conditions" (Bezuidenhout 2002, 105) and that "the contrast between what a speaker means and what she says is illusory and the notion of 'what the sentence says' is incoherent" (Recanati 2004, 4). Besides Anne Bezuidenhout and François Recanati, proponents of contextualism notably include relevance theorists like Dan Sperber and Dierdre Wilson (1995) as well as Robyn Carston (2002). Contextualists agree that a notion of what-is-said adhering to CONVENTIONAL cannot be maintained. They hold instead that arriving at the truth conditions expressed on an occasion of uttering a sentence — what Sperber, Wilson and Carston call explicit content or explicature — involves a process that is not encoded in or controlled by the conventional meanings of the expressions used. Meanwhile, contextualists do maintain MEAN for their notion of explicature.

In what follows, I won't go into issues having to do with maintaining or rejecting CONVENTIONAL, focusing instead on the costs of giving up MEAN. I therefore will not here address contextualist criticisms of the Gricean notion of what-is-said. Instead, I will turn to arguments for and against the so-called minimalist view, which proposes a notion of what-is-said for which MEAN does not hold. I will argue that this move accrues a disadvantage by making the minimalist alternative unfit to do some of the theoretical work that its Gricean counterpart accomplishes so effectively.

In proposing his version of minimalism,[14] Kent Bach's departure point is the same as that of contextualists: meaning underdetermines truth conditions. Yet Bach goes on to draw distinct conclusions about what-is-said: he proposes to part with Grice's constraint MEAN. Bach stresses the need "to account for (the content of) what a speaker does in uttering a sentence independently of whatever communicative intention (if any) he has in uttering it and regardless of how the content of that intention may depart from the semantic content of the sentence" (Bach 2005, 41–42; see also Bach 1994). Bach is therefore explicitly divorcing what-is-said from the second constraint, MEAN. Bach draws on "Austin's distinction between 'locutionary' and 'illocutionary' acts, between saying something and doing something in saying it" (Bach 2005, 25). He distinguishes the locutionary sense of 'say' from its illocu-

[14] The minimalist position is elsewhere labelled 'semantic modesty' (King and Stanley 2005) and the 'syncretic view' (Recanati 2004). The criticisms I raise here carry over to Cappelen and Lepore's (2005) version of minimalism as well. I discussed this in my lecture "What is Said, What is Meant" presented at the Central European University SUN course "Meaning, Context, Intention".

tionary sense, "roughly synonymous with 'state' (or 'assert'). In the locutionary sense, one can say something without stating it [...] The illocutionary act a speaker performs in saying something depends on his communicative intention" (Bach 2005, 18–19). Bach is suggesting that the illocutionary sense of 'say' is one that does satisfy Mean. Let us call Grice's own notion of what-is-said, which is like the illocutionary sense of saying, what-is-said$_G$, to distinguish it from Bach's "strictly semantic notion of what is said" (Bach 2005, 25), a locutionary sense of saying: what-is-said$_B$. According to Bach, CONVENTIONAL does hold for what-is-said$_B$. Meanwhile, it is a distinct notion — that of *conversational impliciture* — that is in synch with utterer's meaning/communicative intentions, and that is arrived at via a processes of expansion and completion. Consider an example of the former:

> EXPANSION
> utterance: I haven't had breakfast.
> what-is-said$_B$: For all past times t, I didn't have breakfast at t.
> Bach's conversational impliciture: I haven't had breakfast *today*.

What-is-said$_B$ is clearly false and it is the impliciture that the speaker means and intends to communicate. Bach also thinks the semantic content of an utterance (what-is-said$_B$) is not always fully propositional, it is at times no more than a propositional radical, matrix or skeleton, and it is only at the level of conversational impliciture that a complete proposition is obtained, via a process of completion, as in the following example:[15]

> COMPLETION
> utterance: Joe is ready. (said in the context of training for a marathon)
> what-is-said$_B$ is not a complete proposition — we are missing the part: ready for what?
> conversational impliciture: Joe is ready to run a marathon.

Crucially, for Bach, implic*i*ture is the product of a process that is, in part, the output of rational reasoning: expansion and completion involve the same sort of pragmatic process of presuming adherence to the Cooperative Principle and the maxims that underlies conversational implic*a*tures (Bach 1994).[16] Thus, one major difference between Bach's approach and Grice's is that truth conditions that are in synch with the speaker's communicative intentions, that is, the conversational

[15]It is here that we can witness the major point of disagreement between Bach and Cappelen and Lepore (2005), as the latter authors hold that, even in this case, there is a complete proposition corresponding to what is said.

[16]In the literature, the label 'pragmatic enrichment' subsumes both processes posited by Bach: expansion and completion.

impliciture in question, involve the pragmatic processes of expansion and completion. For Bach, conversational implicatures are generated based on conversational implicitures (Bach 1994) — one (at least partially) pragmatic process following another. By contrast, given CONVENTIONAL, what-is-said$_G$ is plausibly the result of a semantically controlled process in which all forms of contextual contribution to what-is-said$_G$ are linguistically encoded — on the model of the sort of contextual contribution we encounter in connection with indexical expressions like 'I', 'today' and 'now'. Let us call such a position — defended, for example, by Jeff King and Jason Stanley (2005) — indexicalism.[17]

Bach faces various challenges given what-is-said$_B$. First, as King and Stanley (2005) argue, Bach does not have an explanation for the following two aspects of language understanding:

- language understanding is *systematic*: if I can understand "Thumper chased Skippy", then I can also understand "Skippy chased Thumper";
- language understanding is *productive*: language users can in principle understand an infinite number of sentences of their language.

Someone like Grice holds that language understanding consists in no more than grasping what-is-said$_G$, which, in turn, consists in no more than grasping what is linguistically encoded by the sentence uttered. At that point, the only assumption Griceans need is that what-is-said$_G$ is compositionally determined (it is a function of the semantic values of the constituents and their mode of combination), and they thereby have an explanation of the systematicity and productivity of language understanding. By contrast, for Bach, language understanding consists in speakers grasping implicitures, which are not determined compositionally and are instead (partly) the result of unsystematic pragmatic processes. "So [a theorist like Bach] is committed to an alternative explanation of our grasp of an infinite number of novel utterances, one that does not proceed by attributing our competence to a simple, compositional mechanism" (King and Stanley 2005: 140).

Second, Bach does not have an account of how theories of semantic content can appeal to the linguistic intuitions of speakers and audiences. Stanley and Szabó argue that "accounting for our ordinary judgments about the truth-conditions of various sentences is the central aim of semantics. Since these judgments are the data

[17] Recanati (2004) uses the label 'indexicalism', though King and Stanley (2005) do not. Carston (2002) (and many others) refer to it as a view that posits hidden indexicals; Camp uses another label—'semanticism'. Neale's (1992, 554–555) definition of what-is-said also attributes to Grice an indexicalist view, according to which what-is-said is (among other things) something that the given sentence means "in virtue of the particular meanings of the elements [in the sentence], their order and their syntactic structure.

of semantic theorizing, we should be careful with proposals that suggest a radical revision of these judgments" (2000: 240, see also King and Stanley 2005: 141). This consideration affects any theory, Bach's included, in which semantic content is very often out of synch with speakers' communicative intentions. Grice has an advantage here by maintaining MEANT for what-is-said$_G$.

Bach says very little on these issues, apart from claiming that the intuitions about what is expressed by a given sentence are unreliable guides to semantic content, and that "[t]o keep one's semantic judgments from being pragmatically contaminated, it is always a good idea to imagine a variety of contexts of use, even wildly improbable ones" (Bach 2005: 29). Remarks like these provide little guidance for how we might obtain ordinary judgments about what-is-said$_B$, and how its compositionality can figure in an account of the systematicity and productivity of language understanding. Looking back a few pages at the diagram locating what-is-said and conversational implicature within Grice's framework, it becomes apparent that utterer's meaning, labeled on the top, provides crucial grounding for what-is-said$_G$, securing MEANT. And removing it, as Bach does by forgoing MEANT and opting for what-is-said$_B$ leads to considerable theoretical challenges.

To be sure, what-is-said$_G$ is not without problems. For example, how can it serve as the unit of communication: the determinate content that a speaker expresses and her audience (potentially ignorant and/or mistaken about background information and aspects of the utterance context) grasps?[18] And, crucially, can a notion of what-is-said that maintains MEANT adhere to CONVENTIONAL also?[19] We have also found that what-is-said$_G$ is committed to indexicalism: the view according to which all contextual contribution to truth-conditions is linguistically encoded in the way that the conventional meaning of indexical expressions like 'I' and 'here' control how context contributes to the content of these expressions on a given occasion of utterance. Indexicalism is an ambitious position that has met extensive criticism (including Recanati 2004, 98–114; Lepore and Cappelen 2005, 69–83; Carston 2002, 197–205, Wilson and Sperber 2002, 610–612). It is therefore interesting to see how the objections raised against what-is-said$_B$ might be countered with an alternative nonminimalist construal of a locutionary sense of 'say'; to this we will now turn.

[18] Buchanan (2010) explores this problem. See also Cappelen and Lepore (2005) (186-89).

[19] As we have seen at the beginning of this section, proponents of contextualism — Bezuidenhout (2002), Carston (2002), Recanati (2004), Sperber and Wilson (1995, 2004) — criticize Grice on this point.

3 Prospects for an alternative locutionary sense of 'say'

The two points of criticism we encountered against Bach — he cannot make room for linguistic intuitions of language users in semantic theorizing, and cannot straightforwardly account for the productivity and systematicity of language understanding — indicate the direction for defending a locutionary sense of what-is-said: one needs to show that (i) language users do, after all, exhibit implicit sensitivity to a locutionary level of meaning alongside an illocutionary level of meaning (similar to what-is-said$_G$), and that (ii) there are systematic connections and interactions between the two levels. In forthcoming work, Elisabeth Camp sets out to motivate these two points, drawing on a broad spectrum of examples involving sarcasm.[20] Let's consider these points in reverse order.

Addressing (ii), Camp (forthcoming, 2) distinguishes various species of sarcasm, and argues that despite the fact that they operate on a variety of levels, they still can and should be given a unified account:

> "I will defend the claim that sarcasm involves a unified operation of meaning inversion, which is manifested in distinct ways by four different subspecies of sarcasm. All four varieties *invert* something that the speaker *pretends* to mean (or presupposes someone else to have meant) relative to an evoked *normative scale*. But the target of the sarcasm, and the result of the inversion, vary widely depending on the species involved. *Propositional* sarcasm functions most like the traditional model, delivering an implicature that is the contrary of a proposition that would have been expressed by a sincere utterance [e.g. "Your plan sounds fantastic"]. *Lexical* sarcasm delivers an inverted compositional value for a single expression or phrase [e.g. 'diplomat' inverted in "Because George has turned out to be such a diplomat, we've decided to transfer him to Payroll, where he'll do less damage"]. *'Like'-prefixed* sarcasm [e.g. "Like that's a good idea"] commits the speaker to the emphatic epistemic denial of a declarative utterance's focal content."
>
> (Emphasis in the original)

According to Camp (forthcoming: 37–38), the key to providing a unified account of sarcasm rests on distinguishing various levels of meaning, including:[21]

[20] Camp takes sarcasm to be an extensive (and possibly exhaustive) subclass of verbal irony, the defining feature being that all instances of sarcasm involve meaning inversion. The examples I discuss are instances of both sarcasm and irony, so for the purposes of this paper, I will grant Camp's characterization and will not try to tease apart sarcasm from irony.

[21] Camp considers an addition class of examples of sarcasm: illocutionary sarcasm, in which the speaker expresses "an attitude which is the opposite of one that a sincere utterance would have expressed" (3). For example, "Thanks for holding the door", said to someone who has just slammed

- 'what is locuted' (for which MEAN doesn't hold, yet it involves more constraints than Bach's locutionary what-is-said), "roughly equivalent to 'what the uttered sentence means'"; "also including the assignment of an illocutionary-act-type correlative to grammatical mood, but without entailing actual illocutionary commitment";
- 'what is asserted/asked/ordered' (for which MEAN does hold): the speaker's primary illocutionary act: "what the speaker claimed";
- what is (nonconventionally) implicated: further illocutionary commitments undertaken by the speaker based on background information, the Cooperative Principle and the maxims (this is thus a level arrived at from the previous one by a Gricean process of generating conversational implicatures).

Camp argues that propositional sarcasm always contributes to what is implicated, operating in some cases on what is asserted/asked/ordered and in others on what is implicated. Lexical sarcasm operates on (part of) what is locuted to contribute to what is asserted/asked/ordered. Meanwhile, like lexical sarcasm and unlike propositional sarcasm, metaphor can operate on what is locuted to contribute to what is asserted/asked/ordered, as in a nonsarcastic utterance of "She's the Taj Mahal"; here the speaker is committed to claiming (roughly) that the described person is remarkably beautiful. 'Like'-prefixed sarcasm always contributes the illocutionary force of denial to the level of what is asserted/asked/ordered, but it can combine either with what is locuted or with the output of e.g. metaphor, as in "Like she is the Taj Mahal" (Camp, forthcoming: 27, 43 fn. 34), committing the speaker to *denying* (roughly) that the described woman is remarkably beautiful.

Notice that Camp is taking on board a complex project: just because non-encoded pragmatic processes (like lexical sarcasm and metaphor) contribute to what is asserted/asked/ordered does not mean that semantics ends before then, generating only what is locuted (as Bach had proposed). Instead, Camp holds that there are substantial connections and constraints to link the locutionary and illocutionary senses of what-is-said as two of several levels of meaning all of which are the subject matter of semantic theorizing. Revealing these connections and constraints requires far more detail than what Camp has given in the concluding section of her paper (the bulk of what she says on the two senses of 'say' I have reconstructed here), but this is certainly a direction in which we can hope to glean an explanation for (ii), the systematicity and productivity of language understanding based on the compositionality of what is locuted plus the ways in which that level is linked to the illocutionary sense of what-is-said.

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the door in the speaker's face. In part to accommodate this class, Camp posits a fourth level of meaning: 'what is perlocuted'. I have excluded these details to simplify the discussion.

Addressing (i), Camp (forthcoming: 21–25) points to the special rhetorical role that is played by cases of propositional sarcasm in which the speaker says P, for example, "The boss is in a great mood today", to implicate an inverted content *Q*, about the boss being in a grumpy mood. By speaking sarcastically, the speaker has put herself at a disadvantage in one respect, because she says something (in the locutionary sense) that she doesn't mean, and at an advantage in another respect, by meaning something she doesn't say. The disadvantage is that an uncharitable audience can, without violating the Cooperative Principle, hold the speaker committed to P, taking the utterance literally: "If the boss is so cheery, like you say, go and ask him if we could purchase that fancy coffee machine for the office." In response to this, the speaker is likely to retract her earlier utterance by saying "I was being sarcastic: I didn't actually mean P. I really think *Q*". This sort of problem with uncharitable interpretation does not arise in cases of assertion, when the speaker does mean what she says. But the vulnerable position of a sarcastic speaker is offset by the fact that what the speaker meant, *Q*, is something she hasn't said: she can, if prompted, deny *Q*: "How can you claim that I had said the boss was in a rotten mood? — I said no such thing." Camp takes this pair of phenomena to signal that language users are sensitive to the locutionary sense of what-is-said: they see it as providing grounds for uncharitable responses that hold the speaker committed to what is locuted (even if it isn't part of what the speaker meant), while what isn't part of the locutionary content has a degree of deniability (forthcoming, 38).

This calls for refinements. At first it seems like Camp's point is that what isn't said in the locutionary or illocutionary sense has a degree of deniability; but to make that point, one only needs to invoke Grice's say/implicate distinction, and hold that what is implicated is deniable while what-is-said isn't. It is here that metaphorical utterances, mentioned only briefly in Camp's paper, are crucial.[22] Consider a metaphorical (nonsarcastic) utterance 'She is the Taj Mahal': the speaker's commitment (roughly) to the described woman being remarkably beautiful is part of what is asserted/asked/ordered but not part of what is locuted. The former status — being asserted — results in a lack of deniability: the speaker cannot deny having committed herself to (roughly) the described woman being a beauty. With propositional sarcasm, due to its implicature status, there was room for the speaker to say "I have said no such thing"; with the metaphoric utterance, there is no room to say "I didn't say she was beautiful". The latter status — not being locuted — results in vulnerability to an uncharitable audience: the audience can hold the speaker committed to what was locuted: that a woman is (literally) the Taj Mahal — How can you say a person is a *building*?". In response, the speaker is likely to retract her

[22]Camp (2008) discusses metaphor and deniability in more detail.

earlier utterance by saying "I was speaking metaphorically: I didn't actually mean she is the Taj Mahal, I meant that she was a beauty". Metaphors therefore provide a distinctive combination of lack of deniability and vulnerability to uncharitable interpretation.

That speakers indeed regard instances of propositional sarcasm and metaphor as Camp describes — as both vulnerable to uncharitable interpretation, while the first but not the second is deniable — requires empirical support. It would certainly be interesting to see if Camp's claims bear out, indicating (via the possibility of uncharitable challenges) that speakers are sensitive to what is locuted versus what is asserted, and (via considerations about deniability) that speakers take metaphors (and lexical sarcasm!) but not propositional sarcasm to carry the explicit commitment of assertion. These are intricate issues, judgments and distinctions that are crucial to making a case for speakers' implicit sensitivity to both a locutionary and an illocutionary 'say'. If the case could be made, we could hope to respond to (i) by accounting for the role of the linguistic intuitions of language users: first, semantics concerns the illocutionary sense of 'say' as well as the locutionary one; and more importantly, speakers are sensitive to the locutionary sense of 'say' not just the illocutionary one.

We see then that Camp's proposal is a promising start for maintaining a locutionary sense of 'say' in addition to an illocutionary one, but there is far more work ahead to see if it can respond to the problems that affected Bach's minimalist notion of what-is-said. Camp suggests that all sarcastic utterances can be construed on a single, unified "model in terms of meaning inversion, *so long as we are willing to understand 'meaning' in broader, but still fundamentally Gricean terms*: as a speaker's reflexive intention to be recognized by her hearer, on the basis of her utterance, as holding some attitude, which may be partly or entirely evaluative or emotional rather than purely truth-conditional" (Camp forthcoming: 33–34, my emphasis). While steering away from indexicalism and what-is-said$_G$, Camp maintains a pair of closely connected notions substantially constraining one another: what is locuted as adhering to CONVENTIONAL, and what is asserted/asked/ordered as adhering to MEAN. It is the close connection and the mutual constraints (both of which await further motivation) that make for key differences between Camp's proposal and Bach's minimalism.

4 Minimalism at no advantage

Let us return to Bach's locutionary sense of 'say', what-is-said$_B$, for which MEAN doesn't hold, and consider what advantages it might have over Grice's what-is-said$_G$, which maintains MEAN. I aim to show that the advantages Bach lists prove illusory,

and some of them, in particular, slips of the tongue, point the way toward a richer, more comprehensive Gricean framework than what philosophers and linguists traditionally recognize.

Bach (2005: 25) motivates what-is-said$_B$ as follows:

> Why is the locutionary notion of saying needed, along with the correlative, *strictly semantic notion of what is said*? It is needed to account for each of the following cases, situations in which the speaker:
>
> (i) says something but doesn't mean anything at all (by 'mean' here I mean 'intend to communicate');
> (ii) does not say what he intends to say, as in the misuse of a word or a slip of the tongue;
> (iii) Means what he says and something else as well (cases of implicature [. . .]);
> (iv) (intentionally) says one thing and means something else instead (non-literal utterances). (25, italics and numbering added)

Above, Bach suggests that what-is-said$_B$ is required in an account of the phenomena in (i)–(iv). Let us consider these in (almost) reverse order.

Grice already has the means to accommodate nonliteral uses (iv), with his own notion of what-is-said$_G$ that is like the illocutionary sense of saying rather than the locutionary one. At the end of Section 1, we have already seen Grice bring in the notion of 'make as if to say' to handle nonliteral language use like the ironic remark "The boss is in a great mood today": the speaker doesn't say the boss is in a good mood, only makes as if to say it, and thereby generates the conversational implicature that the boss is in a grumpy mood. Exactly how is Bach's proposal to introduce what-is-said$_B$ superior to Grice's alternative? Bach says very little on this, except for noting that "it seems obvious that in speaking figuratively one really is saying something (but meaning something else instead)" (Bach 2006: 28). Here, Bach seems to be taking for granted a notion of saying that is different from Grice's. But Grice has made it clear that his notion of what-is-said was not supposed to cover the full range of ordinary uses of 'say': he was seeking to define a notion of 'say' that he considered theoretically useful.

Therefore, if 'making as if to say' is a viable notion, then Bach has not shown that what-is-said$_B$ is indispensible if we want to account for nonliteral language use.

Let me briefly respond to some contextualist criticisms concerning the Gricean notion of 'making as if to say'. Wilson and Sperber (2002: 588–592) set out to show that "Grice's treatment of tropes . . . is inconsistent with the rationale of his own enterprise", arguing as follows. Consider the first maxim of Quality: "Don't say what you believe to be false" (27), which Wilson and Sperber call the maxim of

truthfulness. In the maxim, 'say' might be interpreted in (a) a weaker, locutionary sense: "Don't *utter* things you believe to be false", or (b) a stronger, illocutionary sense: "Don't *assert* what you believe to be false". I'll discuss both options and raise problems for the proposed lines of criticism.

The problem Wilson and Sperber raise for option (a) is this: when someone produces a figurative utterance such as the ironical one "The boss is in a great mood today", she flouts the maxim of truthfulness at the level of what-is-said; and that violation remains, even as she adheres to the maxim at the level of what's implicated (The boss is in a grumpy mood). But Grice explicitly allowed for such a possibility — listing, among others, an example in which a pupil is a candidate for a philosophy job, and in writing him a recommendation letter, his professor writes just one sentence "Mr. X's command of English is excellent and his attendance at tutorials has been regular". At the level of what-is-said, the first maxim of Quality ("Make your contribution as informative as is required") is irretrievably violated, though it is adhered to at the level of what is implicated ("Mr X. is no good at philosophy"). Grice lists various other instances of literal speech in which there is a real and not merely an apparent violation of a maxim at the level of what-is-said, with the maxim being observed at the level of what is implicated. Indeed, Grice takes floutings to come in two varieties: real versus apparent violations of maxims at the level of what-is-said. He writes: "[i]n these examples, though some maxim is violated at the level of what-is-said, the hearer is entitled to assume that that maxim, or at least the overall Cooperative Principle, is observed at the level of what is implicated" (33, see also 370). In short, Grice explicitly prepares to handle the sort of scenario that, according to Wilson and Sperber, catches him unprepared.

Wilson and Sperber raise a pair of problems for option (b). First, if 'say' is interpreted as 'assert' throughout the maxims, then it is the making of an *assertion* that requires the speaker to commit to the truth of what she says, so "it is hard to see why a maxim of truthfulness is needed at all. It seems to follow from the very notion of an assertion as a commitment to truth (perhaps together with a proper understanding of commitment) that your assertions should be truthful" (Wilson and Sperber 2002: 589–590). I do not see how our understanding of commitment obviates the need for the maxim of truthfulness: when Richard Nixon asserted in connection with the Watergate investigation "I'm innocent", he did thereby commit to the truth of his assertion; but why is one obligated to commit to the truth of only those statements that (he thinks) are true? To this, construing 'say' as 'assert', and 'making a commitment to the truth of what's uttered' yields no answer; in

the Gricean framework, the maxim of truthfulness is still needed to explain the obligation to tell what (we think) is true.[23]

From the first criticism follows Wilson and Sperber's second, more decisive one: the only time the truthfulness maxim comes into play is when it is violated in the case of figurative utterances. But it fails to be functional even there. Here is why. Opting for the stronger, 'assert' reading of 'say' is supported by considerations about Grice's theory of meaning (discussed in Section 1: what-is-said must be meant), and also by his introduction of 'making as if to say' in the case of nonliteral utterances. But if someone speaking ironically only makes as if to say that the boss is in a great mood, how is the truthfulness maxim violated at all? And if it isn't, then how does the conversational implicature arise at all? "A flouting [in the case of tropes] is a mere appearance of violation. So why should it be necessary to retrieve an implicature in order to preserve the assumption that the maxims have been respected?" (Wilson and Sperber: 591).[24]

This second criticism disregards a crucial aspect of the Gricean framework: granted, in the case of an ironic remark, we have at hand an apparent violation, not a real one; but an apparent violation suffices to trigger a conversational implicature. This happens not just in the case of irony and metaphor, but also in the case of an apparent violation of the maxim of Relevance — indeed, Grice's recommendation-letter example ("Mr. X's command of English is excellent. . . ") we have just discussed could be construed as an apparent violation of Relevance at the level of what-is-said, with the violation proving merely apparent once we consider the conversational implicature (Mr. X. is no good at philosophy). Horn (2004: 8) summarizes this feature of conversational maxims:

> "Unlike syntactic and semantic rules, pragmatic principles and convention *do as much work when they are apparenty violated* — when speaker S counts on the hearer H to recognize the apparent violation and to perform the appropriate contextual adjustment — as when they are observed or ostentatiously violated."
>
> (Emphasis added)

[23] One might try to capture the presence of some sort of obligation to tell the truth via means other than the maxim of truthfulness. Indeed, this is what Wilson and Sperber do: they claim that considerations about relevance yield the obligation in question. "An assumption is relevant to an individual at a given time if and only if it has some positive cognitive effect in one or more of the contexts accessible to him at that time" (Sperber and Wilson 1995: 265); and overall, the positive cognitive effects of true information outweigh the positive effects of false information. Hence arises the obligation in many situations to tell the truth rather than say falsehoods. (Still, as Sperber and Wilson argue, in the case of the loose use of 'flat' in "If you want to plan an easy cycling trip, the Netherlands is a good choice. It's flat.", in uttering the last sentence, the speaker doesn't say something strictly and literally true, nor is it her aim to do so. See, for example, Wilson and Sperber (2002: 592–600).

[24] Carston (2002: 115) criticizes Grice in the same vein.

In the light of this, it is unwarranted to criticize Grice on the grounds that apparent maxim violations can't trigger implicatures. Grice construes floutings as violations — real or apparent ones. One might doubt how the latter kind of flouting could possibly work, and reason that a system operating with real violations only would be superior. But Wilson and Sperber take a different tack: they seem to assume that in the Gricean framework, it is only real violations of conversational principles that can trigger a conversational implicature; they then point out that implicatures that nonliteral utterances are supposed to give rise to remain unaccounted for on that model. But Grice explicitly rejects that very assumption: he mentions "examples in which an implicature is achieved by real, as distinct from apparent, violation of the maxim of Relation. . . " (35, see also 370). In sum, Wilson and Sperber's criticism of the maxim of truthfulness does not, in the end, achieve its aim: they undermine neither the maxim nor the notion of 'making as if to say'.

Returning to Bach's list of cases that serve to motivate his view, let us consider implicatures (iii). As we have already seen in Section 1, Grice, with what-is-said$_G$ on board, has the means to account for implicatures. We are therefore left with the unmeant sayings listed under (i) and (ii) as potential motivations for Bach; my aim is to show that on closer inspection, these, too, fail to provide sufficient grounds for introducing what-is-said$_B$.

Concerning unintended sayings, specifically, slips of the tongue (ii): for all Grice has specified, he is certainly committed to the view that in uttering "she's as headstrong as an *allegory* on the banks of Nile,"[25] Mrs. Malaprop has not said$_G$ (in the relevant sense of 'say') that Lydia is as headstrong as an *allegory* on the banks of Nile (for she did not mean it). Mrs. Malaprop did mean that Lydia is as headstrong as an *alligator* on the banks of the Nile; yet as Grice's definition of conversational implicature stands, this does not count as an instance of conversational implicature. Why not? While it is fairly clear that we want the comparison between an alligator and Lydia to be part of Mrs. Malaprop's utterer's meaning (she did mean it, after all), it is far from clear that we want this to be the kind of utterer's meaning that is also a conversational implicature. By definition, a conversational implicature q is something that the speaker has to be assumed to believe in order to make her saying consistent with the Cooperative Principle and the maxims; and the speaker S has to also think that her audience can work out that the assumption that S believes q is required in this way. But Mrs. Malaprop doesn't fulfill either of these conditions — she did not even realize that she misspoke and her audience needs to do some extra work to make sense of the words she uttered.[26] To be sure, the Gricean theory of meaning does not account for Mrs. Malaprop's unwitting commitment to a

[25] Sheridan: *The Rivals*, Act III Scene III.

[26] Here, I follow Saul (2002, 236) who argues that in cases of unsuccessfully attempting to say p while meaning p (like slips of the tongue, mistaken translations), p is part of the utterer's meaning that

comparison between Lydia and an allegory (because she didn't mean to commit to this). It would therefore be well to see how we might accommodate this in an extended Gricean framework; I will turn to this point shortly. Accounting for slips of the tongue does therefore pose a challenge for Grice, but — as I will try to show in Section 5 — such cases do not serve to motivate introducing what-is-said$_B$ in the end.

Concerning cases of acting, translation, or reading out a passage, when the speaker says something and doesn't intend to communicate anything at all (i): again, for all Grice has specified, he is committed to the view that these speakers haven't said$_G$ anything, and his theory of meaning does not make room for such utterances. Yet these are meaningful utterances. Be that as it may, a crucial feature of such utterances is that the speaker does not commit to (because she does not assert) the given passage. Recall Grice's suggestion for handling nonliteral discourse: the speaker makes as if to say something rather than saying it. We can construe this as similar to what-is-said except the speaker does not commit to it. This model of *pretending* to say something and thereby *pretending* to take on a commitment but not actually doing so naturally lends itself for cases of acting or telling a story as well. There, too, the speaker pretends to make assertions and accrue commitments without actually doing either. Translation and reading out a passage are different in that they don't seem to involve any pretense; yet they are importantly similar: the speaker does not commit to what her utterance would commit her to if she were producing an assertion, a question or a request. So we should expect that something similar to Grice's proposal for nonliteral discourse will cover all cases of saying something while meaning nothing at all. I won't explore this further as I take it that the genuinely pressing issue is accounting for cases in which the speaker does accrue commitments, including unmeant commitments.

(i), (ii) and (iv) are dissimilar in one crucial respect. When a speaker misspeaks, she does *commit herself to* what the conventional meaning of her words specify; for example, Mrs. Malaprop does (unintentionally) commit herself to a comparison between Lydia and an allegory. But that in itself is not sufficient reason to label this unwitting commitment as what-is-said$_B$. Indeed, with respect to commitments accrued by the speaker, there is a sharp contrast between slips of the tongue and misuses of words (ii) on the one hand, and nonliteral discourse (iv) plus utterances when nothing is meant (i) on the other: when speaking nonliterally (ironically or metaphorically, say) and when acting or reading a passage, the speaker *does not commit to* what the conventional meaning of her words specify — that is one of the hallmarks of these kinds of discourse. In sum, we have at hand distinct phenomena

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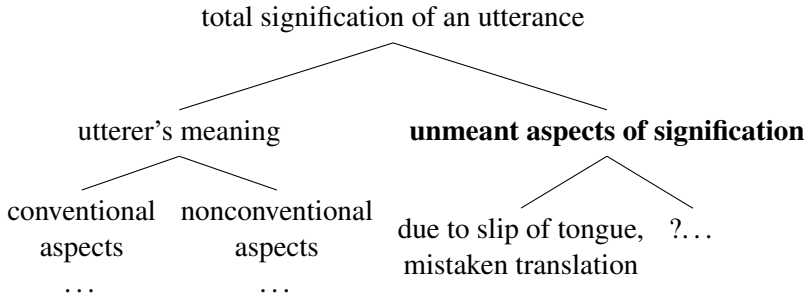
is neither said nor conversationally implicated. Slips of the tongue will be discussed in more detail in Section 5.

with respect to commitments accrued by the speaker. What follows from this? We are not dealing with like phenomena that definitely, without further argument, call for like treatment. Hence, a Gricean approach offering unrelated explanations for slips of the tongue and nonliteral discourse is not at a disadvantage with respect to Bach. Indeed, it is Bach who has to give further arguments for why the two kinds of phenomena should receive a related explanation, in terms of what-is-said$_B$.

We have already observed that Grice's 'make as if to say' withstands various criticisms, so it is not at all clear that what-is-said$_B$ has to be recruited to account for nonliteral discourse. We are about to see that the resources Grice has suffice to account for misuses of language also.

5 A more comprehensive Gricean framework

In this section, I aim to extend the Gricean theory of meaning and communication (outlined in Section 1) to accommodate slips of the tongue and misuses of words. Recall the binary-tree diagram (adopted from Neale 1992) of the Gricean framework from Section 1, with utterer's meaning on top. Given that starting point, it is no wonder that we cannot place unwitting, unmeant commitments anywhere: nothing unmeant can be included under utterer's meaning. How might we make room for slips of the tongue then? I will argue that it is in keeping with the Gricean framework to place them under a more inclusive category recognized by Grice: that of the total signification of an utterance. The diagram below depicts my proposal.



(first pass at an extended Gricean framework)

In addition to slips of the tongue, I have included the parallel case of mistaken translations as well. For example, when a German speaker says: "I'm becoming a steak", meaning "I'm ordering a steak", her inadvertent commitment to her becoming a steak is part of the total signification of her utterance.[27]

[27] On mistaken translations, see also Saul (2002: 236–237).

My proposal parts ways with Neale (1992: 520), who equates the total signification of an utterance with utterer's meaning:[28]

> "Although there is no explicit textual evidence on this matter, it is at least arguable that a specification of the "total signification" of an utterance x made by U is for Grice the same thing as a specification of what U meant by uttering x."

In fact, I think that there is fairly decisive textual evidence and a fairly strong case to be made for rejecting Neale's interpretation. Grice introduces the label 'total signification' in the 1967 William James lectures, in the context of his theory of conversation, where he says he is...

> "operating, provisionally, with the idea that, *for a large class of utterances*, the total signification of an utterance may be regarded as divisible in two ways. First, one may distinguish, within the total signification, between what is said (in a favored sense) and what is implicated; and second, one may distinguish between what is part of the conventional force (or meaning of the utterance and what is not. This yields three possible elements — what is said, what is conventionally implicated, and what is nonconventionally implicated."
>
> (41, emphasis added)

The last sentence could be used to motivate Neale's proposal and the diagram in Section 1, but bear in mind the italicized qualification: there could be utterances, say, slips of the tongue, that aren't included in the *large class of utterances* for which the classification applies, so that what a speaker like Mrs. Malaprop unwittingly committed herself to (a comparison between Lydia and an allegory) could be part of the total signification of the utterance that isn't part of what the utterer meant.[29]

[28] Davidson (1985), whose discussion of Mrs. Malaprop's utterances is an inspiration behind this paper and its title, makes some puzzling claims in this connection. He is interested in the 'first meaning' of a specific utterance, which he admits is basically Grice's utterer's meaning (also widely called nonnatural meaning) (Davidson 1985: 467). Davidson argues that we cannot appeal to a shared language governed by rules and conventions between Mrs. Malaprop and her audience (474). Interestingly, in his discussion, Davidson is only interested in the possibility of interpretation, but remains silent about the commitments that Mrs. Malaprop undertakes when uttering a malaprop. What is puzzling is that elsewhere he seems to equate his notion of first meaning with what he calls "literal meaning", by which he appears to mean Grice's what-is-said: Grice "has shown why it is essential to distinguish between the literal meaning (perhaps what I am calling first meaning) of words and what is often implied (or implicated) by someone using those words" (468). So it is unclear if by first meaning, he means the broader category of utterer's meaning, or the narrower what-is-said. What is clear, however, is that he does not discuss a category as broad as the total signification of an utterance as I am characterizing it.

[29] Saul (2002: 247, fn. 32) also points out the qualification, but does not take it into account in the possible interpretations she considers, instead following Neale's lead and equating utterer's meaning with the total signification of the utterance.

When subsequently Grice mentions again (later on in the William James lectures) the three labels he wants to distinguish "within the total signification of a remark" (118), he no longer restricts to a certain class of utterances; but nor does he suggest that the three-way distinction within total signification is supposed to be *exhaustive*. So this (and the handful of other remarks Grice makes) is easily compatible with holding that the inadvertent and bizarre comparison between Lydia and an allegory is part of the total signification of Mrs. Malaprop's utterance.

Not only do Grice's remarks *allow* that Mrs. Malaprop's unwitting commitment be classified under the total signification of her utterance. There are passages of the Retrospective Epilogue, written in 1987, that are best captured by my proposal. Grice (340–341) describes Strand Five of the Epilogue as proposing "that in considering the notion of *meaning* we should pay attention to two related distinctions. [. . .] (a) between conventional and nonconventional meaning and (b) between assertive and nonassertive meaning" (emphasis added). Accordingly, Strand Five argues for "a feature [. . .] which we may label 'centrality', which can plausibly be regarded as marking off primary ranges of *signification* from nonprimary ranges: the primary range comprises (a) conventional meaning and (b) assertive meaning (358, emphasis added). These two can come apart: for example, in the case of conventional implicature — such as that carried by 'but' and 'on the other hand' — the contrast between the two clauses connected by 'but' and 'on the other hand' is part of conventional meaning but not part of assertive meaning.

Grice discusses an example of a conventional implicature (I underlined some crucial details):

> "(2) Suppose a man says "My brother-in-law lives on a peak in Darien; his great aunt, on the other hand, was a nurse in World War I"; his hearer might well be somewhat baffled; and if it should turn out . . . that the speaker had in mind no contrast of any sort between his brother-in-law's residential location and the one-time activities of the great aunt, one would be inclined to say that a condition conventionally signified by the presence of the phrase "on the other hand" was in fact not realized and so that the speaker had . . . misused the phrase 'on the other hand'."
>
> (361)

Grice returns to the example a bit further down:

> ". . . speakers may be at one and the same time engaged in performing speech-acts at different but related levels. One part of what the cited speaker in example two is doing is making what might be called ground-floor statements about the brother-in-law and the great aunt, but at the same time as he is performing these speech-acts he is also performing a higher-order speech-act of commenting in a certain way on the lower-order speech-acts. He is *contrasting* in some way the performance of some

> of these lower-order speech-acts with others, and he signals his performance of this higher-order speech-act in his use of the embedded enclitic phrase, "on the other hand"."
>
> (362, Emphasis in the original)

The underlined parts highlight Grice's position: although the speaker doesn't have in mind a contrast of any sort, because of his use of 'on the other hand', he is *unintentionally performing a speech act* about the existence of a contrast. That is, in uttering (1) the speaker intends to perform only the speech-acts under (2) and (3), yet ends up performing the speech-act under (4) also:

(1) My brother-in-law lives on a peak in Darien; his great aunt, on the other hand, was a nurse in World War I.

(2) My brother-in-law lives on a peak in Darien. (a lower-order speech-act of assertion)

(3) My great aunt was a nurse in WW1. (a lower-order speech-act of assertion)

(4) (2) contrasts with (1). (a higher-order speech-act of "commenting")

Grice therefore adopts the position that (4) is part of the signification or meaning of the speaker's utterance. It therefore seems overwhelmingly plausible that even when the misuse of words does affect the truth conditions of the utterance — when Mrs. Malaprop, via the conventional meaning of her words, unintentionally commits herself to comparing Lydia to an allegory, the commitment (the speech act performed) is part of the signification of her utterance, albeit an unintended part.[30] It is this idea that my proposal in the diagram above captures.

Some refinements are in order. First, are there both conventional and unconventional varieties of unmeant aspects of signification? Second, once we have located in the diagram what Mrs. Malaprop commits to yet doesn't mean (a comparison between Lydia and an allegory), where should we place what she does mean (a comparison between Lydia and an alligator)? Third, what else besides slips up tongue and mistaken translations should be included under the conventional variety of 'unmeant aspects? Fourth, are we perhaps prompted to include more categories under utterer's meaning also? I will discuss these in turn.

Concerning our first question, slips of tongue and mistaken translations are clearly*conventional* aspects of the total signification of the utterance. Are there perhaps unconventional ones among the unmeant aspects of signification? One possibility that comes to mind, following an idea of Jennifer Saul's (2002, 242),

[30]Indeed, it would be ad hoc *not* to offer like treatment for the two instances of misuse: by the speaker of (1) and by Mrs. Malaprop.

are audience attributions that aren't intended by a speaker.[31] Audience attributions can be conventional or nonconventional. Here is an example of the former: in a Thanksgiving episode of the TV show *Friends*, everyone is running to the roof to see a giant balloon that got away from the Macy's Parade. On the way out, Monica yells 'Got the keys', intending it as a question and an indirect request towards Rachel: "Remember to bring the keys". But Rachel misinterprets Monica's intonation, taking her to have *asserted* that she, Monica has the keys already. Because neither of them has the keys, their Thanksgiving turkey turns to charcoal inside the oven by the time they manage to get someone to open the apartment door. For Monica's utterance, there is an audience attribution of an assertion that is no part of Monica's utterer's meaning. Consider also a *nonconventional* example of audience attributions: in the context of deliberating over the balloon that got away and plans for the rest of the afternoon, Monica utters "I'm staying in today" (and she has in mind not leaving the apartment for an extended period because she is attending to the turkey), but Rachel takes Monica to imply that Monica chooses not to see the balloon from the roof. (As before, the turkey is incinerated.) It is certainly no part of what Monica said (or what Rachel took Monica to have said) that she chooses not to see the balloon. So this could be a candidate for a nonconventional kind of unmeant aspect. But audience attributions, whichever variety we consider, are in the eye of the beholder. They represent cases of miscommunication, the audience mistaking the speaker for having intended to get across something that the speaker had no intention of getting across. It is unwarranted to make audience attributions (conventional or not) part of the *total signification of the utterance*; they are more naturally construed as mistakes about what is part of the total signification.

There is one nonconventional kind of inadvertent commitment worth including, however: contextual implications which are deducible in part based on contextual information and in part based on the utterance (among others, Sperber and Wilson 1995: 107–108). For example, if Monica says 'I'm staying in today' and it is part of the context that the Macy's Parade is taking place that day, then Monica has committed herself to not attending the Macy's Parade that year. Moreover, this is plausibly part of the total signification of her utterance whether or not she intends to convey that she won't be attending the Parade. Clearly, contextual

[31] Saul calls these 'audience-implicatures'; the term 'implicature' is not a good choice for my purposes, so I avoid it. First, the hallmark of audience attributions is that they aren't meant by the speaker; yet for Grice (86), 'implicate' is supposed to be a blanket word to cover 'imply' , 'suggest', 'indicate' and 'mean' (see also Grice 1961, where Grice is talking about cases of implication (the term 'implicature' is not introduced at that stage yet), and, besides latter-day implicatures, presuppositions are supposed to be kinds of implications). Second, as we'll see given the 'say'/'implicate', distinction, audience attributions come in two varieties: counterparts to saying and counterparts to implicature, so the more general 'audience attribution' works better for present purposes.

implications are all nonconventional aspects of the total signification of an utterance. Some of them are part of utterer's meaning, some aren't. There should accordingly be two entries for them in the diagram. Contextual implications are worth more extensive exploration that I leave for another day. Moving onto our second question: where should we place what Mrs. Malaprop does mean by her utterance "She is as headstrong as an allegory on the banks of the Nile"? There is an additional category that Saul (2002: 236–237) proposes in connection with slips of the tongue and mistaken translations: instances of near-sayings. When Mrs. Malaprop speaks, part of what she means is that Lydia is as headstrong as an *alligator* on the banks of the Nile. Indeed, she attempts to say this, but is unsuccessful — this is an example of a near-saying. What Mrs. Malaprop near-says is part of her utterer's meaning that is not a conventional aspect of her utterance: instead, it is a nonconventional aspect. In Section 4, I argued, following Saul, that near-sayings do not satisfy the conditions for conversational implicature. They therefore need their separate category under 'nonconventional aspects of utterer's meaning'.

In addition to near-sayings, Saul (2002: 230–236) motivates an adjacent category of near-implicatures: failed attempts at generating a conversational implicature. For example, when a professor writes a recommendation letter for a philosophy student "Mr. X's command of English is excellent and his attendance at tutorials has been regular", intending to get across the following: "Mr. X is no good at philosophy", his efforts might be thwarted on two counts. First, imagine a situation in which the professor mistakenly thinks the letter is for a philosophy job, but in fact, the student is applying for a call-center job for which the skills sought are precisely command of English and reliability. What the professor intends to implicate doesn't satisfy the condition on conversational implicature according to which in order to maintain that the professor is cooperative, one is required to suppose that the professor believes Mr. X is no good at philosophy. The committee (or anyone) reading the recommendation letter in the context of the call-center job will not realize that anything beyond what the professor has written (said) needs to be attributed to him. So we have a failed attempt at conversationally implicating that Mr. X. is no good at philosophy. Second, imagine a situation in which the student is applying for a philosophy job, but the search committee has been told (falsely and unbeknownst to the professor) that the professor disapproves of the practice of writing recommendation letters, and accordingly, writes uncooperative, irrelevant letters. A condition on conversational implicature, that the speaker is presumed to be cooperative, is not realized. As a result, the speaker tries but fails to conversationally implicate anything. Near-implicatures should, accordingly be added under 'nonconventional aspects of utterer's meaning'.

Moving onto our third question: what might be other instances of unmeant conventional aspects of signification? Examples of entailments readily come to

mind. Consider the standard definition for entailment: if *B* is an entailment of *A*, then the truth of *A* requires the truth of *B*. This time, imagine that Monica asserts "I found my keys" while Rachel is opening the door with her own set of keys. Monica's utterance does entail the following "Keys exist".[32] Yet this isn't part of her utterer's meaning. Why? Because it does not fit the first two clauses of the definition for utterer's meaning in terms of audience-directed intentions (described in Section 1): Monica does not have the intention I: getting Rachel actively to entertain the thought that keys exist; nor does Monica intend Rachel to believe that keys exist via the recognition of Monica's intention I. Yet Monica's utterance does commit her to keys existing, so it is reasonable to expect that this sort of entailment — similarly to conventional implicature and slips of the tongue — should be part of the total signification of her utterance; a conventional part of it. So in the form of entailments that are excluded from utterer's meaning, it is well to add yet another category under the unmeant conventional aspects of the total signification of the utterance.

One might object to the above line of argument on the grounds that I haven't taken into account a crucial parenthetical detail in the definition of utterer's meaning: the first clause mentions the possibility that Monica intended Rachel actively to entertain the thought that *Monica believes* keys exist. I don't think this shift is of help here: Rachel is fully aware not only that keys exist (she is opening the door), but also that Monica believes they exist; moreover, Monica believes all this. Given the definition of utterer's meaning, we still have to leave room for entailments that aren't part of what the speaker intended to convey.

The case of entailments is worth further thought with respect to our fourth question: is there something missing from under utterer's meaning — entailments that the speaker does intend to convey, perhaps? Earlier, we've considered a passage from Grice in which, "for a large class of utterances", he calls for a two-way division under the total signification of an utterance between what-is-said and what is implicated, and under the latter, a two-way division between what is conventionally versus nonconventionally implicated. Grice mentions entailments in passing only, but seems to consider them as part of the *conventional* aspects of utterer's meaning; so what's entailed by a given utterance can't also be conversationally implicated.[33] Evidence of this comes from Grice's discussion of the two readings of "The present king of France is not bald": a "strong reading", "The present king of France is such

[32]It is traditional to classify some of these entailments as presuppositions, for example, "I found my keys" is said to presuppose "my keys exist" in the standard, semantic sense that if *A* presupposes *B*, then for *A* to be true or false requires the truth of *B*. I will not consider the intricate issues surrounding presuppositions in this paper, accepting, for the purposes at hand, Neale's interpretation of Grice's view that all presuppositions (semantic and nonsemantic ones alike) fall into one of two classes: entailments and conversational implicatures (Neale 1992: 522, fn. 17).

[33]Neale (1992, 528–529) attributes this view to Grice, as does Carston (2002: 112–113).

that he is not bald" versus a "weak reading", "It is not the case that (the present king of France is bald)". The strong reading entails that a king of France exists, so it doesn't, Grice seems to assume, conversationally implicate that a king of France exists.[34] Crucially, in the context of the strong reading, "There is a king of France" doesn't fit the definition of conversational implicature Grice gave earlier, in the William James lectures, on several counts: the Cooperative Principle and the maxims are not needed to derive it, so it isn't calculable; and it isn't, on the reading in question, cancelable either. Our present question then is whether, it is most in keeping with Grice's ideas to classify entailments under (i) what-is-said, (ii), what is conventionally implicated, or (iii) within a category of their own. I will provide motivations for option (i). Against option (ii): the key feature of conventional implicatures, according to Grice, is that they do not contribute to the truth conditions of an utterance: recall Grice's example from the Retrospective Epilogue, repeated here:[35]

(1) My brother-in-law lives on a peak in Darien; his great aunt, on the other hand, was a nurse in World War I.

(2) My brother-in-law lives on a peak in Darien. (a lower-order speech-act of assertion)

(3) My great aunt was a nurse in WW1. (a lower-order speech-act of assertion)

(4) (2) contrasts with (1). (a higher-order speech-act of "commenting" or "indicating" (121))

According to Grice, in uttering (1), the speaker performs three speech acts: (2)–(4). Grice holds that the fact that the speaker fails to realize that his words commit him to (4), "a condition conventionally signified by the presence of the phrase 'on the other hand'", is "insufficient to falsify the speaker's statement" (361).[36] Crucially,

> "[t]he truth or falsity … of his words is determined by the relation of his ground-floor speech-acts to the world; consequently, while a certain kind of misperformance of the higher-order speech-act may constitute a semantic offense, it will not touch the truth-value… of the speaker's words."
>
> (362)

[34] In "Presupposition and Conversational Implicature" (1970, 1977), Essay 17 in Grice (1989). See especially 270.

[35] In what follows, I will sometimes refer by (2)–(4) to the speech acts in question, and sometimes to the contents of those speech acts. This double-use is harmless—it should always be clear which interpretation I mean.

[36] See also 25–26.

The idea that conventional implicatures don't contribute to the truth conditions of utterances is suggested in the William James lectures as well[37] (although in prior work, Grice shows hesitation on this[38]). In addition, conventional implicatures exhibit distinctive behavior with respect to detachability and cancelability. On the one hand, they are easily detachable (by uttering "My brother-in-law lives on a peak in Darien and his great aunt was a nurse in World War I" the speaker would say the same as before, without the conventional implicature present). On the other hand, "[a]lthough it will not lead to contradiction, attempting to cancel a conventional implicature will result in a genuinely linguistic transgression of some sort" (Neale 1992: 529, fn. 25).

Consider two examples of entailments that the speaker intends to convey: in the letter-writing example, "Mr. X's command of English is excellent and his attendance at tutorials has been regular" entails the first conjunct, "Mr. X's command of English is excellent"; and "Phoebe is pregnant with triplets" entails "Phoebe is pregnant". Entailments such as these are markedly different from conventional implicatures: first, entailments aren't naturally construed as part of higher-order speech acts; second, they are naturally construed as part of the truth-conditions of the utterance; third, they are not detachable; and fourth, canceling them does result in a contradiction. Given these four respects of dissimilarity, conventional implicature is not the right category for classifying entailments in a Gricean framework, so we should discard option (ii).

Grice's discussion of conventional implicatures does, however, reveal indirect evidence that he intended entailments to belong under what-is-said, as option (i) has it, rather than under a separate category, as option (iii) has it. In the William James lectures, Grice considers clarifications on the notion of what-is-said that he considers theoretically useful, aiming to exclude conventional implicatures. In the context of defining what-is-said, Grice introduces the idea of "being *centrally* meant" in order to exclude conventional implicatures from what-is-said: the latter, but not the former are part of what is centrally meant by an utterance (88). Grice subsequently (120–122) elaborates this idea by suggesting that what-is-said concerns a central speech act performed by the speaker, and that for "elements in the conventional meaning of an utterance which are *not* part of what has been said [that is, conventional implicatures]", ... "at least for an important subclass of such elements", we need an account according to which

[37] In Essay 2: "I do not want to say that my utterance ... would be, *strictly speaking* fails should the [conventional implicature] in question fail to hold" (25–26).

[38] Grice (1961: 127) suggests that even if a conventional implicature (or implication, as he called it then) is false, an utterance can still be false, but adds that one "might perhaps be less comfortable about assenting to its truth if the [implication] did not in fact obtain".

- the problematic elements are "posterior to, and … their performance is dependent upon, some member … of the central range"; for example, the performance of the noncentral speech act of commenting or indicating (4) is dependent on the performance of (2) and (3); and
- the dependence of the noncentral speech act on the performance of a central one is supposed to *explain* why we are reluctant to classify, for example, commenting or indicating that (4) as an instance of *saying* that (4).";
- a noncentral speech act such as (4) is explicated in terms of utterer's meaning (122).

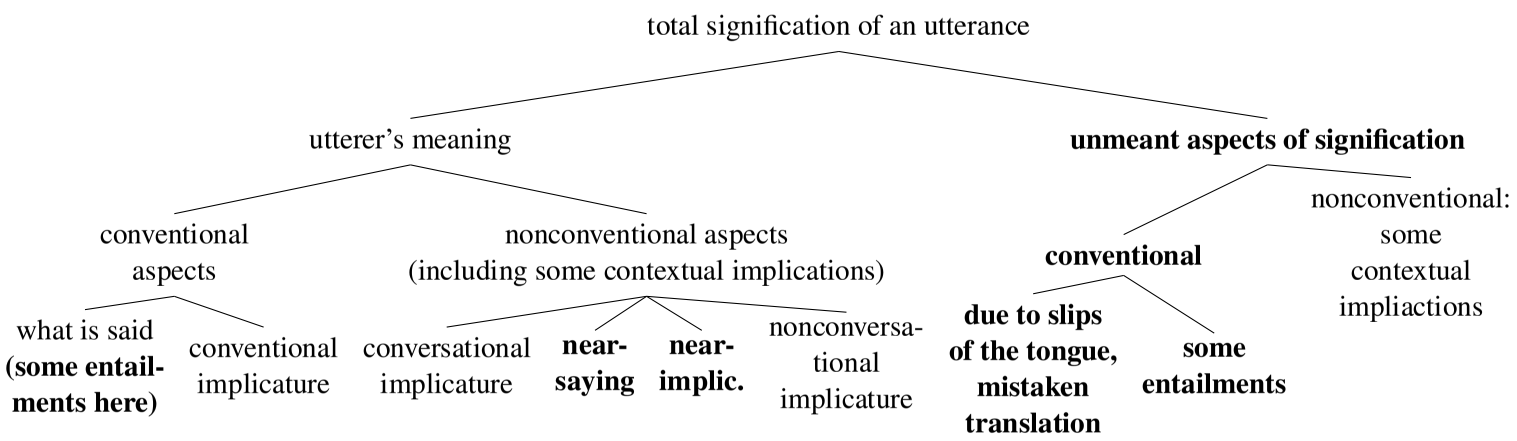
Crucially, whenever Grice explores the need to exclude some aspect of conventional meaning from what-is-said, the central speech act, the *only* kinds of examples he mentions involve conventional implicatures that are due to expressions like 'moreover', 'but', 'therefore', and 'on the other hand'. Nowhere does he mention a concern to exclude entailments. Indeed, we have seen that for an utterance of (1), it is natural to break it down into two central speech acts of assertion, (2) and (3), each of which are in fact entailments of (1). It would be difficult and ad hoc to draw a line between entailments like (2) and (3), which are clearly part of what-is-said, and other entailments that are meant yet aren't part of what-is-said. It therefore seems in line with Grice's ideas to include entailments that are part of what the speaker meant under the already-existing label of what-is-said, in accordance with option (i).

The following diagram depicts the various categories that are needed to present a more comprehensive picture in a Gricean vein, with the new additions in boldface.

6 Conclusions

Several remarks are in order in the light of the Gricean extended framework: about, first, the status of Grice's theory of meaning; second, the degree to which speakers control the total signification of the utterances they make; third, the status of entailment; and, fifth, the status of a Gricean construal of what-is-said, one that (unlike its minimalist counterpart) satisfies MEAN. I'll discuss these briefly in turn.

First, Grice's theory of meaning remains compatible with the extended framework. Granted, within the theory, the notion of utterer's meaning is taken as a basic notion defined in terms of certain audience-directed intentions of the speaker. This notion is then appealed to in the definition of the conventional meaning of words and sentences as well as in the definition of what-is-said. The fact that in the form of



(an extended Gricean framework, final version)

slips of the tongue and certain entailments, the conventional meaning of expressions makes a contribution to the unmeant aspects of signification does not, as far as I can tell, interfere with the hierarchy of definitions. Indeed, this phenomenon is expected in a Gricean framework that defines conventional meaning in terms of regularities in utterer's meaning.

Second, a question arises about the extent to which speakers do *not* control the total signification of their utterances: how much speaker control is there given that the basic notion of utterer's meaning is a function of the speaker's *intention* to influence her audience, and is not sensitive to whether the audience is actually so influenced. This suggests that utterer's meaning is under the speaker's control as long as she has the requisite intention, however farfetched that might be. Meanwhile, the extended framework shows four ways in which the total signification of an utterance is subject to criteria that lie beyond the intentions of the speaker. (i) The presence of conversational implicatures is, according to Grice, tied to a speaker-independent criterion that *supposing* the speaker to have a certain belief is *required* to maintain that she is being cooperative; it's not enough if the speaker *thinks* such a supposition is required. As a result, *near-implicatures* can arise when the speaker, despite her intentions, fails to generate a conversational implicature.[39] (ii) What-is-said is in part dependent on the conventional meanings of the words used, giving rise to *near-sayings* in the case of slips of the tongue. Despite Mrs. Malaprop's intention to *say* that there is a comparison between Lydia and an alligator, she hasn't managed to say this. (iii) By uttering a slip of the tongue, Mrs. Malaprop has, however, quite independently of her intentions, incurred commitments due to the conventional meaning of her words. (iv) And we have observed that such unmeant contributions to signification due to the conventional meaning of the words used are not at all limited to the relatively rare cases of slips of the tongue (and mistaken translations), but arise quite generally in the form of *entailments* that aren't part of what the speaker intended to convey.

This brings us to our third point, about entailments: given that they are due to the conventional meanings of the words used, it is not at all surprising that they come in two varieties: in ordinary cases (with no mishaps like the slip of a tongue) the speaker intends to convey some of the entailments of her utterance but not others, yet she is committed to them all as part of the signification of her utterance.[40]

[39] See Saul (2002: 243–245). She argues against Davis's (1992) construal of what speakers (conversationally) implicate as being, a matter of no more than speakers' intentions and therefore in speakers' control.

[40] For this reason, Dan Sperber (personal communication), proposes that not every entailment of an utterance is part of what he calls explicit content within a relevance theoretic framework. After all, the explicit content has to be something that the speaker intends to communicate to her audience, and not all entailments of an utterance fit this bill.

Fourth, we have seen that an extended framework that is Gricean in spirit, indeed, one for which we can find explicit textual evidence in Grice's work, can smoothly operate with a notion of what-is-said that satisfies the constraint under MEAN: in the relevant sense of 'say', the speaker must mean what she says, or else she hasn't said it at all. Accounting for slips of the tongue adequately does not require a notion of say, such as Bach's minimalist alternative, which parts ways with MEAN.

We therefore have at hand a Gricean framework — featuring the original Gricean notion of what-is-said — which is able to handle just the sorts of issues that had prompted proponents of minimalism to move to an alternative notion of what-is-said. The extended Gricean framework encompasses a broad class of cases (not only slips of the tongue, but also certain entailments) which have traditionally been excluded from the purview of Grice's theory of meaning, with utterer's meaning at its foundation. The exclusion had meant that we could not, within the diagram of Grice's view that is so often appealed to, find room for commitments that the speaker undertakes yet does not mean. We have observed that such commitments are not such a rare breed; they don't just arise for those of us, who, on occasion, cannot fully comprehend the true meaning of what we are saying (or as Mrs. Malaprop would put it "cannot *reprehend* the true meaning of what [we are] saying").[41] Instead, in the form of entailments, unmeant commitments are ubiquitous; and placing them under the total signification of an utterance can bring them into a Gricean fold.

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Enikő Héja: NLP-Supported Dictionary Building (supervisor: Csaba Oravecz, opponent: László Tihanyi, grade: excellent)

Péter Márton Rácz: Hungarian Phonology and Morphology: Discord in the Possessive Allomorphy of Hungarian (supervisor: Péter Rebrus, opponent: Péter Siptár, grade: excellent)

Gábor Recski: NP-chunking in Hungarian (supervisor: András Kornai, opponent: Csaba Oravecz, grade: excellent)

Boglárka Takács: Construction Grammar in Psycholinguistics (supervisor: László Kálmán, opponent: Zoltán Bánréti, grade: excellent)

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Márton Sóskuthy: Analogy at the level of phonology. The emergence of intrusive-r in English (supervisor: Péter Rebrus, opponents: László Kálmán and Miklós Törkenczy, grade: excellent)

Dániel Szeredi: Functional phonological analysis of the Hungarian vowel system (supervisor: Péter Rebrus, opponent: Zsuzsanna Bárkányi, grade: excellent)

Katalin Eszter Lejtovicz: Formális módszerek a diskurzus-partikulák vizsgálatában [Formal methods in the investigation of discourse particles] (supervisor: Beáta Gyuris, opponent: Ferenc Kiefer, grade: fair)

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Zsófia Gyarmathy: Intensionality Phenomena (supervisor: Károly Varasdi, opponent: Beáta Gyuris, grade: excellent)

Andrea Márkus: Participles and the passive in Hungarian (supervisor: Huba Bartos, opponent: Balázs Surányi, grade: excellent)

Cecília Sarolta Molnár: Szintaxis és/vagy szemantika? — Néhány magyar mondattani jelenség vizsgálata [Syntax and/or semantics? — An investigation of some syntactic phenomena in Hungarian] (supervisor: Beáta Gyuris, opponent: András Komlósy, grade: excellent)

András Márton Baló: Lovári leíró nyelvtan. Alaktan. Ige [Lovari descriptive grammar. Morphology. Verbs] (supervisor: László Kálmán, opponent: András Komlósy, grade: excellent)

Emil Gergely Dyekiss: Dinamikus szemantika kérdésekkel [Dynamic semantics with questions] (supervisor: László Kálmán, opponent: Beáta Gyuris, grade: excellent)

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Éva Dékány: Az adverbiumok szintaxisa [The syntax of adverbs] (supervisor: Katalin É. Kiss, opponent: Huba Bartos, grade: excellent)

2006:

Bence Kas: Az egyeztetés vizsgálata nyelvfejlődési zavart mutató gyerekek teljesítményében [Examining agreement in the production of children displaying developmental language disorder] (supervisor: Ágnes Lukács, opponent: Katalin Szentkuti-Kiss, grade: excellent)

Ágnes Gyarmati: Szonoritási modellek jegygeometriában [Sonority models in feature geometry] (supervisor: Péter Szigetvári, opponent: Péter Siptár, grade: good)

2005:

Barbara Egedi: A kopt mondat elemzési lehetőségei [Possibilities in analysing Coptic sentences] (supervisor: Huba Bartos, opponent: Anita Viszket, grade: excellent)

Judit Kertész: Eseményszerkezet, aspektus, mondatszerkezet. A predikatív határozói igenevek [Event structure, aspect, sentence structure. Predicative adverbials] (supervisor: Katalin É. Kiss, opponent: Beáta Gyuris, grade: excellent)

Marianna Tóth: A mássalhangzókapcsolatok reprezentációjáról [On the representation of consonant clusters] (supervisor: Péter Rebrus, opponent: Miklós Törkenczy, grade: excellent)

2004:

Máté Bernáth: Speciális nyelvi zavar szűrése and tesztelése magyar nyelven [Screening and testing for specific language disorder in Hungarian] (supervisor: Zoltán Bánréti, opponent: Ágnes Lukács, grade: good)

2003:

Szofia Mészáros: A produkciós afázia fonológiai aspektusa: a Broca- és Wernicke-afáziára jellemző fonemikus hibák elemzése [The phonological aspect of production aphasia: analysing phonemic errors typical in Broca's and Wernicke's aphasia] (supervisor: Zoltán Bánréti, opponent: Ágnes Lukács, grade: fair)

Orsolya Zábrádi: Variabialitások a magyar magánhangzó-harmóniában [Variability in Hungarian vowel harmony] (supervisor: Péter Siptár, opponent: Anna Borbély, grade: excellent)

2002:

Márta Abrusán: On Operators: Floating Quantifiers in Hungarian (supervisor: Mihály Bródy, opponent: Katalin É. Kiss, grade: excellent)

Ágnes Lukács: Alaktanilag kivételes tövek vizsgálata a magyarban [Examining morphologically exceptional stems in Hungarian] (supervisor: Péter Rebrus, opponent: László Kálmán, grade: excellent)

2001:

Boldizsár Eszes: Az eseményszemantika néhány ontológiai kérdése [Some ontological questions of event semantics] (supervisor: László Kálmán, opponent: Beáta Gyuris, grade: excellent)

Zoltán Kiss: Distributional effects in English and Hungarian non-initial CC clusters (supervisor: Péter Szigetvári, opponent: Miklós Törkenczy, grade: excellent).

Csaba Oravecz: Machine Learning of Natural Language Structure (Feature Reduction for Ambiguity Resolution) (supervisor: László Kálmán, opponent: Attila Novák, grade: excellent)

Árpád Orosz: Statikus jelentés a szenvedő szerkezetekben [Static meaning in passive construtions] (supervisor: András Komlósy, opponent: László Fejes, grade: fair)

András Rung: A jövevényszavak problematikája a magyar nyelv cseh és lengyel elemeinek vonatkozásában [Issues of Czech and Polish loanwords into Hungarian] (supervisor: László Horváth, opponent: Janus Banczerowszki, grade: good)

Balázs Surányi: Negation and an ambiguity account of n-words: The case of Hungarian (supervisor: Katalin É. Kiss, opponent: Huba Bartos, grade: excellent)

Viktor Trón: HPSG (Bevezetés a fejközpontú frázisstruktúra-nyelvtan elméletébe) [HPSG (Introduction to the theory of Head-Driven Phrase Structure Grammar)] (supervisor: András Komlósy, opponent: László Kálmán, grade: excellent)

Nóra Wenszky: The Influence of Affixation on the Stressing of English Words (An Implementation of Burzio's 'Principles of English Stress' (1994)) (supervisor: Miklós Törkenczy, opponent: Péter Siptár, grade: excellent)

2000:

Zsuzsanna Bárkányi: The issue of Quantity Sensitivity: Primary Stress in Spanish (supervisor: Péter Siptár, opponent: Péter Rebrus, grade: excellent)

Tamás Bíró: Írott szövegek statisztikai tulajdonságainak modellezése matematikai eszközökkel [The mathematical modelling of the statistical properties of written texts] (supervisor: László Kálmán, opponent: Csaba Oravecz, grade: excellent)

Anikó Csirmaz: Complex Predicates: An Approach to Argument Structure Change (supervisor: Katalin É. Kiss, opponent: Mihály Bródy, grade: excellent)

Péter Dienes: Hungarian Transparent Vowels (An account of Hungarian Palatal Harmony in terms of Government Phonology) (supervisor: Krisztina Polgárdi, opponent: Péter Siptár, grade: excellent)

Gergely Lukácsy: Human linguistic processing as mapping based structure selection (supervisor: Zoltán Bánréti, opponent: Katalin Kiss, grade: excellent)

Csaba Olsvay: A Syntactic Analysis of Negative Universal Quantifiers in Hungarian (supervisor: Katalin É. Kiss, opponent: Beáta Gyuris, grade: excellent)

1999:

Natália Dankovics: Hanghelyreállítási kísérletek: az alaktan szerepéről a magyar nyelvben [Attempts at sound restoration: on the role of morphology in Hungarian] (supervisor: Csaba Pléh)

Anna Kürti: The Role of Syllable Structure (Syncope: a Government Phonology approach) (supervisor: Miklós Törkenczy, opponent: Péter Siptár, grade: excellent)

Attila Novák: Inflectional paradigms in Hungarian: The conditioning of suffix- and stem-alternations) (supervisor: László Kálmán, opponent: András Komlósy, grade: excellent)

Andrea Révész: Subjects Positions and Specificity in English (supervisor: Huba Bartos, grade: excellent)

Károly Varasdi: Természetes nyelvi szerkezetek gépi elsajátítása [Machine learning of natural language constructions](supervisor: László Kálmán, opponent: Gábor Rádai, grade: excellent)

1998:

Krisztina Szendrői: Mood in Hungarian (supervisor: Katalin É. Kiss, opponent: Katalin Kiss, grade: excellent)

Éva Veres Sándorné Mészáros: A mondatfeldolgozás nyelvi folyamatai afáziás beszélőknél [Linguistic processes of sentence processing in aphasic speakers] (supervisor: Zoltán Bánréti, opponent: Huba Bartos, grade: excellent)

1996:

András Cser: A félhangzók fonológiája az ógörögben and a latinban [The phonology of glides in Ancient Greek and Latin] (supervisor: Miklós Törkenczy, opponent: Ádám Nádasdy, grade: excellent)

Péter Rebrus: Optimalitás a fonológiában: Morfofonológiai jelenségek a magyarban [Optimality in phonology: morphophonological phenomena in Hungarian] (supervisor: Miklós Törkenczy, opponent: Péter Siptár, grade: excellent)

1995:

Huba Bartos: The A/A' Duality: WH-questions and Optimality (supervisor: Mihály Bródy, opponent: Katalin É. Kiss, grade: excellent)

András Zsámboki: Contrastive Coordinations with Focused Clauses (supervisor: László Kálmán, grade: excellent)

1994:

Péter Szigetvári: The Special Nature of Coronal Consonants (supervisor: Miklós Törkenczy, opponent: László Kálmán. grade: excellent)

Presenters at the TLP 20 Conference

Márta Abrusán, PhD: Studied at the Department of Theoretical Linguistics from 1998, graduated in 2002. Currently a Mellon Postdoctoral Fellow at Oxford University.

András Márton Baló: Studied at the Department of Theoretical Linguistics from 2002, graduated in 2008. Currently a doctoral student at the Theoretical Linguistics Doctoral Programme.

Zoltán Bánréti, CSc: Research Professor at the Research Institute for Linguistics, Hungarian Academy of Sciences. Instructor at the Department of Theoretical Linguistics since 1990.

Zsuzsanna Bárkányi, PhD: Studied at the Department of Theoretical Linguistics from 1996, graduated in 2000. Currently Lecturer at the Department of Spanish, Eötvös Loránd University, and Research Fellow at the Research Institute for Linguistics, Hungarian Academy of Sciences. Instructor at the Department of Theoretical Linguistics since 2002.

Tamás Bíró, PhD: Studied at the Department of Theoretical Linguistics from 1994, graduated in 2000. Currently a postdoctoral researcher at the University of Amsterdam.

Mihály Bródy, DSc: Research Professor at the Research Institute for Linguistics, Hungarian Academy of Sciences, and Professor Emeritus at the University College London. Instructor at the Department of Theoretical Linguistics between 1990 and 2001.

Károly Csabay: Currently Head of Department at Orlai Petrics Soma Cultural Centre (Mezőberény). Regularly taught at the Department of Theoretical Linguistics between 1990 and 2001.

András Cser, PhD: Studied at the Department of Theoretical Linguistics from 1991, graduated in 1996. Currently Associate Professor, Head of Department at the Department of Theoretical Linguistics, Institute of English and American Studies, Pázmány Péter Catholic University.

Dankovics Natália, PhD: Studied at the Department of Theoretical Linguistics from 1991, graduated in 1999. Currently Lecturer and Acting Head of Department at

the Department of Special Needs Education, Faculty of Pedagogy, University of Kaposvár.

Éva Dékány: Studied at the Department of Theoretical Linguistics from 2003, graduated in 2007. Currently a doctoral student the University of Tromsø (CASTL).

Emil Gergely Dyekiss: Studied at the Department of Theoretical Linguistics from 1992, graduated in 2008. Currently a doctoral student at the Theoretical Linguistics Doctoral Programme.

Katalin É. Kiss, Member of the Hungarian Academy of Sciences: Research Professor at the Research Institute for Linguistics, Hungarian Academy of Sciences, Professor at the Department of Theoretical Linguistics, Institute of English and American Studies, Pázmány Péter Catholic University. Instructor at the Department of Theoretical Linguistics between 1990 and 2007.

Barbara Egedi: Studied at the Department of Theoretical Linguistics from 2000, graduated in 2005. Currently Junior Research Fellow at the Research Institute for Linguistics, Hungarian Academy of Sciences.

Anna Gazdik: Studied at the Department of Theoretical Linguistics from 2005, graduated in 2010. Currently a doctoral student at Université Paris Diderot-Paris 7 and an intern at the European Language Centre.

Zsófia Gyarmathy: Studied at the Department of Theoretical Linguistics from 2003, graduated in 2008. Currently a doctoral student at the Theoretical Linguistics Doctoral Programme.

Ágnes Gyarmati: Studied at the Department of Theoretical Linguistics from 2000, graduated in 2006. Currently a research student at Dublin City University.

Beáta Gyuris, PhD: Senior Research Fellow at the Research Institute for Linguistics, Hungarian Academy of Sciences. Instructor at the Department of Theoretical Linguistics since 1997.

Enikő Héja: Studied at the Department of Theoretical Linguistics from 2000, graduated in 2010. Currently Junior Research Fellow at the Research Institute for Linguistics, Hungarian Academy of Sciences.

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Bence Kas: Studied at the Department of Theoretical Linguistics from 2001, graduated in 2006. Currently Junior Research Fellow at the Research Institute for Linguistics, Hungarian Academy of Sciences, and Assistant Lecturer at the Department of Phonetics and Speech Therapy, Faculty of Special Needs Education, Eötvös Loránd University.

Ferenc Kiefer, Member of the Hungarian Academy of Sciences: Professor Emeritus at the Department of Theoretical Linguistics. Instructor at the Department of Theoretical Linguistics since 1990.

Ágnes Lukács, PhD: Studied at the Department of Theoretical Linguistics from 1996, graduated in 2002. Currently Associate Professor at the Department of Cognitive Science, Budapest University of Technology and Economics, and Research Fellow at the Research Institute for Linguistics, Hungarian Academy of Sciences. Regularly teaching at the Department of Theoretical Linguistics since 2005.

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István Muzsnai: Regularly taught at the Department of Theoretical Linguistics between 1996 and 2000.

Csaba Oravecz: Studied at the Department of Theoretical Linguistics from 1995, graduated in 2001. Currently Research Fellow at the Research Institute for Linguistics, Hungarian Academy of Sciences. Regularly teaching at the Department of Theoretical Linguistics since 1996.

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Péter Rácz: Studied at the Department of Theoretical Linguistics from 2005, graduated in 2010. Currently a doctoral student the University of Freiburg.

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Gábor Recski: Studied at the Department of Theoretical Linguistics from 2006, graduated in 2010. Currently a software developer at the Computer and Automation Research Institute, Hungarian Academy of Sciences.

András Rung: Studied at the Department of Theoretical Linguistics from 1997, graduated in 2001. Currently a doctoral student at the Theoretical Linguistics Doctoral Programme and Research Fellow at the Department of Physics of the Budapest University of Technology and Economics.

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Márton Sóskuthy: Studied at the Department of Theoretical Linguistics from 2005, graduated in 2009. Currently a doctoral student at the University of Edinburgh.

Balázs Surányi, PhD: Studied at the Department of Theoretical Linguistics from 1995, graduated in 2001. Currently Senior Research Fellow at the Research Institute for Linguistics, Hungarian Academy of Sciences, and Associate Professor at the Department of Theoretical Linguistics, Institute of English and American Studies, Pázmány Péter Catholic University.

Anna Szabolcsi, DSc: Taught introductory and special courses until Autum 1990, then taught again at the Department in Autumn 1994. Currently Professor at the Department of Linguistics, New York University.

Kriszta Szendrői, PhD: Studied at the Department of Theoretical Linguistics from 1994, graduated in 1998. Currently Lecturer in Linguistics, Division of Psychology and Language Sciences, Faculty of Life Sciences UCL.

Péter Szigetvári, PhD: Studied at the Department of Theoretical Linguistics from 1990, graduated in 1994. Currently Associate Professor at the Department of English Linguistics, Eötvös Loránd University.

Boglárka Takács: Studied at the Department of Theoretical Linguistics from 2004, graduated in 2010. Currently a doctoral student at Medizinische Universität Wien.

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Károly Varasdi, PhD: Studied at the Department of Theoretical Linguistics from 1994, graduated in 1999. Currently a computational linguist at Laboratory of Applied Logic. Instructor at the Department of Theoretical Linguistics between 2000 and 2008.

László Varga, DSc: Professor at the Department of English Linguistics, Eötvös Loránd University. Regularly taught at the Department of Theoretical Linguistics between 1991 and 1995.

Zsófia Zvolenszky, PhD: Lecturer at the Department of Logic, Eötvös Loránd University. Regularly teaching at the Department of Theoretical Linguistics since 2007.