PROCEEDINGS

of the Ninth Symposium on Logic and Language

Besenyőtelek, Hungary, August 24–26, 2006

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Edited by

Beáta Gyuris
László Kálmán
Chris Piñón
Károly Varasdi

Research Institute for Linguistics, Hungarian Academy of Sciences
Theoretical Linguistics Programme,
Eötvös Loránd University, Budapest
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Typeset by the authors, László Kálmán and Károly Varasdi
Prepared by Révai Digitális Kiadó
info@konyvcsinalo.hu, http://www.konyvcsinalo.hu
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Table of contents

Preface

This volume contains the papers presented at the Ninth Symposium on Logic and Language (a.k.a. LoLa-9), which was held at Hotel Fauna in Besenyőtelek, Hungary on 24–26 August 2006. It was the latest in the Symposium series, which began in Debrecen in 1987 and continued thereafter on the average of every 2.11 years in Hajdúszoboszló in 1989, Révfülöp in 1990, Budapest in 1992, Noszvaj in 1994, Budapest in 1998, Pécs in 2002, and Debrecen in 2004. The goal of the Symposium series has always been to foster a dialogue between logicians interested in natural language and linguists interested in formal approaches to the analysis of natural language. LoLa-9 had *information structure* as its special theme.

The organizing committee of LoLa-9 (which included Kinga Gárdai in addition to us) relied heavily on the reviews of an external program committee to decide which abstracts to accept. The program committee consisted of Gábor Alberti, Cleo Condoravdi, Paul Dekker, Jan van Eijck, Chris Fox, Hans-Martin Gärtner, Jonathan Ginzburg, Marcus Kracht, Manfred Krifka, Márta Maleczki, András Máté, Barbara Partee, György Rákosi, Robert van Rooij, Enikő Tóth, Ken Turner, and Zsófia Zvolenszky. We wish to thank all of these people for their often detailed reviews, which generally aided both the organizers and the authors of the abstracts. Thanks also go to the four invited speakers, Paul Dekker, Marcus Kracht, Manfred Krifka, and Barbara Partee, who contributed to the success of LoLa-9 by their readiness to come and present their work.

The gratefully acknowledged financial support for LoLa-9 came from the Research Institute for Linguistics of the Hungarian Academy of Sciences, also from the Hungarian Academy of Sciences itself, and last but not least from the registered participants.

Beáta Gyuris
László Kálmán
Chris Piñón
Károly Varasdi

Budapest, August 2006

Anaphoric temporal locators and discourse structure

Ana Teresa Alves
Universidade dos Açores

0 Abstract

Several authors (cf., e.g., Asher 1993) have used discourse structure to constrain anaphora resolution, that is, to prevent cases where the anaphor is not identified with the right antecedent. Others — cf. Alves & Txurruka (1999, 2001); Bras et al. (2001a,b); Alves (2003) — have studied the interaction between temporal adverbials and discourse structure, showing that not only does discourse structure have impact on temporal relations (cf., e.g., Lascarides & Asher 1993 and Kamp & Reyle 1993) but also that temporal explicit adverbials might have impact on discourse structure. This paper is about adverbial temporal anaphora and discourse structure. In particular, I shall focus on ambiguity involving a group of anaphoric temporal locators (henceforth, ATLs) that I will call anaphoric temporal locators without predicative content. These locators underspecify their antecedents. Because of this, some of these ATLs can relate both to antecedents provided by time-denoting expressions and to antecedents representing the running time of an eventuality, giving rise to ambiguity cases in sequences where both kinds of antecedents are available. In most cases, however, ambiguity does not arise, due, that is my claim, to constraints related to world-knowledge and discourse structure, which leads to disambiguation. A proposal to account for anaphora involving these locators is made within Segmented Discourse Representation Theory (henceforth, SDRT) (cf., e.g., Asher 1993). I will concentrate on anaphoric temporal locators both in English and in Portuguese.

1 ATLs and under-specified ATLs

Anaphoric temporal locators are expressions as those in bold type in the following examples:

(1) O João nasceu em 1980. A Maria nasceu **no mesmo ano.**
John was born in 1980. Mary was born **the same year.**

(2) O João deu uma festa no passado fim-de-semana. Conheceu **então** a Maria.
John gave a party last weekend. He met Mary **then.**

(3) A Maria chegou a Lisboa no dia 12 de Maio. O João chegou no **dia anterior.**
Mary arrived in Lisbon on May 12th. John arrived **the previous day.**

These expressions temporally locate the eventuality described by the sentence in which they occur, and they are anaphoric because the definition of the time interval they represent depends on the linguistic context that precedes them.

(4) ????A Maria nasceu **no mesmo ano.**
????Mary was born **the same year.**

(5) ????O João conheceu **então** a Maria.
????He met Mary **then.**

(6) ????O João chegou **no dia anterior.**
????John arrived **the previous day.**

In Discourse Representation Theory (henceforth, DRT) terms (cf. Kamp & Reyle 1993), they introduce in the respective Discourse Representation Structure (henceforth, DRS) the following elements: (i) a new discourse referent t; (ii) an identity condition of the type [t =?]; (iii) depending on the type of locator, predicative conditions such as [year(t)] or [day(t)]; (iv) other conditions, depending on the existence of relational expressions such as, for instance, *mesmo* 'same' and *seguinte* 'following'. Antecedents of anaphoric temporal locators are discourse referents of type t already present in the DRS under construction. They are introduced in the DRS directly by time-denoting expressions — cf. the expressions underlined in (7–9) — indirectly, via, for instance, several types of functions that account for the possibility of inferring time from eventuality descriptions, like in (10–13).

(7) O João visitou Paris em 1980. A Maria visitou Londres **nesse ano.**
John visited Paris in 1980. Mary visited London **that year.**

(8) O João teve um acidente de viação na passada segunda-feira. Chegou tarde à escola **nesse dia.**
John had a car accident last Monday. He arrived late to school **that day.**

(9) A Maria licenciou-se em Junho de 1987. O João licenciou-se **no mesmo mês.**
Mary graduated in June 1987. John graduated **the same month.**

(10) A Maria foi a Paris. Ficou **então** no Hilton.
Mary went to Paris. She stayed at the Hilton **then.**

(11) A noite passada o João fez o jantar. **Entretanto** a Maria leu o jornal.
Last evening John cooked dinner. **Meanwhile** Mary read the newspaper.

(12) A Maria escreveu uma carta ao João. Ele respondeu-lhe **na mesma semana.**
Mary wrote John a letter. He answered her **the same week.**

(13) A escola só contratará um novo professor em 2008. **Enquanto isso,** a Maria dá as aulas à turma A.
The school will only hire a new teacher in 2008. **In the meantime** Mary will be teaching group A.

(7–9) are cases of anaphora with explicit antecedents whereas (10–13) are cases of anaphora with inferred antecedents: in (10–11), function **loc,** which assigns to an eventuality the interval of time it occupies (cf. Kamp & Reyle 1993: 608), introduces in the DRS the necessary anaphoric antecedents of *então* 'then' and *entretanto* 'meanwhile'. In (12) the anaphoric antecedent is introduced by function **s-loc** (cf. Alves 2003). This function assigns to an eventuality the week in which it occurred. In (13) *enquanto isso* 'in the meantime' refers back to a time interval whose left boundary is the $TPpt$ (here the speech time) and whose right boundary is defined by the eventuality described in the first clause. Our mentioning of a situation that will occur in a future time allows us to infer a time interval stretching from the current time to the beginning of that future situation.

In what concerns the question under study here, a relevant distinction is that between locators with predicative content such as *nesse mês* 'that month', *no mesmo ano* 'the same year', *no dia antes* 'the day before' and locators without predicative content like, for instance, *então* 'then', *depois disso* 'after that', *na altura* 'at the time', *três semanas depois disso* 'three weeks after that', *depois* 'afterwards'. The former introduce DRS

conditions like those mentioned in (iii) above, whereas the latter do not. The former constrain the expression providing their antecedents to describe a certain calendar unit (day, month, year, etc.), whereas the latter somehow underspecify their antecedents. Because of this, some locators without predicative content might pick up both discourse referents introduced by time-denoting expressions and discourse referents introduced via the above mentioned loc function.

2 Underspecified ATLs, ambiguity and the role of discourse interpretation

Lascarides & Asher (1993) and Asher & Lascarides (2003) have provided a formal framework to account for the effects of discourse structure on temporal interpretation. These authors have mainly focused on discourse sequences without explicit temporal adverbials, showing that, in the absence of such expressions, we assign a correct temporal interpretation to discourse. Alves (2003); Alves & Txurruka (1999, 2001); Bras et al. (2001a,b) concentrated on the effects produced on discourse structure by the presence of an explicit temporal adverbial. In this paper, however, I will concentrate on the constraints imposed by discourse structure and by temporal relations between eventualities on the interpretation of ATLs.

Consider the following examples:

(14) [A Maria chegou a casa]$_i$ [cerca da meia-noite]$_i$. O João chegou [depois disso]$_i$.
[Mary arrived home]$_i$ [around midnight]$_i$. John arrived [after that]$_i$.

(15) [O João visitou Paris]$_i$ em [1980]$_i$. A Maria visitou [então]$_i$ Londres.
[John visited Paris]$_i$ in [1980]$_i$. Mary visited London [then]$_i$.

(16) [O João deixou Lisboa]$_i$ [no dia 12 de Maio]$_i$. Chegou a Paris [dois dias depois]$_i$.
[John left Lisbon]$_i$ on [May 12th]$_i$. He arrived in Paris [two days later]$_i$.

These examples are ambiguous in what regards the anaphoric antecedent of the temporal locators. In (14), after that might refer back to the discourse referent introduced by *cerca da meia-noite* 'around midnight' or to the discourse referent supplied (via function **loc**) by the eventuality of Mary's arriving home. Similarly, in (15) *então* 'then' might refer back to the discourse referent introduced by *1980* or to the discourse referent representing the running time of the eventuality described in the first sentence. In other words, what (15) communicates is that Mary visited London while John visited Paris or else that Mary visited London in the same year that John visited Paris. As for (16), *dois dias depois* 'two days later' might relate to John's departure or to May 12th. For the sake of illustration, see below the DRSs corresponding to the two possible interpretations of (15), where the conditions regarding the anaphor and the anaphoric antecedent are underlined:

DRS's of (15)

a.

$n\ x\ y\ t_c\ t\ e\ t'\ w\ z\ t^a\ {t_c}^a\ e_1$
John(x)
Paris(y)
$\underline{1980(t_c)}$
$t = t_c$
$e \subseteq t$
$e < n$
e : $\boxed{x \text{ visit } y}$
$\mathbf{loc}(e) = t'$
Mary(w)
London(z)
$t^a = {t_c}^a$
$e_1 \subseteq t^a$
$e_1 < n$
e_1 : $\boxed{w \text{ visit } z}$
$\underline{{t_c}^a = t_c}$

b.

$n\ x\ y\ t_c\ t\ e\ t'\ w\ z\ t^a\ {t_c}^a\ e_1$
John(x)
Paris(y)
1980(t_c)
$t = t_c$
$e \subseteq t$
$e < n$
e : $\boxed{x \text{ visit } y}$
$\underline{\mathbf{loc}(e) = t'}$
Mary(w)
London(z)
$t^a = {t_c}^a$
$e_1 \subseteq t^a$
$e_1 < n$
e_1 : $\boxed{w \text{ visit } z}$
$\underline{{t_c}^a = t'}$

Even though some locators without predicative content might pick up different types of antecedents, in most cases ambiguity does not arise. Consider the following examples, involving the discourse relations (henceforth, DRs) of Elaboration and Background (cf. Lascarides & Asher 1993 and Asher & Lascarides 2003 for a definition of these DRs):

(17) [O João visitou Paris]$_i$ em 1980. Viu [então]$_i$ a Mona Lisa.
[John visited Paris]$_i$ in 1980. He saw the Mona Lisa [then]$_i$.

(18) [O João visitou Paris]$_i$ em 1980. Tinha vinte anos [na altura]$_i$.
[John visited Paris]$_i$ in 1980. He was 20 years old [at the time]$_i$.

In these sequences, the anaphoric locators — *então* 'then' and *na altura* 'at the time' — refer back to the time interval corresponding to the running time of the eventuality described in the first sentence of each sequence. The other readings — according to which they would refer back to the time interval denoted by 1980 — are not available because they are incompatible with the discourse relations that hold between the two segments in each sequence — Elaboration in (17), Background in (18). These discourse relations have impact on the temporal relations holding between the two relevant eventualities: in the first case, the second eventuality is temporally included in the first; in the second case, the second eventuality includes the first. Lascarides and Asher formulate the temporal axioms associated with these DRs as follows:

Temporal axiom: $\Box(\text{Background}(\alpha, \beta) \rightarrow \text{overlap}(\text{me}(\alpha), \text{me}(\beta)))$

Temporal axiom: $\Box(\text{Elaboration}(\alpha, \beta) \rightarrow \neg[\text{me}(\alpha) < \text{me}(\beta)])$

Accordingly, — that is my claim — it is the inference of the above-mentioned DRs and of the associated temporal information that constrains anaphoric locators to be interpreted as relating to the running time of the eventualities and not to *1980*. For the sake of the illustration, see the representations of (17) and (18):

DRS's of (17) and (18)

17:

$n\ x\ y\ t_c\ t\ e\ t'\ w\ z\ t^a\ {t_c}^a\ e_1$
John(x)
Paris(y)
1980(t_c)
$t = t_c$
$e \subseteq t$
$e < n$
e : $\boxed{x \text{ visit } y}$
$\mathbf{loc}(e) = t'$
$w = x$
Mona Lisa(z)
$t^a = {t_c}^a$
$e_1 \subseteq t^a$
$e_1 < n$
e_1 : $\boxed{w \text{ see } z}$
$\underline{{t_c}^a = t'}$

18:

$n\ x\ y\ t_c\ t\ s\ t'\ w\ t^a\ {t_c}^a\ e_1$
John(x)
Paris(y)
1980(t_c)
$t = t_c$
$e \subseteq t$
$e < n$
e : $\boxed{x \text{ visit } y}$
$\mathbf{loc}(e) = t'$
$w = x$
$t^a = {t_c}^a$
$s \circ t^a$
$s < n$
s : $\boxed{w \text{ be 20 years old}}$
$\underline{{t_c}^a = t'}$

Let us consider now two sequences involving the DR of Result (cf. Lascarides & Asher 1993 and Asher & Lascarides 2003), which according to Lascarides & Asher (1993) has the following temporal axiom:

Temporal axiom: $\Box(\text{Result}(\alpha, \beta) \rightarrow \text{me}(\alpha) < \text{me}(\beta))$.

(19) [A Ana teve um acidente de automóvel]$_i$ [em 1980]$_i$. Deixou de guiar [depois disso]$_i$.
[Ana had a car accident]$_i$ in [1980]$_i$. She quit driving [after that]$_i$.

(20) [O João assaltou um banco]$_i$ em [1980]$_i$. Foi preso [depois disso]$_i$.
[John robbed a bank]$_i$ in [1980]$_i$. He was arrested [after that]$_i$.

These two sequences can be interpreted in two different ways. Either as conveying that the second eventuality is a result of the first (which corresponds to the DR of Result), or as conveying that the second situation occurred after the first but has no other relation with it (Continuation). In both sequences, in the Result interpretations, *depois disso* 'after that' represents a time interval whose left boundary is defined by the eventuality described in the first clause (and not by *1980*) and whose right boundary is given by the $TPpt$ (here the speech time).

Consider next an example involving Narration (cf. (21)), and a case that I will dub a narrative flashback (cf. (22)):

(21) [A Ana foi ao banco]$_i$ [ontem de manhã]$_i$. Foi ao supermercado [depois]$_i$.
[Ana went to the bank]$_i$ [yesterday morning]$_i$. She went to the supermarket [afterwards]$_i$.

(22) [A Ana foi para a cama]$_i$ [cerca das 11 horas]$_i$. Escovou o cabelo [antes (disso)]$_i$.
[Ana went to bed]$_i$ at [around 11pm]$_i$. She brushed her hair [beforehand]$_i$.

The constraints imposed on the ATL interpretation by the inference of Narration can be informally described as follows: if the two discourse segments in each sequence are

linked by Narration and Narrative Flashback, then *depois* 'afterwards' and *antes (disso)* 'beforehand' relates to the running time of the main eventuality in the first segment (and not to *ontem de manhã* 'yesterday morning' or to *cerca das 11 horas* 'around 11 o'clock'.

Let us consider now examples involving other types of discourse relations, namely Contrast (signalled here by 'but'), denial of expectation (marked here by 'but'), and Parallel (marked by 'also'). For a definition of Parallel and Contrast, see Asher (1993) and Asher & Lascarides (2003); for a distinction between Contrast and Denial of Expectation see, for instance, Blakemore (1989). See the following examples:

(23) [A Maria chegou a casa]*$_i$ [por volta da meia-noite]$_i$, mas o João chegou depois disso.
[Mary arrived home]*$_i$ [around midnight]$_i$, but John arrived after that.

(24) [O João visitou Paris]*$_i$ em [1980]$_i$, mas a Maria foi então a Londres.
[John visited Paris]*$_i$ in [1980]$_i$, but Mary visited London then.

Both sequences can be interpreted as cases of Contrast. In the first case, the speaker conveys a contrast between the time at which Mary arrived home and the time at which John arrived home. In the second case, the contrast holds between the capitals visited by John and Mary in 1980. In these cases, and in what regards the interpretation of *depois disso* 'after that' and *então* 'then', the only possible interpretations seem to be those where the anaphoric locators refer back to around midnight and 1980, respectively. It is the inference of Contrast that blocks the reading according to which the anaphors relate to the running times of the previously described eventualities.

Imagine now that we know that Mary always travels together with John, that they have always travelled together, and also that they always arrive home together. If this were the case, we would expect them to have travelled together to Paris and we would expect them to have arrived home at the same time. If we re-read the sequences above now, we have now problem in relating then to the running time of the previously described eventuality. In other words, both anaphoric links are possible, although world-knowledge might in some cases favour one of them and exclude the other. See, for instance, the following examples, where the only acceptable anaphoric antecedent is identified:

(25) [O João visitou Paris]$_i$ em 1980, mas não viu [então]$_i$ a Mona Lisa.
[John visited Paris]$_i$ in 1980, but he did not see the Mona Lisa [then]$_i$.

(26) [A Maria foi a Londres]$_i$ em 2000, mas o João não a acompanhou [então]$_i$.
[Mary went to London]$_i$ in 2000, but John did not accompany her [then]$_i$.

In the Parallel cases, the only available readings seem to be those in which the occurrences of then refer to 1980 and to 2000.

(27) O João visitou Paris em [1980]$_i$. A Maria também visitou Paris [então]$_i$.
John visited Paris in [1980]$_i$. Mary also visited Paris [then]$_i$.

(28) # A Maria visitou Londres em [2000]$_i$. Também visitou o British Museum [então]$_i$.
Mary visited London in [2000]$_i$. She also visited the British Museum [then]$_i$.

The sequence given in (28) sounds particularly odd. There seems to be a conflict between our world knowledge, which tells us that going to the British Museum is part of a typical visit to London, and the presence of *também* 'also', indicating that the second eventuality cannot be interpreted as being part of the first. The explicit marker *também* 'also' blocks the Elaboration reading and the resulting discourse is hard to interpret, unless we introduce new linguistic material in the context as in (29a–29b) below:

(29) a. Mary visited London in 1999.
b. She visited the British Museum.
c. She visited London (again) in 2000.
d. She also visited the British Museum.

However, here, what licenses 'also' is not sentence (29c). but sentence (29b). Regarding Parallel and Contrast, what seems to be the case is that these discourse relations appear to be incompatible with temporal inclusion of eventualities, this being the reason why one of the two available antecedents is excluded.

To illustrate the representation in SDRT of the sequences presented above, let us consider again the discourse sequence in (21). Let us consider that the representations of its two segments are, respectively, π_1 and π_2. In case we have Narration (π_1, π_2), the representation is as follows:

π_1

$n\ x\ y\ t_c\ t\ e\ t'$
Ana(x) the bank(y) yesterday morning(t_c) $t = t_c$ $e \subseteq t$ $e < n$ e : $\boxed{x \text{ go to } y}$ $\mathbf{loc}(e) = t'$

π_2

$n\ z\ w\ {t_1}^a\ {t_{1c}}^a\ {t_{cc}}^a\ e_1$
$z = x$ supermarket(w) ${t_1}^a = {t_{1c}}^a$ $e_1 \subseteq {t_1}^a$ $e_1 < n$ e_1 : $\boxed{z \text{ go to } w}$ ${t_{cc}}^a \supset\!\subset {t_{1c}}^a$ ${t_{cc}}^a = t'$

We may, now, conclude the following:

(i) Narration(π_1, π_2) (Maxim of Manner)

(ii) $e \supset\!\subset (\text{post}(e) \cap \text{pre}(e_1)) \supset\!\subset e_1$ ((i), Temporal axiom associated with Narration)

(iii) $e \subseteq t$ (cf. π_1)

(iv) $e_1 \subseteq {t_1}^a$ (cf. π_2)

(v) ${t_1}^a = {t_{1c}}^a$ (cf. π_2)

(vi) ${t_{cc}}^a \supset\!\subset {t_{1c}}^a$ (cf. π_2)

(vii) ${t_{cc}}^a = t'$ (cf. π_2)

3 Under-specified ATLs and cases of non-ambiguity

The ATLs presented in the examples given before contrast with ATLs occurring in the examples given before. In spite of not having predicative content either, they do not give rise to ambiguity cases. That is the case of the Portuguese adverbials *a seguir* 'next', *entretanto* 'in the meantime' and *enquanto isso* 'meanwhile'.

(30) A Ana foi ao banco ontem de manhã. Foi ao supermercado a seguir.
Ana went to the bank yesterday morning. Next she went to the supermarket.

(31) A Ana foi ao cinema ontem à noite. Entretanto o João acabou o artigo.
Ana went to the cinema last evening. In the meantime John finished his paper.

(32) A Ana deixou Paris em Maio e regressou em Julho. Entretanto roubaram-lhe o carro.
Ana left Paris in May and returned in June. In the meantime, her car was robbed.

In (30) and in (31) the linguistic context provides with more than one possible antecedent: on the one hand, the temporal referents introduced by the explicit adverbials *ontem de manhã* 'yesterday morning' and *ontem à noite* 'yesterday evening'. On the other hand, the temporal referents inferred from the eventuality descriptions *a Ana foi ao banco* 'Ana went to the bank' and *a Ana foi ao cinema* 'Ana went to the cinema'. But here the ATLs *a seguir* 'next' and *entretanto* 'in the meantime' can only be linked to the eventuality description previously described. The example in (32) is different from those presented before. Here the anaphor refers back to a time interval whose boundaries are provided by the linguistic context: the initial boundary is inferred from the first eventuality description (and not by 'May') and the final boundary is inferred from the second eventuality description (and not by 'July'). What seems to be the case with these locators is that they have a specific discourse function, which can be described as signalling a temporal parallel.

4 Conclusions

As was shown above, some anaphoric temporal locators might relate to more than one antecedent, giving rise to ambiguity cases. Discourse structure helps to disambiguate those cases. The choice of an antecedent is related to the discourse relation that holds between the discourse segment where the anaphor occurs and the segment providing possible antecedents. This is true not only about discourse relations that have been described in the literature as having temporal impact (Background, Elaboration, and Result), but also about others as Parallel and Contrast. To account for such locators and for the anaphoric relation they express, a framework involving the computation of discourse structure, as for instance SDRT, is therefore needed.

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Exhaustivity operator(s) and Hungarian focus structure

Kata Balogh
Universiteit van Amsterdam

In current syntactic, semantic and pragmatic literature *focus*, *'only'* and *exhaustivity* form a major subject of study. There are several proposals for the semantics and pragmatics of focus and the focus sensitive particle 'only'.[1] The most famous analysis of the exhaustive interpretation of answers is by Groenendijk and Stokhof (1984; 1991 – G&S henceforth), which is widely studied and used in recent work.[2] For many languages — e.g., Basque, Catalan, Greek, Finnish, Hungarian!— focus is a significant syntactic matter as well. The most prominent theories for Hungarian focus structure are in É. Kiss (1998), Horváth (2000) on syntax, Szabolcsi (1981) on the syntax-semantics interface and Szendrői (2001) on the syntax-phonology interface. The issues of focus, 'only' and exhaustivity are often claimed to be interrelated, and from a linguistic perspective the study of Hungarian is a particularly interesting case. Hungarian has a special pre-verbal position for focused constituents, which is assigned a pitch accent and which gets an exhaustive interpretation.

The main aim of the paper is to investigate the semantics of 'only' and identificational focus in Hungarian. The paper is devoted to give an analysis in the Partition Semantics framework (G&S) with distinct **exh** and **only** operators. In this way we intend to give an explanation of (i) the difference between sentences with bare focus and sentences with 'only' and (ii) the two different readings of multiple focus constructions with 'only'.

1 Focus in Hungarian

In Hungarian, as a discourse-configurational language (É. Kiss 1995), certain discourse-semantic information is mapped into the syntactic structure of the sentences as well. Hungarian has special structural positions for *topics*, *quantifiers* and *focus*. The special position for the focused element(s) is the immediate pre-verbal position. In 'neutral sentences' like (1), the immediate pre-verbal position is occupied by the verbal modifier (VM), whereas in focused sentences like (2), this position is occupied by the focused element, and the verbal modifier is behind the finite verb. The constituent in the focus-position is assigned a pitch accent,[3] and receives an *exhaustive* interpretation.

(1) Anna felhívta Emilt.
Anna VM-called Emil.ACC
'Anna called Emil.'

(2) Anna EMILT hívta fel.
Anna Emil.ACC called VM
'It is Emil whom Anna called.'

In her 1998 paper, É. Kiss distinguishes two types of focus: *identificational focus* and *information focus*. Her main claims are that these two types are different both in syntax

[1] See for example: von Stechow (1991) Krifka (1991), Rooth (1985).

[2] For example, by van Rooij and Schulz (to appear) on exhaustivity or Kratzer (2005) on questions.

[3] Here and further on small capitals indicate pitch accent.

and semantics. The main differences between the two types of focus in Hungarian are the following:

(a) *identificational focus:* expresses exhaustive identification, certain constituents are out, it takes scope, involves movement and can be iterated;

(b) *information focus:* merely marks the unpresupposed nature, is nonrestricted, does not take scope, does not involve movement and can project.

The pre-verbal focus in Hungarian falls under the category of identificational focus. In the following we will concentrate on the pre-verbal (identificational) focus to point out several problems with its exhaustive interpretation and 'only'. In Hungarian 'only' is always associated with identificational focus, it cannot go together with the *information focus*. Since in Hungarian both 'only' and identificational focus indicate exhaustivity, the question arises whether sentences with bare (identificational) focus (3) and sentences with 'only' (4) get the same interpretation or not, and if they are not the same, what the difference is.

(3) ANNA hívta fel Emilt.
Anna called VM Emil.ACC
'It is Anna who called Emil.'

(4) Csak ANNA hívta fel Emilt.
only Anna called VM Emil.ACC
'Only Anna called Emil.'

In classical semantic analyses 'only' is identified with an exhaustivity operator, which suggests that identificational focus and 'only' get the same semantic interpretation with one *exh/only* operator. Later on we will see that this view cannot be applied to some focus constructions in Hungarian.

An important question here is if 'only' in Hungarian has an exhaustive semantic content or not. If we suppose that identificational focus involves an exhaustivity operator and 'only' gets exhaustive semantics, too, then examples like (4) involve two exhaustivity operators. We will see in section 2 that this solution is not a problem for the semantics, since exhaustification of an exhaustified term does not have a semantic effect. I will propose an analysis for Hungarian identificational focus and 'only' with two distinct operators, **exh** and **only**. The two operators both get exhaustive semantic content, but **only** has a pragmatic effect on top of it. We will see later that for some multiple focus constructions this distinction is crucial to get the intended interpretation.

2 Exhaustivity in Hungarian

The constituents in the pre-verbal focus position are interpreted as exhaustive identification (É. Kiss 1998; Horváth to appear). Accordingly, the semantic interpretation of identificational focus involves an exhaustivity operator.

In their dissertation from 1984, Groenendijk and Stokhof give an elegant analysis of the exhaustification of answers. I would like to extend their analysis to apply it to focus,

especially to Hungarian identificational focus.[4] For the semantics of linguistic answers they define an answer formation rule introducing an exhaustivity operator, which gives the minimal elements of a set of sets.

(5) **The rule of answer formation**
if α' is the interpretation of an n-place term, and β' is the relational interpretation of an n-constituent interrogative, the interpretation of the linguistic answer based on α in the context of the interrogative β is $(EXH(\alpha'))(\beta')$, where EXH is defined as follows:

$$EXH = \lambda\mathbb{P}\lambda P[\mathbb{P}(P) \wedge \neg\exists P'[\mathbb{P}(P') \wedge P \neq P' \wedge \forall x[P'(x) \rightarrow P(x)]]]$$

EXHapplies to a term T (a set of sets of individuals), and returns another (unique) term T' for which the following holds:

(i) T' is a subset of T, which is to say that every set of individuals in T' is also a set in T, and

(ii) they are minimal sets in T, which means that for no set in T' there is a smaller set in T.

In this model, EXH equals the interpretation of 'only': '*[...] the semantic content of EXH can be verbalized as the term modifier 'only' [...]*' (Groenendijk & Stokhof 1984: 295). If we give the answer *Anna$_F$ called Emil* to the question *Who called Emil?,* then it is interpreted as *Only Anna called Emil:*

(6) $(EXH(\lambda P.P(\text{Anna})))(\lambda x.called(x, \text{Emil})) =$
$\lambda P\forall x[P(x) \leftrightarrow [x = \text{Anna}]](\lambda x.called(x, \text{Emil})) =$
$\forall x[called(x, \text{Emil}) \leftrightarrow [x = \text{Anna}]]$

Along G&S both the interpretation of (3) and (4)[5] involves one EXH operator (7):

(7) $(EXH(\text{Anna}))(\text{called-Emil})$

3 Focus and 'only' in Hungarian

In this section, I will propose an analysis for Hungarian where the two operators are distinct. In this way we can explain certain differences in answers with identificational focus versus 'only' (section 3.1) and we can interpret multiple focus constructions where the two focused constituents go together with two 'only's (section 3.2). My proposal is to assume two distinct operators: **exh** and **only**. The two operators get the same exhaustive semantic content defined by G&S. In case that the two operators modify the same term, 'only' has no semantic but a pragmatic effect on the previous expectations.

[4] Since my aim in this paper is not the comparison of several focus/exhaustivity theories, I will not discuss here the Alternative Semantics (Rooth 1985) or the Structured Meaning Account (Krifka 1991). For the particular interest of this paper they face similar problems as the Partition Theory.

[5] With the underlying question 'Who called Emil?'.

3.1 Question–answer pairs

The first example where we have to distinguish between bare (identificational) focus and 'only'-sentences comes from question-answer pairs. As we saw in the previous section, on the classical analyses (8a) and (8b) get the same interpretation involving one exhaustivity operator. For the question in (8) the answers with or without 'only' are semantically equivalent, saying that Anna and nobody else called Emil. The focus in (8a) expresses exhaustive identification, thus the interpretation is $\forall x[\text{called}(x, e) \leftrightarrow x = a]$. In example (8) this seems to be unproblematic, since both sentences are equally felicitous answers. This suggests that a sentence with bare (identificational) focus and an 'only'-sentence are the same, so the appearance of 'only' in (8b) does not make any difference.

(8) Ki hívta fel Emilt?
who called VM Emil.ACC
'Who called Emil?'

a. ANNA hívta fel Emilt.
Anna called VM Emil.ACC
'It is Anna who called Emil.'

b. Csak ANNA hívta fel Emilt.
only Anna called VM Emil.ACC
'Only Anna called Emil.'

Consider, however, example (9), where the same question is posed in plural, so we have an explicit expectation that more persons called Emil.

(9) Kik hívták fel Emilt?
who.PL called.PL VM Emil.ACC
'Who called Emil?'

a. # ANNA hívta fel Emilt.

b. Csak ANNA hívta fel Emilt.

Question (9) cannot be answered with a simple identificational focus, but (9b) — with 'only' — is felicitous. Considering the above example I propose that it is not the 'only' that is responsible for the exhaustive meaning. The function of 'only' here is cancelling the expectation of plurality. Semantically we have two operators — **exh** and **only** — that have the same exhaustive semantic content as defined by G&S. Thus, semantically both sentences get the interpretation that nobody else but Anna called Emil, but the 'only' in (9) has a pragmatic effect on top of it, saying that it is against the expectations. According to this proposal in these cases it is not the focus particle 'only' that is the main responsible for the exhaustive meaning, exhaustivity comes from the semantics of the identificational focus. The exhaustivity operator defined by G&S filters the minimal elements of a set of sets. Accordingly, if we apply it twice on the same term we get the same semantic interpretation: $\mathbf{exh}(\mathbf{exh}(\alpha)) = \mathbf{exh}(\alpha)$.[6] In this way (9a) and (9b) get the same semantic interpretation: $\forall x.\text{called}(x, e) \leftrightarrow x = a$. The difference between the two sentences is of a pragmatic nature, which is a consequence of the appearance of 'only'.

[6] The proof is rather straightforward:

1. $\forall P(\mathbf{exh}(U)(P) \rightarrow U(P))$. By definition of **exh**, U instantiates $\mathbb{P}$;
2. $\forall P(\mathbf{exh}(\mathbf{exh}(T))(P) \rightarrow \mathbf{exh}(T)(P))$. Directly from 1., $\mathbf{exh}(T)$ instantiates U;

In the partition semantics of G&S, the meaning of an interrogative determines what its possible complete semantic answers are. The semantic interpretation of an interrogative is an equivalence relation over the set of possible worlds, thus an interrogative sentence denotes a partition of logical space. Every block of the partition induced by $?\varphi$ contains the possible worlds where the extension of φ is the same, thus the meaning of a question is a set of propositions, the set of complete semantic answers to the question:

$$[\![?\vec{x}\varphi]\!] = \{(w, v) \in W^2 \mid [\![\lambda\vec{x}\varphi]\!]^w = [\![\lambda\vec{x}\varphi]\!]^v\}.$$

In case of a relevant set of three persons {Anna, Rena, Tomi}, the meaning of question (8) is an eight-block partition (A). Question (9) is posed in plural, so it has an explicit expectation from the questioner's side: (s)he thinks that there was more than one person who called Emil. This expectation should be interpreted as a *restriction* on the partition (B).

A

nobody	*anna* and *rena*
anna	*anna* and *tomi*
rena	*rena* and *tomi*
tomi	*everybody*

B

nobody	*anna* and *rena*
anna	*anna* and *tomi*
rena	*rena* and *tomi*
tomi	*everybody*

The question in example (8) is equated with the partition A. The answer with focus expresses exhaustive identification, thus it contains an exhaustivity operator. Consequently, the proposition that a sentence with identificational focus denotes is one of the propositions in the partition induced by the underlying question. Thus identificational focus selects one block from the partition, or equivalently, it eliminates all blocks but one from the partition. In case of (8) the focus selects the block containing the proposition 'only Anna called Emil'. In example (9), for the identificational focus in the answer only the restricted area (dashed lines) is accessible to select a block from. Therefore we cannot reply (9a) to (9), because the block where the proposition is 'only Anna called Emil' is not among the available ones. In fact, it is not excluded to give an answer to the question (9) expressing that Anna and nobody else called Emil, but then we need 'only' to go explicitly against the expectation of the questioner. Thus 'only' cancels the restriction, whereby the blocks which were excluded before can 'pop up' again, so they become accessible for the identificational focus to select one of them. It follows that the exhaustive identification is

3. $\forall P(\mathbf{exh}(T)(P) \rightarrow \mathbf{exh}(\mathbf{exh}(T))(P))$. Proof by contradiction: suppose this is not the case; then $\exists P.\mathbf{exh}(T)(P) \wedge \neg\mathbf{exh}(\mathbf{exh}(T))(P)$; then (by definition of **exh**)

$$\exists P'((P' \neq P \wedge \forall x(P'(x) \rightarrow P(x))) \wedge \mathbf{exh}(T)(P));$$

but then $\neg\mathbf{exh}(T)(P)$;

4. $\mathbf{exh}(\mathbf{exh}(T)) = \mathbf{exh}(T)$ [from 2. and 3.].

the function of the (identificational) focus, and 'only' has an additional pragmatic effect on the domain restriction.

Given these observations, we may wonder 'What is happening in (8)?' In question (8), the questioner has no expectation about how many people came, but we can answer with an 'only'-sentence. I claim that, in this case, the use of 'only' in the answer gives information about the answerer's previous expectations, namely the answerer expected more people to come. But according to the questioner's information state this additional information is irrelevant. Nevertheless, it shows, too, that (8a) and (8b) are slightly different, and the use of 'only' in (8b) is not redundant.

3.2 Multiple foci

Another example from Hungarian in favour of a distinction of **exh** and **only** can be found in multiple focus constructions. In case of sentences containing two (or more) prosodic foci, there are two possible interpretations: the two foci can form a complex focus, where semantically a pair of constituents is in focus (10), or the first focus-phrase takes scope over the second one (11).

(10) **Pair-reading (complex focus)**

a. John only introduced BILL to SUE. (from Krifka 1991)

b. ANNA hívta fel EMILT.
Anna called VM Emil.ACC
'It is the Anna, Emil pair of whom the first called the second.'

(11) **Scope-reading (double focus)**

a. Even$_1$ JOHN$_1$ drank only$_2$ WATER$_2$. (from Krifka 1991)

b. Csak ANNA hívta fel csak EMILT.
only Anna called VM only Emil.ACC
'Only Anna called only Emil. [the others nobody or more persons]'

The above examples show that the two different readings are present in Hungarian, too. However, interestingly, example (11b) can have both readings: the scope-reading (12a) and the pair-reading (12b):

(12) a. 'Only Anna called only Emil.' [the others nobody or more persons]

b. 'It is the Anna, Emil pair of whom the first called the second.'

For multiple terms, G&S gives the generalized definition of exhaustivity (EXH^n). This operator gives the right result for examples where exhaustivity applies to sets of relations. For example, for (10b):

(13) $(EXH^2(\lambda R[R(a,e)]))(\lambda x \lambda y.\text{called}(x,y)) =$
$\lambda R \forall x \forall y[R(x,y) \leftrightarrow [x = a \wedge y = e]](\lambda x \lambda y.\text{called}(x,y)) =$
$\forall x \forall y[\text{called}(x,y) \leftrightarrow [x = a \wedge y = e]]$

This is the intended interpretation saying that the only pair of persons of whom the 'call' relation holds is: Anna and Emil. The problem arises if we try to get the pair-reading of (11b), because in G&S 'only' and the exhaustivity operator are not distinct, the two 'only's are the operators that exhaustify the phrases respectively: $EXH(a)$ called $EXH(e)$. Following this, the interpretation of (11b) according to G&S goes as follows:

(14) $(EXH(\lambda P.P(a)))((EXH\lambda P.P(e))(\lambda x\lambda y.\text{called}(x,y))) =$
$(\lambda P\forall y[P(y) \leftrightarrow y = a])((\lambda P\forall x[P(x) \leftrightarrow x = e])(\lambda x\lambda y.\text{called}(x,y))) =$
$\forall y[\forall x[\lambda y.\text{called}(x,y) \leftrightarrow x = a] \leftrightarrow y = e]$

It says that only Anna is such that she called only Emil, so we get the 'scope-reading' (12a). Exhaustifying the terms separately we cannot get the complex focus interpretation (12b). As a solution, we can suppose that there is an exhaustivity operator that takes a pair of constituents, and there are two 'only's modifying the two terms as above. Like singular terms, multiple terms as well may need not only exhaustification of the **only** operators, but also exhaustification of the identificational focus (**exh**) on top of it. The exhaustification of the pair of exhaustified terms does not lead to scopal meaning, but gives the pair-reading:

(15) $\mathbf{exh}\langle\mathbf{only}(\alpha),\mathbf{only}(\beta)\rangle = \mathbf{exh}\langle\alpha,\beta\rangle$

With distinct **exh** and **only** operators, we can account for both readings of (11b), but we have to take into consideration the discourse structure as well. An important fact is that in the case of a scope-reading, the second focus is always second occurence, and the new information goes to the focus position which is associated with an **exh** operator. Following this proposal, the interpretation goes as follows. For the pair-reading (12b), both *Anna* and *Emil* are new information, so a pair of constituents, $\langle\text{Anna},\text{Emil}\rangle$ is in focus and associated with an **exh** operator, while both constituents are modified by 'only'. This gives us the pair-reading semantically:

(16) $\mathbf{exh}\langle\mathbf{only}(\text{anna}),\mathbf{only}(\text{emil})\rangle(\lambda x\lambda y.\text{called}(x,y)) =$
$\forall x,y[\text{called}(x,y) \leftrightarrow [x = \text{anna} \wedge y = \text{emil}]]$

In the case of the scope-reading (12a), only *Anna* is new information, so it will serve as (identificational) focus associated with **exh**:

(17) $(\mathbf{exh}(\mathbf{only}(\text{anna})))((\mathbf{only}(\text{emil}))(\lambda x\lambda y.\text{called}(x,y))) =$
$(\mathbf{exh}(\text{anna}))((\mathbf{exh}(\text{emil}))(\lambda x\lambda y.\text{called}(x,y))) =$
$\forall y[\forall x[\lambda y.\text{called}(x,y) \leftrightarrow x = a] \leftrightarrow y = e]$

Thus, information structure as well plays a crucial role for the disambiguation between the pair-reading and the scope-reading.

3.3 Further issues

Next to the distinguished **exh** and **only** operators, there are important linguistic factors which determine the two different multiple focus readings. In order to interpret multiple foci, we have to take into consideration (at least) three factors: intonation, syntactic structure and the appearance of 'only'. In the first place, intonation seems to have a very

important role here, since there are two different intonation patterns that lead to two different meanings. If both focussed constituents get pitch accent, there is a little stop (end of an intonation phrase) before the second focused element, and just before this break there is a rising intonation, we get the complex focus (pair) reading (18); and if all words between the focussed constituents are deaccented and there is no break, we get the double focus (scope) reading (19):

(18) Csak Anna hívta fel Emilt.
H*-L L L-H% H*-L

(19) Csak Anna hívta fel Emilt.
H*-L L L H*-L

Consequently, intonation indicates the information structure, i.e., if both focused constituents are new information or only the first focus. Intonation has the role to yield the intended meaning, however, there is no one-to-one correspondence between intonation patterns and meanings. The pattern in (18) is strong, it always gives the pair-reading, but the intonation pattern (19) is weak, the syntactic structure and the appearance of 'only' has a strong effect on it. These three linguistic factors play a role *together* in the interpretation of multiple focus constructions. For a more extended discussion on this topic see Balogh (2006).

4 Conclusion

In this paper I investigated the semantics and pragmatics of 'only' and identificational focus in Hungarian. I proposed an analysis in the Partition Semantics framework of Groenendijk & Stokhof (1984) with distinct **exh** and **only** operators. In this way we can account for the difference between sentences with bare identificational focus and sentences with 'only', and we can also get the two different readings of multiple focus constructions with 'only'.

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Links, tails and monotonicity

Stefan Bott
Universitat Pompeu Fabra, Barcelona

1 Introduction: Links, locus of update and non-monotonicity

Vallduví (1992, Vallduví & Engdahl 1996) proposes a threefold partition of information structure on the sentence level: Links, Tails and Foci, where Links and Tails correspond to the notion of background (Jackendoff 1990), while Foci and Tails correspond to what has been called the comment in topic-comment structures (e.g., Reinhart 1995).[1]

Vallduví's account is implemented in file change semantics (FCS, Heim 1982). While the notion of file is called a 'metaphor' in Heim's original approach, Vallduví makes the structure of the filing cabinet a crucial element in his account. Different configurations of Links, Tails and Foci translate to different update instructions which operate on the filing cabinet. Links trigger a GOTO-instruction which locates a file card, activates it and prepares it for an update. The content of the update is transmitted by the focus of the sentence.

An important feature of Vallduví's theory is that his update instructions crucially depend on the existence of file cards as a unit which can be located and manipulated. File cards are, however, a concept which is highly dependent on FCS as a framework and they have no correspondence in Discourse Representation Theory (DRT, Kamp & Reyle 1993), its most important alternative framework. In this paper I want to explore the possibility of reinterpreting the function of Links without having to assume the existence of file cards. I will interpret them as anaphora, following Hendriks & Dekker (1996), who claim that Links are non-monotone anaphora. I will revise the non-monotonicity condition and show that this condition is not a necessary one for Links. Instead, I will suggest that Links signal a change of discourse topic and the monotonicity condition follows from that. I will also discuss whether the locus-of-update analysis of Vallduví's original proposal can be maintained in another form, considering that the locus of update is a discourse topic instead of a file card. Under such a reinterpretation the account would prove be transportable from FCS to DRT. I will also show that this account of backgrounds can be extended to an analysis of Tails.

FCS has been said to be essentially equivalent to DRT, since the two approaches capture the same insights and feature similar devices to explain existential closure on the level of texts. There are, however, some differences between the two models, especially concerning the dimension of representation. FCS offers a simple database structure, which represents the knowledge transmitted during a discourse, while the structure of the discourse itself is lost once the information has been annotated on the corresponding file card. This has been shown to allow a cognitive modelling of the knowledge store (Zuo & Zuo 2001), although the file card as a *linguistic* unit does not seem to have a purely linguistic motivation. In fact, Heim referred to the file merely as a *metaphor*.

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DRT, on the other hand, concentrates on the representation of the discourse and does not intend to directly model the knowledge state of the discourse participants. In DRT the discourse referents in the universe of a DRS are simple namespaces which are there to properly bind the free occurrences of variables in the DRS condition set and, thus, guarantee existential closure on the text level. On the other hand, the information on individual discourse referents is scattered all over the DRS. The information concerning referents is recoverable, but not directly accessible as in FCS. In practice and despite the apparent differences, most authors working in DRT have assumed that the insights of FCS can be modeled in DRT, a claim which is true for most of the data which was taken as evidence for the two theories, especially the resolution of anaphora and the definition of their accessibility conditions (cf., e.g., Kadmon 2001).

Returning now to Vallduví's treatment of information packaging, it is not directly clear how his proposal can be transported from FCS to DRT because of the fact that it uses direct operations on file cards (which have no equivalent in DRT). A move from FCS to DRT would be desirable for practical and theoretical reasons. DRT has been an extremely fruitful area of research over the last decade and it has proven to be an adequate framework to model a wide range of discourse phenomena. From a theoretical point of view, it is doubtful if a data structure like file cards should be present in a linguistic representation if they are not needed for the explanation of genuinely linguistic facts. It is nevertheless also important to stress that eliminating file cards from linguistic representations does not necessarily entail abandoning a locus-of-update interpretation for Links. The only necessary consequence of abandoning file cards is that file cards cannot be the locus of update.

Hendriks & Dekker (1996) present an alternative treatment of Links within DRT and argue against Vallduví's located version of Links on the basis of three arguments. First they argue that DRT is a model which presupposes less cognitive effort for the maintenance of the discourse model. Second, they observe that there are sentences which do not allow for an appropriate location in the FCS file, e.g., weather sentences like *It's raining,* which lack nominal referents to which the information content of the sentence can be attributed via an GOTO-UPDATE-instruction (since there is no location/file card to go to in DRT). In this case there is no nominal referent associated to a file card onto which the information 'rain' will be annotated. A third and related argument is the difficulty to represent negated, quantified and disjuctive information.

Their argumentation goes against file cards as a linguistic unit as well as against a located interpretation of Links in general. I will follow them in assuming that file cards do not have a higher linguistic status than the one of a metaphor, but I would like to question the claim that Links do not signal a location. Their criticism is mainly based on the problems that arise if only nominal referents can serve as a location for Links. If a wider range of discourse referents is assumed, including events, spatiotemporal anchors and other abstract objects, their arguments are considerably weakened.

Although Dekker and Hendrik's arguments against a locus-of-update analysis can be questioned, the problem they signal with respect to file card representations is valid and their alternative proposal for the treatment of Links is attractive: They reinterpret Links as non-monotone anaphora, and as such they don't have the need to locate and activate a file card. I will follow them in assuming that Links are anaphora. On the other hand, I will survey various questions which their account leaves open:

1. If Links are anaphora, how can their antecedents be resolved and which factors constrain the anaphoric relationship?
2. If Links are anaphora, what are Tails? Most probably they should be treated as anaphora as well. Are they then monotone anaphora?
3. What does it mean for an anaphor to be monotone or non-monotone? How can the relation between background (Links and Tails) and antecedent be modelled?

I will not pursue a detailed integration of Information Structure in DRT here and will rather concentrate on an account which does not recur to file cards, the main reason why Vallduví's original account is not transportable to DRT. In the next section I will critically revise the non-monotonicity requirements on Links and give an alternative formulation which extend to Tails. In section 3 I will return to the locus-of-update problem. I will sketch a proposal which treats discourse (segment) topics as the locus-of-update update for Links.

2 Data and discussion: The non-monotonicity condition revisited

The examples of link-construction in the literature fall broadly into three categories. I use Catalan examples, since in Catalan, Links are usually preverbal and separated by an intonational pause; hence they are easily identifiable and can hardly be confused with other constructions:

1. Links overspecify (are more specific than) their antecedent (cf. (1), modelled on an example by van Deemter 1993)
2. Links are part of a plural individual antecedent (cf. (2))
3. Links pick up a discourse referent which is not as high in the accessibility ranking as a conflicting alternative antecedent (cf. (3))

(1) a. A Mozart, li agradaven els instruments de corda?
Did Mozart like string instruments?

b. $[\text{La viola}]_{\text{link}}$ segurament li agradava.
$[\text{The viola}]_{\text{link}}$ surely it-cl he-liked
The VIOLA, he surely liked.

(2) a. Què en saps, dels teus amics?
What do you know about your friends?

b. $[\text{La Maria}]_{\text{link}}$, la vaig veure fa poc.
$[\text{ART Maria}]_{\text{link}}$, her have-seen ago little.
Mary, I have seen recently.

(3) A: He vist que el president té una col·lecció de porcellana de Delft. He comprat una nova peça per a la col·lecció. Creus que ha estat bona idea?
I have seen that the president has a collection of Delft china. I bought a new piece for his collection. Do you thing this was a good idea?

B: No. $[\text{El president}]_{\text{link}}$ l'odia, $[\text{la porcellana de Delft}]_{\text{tail}}$.
No. $[\text{The president}]_{\text{link}}$ it-hates, $[\text{the china from Delft}]_{\text{tail}}$.
No. The president hates the Delf china set.

Let us now discuss the non-monotonicity condition. Hendriks and Dekker (H&D hereafter) offer the following hypothesis for Links as non-monotoe anaphora:

(4) NonMonotone Anaphora Hypothesis (NAH, Hendriks & Dekker 1996):
Linkhood (marked by L+H* accent in English) serves to signal nonmonotone anaphora. If an expression is a link, then its discourse referent Y is anaphoric to an antecedent discourse referent X such that X $\not\subseteq$ Y.

This hypothesis is expressed in terms of sets: The set corresponding to the antecedent is not a subset of the set corresponding to the Tail. This prediction is met in (2), since $\{Maria\} \subset \{x : friend(x)\}$ and the second is not a subset of the first. Also (1) might be explained by the NAH: both *string instruments* and *viola* are kind referring. If we assume that kind referents are organised in sets with subsets and supersets then the set of kinds $\{x : string\_instrument(x)\}$ is not a subset of $\{viola\}$.

The NAH also affects identity and it follows that X$\neq$Y, which seems to be empirically inadequate in the light of (3), because *president* is the antecedent for *president.* In contrast to (3), H&D discuss examples where a identity reading is blocked by virtue of an NP being phonologically marked as a Link (and L+H* accent, represented by bold face characters), as the one in (5). I assume that the difference between (3) and (5) has to do with condition 3 for Tails from above, the accessibility ranking of antecedents.

(5) Ten guys were playing basketball in the rain. $[\textbf{The fathers}]_{\text{link}}$ were having FUN.

Further on, there is one more complicating factor, mentioned by Hendriks and Dekker, but not discussed in detail there: the anaphoric link between an individual and the kind it is an instanciacion of (and vice versa). They shortly discuss the following example, under the name of **Kind Introduction:**

(6) a. Few men joined the party. They are very conservative.
b. Few men joined the party. $[\textbf{Men/Humans}]_{\text{link}}$ are very conservative.

The relevant reading of (6a) is the one in which *they* as well as the NP *men* in (6b) is referring to the kind *men*, meaning roughly that *men in general are conservative.* Even the super-kind *humans* is licensed as a Tail with the antecedent *men.* The problem which this example poses for the NAH is that kinds are not the same as the set of their extension (Carlson 1977). In a harmless sentence with a kind-denoting bare plural, such as *lions have manes*, a set-treatment of the NP *lions* will render the prediction that the sentence itself is false, since many members of the set (lionesses, the majority of *lions*) have no manes. This means that the NAH in its set-theoretic version does not predict the anaphoric link in the kind referring readings of (6) since the discourse referent for the kind *men* does not refer to a set.

In Bott (in preparation) I propose an integration of algebraic semantics into DRT. There monotonicity follows directly from the algebraic structure of semantic domains. For the time being we can define monotonic entailment in the following way, along the lines of ter Meulen (1995): 'If x realises (a kind) k and $k \leq k'$ then x realises k'.' '$\leq$' indicates a part-of relationship which holds for the description of kinds. For example *Spunky,* which realises the kind *dog* will also realise the kind *mammal.* The reverse ($\geq$) is not a monotonic inference anymore, since the kind *mammal* may be realized by the kind *dog* as well as by *cat*, among others. Nevertheless the relationship between k and k' is constrained in that one must be a subkind of the other. Note that the not-subset formulation of the NAH requires no other condition for a Link than not being a superset of the antecedent. Here we opt for a positive and more constrained requirement, which allows for identity between Link and its antecedent (probably the reason for H&D's negative condition) and leave

cases like (5) to be ruled out by an independent requirement, which implies accessibility ranking and/or discourse structure. We will return to this issue shortly. Now observe that the $\leq$-relation also holds between individuals (like *Ringo*) and plural individuals (like *the Beatles*) which include the former. Individual referents may form part of plural referents. Plural referents do not necessarily correspond to the set of its members, they can also be treated as an algebraic object. Such an object is a single entity, although it is the referent for a plural individual, such as *my neighbours*. A plural referent then connects to the individuals which are part of it (its 'members' in a set definition) by a $\leq$-relation. This results in a lattice structure, as proposed by Bach (1986) and Carlson (2001).

In addition to the fact that superkinds can be monotonically inferred from their subkinds, we need to say something about the relation that holds between a kind k and all the individuals that instantiate k. I assume that given an individual x, the existence of the corresponding kind k is a monotonic inference. This is also implicit in ter Meulen's definition above, since in order to know what a superkind of a given instance x is, we have to know to which kind k x belongs to. Note that the under this assumption neither of the Links in (6) is a non-monotone anaphor, a problem which mirrors the case of (3).

In the light of this (simplified) definition of monotonicity, we can now return to the examples above. If Links are non-monotonic a $\geq$-relationship must holds between the Link and its antecedent, and that is what we find: $[\![\text{string instruments}]\!] \geq [\![\text{viola}]\!]$ and $[\![\text{friends}]\!] \geq [\![\text{maria}]\!]$. If we hypothesize that Tails are monotone anaphora the difference between Links and Tails is that Tails must stand in a $\leq$-relation to their antecedents, the opposite of the $\geq$-relation which holds for Links. This would predict that the examples which involve a $>$-relation above are reversible. In fact, this is what we can observe in the case of (1) and (2):

(1′) Mozart wrote many pieces for the viola. He must have LOVED $[\text{string instruments}]_{\text{tail}}$.

(2′) A: What do you know about Mary? B: I haven't MET $[\text{friends}]_{\text{tail}}$ recently.

In other cases, however, this seems not to be enough, e.g., in (3). Here the criterion of choice between realisation as a Link or as a Tail seems to be the existence of a more accessible intervening and conflicting discourse referent, i.e., *nova peça*. The $\geq$-relation holds here, since $[\![\text{president}]\!] \geq [\![\text{president}]\!]$. But this relation alone cannot account for the status as a Link since the anaphoric relation is a monotonic one. What such cases seem to suggest is that we need, in addition, a definition of what it means for one discourse referent to be more accessible than another. In standard DRT, an accessibility-ranking does not follow directly, since accessibility is a purely structural relation which has no weights. Nevertheless, this is not a new problem. For example Blackburn and Bos (1999) integrate a centering algorithm in DRT in order to choose between conflicting antecedents in the case of plain pronouns. Most probably discourse segmentation and structuring plays an important role for accessibility conditions as is the case for the accessibility of plain pronouns (Grosz & Sidner (1986) and following work). For the time being I will assume a simplistic no-possible-higher-rated-conflicting-discourse-referent condition, but I assume that accessibility ranking is closely tied to discourse structuring.[2]

Resuming the discussion so far we arrive at the following anaphoricity condition for Links and Tail:

[2] I am thankful to an anonymous reviewer for pointing out that this perspective should be embedded in model of conversational interaction. I will suggest such an integration in section 3 but I will have to leave a more detailed explanation for future work.

(7) Anaphoricity conditions for Tails and Links:

a. If an expression Ξ is marked as a Link, its discourse referent X may be anaphoric to a discourse referent Y if $X \geq Y$.

b. If an expression Ξ is marked as a Tail, its discourse referent X may be anaphoric to a discourse referent Y if $X \leq Y$.

c. If an expression Ξ is marked as a Tail, its discourse referent X may be anaphoric to a discourse referent Y if there is no grammatically matching possible antecedent discourse referent Y' for X and Y' is more accessible for X than Y.

d. $\leq$ is a partial order relation.

e. X can be non-monotonically inferred from Y if $X > Y$.

f. X can be monotonically inferred from Y if $X \leq Y$.

3 Links, contrast and identity

In the last section I have argued that Links with non-identical antecedents are indeed non-monotone anaphora. But cases like (3B) are problematic where the Link *el president* is anaphoric to *el president* in (3A). The NAH would predict wrongly that both NPs have different referents, i.e., that we are talking about two different presidents. In turn, the anaphoricity conditions in (7) allow for a identity between Link and its antecedent and (7c) rules out a Tail realisation of *el president*'s discourse referent. What is unsatisfactory about (7) is that it predicts that a discourse referent may be both realised as a Link or a Tail if it is identical to its antecedent. And worse than being unsatisfactory, it renders the wrong prediction in the case of (5), where an identity reading is blocked by virtue of being a (L+H*-accented) Link and an identity reading of this example is only possible if the NP *the fathers* is realised as Tail and carries no accent.

Before we try to resolve this problem, note that (7) does not rule out that an identical referent may be either realised as a Link or a Tail. And in fact, we find cases like (8), where both a Link or a Tail realisation is possible (the English translations differ in placing a Link-associated accent on *Enric* or not in (8b) and (8b′), respectively)

(8) a. Saps alguna cosa de l'Enric?
Do you have any news about Enric?

b. [De l'Enric,]$_{\text{link}}$ no en sé res.
[About art-Enric]$_{\text{link}}$ not cl I-know nothing.
No, I don't know ANYTHING **about Enric**.

c. Però la seva germana sí que l'he vist
But art his sister yes that her-I-have seen
But I have SEEN **his sister** .

b′. No en sé res, [de l'Enric]$_{\text{tail}}$.
Not cl I-know nothing [About art-Enric]$_{\text{tail}}$.
No, I don't know ANYTHING about Enric.

Again the marking of *Enric* as a Link in (8b) does not signal non-identity with its antecedent. What it does mark is contrast (in the sense of Büring 1999). This makes (8c) a natural continuation. Actually such a continuation is somehow expected by the hearer after the (8b) has been uttered. Also (1), (2), (5) and (6) show this contrastivity effect.

We could now include some contrastivity condition to (7), but there is nothing in the formulation of (7) which makes this more than an ad-hoc solution. And on the contrary to (8b), example (3) does not seem to show such a contrastivity effect. So either not all Links are contrastive topics or contrastivity follows (only in some cases) from some other feature of Links. I will explore the second option and assume together with Brunetti (2006 and this volume) that Links are shifting topics: They (necessarily) signal a shift from one discourse topic (or discourse segment topic) to another (van Kuppevelt 1997) . In most of the cases we have seen, it is clear what such a shift means. In (1) the shift happens from the discourse referent of *instruments de corda* to the one of *viola*, in (2) the change is from *amics* to *la Maria* and in (3) there is a change from *col·lecció de porcellana de Delft* to *el president*. In the former two cases a contrast is evoked because the 'contrast set' is given by the context since the (discourse referent of the) Link forms part of the (discourse referent of) its antecedent. In (3) there is no context given contrastive set and, accordingly, we do not observe a contrastive effect.

Now, what about the shift of discourse topic (d-topic) in (8b)? It looks as if this example displays a null shift from the d-topic *Enric* to *Enric*. This would make us infer that *Enric* is not identical to *Enric*, which is half-true, since the first *Enric* is an individual and the second *Enric* is an individual which is part its contrastive set. Still, *Enric* is equal to *Enric*.

I would like to propose the following solution, following Brunetti's analysis: Let y be the discourse referent of *Enric*. The fact that both the d-topic of (8a) and the signalled d-topic of (8b) are the same (i.e., y) violates the shifting requirement for Links and triggers the creation of a further d-topic: the discourse referent x, such that $x \geq [\![\text{Enric}]\!]$. x is now temporalily the current d-topic and with that it is maximally accessible. The d-topic has now shifted from y to x, and since *Enric* is the Link of (8b), it must shift back to y, *Enric*'s referent. Note that x corresponds to the alternative set of *Enric*. Note further, that *his sister* in (8c) will also be anaphoric to x, since her referent will also be part of x and is in the contrastive set of y. If, in turn, *Enric* is realised as a Tail in (8b′) no d-topic x for the contrastive 'set' of *Enric* will not be created and (7c) will not be violated. No topic shifting occurs with Tails.

Now, what about (5)? Under the current proposal, the Linkhood of *the fathers* signals a shift of the d-topic. To avoid a null shift the referent of *fathers* will be interpreted as being non-identical to the referent of *ten guys* or else the Link would violate its shifting requirement. In this example no referent for the alternative set needs to be created, since *ten guys* already constitute an alternative set.

What advantages does an analysis present that claims a topic shift trigger of Links? First, the contrastive effect is explained since y is interpreted in contrast with it alternative set x. The contrastive effect follows from the fact that the d-topic shifts from x to y. So (8) can be now explained on a par with (3). The difference between (8) and (3) is that the (3) implies no double shift and no alternative set is created implicitly. Hence (3) shows no contrastivity effect. Also the non-identity reading of (5) can be explained because of the obligatory d-topic shift. Secondly, Links can be explained as shifting (or locus-of-update redefining) topics, which preserves the essence of Vallduví's original account of Links as triggering a GOTO instruction. In this account no file card will be located, but a d-topic. And finally, the difference to the Tail-construction (8b′) can be explained, since the presence of the discourse referent x, which becomes maximally accessible after it has been created with the status of a d-topic will block a Tail-realisation of y, by virtue of (7c), i.e., the contrastive set as a referent blocks the Tail-realisation. The Linkhood of

l'Enric does not signal non-identity with its antecedent, nor does it require a contrastive interpretation *per se*. Instead, the realisation of x as a Link signals a shift of the d-topic, which necessarily has to result in a double shift by virtue of the identity between the Link (referent) and its antecedent.

4 Conclusion and outlook

In this paper I have argued for an anaphoric treatment of Links and Tails. I have shown that the Links may be non-monotonic, but I have also shown that this is not a necessary condition, since some Links may be antecedent-identical. The discussion of referent-identical Links in section 3 is only roughly sketched, but the data strongly suggests that Links must be explained in terms of accessibility conditions and/or discourse segmentation. The explanation of Link referents as being part of their antecedent referents and contrastivity could both probably be the consequence of the structure of discourse.

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Structured discourse reference to propositions: Entailment particles and modal subordination in dynamic type logic

Adrian Brasoveanu
Rutgers University and University of Stuttgart

1 The phenomenon

The empirical goal of this paper[1] is to provide a representation for the discourse in (1) below that assigns it the intuitively correct truth-conditions and that explicitly captures the anaphoric connections established in it.

(1) a. [A] man cannot live without joy.
b. Therefore, when he is deprived of true spiritual joys, it is necessary that he become addicted to carnal pleasures.
(Thomas Aquinas[2])

We are interested in the following features of this discourse. First, we want to capture the meaning of the entailment particle *therefore,* which relates the *content* of the premise (1a) and the *content* of the conclusion (1b) and requires the latter to be *entailed* by the former. I take the content of a sentence to be *truth-conditional* in nature, i.e., to be the set of possible worlds in which the sentence is true, and entailment to be *content inclusion,* i.e., (1a) entails (1b) iff for any world w, if (1a) is true in w, so is (1b).[3]

Second, we are interested in the *meanings* of (1a) and (1b). I take meaning to be *context-change potential,* i.e., to encode both *content* (truth-conditions) and *anaphoric potential.* Thus, on the one hand, we are interested in the *contents* of (1a) and (1b). They are both modal quantifications: (1a) involves a circumstantial modal base (to use

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[2] Attributed to Thomas Aquinas, `http://en.wikiquote.org/wiki/Thomas_Aquinas#Attributed`.

[3] I am grateful to a LoLa 9 reviewer for pointing out that modeling the entailment relation expressed by *therefore* as a truth-conditional relation, i.e., as requiring inclusion between two sets of possible worlds, cannot account for the fact that the discourse *π is an irrational number, therefore Fermat's last theorem is true* is not intuitively acceptable as a valid entailment and it cannot be accepted as a mathematical proof despite the fact that both sentences are necessary truths (i.e., they are true in every possible world). I think that at least some of the available accounts of hyper-intensional phenomena are compatible with my proposal, so I do not see this as an insurmountable problem.

the terminology introduced in Kratzer 1981) and asserts that, in view of the circumstances, i.e., given that God created men in a particular way, as long as a man is alive, he must find some thing or other pleasurable; (1b) involves the same modal base and elaborates on the preceding modal quantification: in view of the circumstances, if a man is alive and has no spiritual pleasure, he must have a carnal pleasure. Note that we need to make the contents of (1a) and (1b) accessible in discourse so that the entailment particle *therefore* can relate them.

On the other hand, we are interested in the *anaphoric potential* of (1a) and (1b), i.e., in the anaphoric connections between them. These connections are explicitly represented in discourse (2) below, which is intuitively equivalent to (1) albeit more awkwardly phrased. Indefinites introduce a discourse referent (dref) u_1, u_2 etc., which is represented by superscripting the dref, while pronouns are anaphoric to a dref, which is represented by a subscript.

(2) a. If a^{u_1} man is alive, he$_{u_1}$ must find something^{u_2} pleasurable/he$_{u_1}$ must have a^{u_2} pleasure.

b. Therefore, if he$_{u_1}$ doesn't have any^{u_3} spiritual pleasure, he$_{u_1}$ must have a^{u_4} carnal pleasure.

Note in particular that the indefinite *a man* in the antecedent of the conditional in (2a) introduces the dref u_1, which is anaphorically retrieved by the pronoun *he* in the antecedent of the conditional in (2b). This is an instance of **modal subordination** (Roberts 1989), i.e., an instance of simultaneous modal and invididual-level anaphora (see Frank 1996; Geurts 1999; Stone 1999): the conditional in (2b) covertly 'duplicates' the antecedent of the conditional in (2a), i.e., it asserts that, if *a man is alive* and doesn't have any spiritual pleasure, he must have a carnal one.

I will henceforth analyze the simpler and more transparent discourse in (2) instead of the naturally occurring discourse in (1). The challenge posed by (2) is that, when we *compositionally* assign meanings to (i) the modalized conditional in (2a), i.e., the premise, (ii) the modalized conditional in (2b), i.e., the conclusion; (iii) the entailment particle *therefore,* which relates the premise and the conclusion, we have to capture both the *intuitively correct truth-conditions* of the whole discourse and the modal and individual-level *anaphoric connections* between the two sentences of the discourse and within each one of them.

2 The basic proposal: Intensional Plural CDRT

To analyze discourse (1/2), I will introduce a new dynamic system couched in many-sorted type logic which extends Compositional DRT (CDRT) (see Muskens 1996) in two ways. In the spirit of the Dynamic Plural Logic of Van den Berg (1996), I model information states I, J etc. as *sets of variable assignments* i, j etc., and let sentences denote relations between such *plural* info states. In the spirit of Stone (1999), I analyze modal anaphora by means of dref's for *static* modal objects.[4] I will call the resulting system Intensional Plural CDRT (IP-CDRT). IP-CDRT takes the research program in Muskens (1996), i.e., the unification

[4] This is in contrast to Geurts (1999) and Frank (1996), among others, who use dref's for *contexts* (i.e., for info states) to analyze modal anaphora and, therefore: (i) complicate the architecture of the system, e.g., info states are not necessarily well-founded, and (ii) fail to capture the parallel between anaphora and quantification in the individual and the modal domain — see Stone (1999) and Schlenker (2005) among others for more discussion of this parallel. For a detailed comparison with the previous literature, see Brasoveanu (2006).

of Montague semantics and DRT, one step further: IP-CDRT unifies — in dynamic type logic — the static Lewis (1973)/Kratzer (1981) analysis of modal quantification and Van den Berg's dynamic plural logic.

We work with a Dynamic Ty3 logic. That is, following Muskens (1996), we extend Ty2 (Gallin 1975) — which has three basic types: t (truth-values), e (individuals; variables: x, x' etc.) and $\mathbf{w}$ (possible worlds; variables: w, w' etc.) — with a basic type s whose elements are meant to model variable assignments (variables of type s: i, j etc.). A suitable set of axioms ensures that i, j etc. behave like variable assignments in the relevant respects.[5] A dref for individuals u is a function of type se from 'assignments' i_s to individuals x_e; intuitively, the individual $u_{se}i_s$ is the individual that i assigns to the dref u. A dref for possible worlds p is a function of type $s\mathbf{w}$ from 'assignments' i_s to possible worlds $w_{\mathbf{w}}$; intuitively, the world $p_{s\mathbf{w}}i_s$ is the world that i assigns to the dref p.

Dynamic info states are sets of 'variable assignments', i.e., terms I, J etc. of type st. A sentence is interpreted as a DRS, i.e., as a relation of type $(st)((st)t)$ between an input and an output info state. An individual dref u stores a set of individuals with respect to an info state I, abbreviated $uI := \{u_{se}i_s : i_s \in I_{st}\}$. A dref p stores a set of worlds, i.e., a *proposition*, with respect to an info state I, abbreviated $pI := \{p_{s\mathbf{w}}i_s : i_s \in I_{st}\}$. *Propositional* dref's have two uses: (i) they store *contents*, e.g., the content of the premise (2a); (ii) they store *possible scenarios* (in the sense of Stone 1999), e.g., the set of worlds introduced by the conditional antecedent in (2a).

We use *plural info states* to store sets of individuals and propositions instead of simply using dref's for sets of individuals or possible worlds (their types would be $s(et)$ and $s(\mathbf{w}t)$) because we need to store in our discourse context (i.e., in our information states) both the *values* assigned to various dref's and the *structure* associated with those values. To see this, consider the example of plural anaphora in (3) below and the example of modal subordination in (4).

(3) a. Every^u man saw a$^{u'}$ woman.
    b. They$_u$ greeted them$_{u'}$.

(4) a. A^u wolf might^p enter the cabin.
    b. It$_u$ would$_p$ attack John.

In both cases, we do not simply have anaphora to sets, but anaphora to *structured* sets: if man m_1 saw woman n_1 and m_2 saw n_2, (3b) is interpreted as asserting that m_1 greeted n_1, not n_2, and that m_2 greeted n_2, not n_1; the structure of the greeting is the same as the structure of the seeing. Similarly, (4b) is interpreted as asserting that, if a wolf entered the cabin, it would attack John, i.e., if a black wolf x_1 enters the cabin in world w_1 and a white wolf x_2 enters the cabin in world w_2, then x_1 attacks John in w_1, not in w_2, and x_2 attacks John in w_2, not in w_1.

A plural info state I stores the *quantificational structure* associated with sets of individuals and possible worlds: (3a) requires each variable assignment $i \in I$ to be such that the man ui saw the woman $u'i$; (3b) elaborates on this structured dependency by requiring that, for each $i \in I$, the man ui greeted the woman $u'i$. Similarly, (4a) outputs an info state I such that, for each $i \in I$, the wolf ui enters the cabin in the world pi; (4b)

[5] Notational conventions: (i) subscripts on terms represent their types, e.g., x_e, $w_{\mathbf{w}}$, i_s; (ii) lexical relations are subscripted with their world variable, e.g., $\text{see}_w(x, y)$ is intuitively interpreted as 'x saw y in world w'.

elaborates on this structured dependency: for each assignment $i \in I$, it requires the wolf ui to attack John in world pi.

Moreover, we need plural info states to capture structured anaphora between the premise(s) and the conclusion of 'entailment' discourses like (1/2) above or (5) and (6) below.

(5) a. Every^{u} man saw a$^{u'}$ woman.
b. Therefore, they$_{u}$ noticed them$_{u'}$.

(6) a. A^{u} wolf might^{p} enter the cabin.
b. It$_{u}$ would$_{p}$ see John$^{u'}$.
c. Therefore, it$_{u}$ would$_{p}$ notice him$_{u'}$.

Let's return now to discourse (2), which is analyzed as shown in (7) below.

(7) **CONTENT**^{p_1}**:**
if^{p_2}(a^{u_1} man$_{p_2}$ is alive$_{p_2}$);
must$^{p_3}{}_{p_1,\mu,\omega}(p_2, p_3)$; he$_{u_1}$ has$_{p_3}$ a^{u_2} pleasure$_{p_3}$.
THEREFORE$^{p_4}{}_{p^*,\mu^*,\omega^*}(p_1, p_4)$:
if$(p_5 \Subset p_2;$ **not**(he$_{u_1}$ has$_{p_5}$ a^{u_3} spiritual pleasure$_{p_5}$));
must$^{p_6}{}_{p_4,\mu,\omega}(p_5, p_6)$; he$_{u_1}$ has$_{p_6}$ a^{u_4} carnal pleasure$_{p_6}$.

The representation in (7) is basically a network of structured anaphoric connections. Consider the conditional in (2a) first. The morpheme *if* introduces a dref p_2 that stores the content of the antecedent — we need this distinct dref because the antecedent in (2b) is anaphoric to it (due to modal subordination). The indefinite *a man* introduces an individual dref u_1, which is later retrieved: (i) by the pronoun *he* in the consequent of (2a), i.e., by 'donkey' anaphora, and (ii) by the pronoun *he* in the antecedent of (2b), i.e., by modal subordination.

The modal verb *must* in the consequent of (2a) contributes a tripartite quantificational structure and it relates three propositional dref's. The dref p_1 stores the content of the whole modalized conditional. The dref p_2, which was introduced by the antecedent and which is anaphorically retrieved by *must,* provides the restrictor of the modal quantification. Finally, p_3 is the nuclear scope of the modal quantification; it is introduced by the modal *must,* which constrains it to contain the set of *ideal* worlds among the p_2-worlds — ideal relative to the p_1-worlds, a *circumstantial* modal base (MB) μ and an *empty* ordering source (OS) ω. Finally, we test that the set of ideal worlds stored in p_3 satisfies the remainder of the consequent.

Consider now the entailment particle *therefore.* I take it to relate *contents* and not meanings. This is motivated by the entailment discourses in (5) and (6) above: in both cases, the contents (i.e., truth-conditions) of the premise(s) and the conclusion stand in an inclusion relation, but not their meanings (i.e., context change potentials). Further support is provided by the fact that the felicity of *therefore*-discourses is *context-dependent* — which is expected if *therefore* relates contents because contents are determined in a context-sensitive way. Consider, for example, the discourse in (8) below: entailment obtains if (8) is uttered on a Thursday in a discussion about John, but not otherwise.

(8) a. He$_{John}$ came back three days ago$_{Thursday}$.
b. Therefore, John came back on a Monday.

Moreover, I propose that *therefore* in (2b) should be analyzed as a modal relation, in particular, as expressing *logical consequence;* thus, I analyze discourse (1/2) as a modal

quantification that relates two embedded modal quantifications, the second of which is modally subordinated to the first. Just as the modal *must, therefore* contributes a necessity modal relation and introduces a tripartite quantificational structure: the restrictor is p_1 (the content of the premise) and the nuclear scope is the newly introduced dref p_4, which stores the set of ideal p_1-worlds — ideal relative to the dref p^* (the designated dref for the actual world w^*), an *empty* MB μ^* and an *empty* OS ω^* (empty because *therefore* is interpreted as logical consequence). Since μ^* and ω^* are empty, the dref p_4 is identical to p_1.

Analyzing *therefore* as an instance of modal quantification makes at least two welcome predictions. First, it predicts that we can interpret it relative to different MB's and OS's — and this prediction is borne out.[6] Second, it captures the intuitive equivalence between the *therefore*-discourse *A man saw a woman, therefore he noticed her* and the modalized conditional *If a man saw a woman, he (obviously/necessarily) noticed her* (they are equivalent provided we add the premise *A man saw a woman* to the conditional).

The conditional in (2b) is interpreted like the conditional in (2a), with the additional twist that its antecedent is anaphoric to the antecedent of the conditional in (2a), i.e., to the dref p_2. The dref p_5 is a *structured* subset of p_2, symbolized as $p_5 \Subset p_2$. We need *structured inclusion* because we want p_5 to preserve the structure associated with the p_2-worlds, i.e., to preserve the association between p_2-worlds and the u_1-men in them. The modal verb *must* in (2b) is anaphoric to p_5, it introduces the set of worlds p_6 containing all the p_5-worlds that are ideal relative to the p_4-worlds, μ and ω (the same as the MB and OS in the premise (2a)) and it checks that in each ideal p_6-world, all its associated u_1-men have a carnal pleasure.

Over and above discourse (1/2), IP-CDRT can scale up to account for a wide range of examples, including the modal subordination example in (9) below from Roberts (1996).

(9) a. You should buy a lottery ticket and put it in a safe place.
b. You're a person with good luck.
c. It might be worth millions.

Note that the *might* modal quantification in (9c) is restricted by the content of the first conjunct below the modal *should* in (9a), i.e., it is interpreted as asserting that, given that you're a generally lucky person, *if you buy a lottery ticket,* it might be worth millions. Crucially, (9c) is not restricted by the content of both conjuncts in (9a) or by the set of deontically ideal worlds contributed by *should.*

Roberts (1996) proposes to analyze (9c) by *accommodating a suitable domain restriction* for the quantification contributed by *might.* The accommodation procedure, however, is left largely unspecified and unrestricted; moreover, it is far from clear that accommodation is right way to go when the relevant domain restriction is in fact provided

[6] *Therefore* expresses causal consequence in (i) below and a form of practical inference in (ii).

(i) Reviewers are usually people who would have been poets, historians, biographers, etc., if they could; they have tried their talents at one or the other, and have failed; therefore they turn critics. (Samuel Taylor Coleridge, *Lectures on Shakespeare and Milton.*)

(ii) We cannot put the face of a person on a stamp unless said person is deceased. My suggestion, therefore, is that you drop dead.
(Attributed to J. Edward Day; letter, never mailed, to a petitioner who wanted himself portrayed on a postage stamp.)

by the preceding discourse. In contrast, IP-CDRT provides the right kind of framework for an analysis of (9c) in terms of *content anaphora.* An anaphoric analysis of (9c) is desirable because it is more restricted than an accommodation account and because we can capture the connection between (9c) and the preceding discourse, i.e., (9a), in a simple and formally explicit way.

3 The outline of the formal IP-CDRT analysis

In a Fregean/Montagovian framework, the compositional aspect of interpretation is largely determined by the types for the extensions of the 'saturated' expressions, i.e., names and sentences, plus the type that allows us to build intensions out of these extensions. Let's abbreviate them as **e**, **t** and **s**, respectively. In IP-CDRT, we assign the following dynamic types to the 'meta-types' **e**, **t** and **s**: a sentence is interpreted as a DRS, i.e., as a relation between info states, hence $\mathbf{t} := (st)((st)t)$; a name is interpreted as an individual dref, hence $\mathbf{e} := se$; finally, $\mathbf{s} := s\mathbf{w}$, i.e., we use the type of propositional dref's to build intensions.

To interpret a noun like *man,* we define a dynamic relation $\mathrm{man}_p\{u\}$ based on the static one $\mathrm{man}_w(x)$, i.e.,

$$\mathrm{man}_p\{u\} := \lambda I_{st}.I \neq \emptyset \wedge \forall i_s \in I(\mathrm{man}_{pi}(ui)).$$

These dynamic relations are the counterpart of DRT's conditions. A sentence (type **t**) is represented as a linearized DRS (a.k.a. linearized box), i.e.,

$$[\textbf{new drefs,} \text{ e.g., } u, p \mid \textbf{conditions,} \text{ e.g., } \mathrm{man}_p\{u\}].$$

A linearized DRS is the abbreviation of a term of the form

$$\lambda I_{st}\lambda J_{st}.I[\textbf{new drefs}]J \wedge \textbf{conditions}(J),$$

which states that the output info state J differs from the input info state I at most with respect to the **new drefs**[7] and each **condition** is satisfied in the output state J. A DRS that does not introduce any new dref's is represented as

$$[\textbf{conditions}] := \lambda I_{st}\lambda J_{st}.I = J \wedge \textbf{conditions}(J).$$

The noun *man* is translated as a term of type **e**(**st**):

$$man \rightsquigarrow \lambda v_{\mathbf{e}}\lambda q_{\mathbf{s}}.[\mathrm{man}_q\{v\}].$$

Determiners are relations-in-intension between a property $P'_{\mathbf{e(st)}}$ (the restrictor) and another property $P_{\mathbf{e(st)}}$ (the nuclear scope). Indefinite determiners, e.g., a^u, introduce an individual dref u and check that the dref satisfies the restrictor and the nuclear scope:

$$a^u \rightsquigarrow \lambda P'_{\mathbf{e(st)}}\lambda P_{\mathbf{e(st)}}\lambda q_{\mathbf{s}}.[u]; P'(u)(q); P(u)(q).$$

[7] The definition of $I[\varrho]J$ (for some dref ϱ) is

$$\forall i_s \in I(\exists j_s \in J(i[\varrho]j)) \wedge \forall j_s \in J(\exists i_s \in I(i[\varrho]j));$$

for its empirical and theoretical justification, see Brasoveanu (2006).

The semi-colon ';' is dynamic conjunction, interpreted as relation composition:

$$D; D' := \lambda I_{st} \lambda J_{st}.\exists H_{st}(DIH \wedge DHJ).$$

A pronoun he_u is anaphoric to an individual dref u and is translated as the Montagovian type-lift of the dref u:

$$he_u \rightsquigarrow \lambda P_{\mathbf{e(st)}}.P(u).$$

Given fairly standard assumptions about Logical Forms (LF's) and type-driven translation, a simple sentence like A^{u_1} *man is alive* is compositionally translated as

$$\lambda q_{\mathbf{s}}.[u_1 | \mathrm{man}_q\{u_1\}, \mathrm{alive}_q\{u_1\}].$$

I assume that the LF of such a sentence contains an indicative mood morpheme $\mathbf{ind}_{p^*}$ whose meaning is $\lambda \mathbb{P}_{\mathbf{st}}.\mathbb{P}(p^*)$, i.e., it takes the dynamic proposition $\mathbb{P}_{\mathbf{st}}$ denoted by the remainder of the sentence and applies it to the designated dref for the actual world p^*.

To interpret the conditional in (2a) above, we need to: (i) extract the content of the antecedent of the conditional and store it in a propositional dref p_2 and (ii) define a dynamic notion of *structured* subset of a set of worlds. Let's start with (ii). We need a notion of structured inclusion because: (a) the modal *must* and the 'donkey' pronoun *he* in the consequent of (2a) are simultaneously anaphoric to the p_2-worlds and the u_1-men and we need to preserve the structured dependencies between them; (b) the modally subordinated antecedent of the conditional in (2b) is also anaphoric to p_2 and u_1 in a structured way. In the spirit of Van den Berg (1996), I will assume that there is a dummy world # (of type **w**) relative to which all lexical relations are false and I will use this world to define the **structured inclusion condition**

$$p \Subset p' := \lambda I_{st}.I \neq \emptyset \wedge \forall i_s \in I(pi = p'i \vee pi = \#).$$

The dummy world # is used to signal that an 'assignment' i such that $pi = \#$ is irrelevant for the evaluation of conditions, so we need to slightly modify the definition of conditions:

$$\mathrm{man}_p\{u\} := \lambda I_{st}.I_{p\neq\#} \neq \emptyset \wedge \forall i_s \in I_{p\neq\#}(\mathrm{man}_{pi}(ui)),$$

where $I_{p\neq\#} := \{i_s \in I : pi \neq \#\}$.

To extract the content of the antecedent of the conditional, we define two operators over a propositional dref p and a DRS D: a maximization operator $\mathbf{max}^p(D)$ and a distributivity operator $\mathbf{dist}_p(D)$.[8] These operators enable us to 'dynamize' λ-abstraction over possible worlds, i.e., to extract and store contents: the $\mathbf{dist}_p(D)$ update checks one world at a time that the set of worlds stored in p satisfies the DRS D and the $\mathbf{max}^p(D)$ update collects in p all the worlds that satisfy D. Thus, we translate *if* as:

$$if^{p_2} \rightsquigarrow \lambda \mathbb{P}_{\mathbf{st}}.\mathbf{max}^{p_2}(\mathbf{dist}_{p_2}(\mathbb{P}(p_2))).$$

[8] The definitions in (i) and (ii) below follow the basic ideas, but not the exact definitions, of the corresponding operators over individual dref's in Van den Berg (1996). The definition of $\mathbf{dist}_p(D)$ incorporates an amendment of Van den Berg's definition proposed in Nouwen (2003).

(i) $\mathbf{max}^p(D) := \lambda I_{st} \lambda J_{st}.([p]; D)IJ \wedge \forall K_{st}(([p]; D)IK \rightarrow pK \subseteq pJ)$;

(ii) $\mathbf{dist}_p(D) := \lambda I_{st} \lambda J_{st}.pI = pJ \wedge I_{p=\#} = J_{p=\#} \wedge \forall w \in pI_{p\neq\#}(DI_{p=w}J_{p=w})$,
where $I_{p=w} := \{i_s \in I : pi = w\}$.

We need one last thing to translate the antecedent in (2a). The 'donkey' indefinite *a man* receives a *strong* reading, i.e., the conditional in (2a) is interpreted as asserting that *every* (and not only *some*) man that is alive must have a pleasure. However, the meaning for indefinite determiners given above incorrectly assigns a *weak* reading to the indefinite. I will analyze indefinite determiners as ambiguous between a weak and a strong meaning and I define the strong meaning in terms of **max**:

$$a^{\mathbf{str}:u} \rightsquigarrow \lambda P'_{\mathbf{e(st)}} \lambda P_{\mathbf{e(st)}} \lambda q_{\mathbf{s}}.\mathbf{max}^{u}(P'(u)(q); P(u)(q)).^{9}$$

So, the antecedent of the conditional in (2a) is translated as:

$$\textit{if}^{p_2}\ a^{\mathbf{str}:u_1}\ \textit{man is alive} \rightsquigarrow \mathbf{max}^{p_2}(\mathbf{dist}_{p_2}(\mathbf{max}^{u_1}([\mathrm{man}_{p_2}\{u_1\}, \mathrm{alive}_{p_2}\{u_1\}]))).$$

The modal verb *must* is interpreted in terms of a modal condition $\mathbf{nec}_{p,\mu,\omega}(p', p'')$. The condition is relativized to: (i) a propositional dref p storing the content of the entire modal quantification, (ii) an MB dref μ and (iii) an OS dref ω. Both μ and ω are dref's for sets of worlds, i.e., they are of type $s(\mathbf{w}t)$, a significant simplification compared to the type of static MB's and OS's in Kratzer (1981), i.e., $\mathbf{w}((\mathbf{w}t)t)$.[10,11] So, *must* is translated as follows:

$$\textit{must}^{p_3 \Subset p_2}{}_{p_1,\mu,\omega} \rightsquigarrow \lambda \mathbb{P}_{\mathbf{st}}.[\mu, \omega | \mathbf{circumstantial}_{p^*}\{p_1, \mu\}, \mathbf{empty}\{p_1, \omega\}]; [p_3 | \mathbf{nec}_{p_1,\mu,\omega}(p_2, p_3)]; \mathbf{dist}_{p_3}(\mathbb{P}(p_3)).$$

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[9] Brasoveanu (2006) provides extensive motivation for this analysis of the weak/strong 'donkey' ambiguity.

[10] We can simplify these types in IP-CDRT because we have plural info states: every world $w \in pI$ is associated with a sub-state $I_{p=w}$ and we can use this sub-state to associate a set of propositions with the world w, namely the set of propositions $\{\mu i : i_s \in I_{p=w}\}$, where each μi is of type $\mathbf{w}t$. I take the dummy value for MB and OS dref's to be the singleton set whose member is the dummy world, i.e., $\{\#\}$.

[11] $\mathbf{nec}_{p,\mu,\omega}(p', p'') := \lambda I_{st}.I_{p\neq\#} \neq \emptyset \wedge$
$\forall w \in pI_{p\neq\#}(\mathbf{NEC}_{\mu I_{p=w,\mu\neq\{\#\}}, \omega I_{p=w,\omega\neq\{\#\}}}(p' I_{p=w,p'\neq\#}, p'' I_{p=w,p''\neq\#})) \wedge$
$(p'' \Subset p')I \wedge \forall w \in pI_{p\neq\#} \forall i \in I_{p=w}(p'i \in p'' I_{p=w,p''\neq\#} \rightarrow p'i = p''i)$.
NEC is the static modal relation, basically defined as in Lewis (1973) and Kratzer (1981). The dref's μ and ω associate with each p-world two sets of propositions M and O of type $(\mathbf{w}t)t$. The set of propositions O induces a strict partial order $<_O$ on the set of all possible worlds as shown in (i) below. I assume that all the strict partial orders of the form $<_O$ satisfy the Generalized Limit Assumption in (ii) — therefore, the **Ideal** function in (iii) is well-defined. This function extracts the subset of O-ideal worlds from the set of worlds W. Possibility modals are interpreted in the same way, we only need to replace **NEC** with **POS**; both are defined in (iv) below.

(i) $w <_O w'$ iff $\forall W \in O(w' \in W \rightarrow w \in W) \wedge \exists W \in O(w \in W \wedge w' \notin W)$

(ii) **Generalized Limit Assumption:** for any proposition $W_{\mathbf{w}t}$ and OS $O_{(\mathbf{w}t)t}$,

$$\forall w \in W \exists w' \in W((w' <_O w \vee w' = w) \wedge \neg\exists w'' \in W(w'' <_O w'))$$

(iii) For any proposition $W_{\mathbf{w}t}$ and OS $O_{(\mathbf{w}t)t}$:

$$\mathbf{Ideal}_O(W) := \{w \in W : \neg\exists w' \in W(w' <_O w)\}$$

(iv) $\mathbf{NEC}_{M,O}(W_1, W_2) := W_2 = \mathbf{Ideal}_O((\cap M) \cap W_1)$;
$\mathbf{POS}_{M,O}(W_1, W_2) := W_2 \neq \emptyset \wedge W_2 \subseteq \mathbf{Ideal}_O((\cap M) \cap W_1)$.

We introduce the modal base μ and the ordering source ω and relate them to the dref p_1 (which stores the content of the modal quantification) by the **circumstantial** and **empty** conditions.[12] The condition $\mathbf{circumstantial}_{p^*}\{p_1, \mu\}$ is *context-dependent,* i.e. it is relativized to the dref for the actual world p^*; we need this because the argument in (1/2) goes through only if we add another premise to the one explicitly stated, namely that pleasures are spiritual or carnal. That is, the condition $\mathbf{circumstantial}_{p^*}\{p_1, \mu\}$ is meant to constrain the modal quantification in the premise (2a) so that it is evaluated only with respect to worlds whose circumstances are identical to the actual world w^* in the relevant respects — in particular, the proposition

$$\{w_{\mathbf{w}} : \forall x_e(\text{pleasure}_w(x) \rightarrow \text{spiritual}_w(x) \vee \text{carnal}_w(x))\}$$

has to be true in these worlds just as it is in w^*.

Like *must,* the particle *therefore* introduces a necessity quantificational structure. Since *therefore* expresses logical consequence, both its MB μ^* and its OS ω^* are empty:

$$\begin{aligned} \textit{therefore}^{p_4 \in p_1}{}_{p^*,\mu^*,\omega^*} \rightsquigarrow \lambda\mathbb{P}_{\mathbf{st}}.[\mu^*, \omega^* | \mathbf{empty}\{p^*, \mu^*\}, \mathbf{empty}\{p^*, \omega^*\}]; \\ [p_4 | \mathbf{nec}_{p^*,\mu^*,\omega^*}(p_1, p_4)]; \mathbf{dist}_{p_4}(\mathbb{P}(p_4)). \end{aligned}$$

The effect of the update is that the dref p_4 is identical to p_1 both in its value and in its structure, i.e., if J is the output state after processing the **nec** condition, we have that $p_1 j = p_4 j$ for any 'assignment' $j \in J$. Consequently, p_1 can be freely substituted for p_4. I assume that the anaphoric nature of the entailment particle *therefore,* which requires a propositional dref p_1 as the restrictor of its quantification, triggers the accommodation of a *covert* 'content-formation' morpheme $\textit{if}^{p_1}$ that takes scope over the premise (2a) and stores its content in p_1.

The conditional in (2b) is different from the one in (2a) in three important respects. First, given that (2b) elaborates on the modal quantification in (2a), the modal verb *must* in (2b) is anaphoric to the previously introduced MB μ (circumstantial) and OS ω (empty), so it is translated as

$$\textit{must}^{p_6 \in p_5}{}_{p_1,\mu,\omega} \rightsquigarrow \lambda\mathbb{P}_{\mathbf{st}}.[p_6 | \mathbf{nec}_{p_1,\mu,\omega}(p_5, p_6)]; \mathbf{dist}_{p_6}(\mathbb{P}(p_6)).$$

Second, the negation in the antecedent of (2b) is translated as

$$\textit{not} \rightsquigarrow \lambda\mathbb{P}_{\mathbf{st}}\lambda q_{\mathbf{s}}.[\sim\mathbb{P}(q)],$$

i.e., in terms of the dynamic negation $\sim D$.[13] Finally, the modally subordinated antecedent in (2b) is translated in terms of an update requiring the newly introduced dref p_5 to be a *maximal structured* subset of p_2, i.e.,

$$\textit{if}^{p_5 \in p_2} \rightsquigarrow \lambda\mathbb{P}_{\mathbf{st}}.\mathbf{max}^{p_5 \in p_2}(\mathbf{dist}_{p_5}(\mathbb{P}(p_5))).^{14}$$

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[12] Definitions:

(i) $\mathbf{circumstantial}_p\{p', \mu\} := \lambda I_{st}.I_{p\neq\#,p'\neq\#} \neq \emptyset \wedge$
$\forall w \in pI_{p\neq\#}(\forall w' \in p'I_{p=w,p'\neq\#}(\mathbf{circumstantial}_w(w', \mu I_{p=w,p'=w'}))$.

(ii) $\mathbf{empty}\{p, \omega\} := \lambda I_{st}.I_{p\neq\#} \neq \emptyset \wedge \forall i_s \in I(\omega i = \{\#\})$;
$\mathbf{empty}\{p, \mu\} := \lambda I_{st}.I_{p\neq\#} \neq \emptyset \wedge \forall i_s \in I(\mu i = \{\#\})$.

[13] $\sim D := \lambda I_{st}.I \neq \emptyset \wedge \forall H_{st}(H \neq \emptyset \wedge H \subseteq I \rightarrow \neg\exists K_{st}(DHK))$; see Brasoveanu (2006) for detailed justification.

The IP-CDRT translation of the entire discourse (1/2) is provided in (10) below (for simplicity, I omit some distributivity operators and the modal conditions contributed by *therefore*) and, given the familiar dynamic definition of truth,[15] the discourse is assigned the intuitively correct truth-conditions.

(10) $\mathbf{max}^{p_1}(\mathbf{dist}_{p_1}(\mathbf{max}^{p_2}(\mathbf{dist}_{p_2}(\mathbf{max}^{u_1}([\mathrm{man}\{u_1\}, \mathrm{alive}\{u_1\}])));$
$[\mu, \omega|\mathbf{circumstantial}_{p^*}\{p_1, \mu\}, \mathbf{empty}\{p_1, \omega\}]; [p_3|\mathbf{nec}_{p_1,\mu,\omega}(p_2, p_3)];$
$[u_2|\mathrm{pleasure}_{p_3}\{u_2\}, \mathrm{have}_{p_3}\{u_1, u_2\}]));$
$\mathbf{dist}_{p_1}(\mathbf{max}^{p_5 \Subset p_2}([\sim[u_3|\mathrm{spiritual}_{p_5}\{u_3\}, \mathrm{pleasure}_{p_5}\{u_3\}, \mathrm{have}_{p_5}\{u_1, u_3\}]]);$
$[p_6|\mathbf{nec}_{p_1,\mu,\omega}(p_5, p_6)]; [u_4|\mathrm{carnal}_{p_6}\{u_4\}, \mathrm{pleasure}_{p_6}\{u_4\}, \mathrm{have}_{p_6}\{u_1, u_4\}]).$

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[14] $\mathbf{max}^{p \Subset p'}(D) := \lambda I_{st} \lambda J_{st}.\exists H([p|p \Subset p']IH \wedge DHJ \wedge$
$\forall K_{st}([p|p \Subset p']IK \wedge \exists L_{st}(DKL) \rightarrow K_{p\neq\#} \subseteq H_{p\neq\#})).$

[15] **Truth:** A DRS D (type $\mathbf{t}$) is **true** with respect to an input info state I_{st} iff $\exists J_{st}(DIJ)$.

Italian background: Links, tails, and contrast effects

Lisa Brunetti
Universitat Pompeu Fabra

1 Introduction

In this paper, I analyze the properties of background material in Italian, assuming Vallduví's partition of the background in Link and Tail (Vallduví 1992).[1] According to Vallduví, a link directs "the hearer to a given address [...] in the hearer's knowledge-store, under which the information carried by the sentence is entered" (Vallduví 1992: 59). A tail further specifies how the information must be entered under a specific address. That a link and a tail have different discourse roles is shown by the following Italian example from the LIP corpus (DeMauro et al. 1993), where the same expression *il tempo* 'the time' is present in initial position in the first sentence, with the function of a link, and in final position in the second sentence, with the function of a tail.[2]

(1) Non è questione che **il tempo** non te l'ho DATO, io te l'ho
not is question that the time not to-you it I-have given I to-you it I-have
DATO ***il tempo***.
given the time
'The point is not that I didn't give you time. I DID give you time.'

I make the following assumptions on the distribution of links and tails in Italian. Links are always sentence initial (as Vallduví 1992 argues for Catalan) and tails are always outside the IP, namely right dislocated (as argued by Vallduví 1993 for Catalan). Starting from these assumptions, the goal of this paper is twofold. On one hand, I will show that a contrastive interpretation of links is a consequence of their presence in certain specific discourse contexts (parr. 2.1–2.3). On the other hand, I will show that the properties of tails belong also to backgrounded material that linearly follows the focus when the focus occupies a sentence initial position (parr. 3, 3.1).

2 Links and tails

Links are frequently preverbal subjects (see (2)). In fact, non-focused preverbal subjects always have a link-like interpretation. However, other syntactic elements can be links. In such cases, the link is expressed by a Clitic Left Dislocated expression (from now on, CLLD), as shown in (3). Note that in both examples, the link occupies a position at the beginning of the sentence.

(2) Sai? **Un mio amico** ha vinto la lotteria.
you-know a my friend has won the lottery
'Did you know? a friend of mine won the lottery'

[1] I thank Stefan Bott, Louise McNally, Maribel Romero, Miriam Butt, Laia Mayol, Enric Vallduví, Alex Alsina for useful comments and discussions on this work. My work is financially supported by the 'Juan de la Cierva' postdoctoral fellowship of the Spanish Ministry of Education and Science.

[2] This example has been selected by Frascarelli (2000). From now on, I indicate links with boldface, and tails with boldface italics. Small caps indicate focal stress.

(3) Sai? **A mio fratello** gli hanno rubato la moto.
you-know to my brother to-him they-have stolen the moto
'Did you know? My brother's moto was stolen.'

I will remain agnostic on whether it is the CLLD position that triggers a link-like interpretation, or rather it is sufficient that the topic be in sentence initial position in order to be interpreted as link. This means that I will leave open the question whether preverbal subjects occupy a canonical specIP position or rather a higher, left dislocated position (as claimed for instance by Vallduví (1993) for Catalan and Alexiadou & Anagnostopoulou (1998) for Greek and Spanish, a.o.).

A link does not have to be discourse old, and this is clear from the fact that the sentences in (2) and (3) can be uttered without previous mentioning of *un mio amico* or *a mio fratello.* A tail, instead, is always discourse old. This means that a tail must always be recoverable from the previous discourse or at least from the situational context (cf. Ziv & Grosz 1994). A sentence like (4), which is the same as (3) except for the position of the dislocated element, cannot be uttered 'out of the blue':

(4) ?? Sai? Gli hanno rubato la MOTO, ***a mio fratello***.
you-know to-him they-have stolen the moto to my brother

I will return to this characteristic of tails in par. 3.

2.1 Contrast effects

Another important difference between links and tails is that a link can be contrastive, while a tail cannot. This is illustrated by the Italian example below (see also Frascarelli 2000):

(5) a. Che cosa hai dato ai tuoi fratelli?
'What did you give to your brothers?'
b. **A Leo** (gli) ho dato un cd, e **a Ugo** (gli) ho dato un libro.
to Leo to-him I-have given a cd and to Ugo to-him I-have given a book
c. *(Gli) ho dato un CD, ***a Leo*** e (gli) ho dato un LIBRO, ***a Ugo***.
to-him I-have given a cd to Leo and to-him I-have given a book to Ugo

In (5b), *Leo* and *Ugo* are the two members of the set of brothers mentioned in (5a). The answer is not about the set of brothers as a whole, but rather it is split into two answers in which something different is stated on each member of the set. A contrast/comparison is made between the two members of the set. In (5c), a contrast/comparison between the two members of the set cannot be made, and the sentence results ungrammatical.

As I have already noted in Brunetti (2006), a contrast effect arises also when a link (but not a tail) occurs in an answer to a question. See the example below:

(6) a. **Dante**, lo boccerai? 'Will you fail Dante?'
b. No, **Dante** non lo boccerò. (Ma Ugo e Leo sicuramente sì)
no Dante not him I-will-fail but Ugo and Leo surely yes
'No, Dante, I won't fail him (but Ugo and Leo, I surely will)'

c. No, non lo boccerò (***Dante***).
no not him I-will-fail Dante
'No, I won't FAIL Dante'

(6b) is naturally interpreted as if it were followed by a sentence like the one given in parentheses. In other words, the answer sounds like a partial one, and you expect to know more about the destiny of other students apart from Dante. Such an interpretation does not arise in (6c), where *Dante* is actually preferably omitted.

The difference between b and c was already noted by Arregi (2003) for Spanish. According to him, the CLLD in this context is a contrastive topic as defined in Büring (1997).[3] Arregi makes the strong claim that the semantic interpretation of a CLLD is *always* that of a contrastive topic. His claim, however, is not supported by the data. A contrastive interpretation does not arise each time a CLLD is present in a sentence. If the referent is introduced in the discourse for the first time, like in (3), there is no contrast effect. Thus, what triggers a contrastive interpretation cannot just be the fact that an expression is a CLLD. The contrastive interpretation is triggered by the fact that the expression was already uttered in the preceding question. In order to explain the reason for such behavior, it is necessary to open a parenthesis on what governs the presence or absence of links in a discourse in Italian.

2.2 Non-realized links

The claim I make is that, whenever a link is introduced in the discourse, it is not overtly realized (if it is a subject) or it is realized with a clitic (if it is an object) in subsequent sentences, as long as it represents the *same* discourse topic. The link can be realized again only if the 'topic continuum' is interrupted (cf. Brunetti 2006). This is shown by the example below, taken from a spontaneous narration of one of Mercer Mayer's wordless 'frog stories' (English glosses are rather free):

(7) Ok dunque **il bambino** si prepara per andare a... **Ø** è davanti allo
ok so the boy is getting ready to go to... he is in front of the
specchio e **Ø** si prepara **Ø** si mette la cravatta per andare al
mirror and he is getting ready he puts on the tie to go to-the
ristorante (...)e **i suoi amici** lo guardano tristi perché sanno che
restaurant and his friends look at him sad because they-know that
non andranno con lui. Allora poi **il bambino** saluta il cane...
they won't go with him so then the boy says hello to the dog...

The link *il bambino* represents the discourse topic, until *i suoi amici* is introduced as a new topic and the topic continuum is interrupted. In the subsequent sentence, *il bambino*

[3] According to Büring (1997), the meaning of a sentence with a contrastive topic is a set of sets of propositions (or put it otherwise, a set of questions). For instance, an exchange like: 'What did the pop stars wear?' '**The female pop stars** wore caftans', where *the female pop stars* is a contrastive topic, has the following semantic representation: *((the female pop stars wore caftans, the f. p. s. wore dresses, the f. p. s. wore tuxedos . . .);((the male pop stars wore caftans, the m. p. s. wore dresses, the male pop stars wore tuxedos . . .))*, where the inner brackets represent the alternative sets created by the focus, and the external brackets represent the alternative set created by the topic.

represents the discourse topic again and therefore it is overtly expressed. In other words, whenever a link is given in the sentence, a topic shift occurs (cf. Brunetti 2006).[4]

DiEugenio (1990), DiEugenio (1998) accounts for the presence or absence of subject pronouns in Italian within the framework of Centering Theory (Grosz et al. 1995). She shows that subjects in Italian are null when the center transition between the two sentences is a CONTINUE — that is, roughly, when there is no shift of center of attention from one sentence to another —; an overtly expressed subject pronoun is instead realized if the center transition is a RETAIN or a SHIFT — that is, roughly, when the center of attention is not the one expected, given the previous sentence. The phenomenon Di Eugenio describes is very similar to the one I describe above, despite the fact that she analyses the data by taking centers of attention into account, while I do it by referring to the notion of discourse topic. However, Di Eugenio only restricts her analysis to null *subjects.* In my analysis, on the contrary, what is omitted is the link that would represent the current discourse topic; it does not matter if the link is a subject or not. As I said above, links are usually subjects, but that is not necessarily always the case. In (3), for instance, the subject is arbitrary and therefore it could not represent the topic (cf. Murcia-Serra 2003). The topic is then represented by the CLLDed indirect object. Another example where the subject does not coincide with the discourse topic is given below. The example is taken again from a narration of a wordless 'frog story'.

(8) (...) e **il cane** casca, dalla finestra, col barattolo infilato nella
and the dog falls from-the window with-the canister wedged in-the
testa e **gli** si rompe il barattolo e così **Ø** se ne può liberare
head and to-him SI breaks the canister and so SI of-it he-can get-rid

The subject *Il cane* 'the dog' is introduced as a link in the first sentence and it represents the discourse topic of the whole discourse segment considered. In the second sentence, however, it is the dative clitic that refers to the dog, not the subject, while in the third sentence the null subject again refers to the dog. The predicate in the second sentence is the unaccusative verb *rompersi* 'to break', and its subject refers to an inanimate entity. An inanimate entity is less apt to represent a topic in the discourse, because a topic is preferably animate and with an agent role. For this reason, the subject does not coincide with the discourse topic. Still, the discourse topic remains the dog, and the argument representing it is expressed by a reduced form, the dative clitic *gli.*

2.3 Contrast effects again

Consider now again the exchange (6a–b) given above. What triggers a contrastive interpretation is not the fact that Dante is a CLLD (contra Arregi), but rather that *Dante* was already present in the preceding question. In the light of what I said in the preceding paragraph, the explanation for this behavior is the following. If *Dante* represented the topic of both (6a) and (6b), its omission would be expected in (6b), given that a link is not realized if it represents the same discourse topic as the preceding link, as we have seen in (7–8). But in (6b), *Dante* does not represent the same discourse topic as in (6a). Rather,

[4] The same behaviour is observed by Butt & King (1997) for Hindi, a language that allows null arguments. Butt and King describe the phenomenon basically in the same way as I do: "Arguments which function as a topic within their clause, but which simultaneously indicate a change (switch) in topic from the preceding utterance cannot be realized as null". They also say that "continuing topics, i.e., entities that are the topic of the current utterance and of the previous utterance, can be dropped and in general do not occur overtly".

in (6b) the discourse topic is a set that constitutes the complete answer to the question ((6b) is a partial answer), and Dante is just a member of that set, which is formed by, say, Dante, Ugo and Leo. Thus, the topic in (6b) is not the same as the one in (6a), and omission of the link does not have to occur. The contrastive interpretation in (6b) is the result of an accommodation that allows the hearer to interpret the topic as *different* from the previous topic.

Summarizing, a contrastive interpretation for links then arises in the following two cases. The first case is when when the link is explicitly compared with another one, and both are members of a set, as in (5). In that example, *Leo* and *Ugo* are two members of the same set and are contrasted/put in parallel with each other. Contrast is explicit here, in the sense that the contrasting elements are both present in the discourse. In the second case, a contrastive interpretation arises as a consequence of the fact that a link has always to be interpreted as a shifting topic. In contexts where no topic shift apparently occurs, namely when the same link is repeated in two subsequent sentences (see (6)), the discourse topic expressed by the second link is interpreted as different from the discourse topic expressed by the first link. More precisely, it is interpreted as a set including the entity expressed by the link. The contrast effect arises in that the entity expressed by the link is implicitly compared with the other members of that set. This also explains the fact that a sentence like (6b) is interpreted as a partial answer. The answer (unlike the question) is not about Dante, but rather about a set of individuals including Dante, so we expect that something else will be said about the other members of the set.

In conclusion, in question/answer pairs like (6a–b), it is the very presence of an overtly realized link that yields a contrastive interpretation. Whenever a link is realized in the sentence, a topic shift occurs, so the sentence must be interpreted as having a different discourse topic than that of the previous sentence. This is possible only if we interpret the sentence as a partial answer, as described above.

Remember that the contrast effect described above only pertains to expressions that are sentence initial, namely that are links. An expression representing the discourse topic can be iterated in a subsequent sentence if it occupies a Clitic Right Dislocated position (from now on, CLRD), namely, if it is a tail. This is shown in (1), where the second occurrence of *il tempo,* which is a CLRD, iterates the link of the previous sentence. This means that a tail cannot represent a shifting topic. Consequently, a tail cannot have a contrastive interpretation either, as it is illustrated by the ungrammaticality of a sentence like (5c), and by the fact that in a sentence like (6b), the right dislocated element cannot be interpreted as contrasting with something else. In (5), *Leo* and *Ugo* represent two members of the set of brothers, rather than the whole set, so they represent a different discourse topic than that of the question. Therefore, they are interpreted as shifting topics. But this is possible because they are in initial position, namely because they are links. If they are right dislocated, they cannot be interpreted as shifting topics, and the sentence results ungrammatical. In (6), we don't necessarily have a topic shift, because *Dante* is uttered in the question *and* in the answer. The second *Dante* must be interpreted as a shifting topic if it is in initial position, and we can do it by assuming that it is part of a set, as explained above. But if *Dante* is a tail, the interpretation will be the most obvious in that context, namely that *Dante* just expresses the same discourse topic as *Dante* in the question. Indeed, the sentence in (6b) is not ungrammatical as (5c), it simply cannot be interpreted as a partial answer.

3 Tails and sentences with initial focus

I have said above that tails occupy a position outside the clause, and we have seen that an expression with the properties of a tail is always CLRD in Italian (see (1), (6c)). In this paragraph I will provide some data showing that the Post-Focal Background in a sentence with initial focus (from now on, PFB) shares the same tail-like properties with CLRD. By PFB, I mean backgrounded material that linearly follows a focus occupying a left peripheral position. An example is given in (9), where the PFB is *ho prestato gli appunti* 'I have lent the notes', which follows the focus *a Clara.*

(9) A CLARA ho prestato gli appunti.
to CLARA I-have lent the notes

I have said above that a tail is always discourse old. More precisely, a tail in Italian can refer to: an entity present in the situational context, but not mentioned; an entity mentioned in the discourse context, but not recently; an entity mentioned in the previous sentence (cf. Ziv & Grosz 1994). The example below from the LIP corpus shows that a CLRD can refer to an entity that is situationally implicit. The excerpt is taken from a conversation between a parent and a teacher concerning a student's performance at school. The student is the topic of the conversation, but she is never explicitly mentioned. In (10), she is eventually mentioned, and the expression appears as a CLRD:

(10) Non è soltanto buona volontà (...) ma c'è proprio un miglioramento (...);
not is just good will (...) but there is really an improvement (...)
sì, cioè, c'è da farci qualche CONTO ***su questa ragazza***
yes that is there is to give-her some confidence, to this girl
'It's not just good will; that is, I think it's worth COUNTING on this girl'

The PFB can be situationally recoverable as well. This is shown in (11). The speaker in (11a) has given something to the speaker in (11b), so the action of 'giving something to speaker a' is implicit in the situational context.

(11) a. Questo è il ticket. 'This is the ticket'
b. No questo non mi interessa, un DOCUMENTO mi deve dare.
no this not to-me interests an I.D. to-me you-must give
'No, I don't need this; an I.D. you have to give me'

The following example from the LIP corpus shows that a CLRD can refer to an entity mentioned in the discourse context, but not recently. The CLRD *'sta ragazzina* 'this girl' is mentioned two exchanges earlier, about seven lines higher up in the dialogue.

(12) A mia madre gli piaceva TANTISSIMO ***'sta ragazzina***
to my mother to-her was-pleasing very-much this girl
'My mother liked very MUCH, this girl'

PFB can also have an antecedent that is not recently mentioned in the discourse. Consider (13). The sentence is uttered in the following situation. Anna and Leo are talking about a certain book of Anna's. Anna does not remember who gave it to her. Then the conversation is dropped, and after some time, Anna utters (13) as a continuation of that prior conversation with Leo:

(13) Ora ricordo! DANTE mi ha regalato quel libro!
now I-remember Dante to-me has given that book
'Now I remember! DANTE gave me that book!'

Since the PFB has tail-like properties, it is discourse old. This lets the hearer imply that there is an antecedent for it in the discourse. The hearer will therefore recall that previous conversation and find the antecedent for the PFB there (see Brunetti 2004).

Finally, the example in (1) shows that a CLRD can refer to an entity mentioned in the previous sentence. The example in (14b) shows that a similar context is also possible for PFB. In fact, the PFB *ho prestato gli appunti* 'I have borrowed the notes' has an antecedent in the preceding question.[5].

(14) a. A Leo gli hai prestato gli appunti?
'Did you lend your notes to Leo?'

b. No, a Clara ho prestato gli appunti.
no to Clara I-have lent the notes
'No, I lent my notes to Clara'

Finally, the possibilities for a tail to be unrealized seem to be the same when the tail is represented by a CLRD and when it is represented by PFB. In particular, a CLRD is preferably deleted when it is contained in an answer to a question (see (15b)). In Brunetti (2004) I propose that a fragment answer is a full sentential structure that has undergone ellipsis. More precisely, I propose that the focused element has moved to the left periphery and then ellipsis of the PFB has occurred. Assuming such an analysis, we can see in (15c) that also the PFB in an answer to a question is preferably deleted.[6]

(15) a. Chi ha comprato il giornale?
'Who bought the newspaper?'

b. Lo ha comprato Clara (?il giornale).
it has bought Clara the newspaper

c. Clara (??ha comprato il giornale).
Clara has bought the newspaper

3.1 Conclusions on tails

Concluding, in the second part of this paper I have provided some evidence that the properties of tails pertain not only to CLRD, but also to PFB. Both CLRD and PFB are discourse old expressions, namely they have an antecedent either in the discourse or that is recoverable from the situational context. The antecedent can either be mentioned recently in the discourse or not. If it is mentioned in a question and the tail is in the answer, the tail is usually deleted. When the tail is present in a sentence, a contrastive interpretation of the focus is often given, due to the fact that what is contrasted or corrected must have already been mentioned earlier in the discourse or at least implicitly assumed by the situational context, and this is always true when tails are present, given that they are always anaphoric.

[5] The focus in sentences containing tails is often contrastive, e.g., in (1), (14) and (11) (cf. also Mayol 2002). The relation between contrastive focus and the presence of a tail has to do with the fact that a tail is always discourse old, namely it is anaphoric material. Indeed, when something is contrasted with something else or a correction is made, what is contrasted or corrected has already been said before, or at least it is implied from the situational context. Therefore, the presence of discourse old background is expected (cf. also Wedgwood forthcoming for Hungarian.)

[6] A deeper analysis of when exactly the PFB and a CLRD can or must be deleted is not within the scope of this article. For a discussion on that matter, see Brunetti (2004).

Finally, we must note that if the parallelism I have driven between the discourse function of CLRD and PFB is correct, and if one assumes as I said at the beginning of this paper that tails are always out of the clause, then we have to conclude that also the PFB occupies a syntactic position outside the clause. This claim has indeed been made in the literature, for instance by Vallduví (1992) for Catalan and Samek-Lodovici (2006) for Italian. Although I haven't treated syntactic issues in this paper, my comparison of the discourse properties of CLRD and PFB can provide some support for such syntactic analyses.

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About imperfectivity phenomena

Claudio C. e C. Gonçalves
Universidade Federal de Santa Catarina, Florianópolis

0 Introduction

Though licencing conditions for each reading — and perhaps also the default values — may vary cross-linguistically, it seems to hold universally that any sentence of natural language may alternate somehow between episodic and dispositional readings. The terms *episodic* and *dispositional* in that statement should be considered as intuitive cover terms which hide phenomena of potentially different nature. For example, by means of quantificational or frequency adverbs and *when*-clauses, sentences become dispositional in the sense of expressing a series of events which occur with some regularity. For example, as in the contrast between *Mary swam last night* and *Mary always swam* or *Mary swam whenever she needed to unwind.*

On the other hand, morphological markers usually yield a contrast between 'episodicity' and a more nomic type of dispositionality. The past tenses of Romance languages are an instance of this. Those languages have an imperfective past tense expressing nomic dispositionality and a perfective past tense expressing the episodic. For example, in French when the verb *fumer,* to smoke, appears in the *imparfait* tense in a sentence such as *Jean fumait* it means that many situations were such that Jean was smoking in them. As the paraphrases suggest, the nomic variety of dispositionality has as features that the eventuality happens at intervals, that it is presented as being in course at a certain point. Another important component is that such nomic dispositional sentences tolerate exceptions.

It is widely accepted that the perfective vs. imperfective opposition of Romance is closely related to the more abstract episodic vs. dispositional opposition. But the latter is standardly taken to hold as well in languages which do not mark it overtly. For example, the English sentences in the past tenses such as *Mary swam* can also convey that Mary was formerly in the habit of swimming, much like Romance imperfective tenses. Due to such behaviour, it is assumed that in its habit-conveying uses the verb is in the scope of a cover operator of genericity, which is a silent counterpart to Romance imperfective morphology.

The similarity between the generic use of English past tense sentences and Romance imperfective ones has motivated that they receive similar treatment. For example, in Lenci & Bertinetto (1995: 262), the Italian imperfective tense is considered a morphological counterpart of *Gn*, the generic operator. In their treatment, *Gn* is an aspectual operator. After feature-checking in ASP_0 it adjoins to a higher projection at LF. The material it c-commands at LF is unselectively-bound and fills its restrictor, which is assumed to be the locus of the presuppositions of habitual sentences; a contextual variable C restricts the interval which the *Gn* operator binds. Notice that, in that view, genericity/habituality is derived in the syntax and semantics, the role of pragmatic factors is to limit the intervals/ situations where the claim made by the sentence holds.

Since they typically express events that are in course at a point of reference, periphrases formed with *be* followed by a verb in gerund form (henceforth, ***be ...-ing***) are taken to be a grammaticalised means of expressing imperfectivity. Thus the semantic

process involved in obtaining the reading of be-ing periphrases are presumed to follow the lines of the Gn operator. For example in the readings of the sentences of (1) explicited by the *now* adverbials, a certain variety of the imperfective operator — namely, a progressive operator PROG — applies to the VP and yields a time interval where the event takes place. The habitual readings induced by the *much* intensifiers are obtained by a further operation over the progressive value.

(1) a. The dog is barking now/too much these days.
b. O cachorro está latindo agora/muito essa semana. *(Braz. Portuguese)*
c. El perro está gruñendo ahora/mucho esta noche. *(Spanish)*
d. Il cane sta abbaiando adesso/molto quest'anno. *(Italian)*

As is also well known, the content of the PROG operator turns out to be no simple matter, the main issues were set in Bennet & Partee (2004) and Dowty (1979) and gave rise to a respectable literature. Part of the picture there is the claim that *be . . . -ing* denotes eventualities in progress and that habituality comes in as (some sort of) coercion or a different operator altogether occasioned by context linguistic or not.

Such privileging of the single-eventuality progressive reading seems to be the standard Montagovian strategy. For example, according to Bennet & Partee (2004: 63, 90), the PTQ definition of the English Present Simple captures its 'reportive' — single-eventuality, episodic reading — meaning. Since the definition of other tenses builds on the definition of Present Simple, the reportive strategy spread throughout the tense system and influenced the shape of the analysis that were to come: habituality had to be accounted for by coercion or separate operators.

However, the alternation of progressive vs. habitual values with *be . . . -ing* periphrases causes some problems for that strategy that starts with reportive verb content definitions and goes into modal imperfectivity operators and coercion. Those problems seem to hold for English to a meaningful extent, but are specially crucial in Romance where *be . . . -ing* periphrases are actually much more common as habituals then as strictly progressives. And where, due to that factor, it is difficult to pin down which reading is actually the case. Thus, despite the surface similarity of the periphrases in (1), in what concerns Romance, Dowty's Eventual Outcome Strategy, which is a consequence of the reportive view, gives no reason to posit that progressive is coerced into habitual. It might as well be the other way around, since habitual meaning is actually more frequent.

In what follows, I will inquire a bit more into the problems that arise with progressives and propose a strategy to deal with the alternation which aims also at being general for the dealing with the perfective vs. imperfective alternation. Pragmatic principles will play a different role than that played in Lenci & Bertinetto (1995) and the literature stemming from Krifka et al. (1995). Instead of limiting the intervals/situations the sentence is claimed to hold in, they will determine the licencing of episodic and dispositional readings. For reasons of space I can only approach progressives here. In Gonçalves (2006) I argue for a similar treatment of present simples. In the view argued for here, the semantic content of *be . . . -ing* periphrases remains 'Dowtyan' in spirit but is radically simplified: BE-INGφ says simply that the interval in which the sentence holds is a sub-interval of where φ holds. With this type of definition, the adequate values of *be . . . -ing* sentences arise from their bidirectional interaction with Gricean Maxims.

1 Motivating the short interval view of *be . . . -ing*

In this section I will present part of a problem raised by Szabó (2004) which motivates a claim for abandoning Dowty's Eventual Outcome strategy with respect to the semantics of *be . . . -ing.* I will then show that, although cross linguistic considerations seem to favour his plea, the conclusion may be avoided by looking at *be . . . -ing* periphrases as expressing short intervals instead of events in course. I show also that the short interval analysis has empirical cross-linguistic motivation. Szabó reviews the development of definitions of progressive from Montague, 1974 (2a) to Bonomi, 1999 (2b). He then notes that despite the added elements and the loss of intuitiveness, (2b) still faces serious issues. To see this consider the entailment pattern in (3).

(2) a. PROGφ is true at an instant t iff φ is true at every instant t' in some open interval containing t.

b. PROGφ is true at t in w iff there is an event e at t in w, and for every $\langle e\star, w\star\rangle$ on the continuation tree for e in w, if φ is not true of $e\star$ at $w\star$, then there is a $\langle e', w'\rangle$ on the continuation tree for e in w such that e' is a continuation of $e\star$ in w' and φ is true of e' at w'.

(3) If *Mary crossed the street* is true at t', then *Mary was crossing the street* is true for at least sometime before t'.

The point is that this robust entailment pattern is not captured with (2b). By that definition, the truth of *Mary was crossing the street* requires an event which occurred earlier than the utterance to have within its continuation branches an accomplished crossing of the street by Mary. However, (2b) allows *Mary crossed the street* to be true without it being the continuation of some other event; it suffices that the event that satisfies *Mary crossed the street* be earlier than the utterance time. Szabó (2004: 23) concludes that, by (2b), we could take *Mary crossed the street* to be true without *Mary was crossing the street* ever having been true, which is very counter-intuitive. As he also points out, that problem could be fixed by assuming that every non-instantaneous event $\mathbf{e}$ has an $\mathbf{e'}$ preceding it, such that $\mathbf{e}$ is the continuation of $\mathbf{e'}$. However, Szabó claims this would bring unwanted consequences for the multiple-choice paradox which (2b) aimed at dealing with. Suppose Leo sets out from Chicago and (after bordering the lake) drives east undecided if he is going to Boston or New York City; he passes through Cleveland, where he still hasn't made up his mind; next, in Albany, he decides to go to New York, where he arrives safely. By assuming that any initial temporal part of a non-instantaneous event counts as a development part we will predict that, in Cleveland, Leo was already driving to New York and that sentences such as *Leo was already driving to New York for hours when he decided to drive to New York* are acceptable.

Szabó takes this as part of the motivation for suggesting that the enterprise of explaining the truth of *Mary was crossing the street* in terms of *Mary crossed the street* should be abandonned and that what is actually feasible and needed is an explanation of the latter in terms of the former. Looking at phenomena from the perspective of Brazilian Portuguese suggest that the abandonement is not necessary as long as we are ready to accept that, instead of denoting progressiveness, *be . . . -ing* periphrases denote intervals which are short in relation to their simple present tense counterparts, a point to which I turn directly.

In his use of *be . . . -ing* sentences as a test for stativeness of a verb, Vendler had a view of the semantic value of those periphrases which may be summarised in the biconditional in (4), and which I will call **the biconditional view** of *be . . . -ing.*

(4) A *be . . . -ing* sentence is meaningful if that sentence is read as describing a process which is ongoing at utterance time, i.e., as a progressive.

By this biconditional view, *be running, be eating an apple* are fine; but not *be reaching the top, be loving Lucy, be living in Rio.* The latter two occurrences are, of course, fully acceptable, albeit not as progressives strictly, despite the stativity of the main verbs. Vendler could hold the biconditional view because he also held the view that contextually-driven re-interpretation of the state verb as an event verb made such sentences acceptable. This is the main idea behind coercion. The biconditional view and the idea of re-interpretation are key ingredients in the analysis of aspect. Thus, technicalities apart, existing aspectual analysis in linguistics are Vendlerian in an important sense.

Vendler's argument for verb classes remains in general compelling, no doubt. But, at least for linguistic purposes (i.e., inquiring about the content of expressions, instead of assuming it) I think it is fair to claim that his view on the value of *be . . . -ing* periphrases was far from being the only alternative. It is perfectly plausible to drop the **biconditional view** for the more descriptive **short interval** view.

(5) A *be . . . -ing* sentence is meaningful iff it is read as pertaining to an interval which is short in relation to its simple present counterpart; if the main verb is either an accomplishment or an achievement, than the sentence may also be read as a progressive.

If we adopt this view we predict that the following sentences hold in a sub-interval of where their present simple counter-parts hold, which seems adequate. Notice, that we, as of yet, say nothing about the oddity that many native speakers will see in *knowing the answer.* But on the other hand, we do not have to make special provisions for accepting *loving only her pet canary* etc.

(6) a. John is knowing the answer to that question/to our problems.
b. Mary is loving only her pet canary.
c. Wait for Rick, he is finding his watch.
d. I am seeing the monitor but not the mouse from here.
e. John is crossing Oak st. to get home from work, not Pine st.
f. He has lost weight because he is working out

The short interval view allows one to remain open about the semantic value of *be . . . -ing.* This has a welcome empirical cross-linguistic consequence. In languages such as Brazilian Portuguese where stative verbs occur freely in *be . . . -ing* form, the short interval view will have the advantage of not throwing doubt on the existence of verbal classes. Since in such languages there is no restriction on sentences such as *John is liking this play,* by using the biconditional view along with coercion the argument for distinguishing events from states becomes circular. We arrive at the conclusion that there is coercion in that sentence because *like* is a stative verb which, as such, cannot be in progress. (But) We arrive at the conclusion like is a stative because the *be . . . -ing* is semantically progressive and thus must have undergone coercion. I will get back to this point.

I propose that the short-interval view can be implemented in a framework along the lines of Blutner (2000). By giving *be . . . -ing* periphrases an analysis in which they denote short intervals the readings for the sentences arise from the bidirectional interplay of semantic and pragmatic material. In such a setting we may simply take the semantic content of *be . . . -ing* periphrases to be:

(7) BE-INGφ is true at t iff there is an event within the boundaries of t and t is a proper subpart of an interval t' such that φ is true at t'.

Notice that this definition is not reportive. The event holds within a certain interval, which leaves open the possibility of other similar events within that interval and there is no requirement that the event of which BE-INGφ holds be concomitant to utterance time. In other words, the definition is not committed to there the existence of a single event nor to a series of them. Notice also that the question of why we can conclude that *Mary has run* if we know that *Mary is running,* but not that *Mary has eaten an apple* if we know that *Mary is eating an apple* has not been answered. The existing solutions to the paradoxes can plausibly be recast into this approach, though I cannot get into the details here.

As stated in the short interval view, progressive reading only arises when the arguments of the verb are definite descriptions or proper names. Thus, the set of sentences below are predicted not to have progressive reading in English. The same goes for Brazilian Portuguese counterparts with the bare singulars.

(8) a. Dogs are barking.
b. Carnivores are becoming extinct.
c. Ten-year olds are knowing the answer to that question.

An important point to notice is that, while a sentence like *Dogs are barking* does not have a reading saying that the dog kind is barking at the utterance time, in it can be read as *There are dogs barking* if the existence of the event is given where the sentence is uttered. For example, if the conversational agents can hear the barking. Thus, I will sometimes refer to that reading as the weak progressive. Consider now these sentences with definite description arguments.

(9) a. The dogs are barking.
b. The carnivores are becoming extinct.
c. The ten-year olds are knowing the answer to that question.

As definite descriptions the arguments here carry a presupposition of maximality and salience. Suppose *the dogs* in (9a) triggers a presupposition which is satisfied such that it commits the speaker to the presence of the dogs at the situation of utterance. And that concomitance of the event and the utterance time is available also to the hearer either because (s)he witnesses it or because the speaker's utterance, by its intonation for example, gives away such commitment. In such cases, the hearer will verify that (9a) is true at utterance time, and will thus interpret it as a progressive. Now suppose that *the dog* has its maximality and salience presupposition requirements satisfied in some other way which does not permit the hearer to conclude truth at utterance time of the purported event. In such a case the habitual interpretation will be preferred. The behaviour of *be . . . -ing* periphrases in those cases is uniform for the languages in (1). It suggests that the licencing of progressive depends on the event being evidenced at utterance time. Also,

the strategy used for the (9a) sentence predicts that (9b) and (9c) are ungrammatical with the progressive reading, as required. That the presupposition of the definite description is satisfied in a way that permits evidentialiy is a necessary, but not sufficient, requirement for the progressive reading to arise. Since the predicates in (9b) and (9c) are respectively kind-level and state, evidentiality of the event is not an option, nor is the progressive reading.

With respect to verb classes, it seems that by considering progressive as licenced by the filling of requisites for commitment to truth at utterance time (i.e, evidentiality) and by adopting the short interval view, we can take out the circularity of be-ing when used as a test for stativeness. The strategy would be to identify as statives those verbs that in *be . . . -ing* form are read only as pertaining to a short interval with respect to present simple.

2 The *be . . . -ing* periphrases in OTS

Blutner (2000) argues for an optimality-theoretic framework which captures Gricean maxims and balances informativeness and efficiency in natural language processing. Gricean maxims are formulated as the I-principle (Say no more than you must (given Q)), which is the speaker's perspective of comparing different syntactic expressions to convey the meaning intended; and the Q-principle (Say as much as you can (given I)), the hearer's perspective which compares alternative syntactic candidates for a certain meaning and acts as a blocking mechanism. The principles are a metric for optimality and appear as the constraints Avoid Accommodation and Be Strong. Where Be Strong captures the speaker's goal of being informative, and strength is based on entailment relations. Avoid Accommodation counterbalances that tendency. With Blutner's definition (11), the result of optimization under one perspective has influence in structures that compete in the other perspective.

(10) a. *AvoidAccommodation:* The higher the number of discourse markers involved in accommodation, the higher the cost of the expression.
b. *BeStrong:* Evaluate form, context pairs $\langle A, \tau \rangle$ higher according to the strength of τ.
c. Constraint ranking: *AvoidAccommodation* $\gg$ *BeStrong*.

(11) a. $\langle A, \tau \rangle$ satisfies the Q-principle iff $\langle A, \tau \rangle \in$ **Generator**, and there is no other pair $\langle A', \tau \rangle$ *satisfying the I-principle* such that $\langle A', \tau \rangle$ is less costly than $\langle A, \tau \rangle$;
b. $\langle A, \tau \rangle$ satisfies the I-principle iff $\langle A, \tau \rangle \in$ **Generator**, and there is no other pair $\langle A', \tau \rangle$ *satisfying the Q-principle* such that $\langle A', \tau \rangle$ is less costly than $\langle A, \tau \rangle$;
c. $\langle A, \tau \rangle$ is called **super-optimal** iff it satisfies both the Q-principle and the I-principle.

With the semantics proposed for *be . . . -ing* in (7), the OTS framework can account for how the habitual and progressive values arise. Suppose the sentence *The dog is barking* is uttered in a scenario where both speaker and herear are committed to the truth of the barking event because they hear it, for example. The preferred reading for the sentence is the progressive one in this case. That is reflected in the tableau below, where the hand '☞' indicates optimality in the production perspective and the arrow '➡' indicates

optimality from the comprehension perspective.

forms		Avoid A	Be Strong		Avoid A	Be Strong
The dog barks	☞➡					*
The dog is barking		*	*	☞➡		
Interpretation		Habitual			Progressive	

By hypothesis, the progressive value requires evidential identification of the event, thus the background must have information about its simultaneity to utterance time. With that in mind, suppose the speaker wants to convey the progressive. Since *The dog is barking* entails *The dog barks,* the former ranks higher with respect to *BeStrong.* The hearer prefers the progressive interpretation since the habitual one would require assuming that the event at the utterance time was not the one talked about, which makes it more costly with respect to *AvoidAccomodation.* Suppose in this scenario the speaker wants to convey habituality. Knowing the entailment pattern mentioned between the sentences, (s)he will choose the present simple which is stronger, given his/her communicative aim. The hearer will prefer the habitual value for *The dog barks,* because by the definition of weak optimality, all things being equal with *AvoidAccomodation,* it ranks higher with *BeStrong.* There being no particular pragmatic requirement for habituals, that concomitance to utterance time is given by pragmatic evidence has no effect on the conditions for obtaining the habitual interpretation, thus *The dog barks* fares equally well with both interpretations with respect to *AvoidAccomodation.*

3 Imperfective tenses

I will close with a general remark of how the strategy for *be . . . -ing* can be extended to account for imperfective tenses. Present tense *be . . . -ing* periphrases convey the notion of progressive as concomitance of the event to the utterance time. That notion can be generalised to other tenses if formulated as concomitance to the reference time. Thus we should expect not only concomitance to utterance time, but rather concomitance to reference time in general, to be a byproduct of evidentiality of the event which needs the presuppositions associated with definite descriptions to be licenced. Since imperfective tenses of Romance tipically convey overlap with reference time, we should expect that the lines argued for *be . . . -ing* hold also for those tenses. I will focus on French *imparfait* and its counterpart in Brazilian Portuguese *imperfeito,* and argue that those lines can pausibly deal with differences between them. Consider the following sets of sentences.

(12) a. Quand Marie arriva, Jean fumait.
when Marie arrived-PS Jean smoked-IMPF
'When Marie arrived, Jean was smoking.'

b. Quand Marie arriva, les garçons fumaient.
when Marie arrived-PS the-PLU boys smoked-IMPF
'When Marie arrived, the boys were smoking.'

c. ?Quand Marie arriva, des garçons fumaient.
when Marie arrived-PS some boys smoked-IMPF
'When Marie arrived some boys were smoking.'

(13) a. Quando a Maria chegou, o João fumava.
when the Maria arrived-PS the João smoked-IMPF
'When Maria arrived, John used to smoke.'

b. Quando a Maria chegou o João estava fumando .
when the Maria arrived-PS the João was-IMPF smoking
'When Maria arrived, John was smoking.'

c. ??Quando a Maria chegou, menino fumava.
when the Maria arrived-PS boy smoked-IMPF
'When Maria arrived boys used to smoke'

d. ??Quando a Maria chegou, menino estava fumando.
when the Maria arrived-PS boy was-IMPF smoking
'When Maria arrived there were boys smoking/boys used to smoke'

As desired, by interpreting the state denoted by *imparfait* as necessarily continuous with the event of the *when*-clause in (12a), the arrival overlaps with either the state of 'John being puffing away at a cigarette' or 'John being a smoker'. However, the reading 'John being puffing away at a cigarette' is disprefered for (13a). In Brazilian Portuguese for both readings to be possible, the imperfective tense must be in *be . . . -ing* form, as in (13b). This difference can be accounted for by the short-interval analysis of *be . . . -ing* and the lack of a grammaticalised *be . . . -ing* periphrases in French. Brazilian Portuguese allows bare singular arguments which, roughly, denote kinds. With such arguments the *imperfeito* sentences (13c) and (13d) are odd weak progressives in out-of-the-blue contexts. If one is forced to interpret (13c), it is acceptable contrastively as saying that some grouping of boys (but not of girls) used to smoke, likewise for (13d). But the weak progressive reading of (13d) remains odd even when read contrastively. The conclusion is that the absence of the definite description worsens the concomitance to utterance time reading in Brazilian Portuguese. The French counter-part to those sentences (12c) requires the partitive *des* and the absence of the definite article. With the *passé simple* *when*-clause, the *imparfait* is odd with the weak concomitance to reference time reading as with the habitual reading. Thus, in French, the absence of the definite descriptions worsens both readings. That the role of pragmatics in licencing the concomitance to utterance time reading. Since the presuppositions of definite descriptions are necessary but not sufficient for licencing the concomitance to utterance time reading, it is natural to assume that they are necessary also to licence the habitual reading of the imperfective tenses. If so, that the habitual reading is also worsened in French can be explained by the obligatory partitive *des* blocking one of the requirements of habitual readings, namely that of maximality. On the other hand, in Brazilian Portuguese since bare nouns are accepted nothing blocks maximality and the habitual interpretation remains available. Thus, exploring the independent and overt differences between the two languages may afford a unified explanation for their similar tenses under the hypothesis that the notion of concomitance to utterance time is arrived at pragmatically.

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Structuring aspectual and temporal relations with two Hebrew adverbials, and the semantics/pragmatics of *still*

Yael Greenberg
Bar Ilan University

0 Introduction

Yitzhaki (2003) discusses two Hebrew particles which intuitively correspond to the English particle *while,* namely *be-* (literally 'in', as in (1)) and *beodo* (literally 'while-he', as in (2)). In both cases the non-tensed adjunct clauses get their tense marking from the matrix:

(1) be-[xacoto et ha-kviS]$_{\text{adjunct}}$ [pag'a bo mexonit]$_{\text{matrix}}$
in-cross-he ACC. the road hit him car

(2) beod[o xoce et ha-kviS]$_{\text{adjunct}}$ [pag'a bo mexonit]$_{\text{matrix}}$
while-he cross ACC. the road hit him car
Both: 'While he was crossing the road a car hit him'

Yitzhaki proposes an equivalent semantics for *be-* and *beodo* where in both the temporal location of the matrix event (e.g., crossing the road) interrupts / is located within the interval where the adjunct event (e.g. being hit by a car) holds.

In this paper I argue that despite the apparent similarity between the two constructions, exemplified in (1) and (2) their semantics is different. I start in section 1 by pointing out three differences between *be-* and *beodo.* In section 2 I give a brief semantics for *be-* in terms of temporal coincidence. And in section 3, the main part of the paper, I claim that the semantics of *beodo* is composed of that of *be-* (temporal coincidence) plus the semantics/pragmatics of *odo* — an inflected form of the Hebrew word for *still (od/adayin).* I develop an analysis of *odo/still* which is based on both traditional claims about the assertion and presuppositions of sentences with *still,* as well as on some novel claims. Specifically I propose that (a) The reference time of sentences with *still/odo* must be salient/anaphoric (The 'reference time anaphoricity requirement'), and (b) that this 'anaphoricity requirement' is a conversationally triggered presupposition.

1 The data: Three differences between *be-* and *beodo*

Whereas *beodo* can only express temporal inclusion between the matrix and the adjunct interval (i.e., $i_m \subset i_a$), *be-* can express a wider range of temporal relations, namely temporal inclusion, reverse inclusion and temporal identity ($i_m \subset i_a$, $i_a \subset i_m$ and $i_a = i_m$, respectively). For example, the *beodo* version of (3) can only mean that not feeling well is temporally included in writing the paper, whereas the *be-* version can also mean that writing the paper was temporally included in not feeling well, or that the two events have exactly the same temporal locations:

(3) beodo kotev / be-kotvo et ha-maamar hirgiS dani lo tov
while-he write / in-write-he ACC. the-paper felt Danny not good
'Writing the paper Danny didn't feel well'

In addition, the adjective *ca'ir* 'young' is fine in the adjunct of both *be-* and *beodo* (see (4)) whereas *mevugar* 'old' is bad with *beodo* but fine with *be-* (see (5)):

(4) be-heyoto / be-odo ca'ir, haya dani populari meod
in-he-be / while-he young, was Danny popular very
'Being young, Danny was very popular'

(5) be-heyoto / ??beodo mevugar hirvi'ax dani harbe kesef
in-he-be / while-he old, earned Danny lots-of money
'Being old, Danny earned lots of money'

Finally, as seen in (6), *be-,* but not *beodo* adjuncts can restrict adverbial quantifiers:

(6) be-holxo / ??beodo holex la-'avoda, ro'e dani lif'amim et ha-ganan
in-he-go / while-he go to-the-work, see Danny sometimes ACC. the-gardener
'Going to work, Danny sometimes sees the gardener'

2 The semantics of *be-*

Despite the range of temporal relations with *be-,* I suggest that *be-*$[p_a]$,$[q_m]$ uniformly asserts that i_a temporally coincides with i_m, written as $i_a >< i_m$ (see Stump 1985; Bonomi 1997 semantics for *when*), and defined as in (7). The *be-* version of (3), for example, has the truth conditions in (8), according to which there is a past time where Danny wrote the paper, and a past time where he didn't feel well, and the two time intervals coincide — they have a nonempty intersection:

(7) $i_a >< i_m$ holds iff $i_a \cap i_m \neq \emptyset$ (i.e., iff i_a and i_m have a nonempty intersection)

(8) $\exists e_1, t_1, e_2, t_2[\text{write}(e_1, \text{dani}, \text{the paper}) \wedge t_1 < t_c \wedge \text{at}(e_1, t_1)] \wedge [\neg\text{feel well}(e_2, \text{dani}) \wedge t_2 < t_c \wedge \text{at}(e_2, t_2)] \wedge t_1 >< t_2]$.

Temporal coincidence is flexible enough to cover temporal inclusion, reversed temporal inclusion and temporal identity. The fact that (1) above expresses only temporal inclusion can be attributed to the well known fact, reported also for *when*-clauses, the progressive and the perfect, that achievements (like car hitting) are taken to be temporally included in accomplishments (like crossing the road).

3 The semantics of *beodo*

3.1 A *still*-based analysis of *beodo*

The proposal I would like to make is that unlike *be-, beodo* is not a simple word. Rather it is composed of *be-* plus *odo,* where *be-* expresses temporal coincidence (as just defined above) and *odo* is the inflected form of the Hebrew *od/adayin* 'still', seen in (9):

(9) dani odo / adayin yaSen
Danny still-he / still asleep
'Danny is still asleep'

Thus *beodo* p, q is reanalyzed as *be-odo* p, q, i.e., *be- still* p, q, and roughly asserts that the temporal location of *odo p (still-p)* coincides with the temporal location of q.

As initial evidence for this proposal notice that adding an explicit *adayin* 'still' to *be-* and *beodo,* as in (10), is fine in the former case, but in the latter it sounds odd and redundant:

(10) be-heyoto / ??be-odo ‘adayin ‘al ha-‘ec Sama dani klavim novxim
in-be-he / in-he-still still on the-tree heard Danny dogs bark
‘Being still in the tree (??when he was still in the tree), Danny heard dogs barking’

To account for the three constraints on *beodo,* reported in section 1, let me start by following previous work on *still,* according to which it has three components: an assertion and two presuppositions. These are summarized in (11) for the example *John is still asleep:*

(11) **Traditional assertions and presuppositions of *John is still asleep***
a. **Assertion:** $\exists e : \text{asleep}(e, \text{Danny}) \wedge \text{at}(e, t_c)$ (i.e., ‘John is asleep at the speech time (t_c), i.e., now’, e.g., Löbner 1989; Mittwoch 1993)
b. **The prior time presupposition:** $\exists t', e : t' \propto t_c \wedge \text{asleep}(e, \text{Danny}) \wedge \text{at}(e, t)$, where $\propto$ stands for the ‘abut’ relation — i.e., ‘John is asleep also at a time prior to (and abuts) the speech time (i.e., before now)’ (e.g., Löbner 1989; Mittwoch 1993; Krifka 2000)
c. **The ‘expected cessation’ presupposition:** ‘It is expected/reasonable that John will stop being asleep at some time after the speech time, i.e., after now’ (e.g., Michaelis 1993)[1]

3.2 Explaining the incompatibility of *beodo* with *mevugar* ‘old’

Assuming that in the *beodo* construction *odo* has the semantics of *still* we can immediately explain the incompatibility of *beodo* with *mevugar* ‘old’, seen in (5) above. The ‘expected cassation’ presupposition of *still* and *odo* is easily met with *ca’ir* ‘young’ (you can expect someone to stop being young), but not with *mevugar* ‘old’ (once someone is old, you do not expect him to stop being old). As (12) shows, we find the same difference with English *still:*

(12) Danny is still young/*old.

3.3 Explaining quantification facts with *still* and *beodo*

Let me start with the observation that quantification with the *beodo* construction has parallel manifestations with *when*-clauses with *still* and *adayin.* Compare, for example (13) with and without *adayin/still:*

(13) kSe-dani (adayin) halax le-beit ha-sefer hu tamid haya meduka
when-Danny (still) went to-house the-book he always was depressed

[1] The ‘expected cessation’ presupposition can be derived as an implicature from Krifka’s (2000) approach to *still* according to which

(a) *still* is focus sensitive and induces a set of alternatives. Specifically it can be associated with the whole sentence. For example, *It is still raining* asserts that ‘It is raining’ and has as its alternative ‘It is not raining’;

(b) the alternatives are aligned to the right with respect to time (i.e., we consider alternatives, e.g., ‘It is not raining’, later than the reference time); and

(c) the implicature that ‘the alternative propositions must be considered reasonable, or entertainable’ (p. 5).

We thus get the fact that that *John is still asleep* implicates that it is reasonable/entertainable that John is not asleep at some later point — namely exactly the ’expected cessation’ implication.

'When Danny (still) went to school, he was always depressed'

Without *adayin/still* (13) is ambiguous between a quantificational reading ('For every event where John went to school there is an event where he was depressed') and a 'temporal background' reading ('In the period where Danny went to school, Danny was depressed in every contextually relevant event/situation'). But crucially, when *adayin/still* are present (13) has the background reading only, and the quantificational reading is lost.

This observation supports an analysis of *beodo* in terms of *still* — neither can restrict adverbial quantification. But why do we get this general constraint on *still* and *odo?*

The reason, I suggest, is that when *still* is present, the reference time of the sentence must be contextually salient or anaphoric. In Heim's (1982) terminology, the reference time of *still p* or *odo p* has to be familiar.[2] I will call this the 'reference time anaphoricity requirement' on *still* and *odo,* and will suggest below that this is what blocks restricting adverbial quantification with *still* and *adayin* (as in (13)) and in the *beodo* construction (as in (6) above).

As a support for the 'reference time anaphoricity requirement' suggestion let us compare first simple past tense sentences with and without *still.* In English simple past tense sentences can be uttered out of the blue, or with no salient past reference time (Kratzer 1998), and can be asserted to hold at an existentially closed time prior to the speech time: a sentence like (14) asserts in the indicated context that $\exists t', e : t' < t_c \wedge$ unemployed(my brother, $e) \wedge \text{at}(t', e)$, i.e., that my brother was unemployed at some past time interval:[3]

(14) (How's your brother?) Well, he was unemployed, (but now he has a job).

But when *still* is present, as in (15) the past tense sentence is bad:

(15) (How's your brother?) Well, he was (# still) unemployed (but now he has a job).

The example in (15), I suggest, is infelicitous because its reference time is novel — it cannot be anaphoric to anything. This is further supported by the existence of four types of *felicitous* sentences with *still* seen in (16–19), where, unlike (15), in all of them the reference time *can* be anaphoric. Each of these sentences uses a different strategy for satisfying the 'anaphoricity requirement'.

The first strategy is having a contextually salient reference time antecedent, as in (16):

(16) (How's your brother ?)Well, he is still unemployed.

a. **Assertion:** $\exists e :$ unemployed(my brother, $e) \wedge \text{at}(e, t_c)$

b. **Presupposition:** $\exists t', e : t' \propto t_c \wedge$ unemployed(my brother, $e) \wedge \text{at}(e, t)$

The sentence in (16) asserts that my brother is unemployed now, and presupposes that he was unemployed also before now. Importantly, the latter information is not necessarily

[2] Ippolito (2004) has already suggested that *still* has an anaphoric, 'familiar', component, but the type of anaphoricity she talks about and the predictions she makes are different from the present ones. Ippolito, for example, is talking about anaphoricity of events. Unlike the predictions in this paper (see below), she predicts that a sentence like *John is still cooking* 'will be felicitous only if the common ground entails that: (a) there is a salient eventuality of cooking by John and (b) the time of this eventuality includes a past time' (p. 6). Below I will follow Ippolito's methodology, however, in illustrating the anaphoricity requirement on *still* by using comparisons from nominal anaphora.

[3] Though this can be thought of as a subinterval of a larger, contextually relevant period, e.g., last year.

present in the common ground, but can be accommodated. The same happens if one hears out of the blue somebody whispering *Be quiet! The baby is still asleep!* Here too the information that the baby was asleep before is easily accommodated. This holds for the presuppositions of (17–19) as well.

What is important in (16) is that the reference time of *He is still unemployed* is indeed familiar — it is anaphoric to the (contextually salient) speech time. The parallel in the nominal domain are cases like *He is really handsome* (pointing to a contextually salient man).

The second strategy is having a referential antecedent, as in (17):

(17) (How's your brother?) Well, last month he was still unemployed, (but now he has a job).
   a. **Assertion:** $\exists e : \text{unemployed}(\text{my brother}, e) \wedge \text{at}(e, t) \wedge t = \text{month before } t_c$
   b. **Presupposition:** $\exists t', e : t' \propto \text{last month} \wedge \text{unemployed}(\text{my brother}, e) \wedge \text{at}(e, t')$

The sentence in (17) asserts that my brother was unemployed last month and presupposes that he was unemployed also before last month. Here too the reference time of *He was still unemployed* is anaphoric — this time to the explicitly mentioned reference time of the sentence (last month). The parallel in the nominal domain are cases like *John$_i$ came in. He$_i$ sat on the chair.*

The third strategy is having an existentially closed antecedent, as in (18):

(18) John knocked on the door. I was still undressed, so I told him to wait.
   a. **Assertion:** $\exists e_1, e_2, t : \text{knock}(\text{john}, e_1)\text{at}(e_1) \wedge t < t_c\text{undressed}(\text{me}, e_2) \wedge \text{at}(e_2, t)$
   b. **Presupposition:** $\exists t', e : t' \propto t \wedge \text{undressed}(\text{me}, e) \wedge \text{at}(e, t')$

The sentence in (18) asserts that John knocked on the door at some past time t, and that I was undressed at that time t and presupposes that I was undressed also before that time. The anaphoricity requirement is met since the reference time of *I was still undressed* is anaphoric to the existentially closed reference time of the previous sentence. The parallel in the nominal domain are cases like *A man$_i$ came in. He$_i$ sat on the chair,* where the pronoun refers to an existentially closed indefinite.

Finally, the anaphoricity requirement can be met by having a quantified-over antecedent. This happens when *still* appears in the scope of a quantificational structure, as in (19):

(19) Whenever I came to pick up John from school, he was still eating.
   a. **Assertion:** $\forall e_1, t[\text{came to pick-up j}(\text{me}, e) \wedge t < t_c \wedge \text{at}(e_1, t)] \rightarrow \exists e_2[\text{eating}(\text{j}, e_2) \wedge \text{at}(e_2, t)]$
   b. **Presupposition:** $\exists t', e : t' \propto t \wedge \text{eating}(\text{j}, e) \wedge \text{at}(e, t')$

The sentence in (19) asserts that for every event in every past time t where I come to pick up John, there is an event where John is eating at *that past time t*, and presupposes that John is eating also before the time I come to pick him up. The reference time of *He was still eating* in the scope is anaphoric to the reference time of *I come to pick him up* in the restriction. The parallel in the nominal domain are donkey sentences like *When John owns a donkey$_i$, he always beats it$_i$.*

In contrast to these strategies, *still* clauses are bad when their reference time cannot be anaphoric, as in the past tense (15) above, and crucially, also when *still* appears in the restriction (rather than the scope) of a quantificational structure, as in (20):

(20) # Whenever John was still eating I came to pick him up from school.

a. **Assertion:** $\forall e_1, t[\text{eating}(\text{j}, e) \wedge \text{at}(e_1, t)] \rightarrow$
$\exists e_2[\text{came to pick-up j}(\text{me}, e_2) \wedge \text{at}(e_2, t)]$

b. **Presupposition:** $\exists t', e : t' \propto t \wedge \text{eating}(\text{j}, e) \wedge \text{at}(e, t')$

Here the reference time of *John was still eating is novel* has no antecedent. Crucially, it cannot be anaphoric to the time variable (t) in the scope *(I come to pick him up)* because not only the scope appears linearly after the restriction, it is also inaccessible to it. The parallel in the nominal domain are things like *# When John owns it, he always beats it/a donkey.*

We can now turn back to the *beodo* construction. We claimed above that *odo* has the semantics of *still,* and that *still* cannot appear in the restriction of a quantificational structure, since the anaphoricity requirement on *still p* cannot be met there. This immediately explains why *beodo* cannot restrict quantification. Here too the reference time cannot be anaphoric.

3.4 Explaining temporal inclusion with *beodo*

In section 1 above we showed that *beodo* constructions express only temporal inclusion. I suggest that this is caused by the combination of the 'prior time' presupposition on *odo,* plus the 'anaphoric reference time' requirement on *odo,* argued for in the previous section.

Notice, however, that there is an apparent problem with assuming the anaphoricity requirement on *odo.* Unlike the good sentences with *still* before, in (16–19), in *be-odo p, q (be-still p, q) odo p* does not seem to have any anteceding reference time — explicit, contextually salient or quantified — before it. Why is *be-odo p, q (be-still p, q)* felicitous, then?

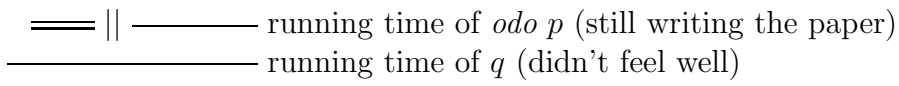
The answer, I suggest, is that *beodo* uses another strategy for satisfying the 'anaphoricity requirement', namely backward anaphora, manifested in the nominal domain by sentences like *When he_i saw me, $John_i$ was really surprised.* In such sentences the reference of the pronoun in the adjunct is anaphoric to that of the linearly later noun in the matrix. Similarly, I suggest, with the *beodo* sentences (as in (21)) the reference time of the adjunct (writing the paper) is anaphoric to the linearly later reference time of the matrix (not feeling well):

(21) be-odo kotev et ha-ma'amar hirgiS dani lo tov
in-still-he write ACC. the-paper felt Danny not well
'When he was still writing the paper Danny didn't feel well'

In (21) p (writing the paper) is required to have the same temporal location as q (not feeling well) due to the anaphoricity on *odo p.* In addition, p is presupposed to be temporally located also before q (due to the 'prior time presupposition' on *odo p*). Thus we necessarily get temporal inclusion, as can be seen in (22) (assertion: ——, presupposition: ═══):

(22) ═══ || ———— running time of *odo p* (still writing the paper)
———— running time of q (didn't feel well)

Notice that using the traditional definition of *still* cannot guarantee inclusion. If *odo p* is not required to be temporally anaphoric to q, the assertion and presupposition of (21) can be easily met as in (23), with no inclusion:

(23)


But in reality inclusion *is* expressed by the *beodo* construction (this is what gives it its *while*-like nature, observed by Yitzhaki 2003). This indicates that anaphoricity, which guarantees inclusion, is indeed an integral part of the semantics of *odo.*

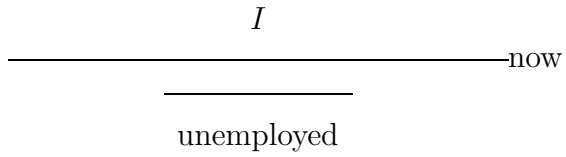
3.5 Status and triggering 'anaphoricity' requirement

The anaphoricity requirement on *still* survives in (24a–24c):

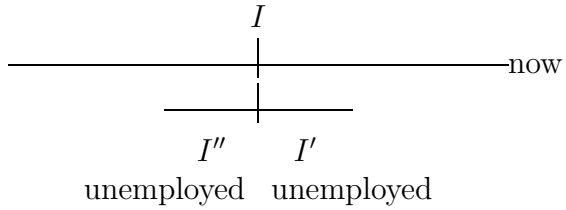
(24) a. Was John still asleep?
b. It's possible that John was still asleep.
c. If John was still asleep, his mother was angry at him.

All of these sentences are very odd when no contextually salient time is present in the common ground. The anaphoricity requirement, then, seems to be a presupposition. But if it is indeed the case, what triggers it?

I suggest that without the anaphoricity requirement, the 'prior time' presupposition of *still p* may be trivially met. Suppose, for example that all you know is that John was unemployed, i.e., that there is some past interval (I) where *John is unemployed* is true. This is schematically illustrated in (25):

(25)


But given (25) one can automatically infer also that (a) there is a subinterval of I, I' where John was unemployed (the assertion of *John is still unemployed*), and (b) that there is another subinterval of I, I'', such that $I'' \propto I'$ where John was unemployed as well, (the presupposition of *John is still unemployed*), as shown in (26):

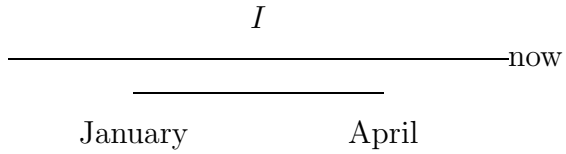
(26)


Thus, given the traditional definition of *still,* the paradoxical result is that once you know that *John was unemployed* is true (in (25)), you can automatically infer that *John was still unemployed* is true (in (26)), since both the assertion and the 'prior time presupposition' of this sentence are met in (26). The 'prior time presupposition', then, is trivially met. But this presupposition is the main contribution of *still* to the sentence (remember: the assertion of *still p* is just like that of p). If it is trivially met then using *still* is unjustified — it is vacuous.

In contrast, if we require that the reference time be identified with another reference time — i.e., anaphoric — the presupposition cannot be trivially met. Suppose it is known

that John was unemployed at some salient time interval in the past, e.g., between January and April, as in (27):

(27)



If we want to utter now *Between January and April John was still unemployed* there should be a time prior to January (and abuts it) where John was unemployed as well. Unlike the previous case, the information about such a prior time cannot be inferred on the basis of (27) — it has to exist in the common ground, or to be accommodated by the listener. Hence, the use of *still* is not trivial, not vacuous, and is thus justified.

We can thus say that the anaphoricity requirement on *still p/odo p* is some sort of conversational presupposition. It is triggered by the need to ensure that the 'prior time presupposition' of *odo p/still p* — i.e., its semantic presupposition — is not trivially met.

4 Conclusion

In this paper I argued that the semantics of the *beodo* construction in Hebrew is composed of that of *be-,* which asserts temporal coincidence, and *odo,* which is the inflected form of *still* in Hebrew. To account for the full range of facts about *beodo* I used both traditional, as well as novel claims about the semantics and pragmatics of *still,* and motivated the latter by comparing felicitous and infelicitous sentences with *still.* The resulting semantics/pragmatics of *still* and *odo* is now summarized in (28):

(28) **Summary of the semantics/pragmatics of *odo* *p*/*still* *p***

a. **Assertion:** p holds at reference time t

b. **'Prior time presupposition'** (semantic/conventional): p holds before t (and abuts t)

c. **'Anaphoricity presupposition'** (pragmatic/conversational): t is anaphoric to another reference time/familiar

d. **Expected cessation presupposition/implicature:** p is expected to cease after t.

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Information structure and aspectual competition

Atle Grønn
University of Oslo

0 Introduction

The imperfective aspect in Russian competes with the perfective in referring to events whose existence is entailed by the input context. In the first, major part of the paper (sections 1–5) I take a global view on aspectual competition, which is analyzed in light of various pragmatic constraints. It is shown in a bidirectional optimization how the default/ unmarked imperfective in the appropriate context gets a presuppositional interpretation. Then, in the second part of the paper, I turn to the issue of how this presuppositional reading can be accounted for locally (compositionally) at the syntax-semantics interface, without assuming a proliferation of imperfective operators.

1 Aspectual competition

One of the main puzzles of the aspectual system in Russian is the fact that the unmarked imperfective aspect (Ipf) is compatible with complete event interpretations — known in Slavic linguistics as the 'factual Ipf' (Grønn 2004) — despite the strong competition from the perfective (Pf), which represents a grammaticalization of this aspectual configuration.

A standard, compositional DRT-analysis of aspectual operators gives us the following semantics for both the Pf and the factual Ipf:

$$\text{Pf (and the factual Ipf)} \Rightarrow \lambda P \lambda t[e \mid P(e), e \subseteq t]$$

Aspects convert predicates of events into predicates of times, and here they convey the information that the event e described by the VP is included in the assertion time t.[1] An example is given below:

(1) A: Krasivo **ukrasili**$^{\text{Pf}}$ elku.
'They **decorated** the Christmas tree beautifully.'
B: Kto **ukrašal**$^{\text{Ipf}}$?
'Who **decorated** it?'

But why does speaker A choose the Pf, while speaker B prefers the Ipf in referring to the same complete event of decorating the Christmas tree? The aspectual pattern in discourse (1) appears to display synonymy (from the hearer's interpretation perspective) and optionality (from the speaker's production perspective) — not a very attractive situation from the linguist's perspective. In order to appreciate the problem and locate it in the global picture of Russian aspect, I propose to have a look at Blutner's bidirectional optimality theory (BOT), which has shed light and formal precision on various phenomena at the semantics-pragmatics interface.

[1] The value of the Reichenbachian assertion time t is provided by the 'tense branch' above aspect, which contains tenses and temporal adverbials.

2 Blocking of the factual Ipf in BOT

What are the relevant form-meaning pairs? We need only consider two forms, $F = \{\text{Pf}, \text{Ipf}\}$, and I assume the following inventory of M, a set of partial state descriptions which for convenience are represented as the familiar aspectual configurations: $\{e \subseteq t, t \subseteq e\}$. This is to say that the interpretation of the aspects is reduced to two opposite inclusion relations — a complete event interpretation $e \subseteq t$ and the incomplete/processual/progressive event interpretation $t \subseteq e$. According to the standard view on Russian aspect, the Pf grammatically encodes the complete event configuration, while the meaning of the Ipf is underspecified and compatible with both inclusion relations above. This gives us the following set of form-meaning pairs, generated by the OT-function GEN:

$$\text{GEN} = F \times M \setminus \{\langle \text{Pf}, t \subseteq e \rangle\}$$

Another crucial feature of OT is the use of ranked and violable constraints. In the bidirectional version adopted in this paper focus is on Economy — the mother of all pragmatic constraints — which will be interpreted in terms of **conditional informativity** (Blutner 1998).[2] This allows for a formally precise implementation of the Gricean idea that the best form-meaning pairs are the ones which minimize both the speaker's and hearer's effort (whose interests are, in a sense, conflicting). The competition perspective tells us that a pair $\langle f, m \rangle$ wins the contest if it is less costly '$<$', i.e., more economic, than the alternative candidates. When the probability of meaning m given the form f is 1, the 'surprise' value of $\langle f, m \rangle$ equals zero — and this pair is most economic. At the opposite end of the scale, if the probability of m given f is zero, then the surprise that $\langle f, m \rangle$ holds is infinitely high, and the pair is ruled out.

The more interesting cases are the ones in between these two extremities. Being semantically underspecified, the form Ipf participates in such pairs. Accordingly, a straightforward application of (strong) bidirectionality can show us why the processual/progressive reading is considered the *Hauptbedeutung* of the Ipf, cf. tableau 1.[3]

inf(m/f)	Pf	Ipf
$e \subseteq t$	$\Rightarrow 0$	1
$t \subseteq e$	∞	$\Rightarrow 1$

Table 1: A bidirectional OT-tableau for Russian aspect

The underspecified semantics of the Ipf is equally compatible with both inclusion relations, but the complete event interpretation is blocked by the strongly optimal pair $\langle \text{Pf}, e \subseteq t \rangle$. It is difficult to see how the pair $\langle \text{Ipf}, e \subseteq t \rangle$ can survive in this system. And, indeed, I will claim that the following theorem comes out in (strong/weak) BOT:

Theorem 1

[2] See also Sæbø's contribution to this volume.

[3] The OT-tableau is based on the assumption that complete and incomplete event interpretations are equally probable for Ipf. The numbers in the tableau then follow from the function *inf*, which is inversely related to probability: $inf(m/f) = \frac{1}{\text{Prob(m/f)}} - 1$. In OT-pragmatics, for instance in the original paper (Blutner 1998) and several recent papers by Sæbø, the authors make use of a similar graph obtained from a logarithmic function which exhibits certain additional mathematical properties. For the purposes of formalization of natural language pragmatics, the simpler function above appears to be good enough.

A complete event interpretation $e \subseteq t$ is not available for the Ipf whenever a progressive/processual interpretation $t \subseteq e$ is possible.

3 An illustration of blocking

The generalization stated in theorem 1 explains a puzzle raised by examples like the following:

(2) Kogda pozvonil$^{\text{Pf}}$ Boris Georgievič, my s Iroj **gotovili**$^{\text{Ipf}}$ dokumenty.
'When Boris Georgievič called, Ira and I **were preparing** (*not available reading:* had prepared) the documents.'

Given a standard analysis of the temporal system in Russian (Grønn to appear), temporal *kogda/when*-clauses are expected to be compatible with two interpretations of an imperfective past in the main clause: a simple past or a relative past. In our case, the simple past would correspond to a progressive interpretation of the event e of preparing the documents — 'the past time interval of B.G.'s calling $\subseteq e$' — while a relative past would produce the following interpretation of the utterance: '$e \subseteq$ the whole past of B.G.'s calling'. Thus, the value of the assertion time t provided by the *kogda/when*-clause is underspecified, which in turn creates an ambiguity in the aspectual relation. However, the OT-argument correctly predicts that the progressive interpretation is the only one available, $\langle \text{Ipf}, t \subseteq e \rangle$ being the winner. Hence, in order to express a relative past reading with a complete event interpretation in constructions like (2), the Pf must be used. Previous accounts, notably Paslawska & von Stechow (2003), got the description of the facts right, but failed to explain the restrictions on the use of the Ipf in this environment.

4 The return of the factual Ipf

In light of the considerations above, one still wonders why the factual Ipf is acceptable in (1) — and also in (3) and (4) below.

(3) Vanja **čital**$^{\text{Ipf}}$ 'Vojnu i mir'.
'Vanja **has read** 'War and Peace'.'

(4) V ėtoj porternoj ja **napisal**$^{\text{Pf}}$ pervoe ljubovnoe pis'mo. **Pisal**$^{\text{Ipf}}$ [karandašom]$_{\text{F}}$.
'In this tavern, I **wrote** my first love letter. I **wrote** it [in pencil]$_{\text{F}}$.

The reason why tableau 1 in section 2 fails to capture aspectual competition and the emergence of the factual Ipf is the lack of context sensitivity. I propose to repair this by incorporating the speaker and hearer's common ground (CG) into the OT-reasoning, thereby adding a third dimension to the two-dimensional BOT-architecture.

In this paper, I will only consider the kind of aspectual competition which is illustrated in (1) and (4) — the simplest case from the point of view of modeling CG. In previous work, I referred to this usage of the factual Ipf as the "presuppositional Ipf". It is characterized by a deaccentuated verb, representing given/backgrounded material, while focus is on some other constituent, as indicated through the F(ocus)-marking in (4). Following the DRT-treatment of presuppositions as anaphora (van der Sandt 1992), presuppositional Ipf can (and should) be analyzed as an instance of event anaphora.

Obviously, the two viewpoint operators are equally informative in the input context for the second utterance in (4). In order to decide between the two competitors, an additional parameter is needed. In OT, a distinction is often drawn between informational and structural markedness. The latter is incorporated into the definition of conditional

informativity in Blutner (1998) through a function called "complexity of form". However, if this structural constraint merely amounts to counting the number of syllables, it cannot be used to separate the Ipf from the Pf. In Russian, imperfective verbs come in two variants: simplex verbs (e.g., *pisal* in (4)) and derived, secondary imperfectives (e.g., *ukrašal* in (1)), with the following ranking in terms of complexity:

$$\text{Simplex Ipf} < \text{Pf} < \text{Secondary Ipf}.$$

Despite these structural differences, secondary imperfectives are perceived of as just as "unmarked" as the simplex verbs, being used in exactly the same environments.

In this respect, one should bear in mind the fact that every verb in Russian is obligatorily marked for aspect, even when the issue of aspectual competition or opposition is not on the speaker's agenda (e.g., with statives, in present tense etc.). Importantly, the Ipf is used as the *default form* in these cases. Accordingly, I propose to include in the definition of conditional informativity a "tie-break" function **defaultness,** which penalizes the Pf for being a non-default by mapping the Pf to 0.1 and the Ipf to 0. Thus, everything else being equal, the Ipf is the winner, minimizing the speaker's effort.

Conditional informativity:

$$inf(m/f) =_{\text{def}} \text{defaultness}(f) + (\frac{1}{\text{Prob(m/f)}} - 1)$$

The preference for the Ipf in examples such as (1) and (4) is thereby based on the BOT-tableau 2, where CG entails the complete event in question.[4]

$inf(m/f); \text{CG} \models e \subseteq t$	Pf	Ipf
$e \subseteq t$	0.1	$\Rightarrow 0$
$t \subseteq e$	∞	∞

Table 2: A context-sensitive OT-tableau for Russian aspect with the 'presuppositional Ipf' as the winner

5 Division of labor: Presuppositional Ipf vs. assertoric Pf

Indeed, intuitively, there is no reason for marking the event as completed through the Pf when this feature is inferable from the context. But in what sense is the Ipf a true "presupposition trigger"? My claim is that the presuppositional status accorded to the Ipf follows from two independent principles: the defaultness of the Ipf and a soft OT-constraint such as DOAP ("Don't Overlook Anaphoric Possibilities.").[5] Hence, although there is nothing inherently "presuppositional" about the Ipf, it acquires — in the right context — this additional reading.

[4] The constraint on consistency with the input context could also be treated as part of GEN itself (Blutner & Zeevat 2004), in which case GEN equals $\{\langle \text{Pf}, e \subseteq t\rangle, \langle \text{Ipf}, e \subseteq t\rangle\}$. Consistency cannot be outranked by Economy in the same way as Gricean quality maxims are a prerequisite for the quantity maxims.

[5] Due to the close relationship between presuppositions and anaphora (van der Sandt 1992), the relevant constraint could presumably also be formulated as "Maximize presuppositions".

Due to a general tendency of polarization, the division of pragmatic labor ensures that the Pf is associated with assertoric content. In actual language use, speakers are often redundant, and we should not be too surprised to find the Pf in contexts where an eventive presupposition is licensed. Russian-speaking informants will often accept to substitute the Pf for the presuppositional Ipf, e.g., the alternative *ukrasil*$^{\text{Pf}}$ is not completely excluded in speaker B's utterance in discourse (1). But by choosing the Pf in this environment, the speaker ignores DOAP and should be penalized by a 'bad rating', i.e., a high number in terms of conditional informativity. In the current framework, the "softness" of DOAP is translated into a numerical value: It is expected with a probability of, say, 0.75 that the speaker seizes opportunities to anaphorize or, equivalently, marks information entailed by CG as a presupposition, while a less likely strategy (probability of 0.25) would be to reassert the same information.

The division of labor between the two aspects can now be derived in a principled way in *weak* BOT, cf. tableau 3.

$inf(m/f); \text{CG} \models e \subseteq t$	Ipf	Pf
$e \subseteq t$ (in presupposition)	$\Rightarrow \frac{1}{0.75} - 1 = 0.33$	$0.1 + (\frac{1}{0.75} - 1) = 0.43$
$e \subseteq t$ (in assertion)	$\frac{1}{0.25} - 1 = 3$	$\Rightarrow 0.1 + (\frac{1}{0.25} - 1) = 3.1$

Table 3: A weak bidirectional OT-tableau (consistency with CG; probability distribution according to DOAP)

A strong version of BOT would block the pair $\langle \text{Pf}, e \subseteq t \text{ (in assertion)} \rangle$ in contexts like (1) and (4) since it loses the competition both from the production perspective ($3 < 3.1$) and interpretation perspective ($0.43 < 3.1$). Importantly, however, in *weak* bidirectional optimization the two dimensions of optimization are mutually related. This means that the last two form-meaning pairs are removed from competition by the pair $\langle \text{Ipf}, e \subseteq t \text{ (in presupposition)} \rangle$, since $0.33 < 3$ and $0.33 < 0.43$, and are therefore not able to block the Pf from appearing with an assertoric meaning. This result can also be obtained in weak BOT by a more traditional treatment of markedness and economy constraints (including "DOAP").

To conclude this section: Neither of the two aspects starts out as "presuppositional" or "assertoric", but weak BOT accounts for the emerging polarization whereby the factual Ipf gets its presuppositional reading. Furthermore, the division of labor allows for the speaker to reintroduce the event at the assertoric level through a perfective verb, even if the conditions hold which would allow a presupposition to be satisfied.

6 From the viewpoint of compositional semantics

A global explanation has been given for why the factual Ipf can be used in (1) and (4) — and, to a certain extent, be interchangeable with the Pf. Unlike the Pf, the factual Ipf shows signs of being a "presupposition trigger" of the anaphoric kind, whose "primary function is to collect old and given material from the context in order to say new things about it" (Zeevat 1999: 70). For instance, in (4), the speaker adds the new information that the given writing event was performed with a pencil.

In the words of Blutner (1998: 32), "economy principles are crucially involved in determining how non-representational parameters control the selection and suppression of representations", but so far we have by and large ignored the question of how the Ipf should be represented at the syntax-semantics interface.

In light of examples such as (1) and (4), it is tempting to propose the following revised semantics for the factual Ipf, where the subscript notation encodes the presuppositional part of a complex DRS:

$$\text{Factual Ipf (preliminary version)} \Rightarrow \lambda P \lambda t[\ |\ P(e)]_{[e\ |\ e \subseteq t]}$$

The above representation invites a proliferation of imperfective operators. It covers examples like (1) and (4), but does not extend to cases like (3). The point is that complete event interpretations of the Ipf in *absence* of an appropriate eventive discourse referent in the input context cannot be saved by accommodation. The factual Ipf is not accommodatable, due to the following theorem by Blutner and Zeevat.[6]

Theorem 2:

If a trigger context has simple non-triggering expression alternatives with the same meaning, it does not accommodate.

The "presupposition" of the factual Ipf is never accommodated, since the simple non-presuppositional/assertoric Pf is always an available alternative expression. "The simplicity of the alternative expressions guarantees that they are considered in the optimality contest [...] If the context lacks a suitable antecedent and non-presupposing means of expression are available, the principle forces us to choose those means of expression rather than the presupposing ones, which would force an accommodation" (Zeevat 1999: 77). The reason for avoiding accommodation (cf. the OT-constraint "Do Not Accommodate!") again involves considerations of efficiency/economy: Using a simple assertoric alternative is always a more efficient strategy than relegating the same content to presupposition accommodation, cf. Zeevat (1999: 74).

So, after all, the factual Ipf is not a pure presupposition trigger. Below, I will propose a unified semantics for the factual Ipf, which incorporates the empirical observation that the factual Ipf is compatible with both event anaphora and event assertion. In this paper, I will not discuss the issue of what a unified (and underspecified) semantics for the Ipf *tout court* should look like Sonnenhauser (2005). The treatment of the factual Ipf proposed here suggests that this operator is distinct from a progressive/processual operator (and an habitual-iterative operator).[7]

7 A function defined over different cases

The factual Ipf locates a complete event into the assertion time either by linking it anaphorically to a given event or by introducing the event.[8] Which of the two options actually obtains is derived from the focus-background structure of the underlying VP according to a special principle introduced below. The idea is to ensure that the Ipf operates on the background if the latter is non-empty. Otherwise it operates on the focus.

[6] Theorem 2 is referred to as 'Blutner's theorem' in Zeevat (1999) and as 'Zeevat's theorem' in Blutner (2000).

[7] But see Grønn (2004) for an alternative implementation of the ideas presented below. In my previous work, I accorded a vague semantics of temporal overlap — $e \bigcirc t$ — to the imperfective operator, the idea being that this most general topological relation is subject to pragmatic strengthening such that in a particular context the interpretation turns into one of the more specific inclusion relations.

[8] I thank Kjell Johan Sæbø for his valuable comments on earlier versions of the analysis presented in this section. See Grønn (2005) for a more detailed exposition.

Thus, the information structure of the input determines whether the factual Ipf has a presuppositional or an assertive interpretation.

I represent the VP being input to an aspectual operator as an ordered pair

$$\langle \mathrm{B(ackground)}, \mathrm{F(ocus)} \rangle$$

along the lines of the structured meaning approach. In accordance with neo-Davidsonian event semantics, the main event is decomposed into several event predicates:

$$\langle \lambda e[\ |\ \mathrm{write}(e)], \lambda e[x\ |\ \mathrm{Instrument}(e,x), \mathrm{pencil}(x)] \rangle \text{ [cf. example (4)]}$$

The background part is considered to contain presupposed material, and the $\langle \mathrm{B}, \mathrm{F} \rangle$-partition is therefore transformed into a complex DRS as follows, where the subscript DRS represents the presupposed/given material:

$$\lambda e[x\ |\ \mathrm{Instrument}(e,x), \mathrm{pencil}(x)]_{[\ |\ \mathrm{write}(e)]}$$

This complex DRS is input to the Ipf-operator in (4). Since a $\langle \mathrm{B}, \mathrm{F} \rangle$ structure is formed already at the VP-level, we can maintain a uniformed treatment of different aspectual operators, which all have the same logical type and convert predicates of events into predicates of times.

The factual Ipf is now treated as a function defined over different cases:

$$\mathrm{Ipf}_{\mathrm{factual}} \text{ (final version)} \Rightarrow \lambda P \lambda t[\mathbf{e}\ |\ P(e), \mathbf{e} \subseteq \mathbf{t}]$$

Note the use of **bold face** discourse referents and conditions, which only occur in the translation of the operator and disappear at the next stage of the derivation, according to the following principle:

The bold face convention

Bold face discourse referents $\mathbf{x} \in U_{Fun}$ and conditions $\mathbf{Con} \in \mathrm{Con}_{Fun}$ occurring in the translation of an operator $Fun_{\langle \mathrm{a,b} \rangle}$, are 'rewritten' in the process of applying *Fun* to an argument $Arg_{\langle \mathrm{a} \rangle}$. In the resulting DRS $K_{\langle \mathrm{b} \rangle}$,

(i) if K's presupposition part P is empty, $\mathbf{x}$ and $\mathbf{Con}$ are rewritten as $x \in U_K$ and $\mathrm{Con} \in \mathrm{Con}_K$, respectively.

(ii) if K's presupposition part P is non-empty, $\mathbf{x}$ and $\mathbf{Con}$ are rewritten as $x \in U_P$ and $\mathrm{Con} \in \mathrm{Con}_P$, respectively.

The point is that the bold face discourse referent '$\mathbf{e}$' and the bold face aspectual configuration '$\mathbf{e} \subseteq \mathbf{t}$' in the translation of the aspectual operator will be drawn to the presuppositional DRS if and only if the latter is non-empty. In the case of a presuppositional Ipf reading, the 'bold face convention' thereby ensures that the eventive discourse referent and aspectual configuration are eventually declared in the presupposition part.

By applying the factual Ipf to its argument in (4), we end up with the following complex DRS:

$$[\mathrm{AspectP}] : \lambda t[x\ |\ \mathrm{Instrument}(e,x), \mathrm{pencil}(x)]_{[e\ |\ \mathrm{write}(e),\ e \subseteq t]}$$

8 Reconciling a global and a local perspective

The goal of this paper was twofold: (i) to show how the presuppositional Ipf emerges from a competition with the Pf, and (ii) to implement this information structure component into a compositional analysis of the aspectual operator. The first part of the paper is an illustration of how the Gricean mechanism of pragmatic strengthening fills out the underspecified meaning of the Ipf, thereby contributing to truth-conditional content (Blutner & Zeevat 2004). The second part of the paper applies these results locally, in a compositional set-up.

In recent work, Blutner (2006: 11) discusses global vs. local pragmatic theories: "A global theory describes the principal forces that direct communication — it has a diachronic dimension and allows a rational foundation of conversational implicatures; a local theory describes the actual, synchronic dimension — it explains how online, incremental interpretation [...] is possible". Importantly, he argues that the two approaches can coexist, since they are connected by the assumption "that the results of global optimization fossilize into a local mechanism of utterance processing".

In other words, pragmatic inferences can grammaticalize and turn into semantic, conventionalized content through a process of "fossilization". Blutner's ideas on fossilization — although rudimentary at the present stage — can hopefully develop into an attractive linking theory between the semantics-pragmatics and diachrony-synchrony interfaces. The aspectual system of Russian provides many more examples of fossilized/ conventionalized interpretations than the ones considered here, and it will be interesting to see how these data can be dealt with within this new branch of OT-based semantics and pragmatics.

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Presuppositions, games, and bounded rationality

Gerhard Jäger
University of Bielefeld

1 Introduction

In van der Sandt (1992), an algorithm for the computation of presupposition resolution within the framework of DRT is given. It

(a) computes a set of possible readings of a sentence containing a presupposition,

(b) imposes a set of hard constraints for possible readings and thus possibly excludes some of the outputs of step (a), and

(c) defines a preference ordering on the remaining set.

The most preferred reading according to step (c) is the actual reading of the sentence. The constraints mentioned in (b) are **local informativity** (every sub-DRS is informative in its local context), **global informativity** (every sentence is informative), and **consistency** (no sub-DRS is inconsistent).[1] The preference ordering mentioned in (c) amounts to the claim that binding is better than accommodation, and high accommodation is better than low accommodation.

This algorithm is empirically highly successful. However, some of its aspects, especially the preference of high over low accommodation, are not independently justified. This abstract attempts to derive them from general principles of pragmatics, couched in game theoretic terms.

2 Epistemic logic and game theoretic pragmatics

Following most authors in game theoretic pragmatics, I assume that communication can be modeled as a signaling game in the sense of Lewis (1969). Inspired by Stalnaker (2005), I take it that natural language expressions have a conventionalized meaning that is common knowledge between the interlocutors. However, the actually transmitted information need not coincide with this literal meaning. Rather, pragmatic communication takes place in a Nash equilibrium of the underlying signaling game. The conventionalized meaning itself need not constitute a Nash equilibrium itself, but it forms the base for computing the pragmatic equilibrium.

I assume that interests of both players (speaker and hearer) are identical – they both want the speaker to transmit as much of his private knowledge to the hearer as possible as efficiently as possible.[2]

To be more precise, I assume that the hearer is interested in information about the world, not in opinions of the speaker about the epistemic state of the hearer. This can be formalized in terms of epistemic modal logic. Suppose the literal meaning of the message that the speakers emits is ϕ, where ϕ is an expression of multimodal epistemic logic, with at least two modalities, $\Box_S$ and $\Box_H$ (for speaker and hearer respectively). The hearer can thus provisionally assume that $\Box_S\phi$. However, the decision problem that the hearer faces

[1] Issues of variable binding, including the "trapping constraint", are ignored in the present abstract.

[2] Efficiency means that signals are not "cheap": coding complexity incurs costs, i.e. negative utility.

concerns the world as such, not the speaker's opinions about the epistemic state of the hearer himself. Technically, this means that any two worlds that only differ with respect to the worlds that are accessible from them for the hearer are considered identical for the purpose of the hearer's decision problem. Therefore the hearer will update his information state with ψ where ψ is the strongest formula **not containing modal operator** $\Box_H$ such that $\Box_S\psi$ can be derived from $\Box_S\phi$. Since the speaker can anticipate this inference, what is pragmatically communicated is ψ rather than ϕ.

I will leave the question open which modal logic is appropriate to model pragmatic reasoning. As a lower bound, I assume system T, but I remain agnostic as to whether the introspection axioms do or do not hold.

3 Presuppositions

Presuppositions are modeled as statements about the knowledge of the hearer. So a sentence as (1a) is interpreted as (b), which can be paraphrased as (1c).

(1) a. The king of France is bald.
b. $\Box_H A \wedge B$ (side condition: $B \vdash A$)
c. As you know, France has a king, and this king is bald.

The communicated meaning is the strongest non-modal statement that can be derived from

$$\Box_S(\Box_H A \wedge B)$$

In this example, this would be the formula B (by applying K and T once each, plus some propositional reasoning). Depending on the common ground, this can be interpreted as an instance either of binding or of accommodation. In the sequel, I will focus on accommdation, but I will return to the issue of binding later.

If a presupposition trigger is embedded under some operator, this gives rise to an ambiguity between local and global accommodation. For instance, if (1) is negated, this can be construed either as (b) or as (c).

(2) a. It is not the case that the king of France is bald.
b. $\neg(\Box_H A \wedge B)$
c. $\Box_H A \wedge \neg B$

Consider (2b). From $\Box_S(\neg(\Box_H A \wedge B))$, there is only one $\Box_H$-free proposition that the hearer can infer, nameley the tautology. From $\Box_S(\Box_H A \wedge \neg B)$, however, he can infer B via two applications of (T), plus some propositional reasoning. The current model thus predicts that in (2), only global accommodation is possible (since it is never rational for the speaker to communicate a tautology). This result is welcome, because local accommodation is only construable as a denial here – a type of speech act that goes beyond the scope of the present paper.

Let us now consider a case where a presupposition is embedded under a modal operator. Again, the presupposition can be accommodated locally or globally. (The adverb *perhaps* is translated as an epistemic possibility operator, the dual of $\Box_S$.)

(3) a. Perhaps the king of France is bald.
b. $\Diamond_S(\Box_H A \wedge B)$

c. $\Box_H A \wedge \Diamond_S B$

The strongest $\Box_H$-free formula that can be derived from $\Box_S \Diamond_S (\Box_H A \wedge B)$ (the local accommodation reading), is $\Box_S \Diamond_S (A \wedge B)$, as the following semi-formal proof shows ("*PC*" abbreviates "propositional calculus"):

$$\begin{array}{rl}
\Box_S \Diamond_S (\Box_H A \wedge B) & (ass.) \\
\Box_H A \rightarrow A & (T) \\
\Box_H A \wedge B \rightarrow A \wedge B & (PC) \\
\Diamond_S (\Box_H A \wedge B) \rightarrow \Diamond_S (A \wedge B) & (K + PC) \\
\Box_S \Diamond_S (\Box_H A \wedge B) \rightarrow \Box_S \Diamond_S (A \wedge B) & (K + PC) \\
\Box_S \Diamond_S (A \wedge B) & (PC)
\end{array}$$

So the communicated meaning can be paraphrased as "Perhaps there is a king of France who is bald."

If we turn to (3b), the strongest $\Box_H$-free formula derviable from $\Box_S (\Box_H A \wedge \Diamond_S B)$ is $\Box_S (A \wedge \Diamond_S B)$, which can be paraphrased as "There is a king of France, and perhaps he is bald." The corresponding proof is as follows:

$$\begin{array}{rl}
\Box_S (\Box_H A \wedge \Diamond_S B) & (ass.) \\
\Box_H A \rightarrow A & (T) \\
\Box_H A \wedge \Diamond_S B \rightarrow A \wedge \Diamond_S B & (PC) \\
\Box_S (\Box_H A \wedge \Diamond_S B) \rightarrow \Box_S (A \wedge \Diamond_S B) & (K + PC) \\
\Box_S (A \wedge \Diamond_S B) & (PC)
\end{array}$$

Note that the proof for the latter reading requires two applications of modal axioms (T and K), while the corresponding proof for the local accommodation reading requires one additional application of K.

The argument can be continued with more complex examples, like

(4) Perhaps John believes that the King of France is bald.

Here we have three options: local, intermediate and global accommodation. The corresponding proofs contain at least one application of K for the global reading, at least two for the intermediate and at least three for the local accommodation reading.

4 Bounded rationality

As indicated in the previous section, the proof that a certain accommodation reading is a Nash equilibrium requires successively more applications of modal axioms the deeper the accommodation site is embedded under modal operators. The preference for high accommodation can thus be interpreted as a strategy to avoid proof complexity. Under a game theoretic perspective, this makes sense if we take into account that **reasoning consumes resources**. This is one aspect of the often observed fact that "real" agents are not the perfectly rational beings that classical game theory (or traditional pragmatics, for that matter) assumes them to be. Economists call this insight "bounded rationality". For reasons of space I only sketch a formalization for the present application: Ambiguity

is modeled as uncertainty of the hearer about the identity of the signal that the speaker emits. It is common knowledge that for each reading, the intended interpretation constitutes a Nash equilibrium. In the simplest case, the hearer does not know which signal is intended though and considers all resolutions equally likely. Reasoning incurs costs that are infinitesimal if compared to the utility of succcessful communication, but not completely negligible. Therefore a utility maximizing listener will minimize reasoning costs and thus resolve presuppositions as high as possible.

Little is known about the actual cognitive costs of reasoning. It seems plausible though to assume that modal reasoning is massively more costly than plain propositional reasoning. Counting applications of modal axioms is thus a first, if crude, approximation of this aspect of bounded rationality.

5 Conclusion

For reasons of space, I disregarded presupposition binding. Let me point out though that in van der Sandt's theory, binding involves reasoning about known variables, while accommodation requires the introduction of new variables. In a first order system, accommodation thus incurs applications of quantifier proof rules while binding doesn't. I conjecture that quantification rules incur reasoning costs comparable to quantification rules.

The hard constraints that van der Sandt assumes to restrict resolution options can be accounted for straightforwardly in the game theoretic setting. It is part of the very notion of a signaling game that contradictory or uninformative messages lead to low utility and therefore cannot be part of a Nash equilibrium strategy. Locally uninformative sub-DRSs—that correspond to redundant parts of syntactic structure—incur complexity costs for the speaker without increasing the value of the transmitted information and thus cannot be part of a rational strategy either.

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Specificity as speaker identifiability

Olga Kagan
The Hebrew University of Jerusalem

0 Introduction

The concept of specificity is often referred to in the linguistic literature. However, the precise definition of the term is unclear. Different researchers argue for different definitions of specificity. The specific / non-specific contrast is sometimes claimed to be semantic in nature, and sometimes, pragmatic. Under the semantics approach, specificity is considered to affect truth conditions of a sentence, and is often essentially treated as scope (Karttunen 1976; Farkas 2002, among others). Under an alternative pragmatic approach (Groenendijk & Stokhof 1980), the crucial component of specificity is identifiability to the speaker. Thus, the referent of a specific NP is identifiable to the speaker, whereas the referent of a non-specific NP is not.

In this paper, I argue in favor of the pragmatic approach. I argue that the notion of speaker identifiability is linguistically relevant and should be reflected in an adequate representation of the context. I will bring new evidence in favor of this approach, coming from the interpretational properties of certain lexical items in Russian. I will then propose a formal analysis of specificity which is based on the notion of speaker identifiability.

1 Previous analyses

1.1 Semantic approaches: Scope

As mentioned above, within the framework of the semantics approach, specificity is often analyzed as a property essentially identical to scope. According to this approach, specific NPs are wide scope NPs, whereas non-specific NPs are NPs that take narrow scope relative to some operator. For instance, consider sentence (1), which is ambiguous between two readings.

(1) Melinda wants to buy a motorcycle. (Ioup 1977: 233)

According to one reading, it means that there is a particular motorcycle that Melinda wants to buy. Under this interpretation, the indefinite NP *a motorcycle* takes wide scope relative to the intensional verb *wants.* Alternatively, the sentence can mean roughly that Melinda wants to buy *any* motorcycle. Under this reading, the indefinite NP takes narrow scope.

Intuitively, the wide/narrow scope ambiguity seems to correspond in this case to the specific/non-specific contrast. Under the wide scope reading, Melinda wants to buy a specific motorcycle, whereas under the narrow scope reading, all she cares about is the property *motorcycle,* and the non-specific interpretation results.

The scope approach has a number of shortcomings. Firstly, within the framework of this analysis the concept of specificity seems to be redundant. The term *scope* has a long history of use in the literature on linguistics and philosophy, and it seems to be unnecessary to introduce an additional term that corresponds to exactly the same distinction.

The second problem of the scope analysis is its failure to account for the specificity contrast in such sentences as (2).

(2) A picture fell off the wall.

Intuitively, this sentence exhibits the specific/non-specific opposition. Under the specific reading, the speaker knows exactly which picture is missing but for some reason chooses not to name it. Under the non-specific reading, the speaker merely knows that (at least) one picture is absent, without being able to identify it, say, because she has just heard the electronic device go off in the gallery signaling an empty frame on the wall. This contrast cannot be accounted for within the scope approach, however, as the sentence contains no operator relative to which the indefinite NP could take wide or narrow scope. Thus, scope ambiguity is absent.

1.2 Pragmatic approach: Speaker identifiability

Alternatively, specificity has been accounted for within the framework of a pragmatic approach, which analyzes specific NPs as NPs whose referent is identifiable to the speaker. A formal analysis of specificity on these lines is provided in Groenendijk & Stokhof (1980). G&S propose that specificity of definite NPs differs in an important way from specificity of indefinite ones. A definite NP, by virtue of its definiteness, denotes a unique individual (or set of individuals), and it is specific if and only if the speaker knows which individual(s) it denotes. In contrast, specificity of indefinite NPs is claimed to be dependent on the speaker's knowledge of the denotation of two predicates: the one contributed by the NP in question and the one that corresponds to the predicative part of the sentence. An indefinite NP is specific only if the speaker knows the denotation of the set that constitutes the intersection of these two predicates. Further conditions depend on the determiner that the phrase contains. For instance, in the case of the English indefinite article *a,* the intersection must constitute a singleton set. Importantly, this approach fails to provide a unified analysis of specificity.

It has been claimed that the pragmatic approach in general is problematic since identifiability is a vague concept that has to do with knowledge of the world, with people's minds and intentions, but does not constitute a part of the message that an utterance encodes. In addition, it has been suggested that identifiability is not lexically encoded, whereas semantic properties associated with specificity are (Ioup 1977).

Below, I will demonstrate that certain lexical items with existential meaning in Russian are inherently specified as not speaker identifiable. This proves that speaker identifiability is a linguistically relevant property that can be lexically marked.

2 *-to* items

-to items constitute a series of lexical items with existential meaning in Russian. Morphologically, they consist of a wh-word and the suffix *-to* attached to it. The items are exemplified in Table 1.

Table 1.

kto-to	who + *-to*	someone
chto-to	what + *-to*	something
kakoj-to	which + *-to*	some

Pereltsvaig (2000) mentions briefly that these items can only have wide scope readings. This conclusion is also drawn by Dahl (1970). He analyzes *-to* items as inherently specific, as he assumes an approach according to which specificity is identical to scope. Below,

I consider the semantic and pragmatic properties of *-to* items and their behavior with respect to scope and speaker identifiability.

2.1 *-to* items and scope

Indeed, NPs that contain the word *kakoj-to,* which can be roughly translated as 'some', tend to allow for only wide scope readings.

(3) Dima ne zametil kakogo-to studenta.
Dima NEG noticed some student
'There is a student that Dima didn't notice.'

(4) Maša xochet vyjti zamuž za kakogo-to šveda.
Masha wants marry-INF to some Swede
'Masha wants to marry some Swede.'

For instance, (3) can only mean that there was a student that Dima failed to notice, and not that Dima noticed no student at all. Thus, the existential NP that contains a *-to* item obligatorily takes wide scope relative to the negative operator. In turn, (4) means that there is a particular Swede whom Masha wants to marry. The sentence does not have a reading according to which Masha is ready to marry any Swede.

It should be pointed out that, in certain cases, *-to* items can take narrow scope as well; thus, their appearance is not always restricted to wide scope readings. Still, *-to* items strongly tend to take wide scope, as demonstrated in (3–4), and this generalization is sufficient for our current purposes.

2.2 *-to* items and speaker identifiability

There is, however, a property that unifies all the uses of *-to* items independently of their scope options. In particular, these items are obligatorily *not* speaker identifiable. Even in those environments in which they obligatorily take wide scope, the referent of an NP that contains such an item must not be identifiable to the speaker. This property of *-to* items is noted in Haspelmath (1997), who classifies them as *unknown to the speaker.* It should be emphasized that for Haspelmath, this property is independent from specificity. Thus, he classifies *-to* items as *unknown to the speaker* and, at the same time, *specific.*

Leaving aside the question of specificity at this point, let us focus on the absence of speaker identifiability. The claim that *-to* items inherently lack this property is supported by the infelicity of (5), as opposed to (4) above.

(5) # Ja xochu vyjti zamuž za kakogo-to šveda.
I want marry-INF to some Swede
'I want to marry some Swede.'

My informants consider (5) strange and even funny. By virtue of the semantic properties of the word *kakoj-to* 'some', discussed in the previous section, this sentence means that the speaker wants to marry a particular Swede. At the same time, it follows from (5) that the speaker has no idea who that Swede is. Since, at least out of context, such a situation is rather unlikely, the sentence sounds strange.

In contrast, it is perfectly easy to conceive of a situation whereby the speaker knows about Masha's willingness to marry a particular individual, but cannot identify him. As a result, (4) is perfectly acceptable.

An additional example illustrating that *-to* items are obligatorily *not* speaker identifiable is provided in (6):

(6) # Ja xorošo znaju kakogo-to šveda.
I well know some Swede
'I know some Swede well.'

The use of the *-to* item ensures that the referent of the object NP is not speaker identifiable, a factor that is incompatible with the assertion that the speaker knows the individual well.

-To items are therefore very important, since they demonstrate that the notion of speaker identifiability is indeed linguistically relevant and, crucially, it is relevant independently of the notion of scope. Thus, in most cases, *-to* items obligatorily take wide scope, which, in turn, is in principle perfectly compatible with speaker identifiability. Still, the latter property is obligatorily absent.

Thus, speaker identifiability is not an extra-linguistic factor. Language is sensitive to this property, as there are lexical items inherently specified as (not) speaker identifiable, and this property must be present in an adequate representation of discourse. Since on the intuitive level, this property is strongly associated with specificity, as revealed in the linguistics literature on the topic, I propose to analyze specific NPs as NPs whose referent is identified by the speaker. Below, I propose a formal analysis of specificity in terms of speaker identifiability.

3 Specificity as speaker identifiability: A formal representation

In order to represent specificity as speaker identifiability, a framework is needed that allows to distinguish knowledge of different individuals. Such a framework is provided in Gunlogson (2001).

3.1 Representing beliefs of different discourse participants: Gunlogson (2001)

Following Stalnaker (1978), Gunlogson analyzes discourse using the notion of **context set (CS),** a set of possible worlds 'of which all of the propositions representing mutually held beliefs of the participants are true' (Gunlogson 2001: 39). In other words, this is a set of worlds that are compatible with mutually held beliefs of the individuals who participate in the conversation.

Gunlogson demonstrates, however, that context set as defined above cannot include all the information shared by the participants since it is limited to their *mutual* beliefs. Clearly, individuals who participate in a conversation may disagree on some points. Thus, they may publicly disagree on whether a proposition q is true. Participant A may say that q is true, and participant B may disagree and claim that q is false. Thus, neither q nor $\neg q$ constitutes a part of the participants' mutual beliefs. Still, it is clear that q is in some way present in the discourse. In particular, the participants know that A believes q to be true and B believes q to be false. These facts do constitute a part of the participants' mutual beliefs.

Gunlogson develops a system that allows including this kind of information in the formal representation of the context. First, she introduces the notion of an individual's public belief. (The definition in (7) holds for a discourse with two participants, A and B.)

(7) **Definition: Public belief**
p is a **public belief** of A iff 'A believes p' is a mutual belief of A and B. (Gunlogson 2001: 42)

She further proposes to distinguish context sets associated with different discourse participants. Thus, for a discourse in which two individuals, A and B, participate, she distinguishes CS_A from CS_B. CS_A is a set of possible worlds in which all the propositions representing A's public beliefs are true. Thus, it is a set of possible worlds that are compatible with A's public beliefs. Similarly, CS_B is a set of possible worlds in which all the propositions representing B's public beliefs are true. In turn, the mutual context set is recoverable from $\langle \mathrm{CS}_A, \mathrm{CS}_B \rangle$, as it constitutes the set of possible worlds in which all the mutual beliefs of A and B hold.

3.2 Specificity as speaker identifiability: The analysis

3.2.1 Speaker identifiability

The notion of distinct context sets corresponding to different individuals makes it possible to formally represent speaker identifiability without presupposing that the referent of an NP is identified by other discourse participants.

The definition in (8) below contains a formal definition of speaker identifiability for a singular NP (I restrict the discussion to singular NPs for the sake of simplicity):

(8) **Definition: Speaker identifiable**
A singular NP that appears in a sentence S uttered by speaker A is **speaker identifiable** iff

$$\exists y \forall w[w \in \mathrm{CS}_A \rightarrow (P(y,w) \wedge Q(y,w))],$$

where P is the property contributed by the content of the NP, and Q is the other property ascribed to the referent of the NP in the sentence.

(If the NP in question functions as the subject of the sentence, then Q corresponds to the property denoted by the VP. Thus, in the sentence *A picture is missing from the gallery,* P corresponds to the property of being a picture, and Q to the property 'missing from the gallery'. In turn, in the sentence *John saw a student,* P stands for the property of being the student, and Q for the property of being an individual that John saw.)

The condition in (8) essentially means that an NP is speaker identifiable if and only if there is an individual that constitutes its referent in every possible world that belongs to the speaker's context set. If the speaker identifies the referent as a particular individual, say, a, then a will have the properties ascribed to the referent in every world that is compatible with the speaker's beliefs.

An NP is not speaker identifiable if the condition in (8) does not hold. This can happen in two cases. Firstly, the speaker may not be committed to the existence of a referent at all. Secondly, the speaker may be committed that the referent exists but be unable to identify it. In that situation, it is possible for different individuals to satisfy the properties P and Q in different worlds in CS_A, as represented in (9):

(9) $\forall w[w \in \mathrm{CS}_A \rightarrow \exists y(P(y,w) \wedge Q(y,w))]$,
where P is the property contributed by the content of the NP, and Q is the other property ascribed to the referent of the NP in the sentence.

To illustrate, consider again the sentence in (2), repeated below:

(2) A picture fell off the wall.

Suppose that the speaker utters this sentence having in mind Primavera and intending to refer to this particular picture. In that case, Primavera would be a picture that fell off the wall in every possible world that belongs to the speaker's context set. Since the speaker is committed that Primavera fell off the wall, a world in which this is not the case will be excluded from her context set. Such a world will not be compatible with her beliefs.

In turn, consider a situation when the speaker utters (2) without having any idea as to which picture has fallen. In that case, any world in which at least one picture fell off the wall will belong to the speaker's context set, as long as it conforms to the speaker's beliefs in all the other respects. Thus, in every possible world in the speaker's CS there will be an object that is a picture and that fell off the wall, but in one world this may be Primavera, in another, Portrait of a Lady, in the third one, Mona Lisa, etc.

It can be seen that speaker identifiability is essentially represented as a condition on scope. Namely, it is a condition on the relative scope of the existential operator that binds the NP in question and the universal quantifier that quantifies over possible worlds in the speaker's CS. Crucially, however, the universal quantifier does not constitute part of the truth conditions of the sentence. Rather, it is introduced by the context, and quantifies over possible worlds in a context set.

3.2.2 Uniqueness

It should be pointed out, however, that speaker identifiability is not a sufficient condition for specificity. According to the definition in (9), an NP is speaker identifiable iff there exists an individual that has the properties ascribed to the referent in the sentence in every possible world within the speaker's context set. This, in turn, does not eliminate the possibility that other individuals share these properties. It thus follows that a sentence that satisfies the condition in (8) may still exhibit a specific/non-specific contrast.

Consider, for example, the following scenario. Mary is a teacher, and I know that yesterday she talked to five students. I know that one of these students was Bill, because he is my neighbor and he has told me about the meeting. However, I have no idea as to who the other four students were. In this case, the sentence in (10) can have both a specific and a non-specific reading.

(10) Mary talked to a student yesterday.

Contrary to Groenendijk & Stokhof (1980), I believe that such a sentence can be specific, despite the fact that the intersection of the set of students and the set of individuals to whom Mary talked yesterday is not a singleton set. A specific reading will result if I utter (10) having in mind Bill and intending to refer to him and not to anybody else. (10) can then be followed by a sentence like *He is my neighbor,* which is a property that characterizes Bill and not the other students. This will make it clear that the indefinite NP in (10) is specific, even though this sentence happens not to contain reference to properties that characterize Bill only.

On the other hand, (10) has a non-specific reading as well. Suppose that someone tells me that Mary is haughty, inconsiderate and never even talks to her students. I can then disagree and utter (10) as evidence that my interlocutor is wrong. In this case, it makes absolutely no difference whether I can identify the individuals to whom Mary talked or not. As far as I am concerned, any of the five students satisfies the conditions in

(10), making the utterance true and appropriate, Bill to the same extent as the ones that I cannot identify. Crucially, under this scenario, the indefinite NP is non-specific, despite the fact that the conditions of speaker identifiability formalized in (8) are fulfilled.

It thus follows that an additional condition should be added that must hold in order for an NP to be specific. This condition is **uniqueness.** It is not sufficient that there exists an individual who has all the properties of the referent in every world within the speaker's CS; there must exist *only one* such individual.

The representation of the uniqueness restriction provided below is based on the analysis of singleton indefinites proposed in Schwarzschild (2002). According to Schwarzschild, the indefinites are existentially quantified. However, the set that the existential operator quantifies over may be determined not only by the content of the NP but also by the context. Namely, the restrictor includes implicit material available from the context, in addition to the overt material. In turn, the implicit information that turns the set into a singleton may be available to both the speaker and the hearer, or to the speaker only, or sometimes even to a third party. In the case of specific NPs, it must be available to the speaker.

This approach allows defining uniqueness which constitutes one of the conditions for specificity:

(11) **Definition: Uniqueness**
A singular NP **has a unique referent** (in the sense discussed above) if

$$\exists R \exists y \forall w[w \in \mathrm{CS}_A \rightarrow (P(y,w) \wedge R(y,w) \wedge \forall z[((P(z,w) \wedge R(z,w)) \rightarrow z = y)])],$$

where P is the property contributed by the content of the NP, and R is a property known to the speaker.

R is a property that causes the NP to have a unique referent, as far as the speaker's beliefs are concerned.

Thus, under the scenario proposed above for (10), the speaker knows that the intersection of the two properties ascribed to the referent of the indefinite NP is not a singleton. However, under the specific reading, when she intends to refer to Bill, she knows about additional properties which distinguish the intended referent from the other students to whom Mary talked yesterday (for instance, the property of being the speaker's neighbor). The intersection of these properties corresponds to R in the formula in (11).

Note that uniqueness defined in (11) is not a sufficient condition for specificity under the analysis developed in this paper. The speaker may be aware of properties that distinguish the referent from other individuals without being able to identify the referent. For instance, the speaker may utter (10) above knowing that Mary talked to only one student. Still, she may have no idea as to which student that was.

Thus, speaker identifiability and uniqueness are the two conditions each of which must hold in order for an NP to be specific. We can now provide a formal definition of specificity, which constitutes a combination of the two conditions:

(12) **Definition: Specificity**
A singular NP that appears in a sentence S uttered by speaker A is **specific** iff

(i) $\exists y \forall w[w \in \mathrm{CS}_A \rightarrow (P(y,w) \wedge Q(y,w))]$;

(ii) $\exists R \exists y \forall w[w \in \mathrm{CS}_A \rightarrow (P(y,w) \wedge R(y,w) \wedge \forall z[(P(z,w) \wedge R(z,w)) \rightarrow z = y])]$,

where P is the property contributed by the content of the NP, Q is the other property ascribed to the referent of the NP in the sentence, and R is a property known to the speaker.

3.3 A formal analysis of *-to* items

It has been demonstrated above that *-to* items in Russian are inherently specified as not speaker identifiable. At this point it is possible to provide a formal representation of this property.

(13) **Felicity condition imposed by *-to* items**
Let S be a sentence that is uttered by speaker A which embeds an NP containing a *-to* item. Let P be the property contributed by the content of the NP, and let Q be the other property ascribed to the referent of the NP in the sentence.

Then S is felicitous iff

$$\neg\exists y\forall w[w \in \mathrm{CS}_A \rightarrow (P(y,w) \wedge Q(y,w))].$$

The referent of an NP that contains a *-to* item cannot be identified by the speaker. Thus, one of the conditions for specificity is violated and, as a result, an NP that contains a *-to* item is obligatorily non-specific.

4 Conclusion

To sum up, in this paper I have argued that speaker identifiability is a linguistically relevant property which can be lexically encoded and which affects the interpretation of a sentence. However, this is a pragmatic property dependent on the context in which a sentence is uttered and, thus, it does not affect the truth conditions of the sentence. Rather, as suggested in Groenendijk & Stokhof (1980), it constitutes a restriction on the context in which a given utterance is appropriate. I have proposed a formal analysis of specificity based on this property which captures the intuition that the referent of a specific NP is 'known' or 'familiar' to the speaker.

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The German response particle *doch* as a case of contrastive focus

Elena Karagjosova
University of Oslo

1 Introduction

The accented German response particle (henceforth, RP) *doch* 'though' is typically used to refute an immediately preceding negated utterance.[1] Semantically, its contribution consists in asserting the positive counterpart p of the negated proposition $\neg p$ expressed in the refuted utterance. For instance, (1B) denies the preceding statement (1A) that Karl was not at the party and asserts that, on the contrary, he was at the party:

(1) A: Karl war nicht auf meiner Party. ($\neg p$)
'Karl was not at my party.'
B: DOCH.[2] (p)
'He was INDEED.'

Response particles like *doch*, *ja* 'yes' and *nein* 'no' are *sentence equivalents* which can be seen as representing an underlying full-fledged sentence. Thus, the RP *doch* in (1B) can be seen as a short version of (2):

(2) B: Er WAR auf deiner Party.
'He was at your party.'

Now, (2) as an answer to (1A) is a case of what is known as **verum focus** (Höhle 1992). Höhle (1992) uses the term *verum focus* (henceforth, **VF**) to refer to cases where the finite verb or a subordinating particle such as *dass* 'that' and *ob* 'whether' carry the main accent in the sentence. An important characteristic of cases of VF is that "the thought expressed [by the sentence] is known from the context" (Höhle 1992: 113).[3] The function of VF according to Höhle consists in emphasising the truth value of the sentence, rather than the lexical meaning of the verb (or subordinator) on which the accent is placed. Thus, (2B) can be paraphrased as *it is true that Karl was at your party.*

Similarly, the RP *doch* in (1B) is used in a context in which the proposition it expresses is known from the context. Moreover, *doch* can also be seen as having the purpose of emphasising the truth value of the proposition it asserts. Consider the dialogues below. In (3a) and (3b), the accent is placed on the finite verb (VF) and the sentence negation respectively, determining the focus of the sentence as being its polarity. In both cases, *doch* is an adequate response. This is however not the case in (3c–3e) where the focus is not on the polarity but on other aspects of the sentence, suggesting different oppositions than the one between true and false: the train vs. the bus in (3c), being on time vs. being late in (3d) and arriving vs. departing in (3e).

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[2] Small capitals denote accent.

[3] According to Höhle the negation is not interpreted as part of the contextually given thought.

(3) a. A: Der Zug IST nicht pünktlich angekommen.
'The train did not arrive on time.'
B: DOCH.
b. A: Der Zug ist NICHT pünktlich angekommen.
B: DOCH.
c. A: Der ZUG ist nicht pünktlich angekommen (, aber der BUS schon).
'The train did not arrive on time, but the bus did.'
B: # DOCH.
d. A: Der Zug ist nicht PÜNKTLICH angekommen (, sondern mit grosser VERSPÄTUNG).
'The train did not arrive on time but with a big delay.'
B: # DOCH.
e. A: Der Zug ist nicht pünktlich ANGEKOMMEN (, sondern/aber pünktlich ABGEFAHREN).
'The train did not arrive on time, but left on time.'
B: # DOCH.

These restrictions on the use of the RP *doch* suggest that the part of the preceding sentence that is refuted by means of *doch* is its polarity, similarly to the function the VF-sentence (2) serves in the context of (1A). In both cases, (1A) is denied by suggesting that the opposite holds. In addition, it seems that the RP *doch* in general can be seen as equivalent to a sentence with VF: The response in (4b) with accent on *pünktlich*[4] is not felicitous since the respective information is already given, as is the rest of the sentence, except for the finite verb which is the only possibility for an adequate accent placement:

(4) A: Der Zug IST nicht pünktlich angekommen.
'The train did not come on time.'
a. B: DOCH, er IST pünktlich angekommen.
'No, it did come on time.'
b. B: # DOCH, er ist PÜNKTLICH angekommen.
'No, it came on time.'

The conclusion that can be drawn from the linguistic data is that the RP *doch* could be given a proper treatment in terms of VF. However, an alternative view on *doch* that should also be considered, since it does justice to the intuition that *doch* refutes the preceding negated sentence, is that it is a simple negation operator like the sentence negation *nicht*, i.e., that (1B) can be paraphrased as in (5):

(5) Es ist NICHT der Fall, dass Karl nicht auf deiner Party war.
'It is not the case that Karl was not at your party.'

In this paper, these two possibilities for analysing the RP *doch*, namely as VF and negation, will be explored and discarded (Section 2) in favor of an account in terms of contrastive focus that does justice both to the general meaning and the dialogue behaviour of the particle *doch* (Section 3). Section 4 discusses related previous work, and Section 5 provides a brief summary and conclusions.

[4] (4b) represents the neutral intonation pattern in German declarative sentences where accent is placed on the deepest embedded verbal complement or adjunct (Steube 2001).

2 The RP *doch*, verum focus and sentence negation

In this section, I will provide arguments against the two most obvious analyses of the RP *doch* mentioned above.

2.1 *Doch* and VF

I first explore the possibility of analysing the RP *doch* in terms of VF. Höhle (1992) accounts for the effect of VF by assuming that the accented verb introduces a semantic element, the truth-predicate *VERUM*. In other words, (2) is interpreted as *VERUM*p, where p is the proposition expressed by the sentence. In a VF-approach, the RP *doch* in (1B) would be interpreted as *VERUM*p, where p is the positive counterpart of the negated proposition $\neg p$ expressed by the preceding sentence (1A).[5]

There are several problems with this view on *doch*. The first is the unclear status of the predicate *VERUM*. In his paper, Höhle gives up an original treatment of *VERUM* as an illocutionary type operator in favor of a view in terms of a truth predicate whose function amounts to merely explicating the intuition of emphasising the truth of the sentence. However, he leaves this issue somewhat unsettled, giving arguments for and against the illocutionary type operator view throughout the paper.

A second problem with a VF-approach is that it does not generalise to other uses of the accented particle *doch*. Consider (6).

(6) A: Karl war auf meiner Party. (p)
'Karl was at my party.'
B: Oh, er war also DOCH auf deiner Party. (p; expected: $\neg p$)
'So he was there after all.'

On one interpretation, *doch* indicates an earlier belief $\neg p$ of the speaker that has been given up in the light of the information provided in (6A), i.e., (6B) indicates *belief revision* with respect to $\neg p$. Another possible interpretation of (6B) is it indicating that the information in (6A) confirms an earlier belief of the speaker, i.e., *doch* expresses *belief verification* with respect to p. A VF-account would only capture the second interpretation, i.e., 'So it is true that he was at your party, just like I thought'.

An additional argument against an VF-account of *doch* in (6) is that in a context that does not challenge the truth of a sentence, but on the contrary asserts it, there is no need to put special emphasis on the truth value of the sentence. This argument applies also for a less frequent but nevertheless perfectly correct use of the RP *doch*, namely when it represents a confirmation of a preceding positively formulated sentence, rather than denial of a negated one. Consider (7) where the situation is similar to (6) in that the *doch*-utterance (6B) is a confirmation of the preceding sentence (6A).

(7) A: Das war sehr freundlich von ihm. (p)
'This was very friendly of him.'
B: DOCH, das muss man sagen. (p)
'Yes, indeed.'

[5] A similar approach is taken in Romero (2005) who accounts for the meaning of the epistemic adverb *really* by it introducing *VERUM*.

2.2 *Doch* and sentence negation

The second possibility mentioned above is to analyse *doch* as a special case of negation reserved for a purpose the RP *nein* and the sentence negation *nicht* do not serve, namely denying negated sentences. Note that a *nein* or a sentence with the negation *nicht* as a response to a negated statement amounts to agreeing that the respective state of affairs does not hold (cf. also Merin 1994: 249):[6]

(8) A: Karl war nicht auf deiner Party. ($\neg p$)
'Karl was not at your party.'
B: Nein, er war nicht da. ($\neg p$)
'No, he was not there.'

Analysing *doch* in terms of negation would not account for the fact that in (9a), both the negation particle *nein* and the sentence negation *nicht* signal that A_2 *disagrees* with B_1 with respect to the truth value of the sentence. Treating *doch* as negation of a negated sentence would lead to interpreting the response *nein* in (9bA_2) as expressing *agreement* with respect to the truth value of the sentence:

(9) A_1: Karl war nicht auf deiner Party. ($\neg p$)
'Karl was not at your party.'
a. B_1: DOCH. = Karl war auf meiner Party. (p)
'Yes [= Karl was at my party].'
A_2: Nein. = Es ist nicht der Fall, dass Karl auf deiner Party war. ($\neg p$)
'No [= It is not the case that Karl was at your party].'
b. B_1: DOCH. = Es ist nicht der Fall, dass Karl nicht auf deiner Party war. ($\neg\neg p$)
'No [= It is not the case that Karl was not at your party].'
A_2: Nein. = Es ist nicht der Fall, dass Karl nicht auf deiner Party war. ($\neg\neg p$)
'No [= It is not the case that Karl was not at your party].'

A second argument against the view of the RP *doch* as a simple negation provides its confirmation use in (7) where the *doch*-utterance asserts p rather than $\neg p$.

The linguistic data suggest that the RP *doch* is the polar opposite of the sentence negation *nicht* and the negative RP *nein* rather than synonymous with them: Regardless of the polarity of the context, the RP *doch* asserts a positive proposition p,[7] contrary to *nein* and *nicht* which assert a negative proposition $\neg p$ also regardless of the polarity of the preceding sentence.

The conclusion of this section is that neither of the two possibilities of analysing the RP *doch* we originally considered proves adequate. What these accounts fail to capture is both the dialogue behaviour of the particle and its general meaning. In the next section, I propose a different view on the RP *doch*, namely as a bearer of contrastive focus.

[6] A *nein*/*nicht*-response also confirms the negative bias of a negated question. In other words, natural language negation differs from logical negation: whereas the former also sends true to false, it cannot be generally seen as an operator sending false to true. Sadock & Zwicky (1986) interpret the emergence of particles like German *doch* and French *si* as forced by an ambiguity of the simple positive answer *yes* to negated biased questions like *Isn't it raining?* Such an answer, it is argued, is ambigouos between *Yes, it is not raining* and *Yes, you are right; it is raining.* However, this argument is somewhat weak since one would rather use a *No*-answer to express agreement that some state of affairs does not hold.

[7] Note, however, that other uses of *doch* may also assert a negative proposition.

3 *Doch* and contrastive focus

The examples discussed in the previous section show that in order to be able to correctly account for both the general meaning and the dialogue behaviour of the RP *doch*, it should be interpreted as asserting just a positive proposition p. On the other hand, an adequate analysis should be able to capture this behaviour as well, i.e., it should be able to account for both the case where *doch* denies a preceding negated sentence as well as where it confirms a preceding positive sentence. I suggest that conceiving of the RP *doch* as a bearer of contrastive focus is a view that complies with these requirements.

3.1 Contrastive focus

It is a commonly accepted view that accented or focussed expressions evoke alternative expressions that the speaker might have said but has chosen not to (cf., e.g., Zeevat 2004). One of the most influential semantic frameworks dealing with focus is Rooth's **alternative semantics** (cf., e.g., Rooth 1992). In alternative semantics, a focussed expression is accounted for by assuming that it provides an additional semantic value $[\![\cdot]\!]^f$ next to the ordinary semantic value $[\![\cdot]\!]^o$ of the sentence. The focus semantic value represents a set of alternatives — a set of propositions consisting of the ordinary semantic value of the focussed expression and the propositions it contrasts with. The set of alternatives is furthermore salient but not necessarily explicitly mentioned and contains only alternatives which are of the same semantic type as the focussed expression.

According to Rooth (1992), focus may have two main functions, depending on how the uttered sentence is understood against the salient set of alternatives: exhaustive focus and contrastive focus. In the case of exhaustive focus, the function of the accent is signalling that the focussed expression is the only one that is true out of the set of alternatives, e.g., in question—answer pairs. In the case of contrastive focus, accent signals that the focussed expression contrasts with a previously uttered member of the focus set of alternatives, i.e., the focussed expression is anaphorically linked to some antecedent in the preceding context.

In order to give an account in terms of contrastive focus, we first need to determine what focus sets of alternatives the RP *doch* evokes. We already established that the ordinary semantic value of the RP *doch* is some proposition p asserted or negated by the sentence immediately preceding the RP, i.e., $[\![[_S\text{doch}]]\!]^o = p$. This means that the alternatives *doch* evokes should be of the same, propositional type. In order to determine what propositions the RP *doch* contrasts with, we need to examine again the contexts in which the RP occurs. The occurence of the RP *doch* in negative environments is restricted to contexts in which the focus of the preceding sentence is its (negative) polarity, as we saw in Section 1, as well as to sentences with overt (10), top-level (non-embedded) (11) and wide-scope (12) negation:

(10) A: Ich bedauere nicht/hoffe nicht/habe nicht geträumt, dass Karl (nicht) gelogen hat.
'I do not regret/hope/did not dream that Karl has (not) lied.'
B: DOCH (, das hast du).
'Yes you have.'

(11) A: Ich bedauere/hoffe/habe geträumt, dass Karl nicht gelogen hat.
'I regret/hope/dreamt that Karl has not lied.'
B: # DOCH.

(12) A: Nicht Peter kommt, sondern Paul.
'Not Peter will come but Paul.'
B: # DOCH.

These contextual restrictions suggest that *doch* contrasts the proposition it asserts with its negated counterpart expressed by the preceding utterance. In other words, the focus semantic value of *doch* is the set containing its ordinary semantic value $[\![[_S \text{doch}]]\!]^o = p$ and the alternative that contrasts with it, namely $\neg p$:

(13) $[\![[_S[\text{doch}]_F]]\!]^f = \{p, \neg p\}$, where p is a proposition negated or asserted in the immediately preceding sentence.

For comparison, and in support of the claim made in Section 2.2 that accented *doch* is the polar opposite of *nicht*, the focus set of alternatives evoked by the accented sentence negation *nicht* is $[\![[_S[\text{nicht}]_F S]]\!]^f = \{\neg p, p\}$, where p is the proposition expressed by the sentence S and $[\![[_S \text{nicht} S]]\!]^o = \neg p$.[8]

Now, the fact that the preceding context contains an element of the focus semantic value of *doch* with which *doch* contrasts, strongly suggests a treatment in terms of contrastive focus. In addition, focus on the RP *doch* cannot be seen as being exhaustive: although *doch* answers the question $\neg p$? in (14), the context does not license a set of alternatives from which one could be chosen and presented as the only true one.[9]

(14) A: War Karl nicht auf deiner Party? ($\neg p$?)
'Wasn't Karl at your party?'
B: DOCH. (p)

Following Rooth (1992), a phrase α is contrasting with a phrase β, if $[\![\beta]\!]^o \in [\![\alpha]\!]^f$ and $[\![\beta]\!]^o \neq [\![\alpha]\!]^o$. An analysis in terms of contrastive focus correctly predicts that the ordinary semantic value $\neg p$ of the contrasting phrase S is a previously uttered member of the focus set of alternatives evoked by *doch*:

(15) A: Karl war nicht auf deiner Party. $[\![[_S S]]\!]^o = \neg p$
'Karl was not at your party.'
B: DOCH. $[\![[_S[\text{doch}]_F]]\!]^f = \{p, \neg p\}$ ($\neg p \in \{p, \neg p\}$)

The analysis of the RP *doch* as a case of contrastive focus accounts for both its general meaning and its function in dialogue. On this account, the RP *doch* asserts a positive proposition p. It denies a preceding negated sentence by asserting the positive counterpart of the proposition expressed by the preceding sentence. The impression that *doch* introduces negation can be seen as a side effect of information structural contrast involving the evocation of focus alternatives that the speaker could have uttered but has chosen not to, because they are considered not true in the particular situation (Umbach 2001; Zeevat 2004). Similarly, the RP *doch* evokes an alternative proposition $\neg p$ and at the same time discards it by asserting its positive counterpart p.

[8] VF appears not only in opposite polarity contexts but also in cases where the "contextually given thought" is modalised such that it is presented as possibly true or false. In the latter context, the contrast is between the state of affairs being *possibly* true/false and *actually* true/false.

[9] What is more, an answer *doch* to a polar question like *Willst du Zucker in den Kaffee? (Do you want sugar in your coffee?)* ($p \vee \neg p$), leads to reinterpreting it as a biased question ($\neg p$?).

3.2 Correction and acceptance

The view on the RP *doch* as a case of contrastive focus also accounts for its behaviour in discourse and dialogue. In a context like (1B) in which the preceding utterance contains an element of the focus set of alternatives *doch* evokes, the RP refutes the preceding negated sentence, thus performing the function of **correcting**. Correction is usually viewed as a discourse relation which also manifests itself in dialogue (cf. Asher 1998). Umbach (2004) relates the discourse relation of correction to the information structural notion of contrast between alternatives. She views correction as a special case of contrast where one element of the set of alternatives evoked by an accented expression is excluded by substitution: the asserted element is presented as a replacement for the alternative, suggesting that the former should be added to the common ground and the latter removed from it. Steube (2001) proposes a similar treatment of correction realised by means of contrastively focussed expressions.[10]

The analysis of the RP *doch* in terms of contrastive focus generalises also to its acceptance uses. As we saw, in the cases where the preceding utterance does not contain an element of the focus set of alternatives of *doch*, the use of *doch* is not infelicitous but the utterance is interpreted as a confirmation. According to Rooth (1992), a focus set of alternative need not be explicitly mentioned but can be accommodated, similarly to other kinds of presupposed material. Thus, the acceptance cases of the RP *doch* can be accounted for by assuming that the alternative which *doch* evokes is accommodated. This is supported by the intuition that in cases where the RP *doch* indicates acceptance, the use of *doch* is justified only if it is understood as the result of reinterpreting the preceding positive utterance as expressing a negative bias towards the truth of the sentence (cf., e.g., Helbig 1988 from whom also the following example is taken):

(16) A: Das war sehr freundlich von ihm. (→ War das nicht sehr freundlich von ihm?)
'This was very friendly of him. (Wasn't this very friendly of him?)'

B: DOCH, das muss man sagen.
'Yes, indeed.'

The accomodation account captures this intuition nicely, since accommodation involves exactly the kind of reinterpretation or context repair that is intuitively required in the acceptance cases of *doch*: accommodating $\neg p$ amounts to adding it to the context.

4 Related work

Previous work fails to adequately capture the dialogue behaviour of the RP *doch*. Helbig (1988) describes non-formally the meaning of RP *doch* as negating the negation in the preceding utterance and asserting its positive counterpart. The cases where *doch* functions as confirmation are simply mentioned as exceptions. Abraham (1991) treats the RP *doch*

[10] A formalisation of correction (or denial as it is called there) is proposed in van der Sandt & Maier (2003) in the framework of (layered) DRT in terms of a non-monotonic correction operation on discourse context, implemented as a *directed reversed anaphora* mechanism to locate, remove and negate the material that is being objected to. However, the plain removal of the downdated material from the DRS does not allow for keeping track of what has been said (or otherwise conveyed) in a dialogue. Merin's (Merin 1994) elementary social act of denial seems more adequate since it allows keeping the discourse context separate from the joint commitments of the dialogue participants. In this way, one can allow the discourse context to record the process of negotiating the denied material, while the joint commitments will record the result of this process.

as asserting a positive proposition negated in the preceding utterance, without considering the confirmation cases. A similar deficiency is found in Graefen (2000) and Merin (1994).

König et al. (1990) suggest a slightly different view according to which the meaning of the RP *doch* consists in contradicting an *assumption* of the interlocutor. This view is also promoted by Karagjosova (2001) who, after recognising the inadequacy of treating the RP *doch* as negation, proposes an account in terms of denial of expectation that generalises both over its uses as correction and acceptance. On this account, the RP *doch* signals denial of an expectation of the previous speaker, where the expectation arises as an implicature from what is said. For instance, (1B) can be seen as expressing 'Although you seem to believe that Karl is not coming, he is coming'. This view, however, is critisised in Zeevat & Karagjosova (in prep.) for its inability to adequately relate to the unaccented use of the particle *doch* under a focus semantic perspective. A general problem with this view is also that it fails to account for the felicitous use of *doch* as a response to negated confirmation questions implicating a positive speaker bias such as (17A):

(17) A: War das nicht TOLL? (≫ Das war toll.)
'Wasn't this great? (This was great.)'
B: DOCH.

The expectation 'It was great' is not denied but confirmed with *doch*, which leads to a nonsensical paraphrase like *Although you seem to believe that it was great, it was great.*

Finally, Zeevat (2005) treats the RP *doch* in terms of correction marking the content as being denied in the common ground. This, however, does not apply to the case of acceptances like (16).

5 Summary and conclusions

It was argued that the German RP *doch* is best viewed as a bearer of contrastive focus. The analysis proposed was shown to account for the general meaning of the particle as well as its dialogue behaviour, and it also generalises over other accented *doch*-uses (cf. Karagjosova 2006). However, it is not immediately clear how this approach can account for the inadequacy of using the RP *doch* after sentences with embedded or narrow-scope negation. It also remains to be seen how the unstressed variants of *doch* can be incorporated into this information structural analysis.

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Gnosis

Marcus Kracht
Department of Linguistics, UCLA

1 Motivation

Semantic theories generally consider meanings as static objects. Construction and evaluation are seen as distinct processes, and the construction of a representation can be performed without evaluating it. This applies also to dynamic semantics, whose dynamic character rests only in the way the formulae are evaluated, not how they are being built. Yet it seems that it is not the representation that is the ultimate goal but something else. We want to *understand* what is being said. But to understand a sentence is more than simply to evaluate it; it is, if you will, to gain insight into what it says about the world as it is. The fact that it is true or false is part of that. It seems furthermore that the process of understanding itself is a complex affair, not only because it is to date rather poorly understood; but also because not everything that is said can be straightforwardly understood. The underlying message of this paper is that this fact has far reaching consequences. Consequently, to be able to build a representation does not mean that one can *understand.* Such a representation is a lifeless being. Understanding is a psychological process that yields more that just a representation; bypassing the process is dangerous. Content is not easily read off a representation.

The present paper, though using psychological jargon, is not meant to provide a testable psychological theory of understanding. Rather, it wants to show a way how it is that we can understand a sentence without sacrificing logical content. I do offer facts from linguistics to support my claims. I will argue here that (1) there are process directed meanings, which cannot be understood in representational terms, and (2) we can provide an analysis of notions that have so far defied logical analysis, the most prominent among them being topic and focus.

2 Building meanings

Consider the standard picture of what happens when we hear a sentence. At the first stage there is just a sequence of words, nothing more. At the second stage, we trade the words for what they mean. And we start to assemble the meanings into a complex representation. Unfortunately, this picture suffers from several defects: the first defect is that it presupposes that we can always complete the process. This might not be so: we may simply be unable to understand the meaning of each word. (This situation is not as uncommon as one might think. Even of the language we speak we master only a fraction of the words.) We are however not unable to get *some* meaning out of a sentence, filling the gap when we finally know what to put for an unknown word. Secondly: as language is able to express the most complex ideas, it is not reasonable to assume that the representation is everything. For example, one may know what a *solvable group* is. Yet even then one may not know how use it fruitfully. Those that know it well, understand the meaning of "G is a solvable group" to a degree that others do not, even if they know what the definition of the concept is.

The last point may be dismissed as a simple problem of being familiar with the meaning. I think however that this is not the case. To prove my point, I shall turn to boolean logic. What is striking in boolean logic is that even if we are very well acquainted with it, we seem to stumble over part of the same problems as a beginner. For example,

(1) $$(p \wedge (p \to q)) \to q$$

makes almost immediate sense, but Peirce's formula does not:

(2) $$((p \to q) \to p) \to p$$

The reason for this difficulty is that the concept associated with $\to$ is phrased in such a way as to make it impossible to stack implications to the left.

This carries over to natural language. I assume that the English connective *if ... then* is translated into $\to$, which I call its *mental correlate.* Mental correlates need not be unique. It is unimportant for our purposes whether the correlate is literally the same object or not. But it seems reasonable to assume that at least for me the correlate is the same as for German *wenn ... dann*, so that it is a good idea to keep the correlates notationally independent. A sentence *If A then B* uttered assertively is translated into $\vdash A \to B$.[1] This means: the speaker judges the *object* $A \to B$ true. I said 'object' here because it is just a piece of notation. It is perfectly fine for you (or me) as a hearer to stop here. You have heard speaker say *if A then B*, and you take him to have meant $A \to B$. End of story. Suppose you do want to go further and try to see what *that* means. So you trade it for another mental correlate. In the case of the arrow however, there is none. It is different from a simple word like *cat* which has a certain concept associated with it. An implication by contrast has to be *enacted.* This means: you need to go through a series of steps. Here the steps are: (1) assume A; (2) see whether B holds. This is exactly like the Ramsey theory of conditionals. It is important though to realise that this way of assessing an implication (as opposed to using truth tables) is just one way. I do think though that natural language *if ... then* is typically vague, and that the Ramsey test is the lowest common denominator.

The interesting problem with it is that enacting an implication carries the danger of lack of intersubjectivity: it is you who enacts it, but you may not be likely to accept that A implies B. So you will at this point either reject what speaker said, or accept it at face value, that is, you make a leap of faith from A to B. The latter can in the long run establish a disposition to accept that B follows from A (Pavlov's dog).

3 Getting involved

What lies behind all this? Behind all this lies the idea that *thinking* is a series of **noetic acts.** Understanding is a part of it, which I call **gnosis.** One noetic act that takes part in gnosis is to take a sentence and judge whether it is true, or whether one believes it, or rejects and so on. We say in this case that a person P **apprehends** a proposition φ. Apprehending φ is to put it in front of one's mind, so to speak; apprehension is followed by **judgement.** The act of judging a sentence requires the immediacy of appehension. Only while I apprehend a proposition can I reach a conclusion whether it is true or not. But if I don't understand what it says, how can I make such a judgement? Two possibilities exist: the first is that I have a *disposition* to immediately consent to it. Let me call that an **immediate disposition.** This disposition may be acquired in various ways (learning, for example); alternatively, I may build it up from other dispositions that I have. Call that a **derived disposition.** If, for example, I believe that cats eat mice, and I see a particular cat, then I may consent to the sentence *This cat eats mice,* even though I have no immediate disposition to consent to it. I have however a derived disposition to consent to it. The question that I am raising is: how can such a derived disposition take its effect?

Let us return to implication. Rather than having a disposition to consent to some proposition we typically have only a **conditional disposition** to consent to it. This means that we shall

[1] This is not sloppiness: I do hold that you may put here A and B instead of a translation thereof.

not judge A true all the time, but only if certain other propositions, say B and C, are given.[2] We write this as:

$$B; C \vdash_P A \tag{3}$$

The symbol $\vdash_P$ is best interpreted here as "P judges true" or "P accepts". The symbol $\vdash_P$ is metalinguistic: P does not carry this statement in his head. The dependency on P is often not denoted (neither do languages require such marking), a point to which we shall return. Even the belief system of Pavlov's dog can be described using the conditional judgement sign $\vdash$. What is unique to humans is that they have a symbolic correlate of this disposition, which comes out as $\rightarrow$. Thus, (3) gives rise to

$$\vdash_P B \wedge C \rightarrow A \tag{4}$$

Likewise, it gives rise to

$$\vdash_P B \rightarrow (C \rightarrow A) \tag{5}$$

The latter two express the fact that P judges some proposition unconditionally true. Again, beware that $\vdash_P$ is metalinguistic; it is best rendered as "P has a derived disposition to judge true". Notice also that $\rightarrow$ does *not* contain any relativisation to a subject. This is just an accident. For example, the attitude report *P knows that B* is a linguistic correlate of the statement $\Box\!\!\rightarrow_P B$, which in turn reports a judgement of P (namely that he knows that B). Again, as we may ascribe to a dog D that it knows B (via $\Box\!\!\rightarrow_D B$) we may not ascribe to D any attitude towards *D knows that B,* since the latter requires that the dog has a symbolic representation of that fact.[3]

Immediate dispositions can be anything you like; there is no logic behind them, since they correspond to concepts acquired through time. (They are like the axiomatic basis of a theory.) I do consent to the sentence "Every group of odd order is solvable.", since I know it has been proved. But I do not know how such a proof might go (the original proof is more than 400 pages long!) though I understand each word in that sentence. For derived dispositions, however, there is a logic. For the arrow, the heart is the deduction theorem (DT). It asserts that

$$\chi; \Delta \vdash \varphi \Leftrightarrow \Delta \vdash \chi \rightarrow \varphi \tag{6}$$

Here, Δ is a set of formulae, φ a single formula. We may even prove it; recall that $\Delta \vdash \varphi$ means that for every deductively closed set T, if $\Delta \subseteq T$ then $\varphi \in T$. From this and closure under modus ponens (if $\delta, \delta \rightarrow \zeta \in T$ then $\zeta \in T$) we can deduce DT.

Translated into the calculus of dispositions this gives:

$$B; \Delta \vdash A \Leftrightarrow \Delta \vdash B \rightarrow A \tag{7}$$

This rule allows to deduce (5) from (3). There are analogous rules for conjunction, so we can likewise deduce (4).

But we need to be careful here. Just as proofs need to be carefully constructed, so meanings must be built in a judicious way. Since we are talking about derived dispositions, there is

[2] I shall be somewhat vague as to what "given" means. One approximation is: B is given if it has been judged true. This needs elaboration.

[3] I gloss over the problem of personal reference. Obviously, the author of the judgement must somehow be explicitly denoted, causing problems not of correctly ascribing a belief to a given person, but rather of ascribing a given belief to the correct person.

no easy way to see that if P complies with, say, (3) he also complies with (5). For the latter, some work is needed. That is to say, even if (3) expresses an immediate disposition of P's, (4) or (5) need not, and conversely. It is only immediate dispositions that elicit a spontaneous response out of context. All other judgements have to be more or less 'framed'. This is because it may well be that P is unable to see the connection himself. Even though he has all means in his hands, he still cannot work his way to it. In this circumstance, P may either close the matter, or work harder at it. A third possibility is that someone help P in it. (Proofs in mathematics are a case in point. We are reminded of Socrates' position that all learning is rediscovery. . .)

There are two ways to establish the connection between (3) and (5). The external method (to be used to describe Ps dispositional behaviour) is to use DT twice:

$$\begin{aligned} & B; C \vdash_P A \\ & B \vdash_P C \to A \\ & \vdash_P B \to (C \to A) \end{aligned} \tag{8}$$

The internal method is the one used by P himself. It works with the help of **supposition.** Write $: \varphi$ for the fact that φ is merely supposed. Write φ for the fact that φ is true. Order matters. If $: \varphi$ occurs before χ, it means that χ is stated in the context of φ.

$$\begin{aligned} & . \\ & : B. \\ & : B, : C. \\ & : B, : C, A. \\ & : B, C \to A. \\ & B \to (C \to A). \end{aligned} \tag{9}$$

The first three lines are explained as follows. It is legitimate to start with ., the empty sequence. At any time you may suppose something. P supposes first B and then C. At this point he can use his immediate disposition (as coded in (3)) and he will consent to A. The next two steps simply perform DT backwards: they also introduce some piece of notation ("→"). At the end, a single uncoditional formula is derived.

4 Force

So far the entire discussion was centered around the question of understanding a sentence. This might be deemed a luxury for the linguist. We might simply say that if a sentence is uttered it comes endowed with, say, assertive force, and so we shall simply take it as "speaker judges that sentence to be true" and take it from there. Yet it turns out that force does not apply equally to every part of a sentence. Moreover, the same truth conditional content can be articulated differently and these differences are reflected in subtle differences in the way gnosis works. And as meanings are more than truth conditions, namely *actions,* it is to be expected that sentences transport action sequences rather than just meanings.

We begin with *A implies B.* This is a statement to the effect that $A \to B$. In this case the hearer cannot immediately respond with acceptance unless he has an immediate disposition to accept $\vdash A \to B$; otherwise he will first have to enact the meaning of →. This is done by going through the step of supposing A and then doing the same as above.

Look by contrast to the sequence

(10) *Suppose A. Then B.*

This is different from $A \to B$. Not truth conditionally; but it elicits a different sequence of acts in the hearer. The first half is a *request.* It asks the hearer to enter into the state

(11) $: A$

Next follows the proclamation that in this state B follows. If the hearer has the immediate disposition $A \vdash B$ then he will consent to the truth of B. He has understood.

A third way to express the same is by

(12) *If A then B.*

This is not to be confused with either of the above. It actually *expresses* a conditional judgement. It is a claim of B, *given that* A. That there is a difference is seen with probabilities. The conditional probability $P(B|A)$ is different from $P(A \to B)$. If the two are independent, then $P(B|A) = 1/2$, while $P(A \to B) = 3/4$. Analogously, a conditional obligation of B given that A is not an obligation to bring $A \to B$ about. It is an obligation to bring about B when A is the case.

5 Theme and rheme

An immediate application of the previous ideas is in topic and focus (I prefer the words *theme* and *rheme*). It is known that the theme—rheme articulation is not truth functional. Yet it does show interaction with propositional operators, even negation. The explanation that I am going to give is that rheme is the only part to which the force attaches. It establishes the context of some sort for the rheme. The idea is that mental acts have a correlate in language, which I call **phatic acts.** Like noetic acts, phatic acts cannot be subordinated. An utterance enacts not a single act, but a sequence thereof. A **normal sequence** of acts consists in several suppositions followed by a **principal phatic act,** which can be of different type, such as stating, asking, doubting, and so on. Each of the suppositions is expressed by a **theme.** The principal phatic act consists of two parts: the phatic type, denoted by the **pheme,** and the phatic content, the **rheme** (see Zemb 1978).

(13)
$$\underset{\text{Theme}_1}{: \delta_1} \quad \underset{\text{Theme}_2}{: \delta_2} \quad \cdots \quad \underset{\text{Theme}_n}{: \delta_n} \quad \underset{\text{Pheme}}{\succ} \quad \underset{\text{Rheme}}{\varphi}$$

Notice that the themes and the rhemes are propositions. This presents a phatic sequence that describe by a conditional judgement of the form:

(14) $\delta_1 \quad \delta_2 \cdots \delta_n \quad \succ \varphi$

Notice that the colon is redundant and not written in logic. Let me give an example.

(15) *Tullius is Cicero.*

This sentence may express various phatic sequences.

① I picture the person named *Tullius*; and I picture the person named *Cicero.* I consent to the fact that they are the same.

(16) $: \mathit{Tullius}(x) \quad : \mathit{Cicero}(y) \quad \vdash x = y$

② I picture the person named *Tullius.* I consent to the fact that he is Cicero.

(17) $: Tullius(x) \quad \vdash Cicero(x)$

③ I picture the person named *Cicero.* I consent to the fact that he is Tullius.

(18) $: Cicero(x) \quad \vdash Tullius(x)$

④ I consent to the fact that Cicero is the same as Tullius.

(19) $\vdash Tullius(x) \leftrightarrow Cicero(x)$

Not all of these phatic sequences are equally likely to be rendered by (15). There are alternatives to the sentence (small caps represent emphasis):

(20) Tullius *is Cicero.*

(21) *Tullius* is *Cicero.*

(22) *Cicero is Tullius.*

It seems to me that (20) fits best with ③, that (21) fits best with ①, (22) with ③. For ④ the neutral intonation on (15) seems to be most appropriate.

This idea has several consequences. For example, if someone else is going to describe my belief state, he may have to choose among these options. For notice that in belief contexts the equivalence between these renderings breaks down. Thus, while the truth conditions of (15)–(22) may be the same, the corresponding embeddings in propositional attitudes are not.

(23) *Marcus believes that Tullius is Cicero.*

(24) *Marcus believes that* Tullius *is Cicero.*

(25) *Marcus believes that Tullius* is *Cicero.*

(26) *Marcus believes that Cicero is Tullius.*

In order to see this we need to explore what these sentences actually correspond to. Return to the sequence of noetic acts above. Suppose what counts as the content of my belief really is only the apprehended fact, not its suppositions. The suppositions are just ways to enter the objects into the scene. In that case the belief reports will have the following representation.

(27) $: Tullius(x) \quad : Cicero(y) \quad \vdash B_M(x = y)$

(28) $: Tullius(x) \quad \vdash B_M Cicero(x)$

(29) $: Cicero(x) \quad \vdash B_M Tullius(x)$

(30) $\vdash B_M(Cicero(x) \leftrightarrow Tullius(x))$

The first is now the de re identity belief: of the people that are called Tullius and Cicero, I regard them as the same (though you may not). The second and the third are de re attributions, and the fourth is completely de dicto. Notice that we could imagine a host of other representations, like this one:

(31) $: B_M Cicero(x) \quad : B_M Cicero(y) \quad \vdash B_M(x = y)$

This says (if representing something you say to a third person): think of the object that Marcus calls Cicero, and think of the object that he calls Tullius. I claim that these two Marcus believes to be the same. There are explicit ways of saying this:

(32) *Marcus believes that the person he calls Tullius is the same person he calls Cicero.*

Additionally, you might believe of the two people that I call *Tullius* and *Cicero,* respectively, that they are the same. But none of that is what a simple belief report says. The underlying principle is that a simple belief report reports a belief state. It does not report any mental acts. The mental acts that are packaged into the sentence are therefore yours, not mine.

If this is true, then also negative belief reports act that way.

(33) $: \mathit{Tullius}(x) \quad : \mathit{Cicero}(y) \quad \vdash \neg B_M(x = y)$

(34) $: \mathit{Tullius}(x) \quad \vdash \neg B_M \mathit{Cicero}(x)$

(35) $: \mathit{Cicero}(x) \quad \vdash \neg B_M \mathit{Tullius}(x)$

(36) $\vdash \neg B_M(\mathit{Cicero}(x) \leftrightarrow \mathit{Tullius}(x))$

(37) *Marcus does not believe that Tullius is Cicero.*

(38) *Marcus does not believe that* Tullius *is Cicero.*

(39) *Marcus does not believe that Tullius* is *Cicero.*

(40) *Marcus does not believe that Cicero is Tullius.*

The logical distinctions I am using here have long been noted; it has also been noted that emphasis can change the meaning and the topic focus articulation (see for example Taglicht 1984). What was missing was an account of how it is that the topic focus articulation bears on the question of de dicto ambiguities; what was missing was a theory that could explain how the sentences (15)–(22), which are truth conditionally equivalent, suddenly part company when inside a propositional attitude. Attempts have been made, for example the structured meaning approach. However, the latter is a massive overkill (see Gupta & Savion 1987). What has not often been noted is that the phenomenon is not restricted to propositional attitudes alone. Even negation is sensitive to the topic focus articulation.

(41) *It is not the case that Tullius is Cicero.*

(42) *It is not the case that* Tullius *is Cicero.*

(43) *It is not the case that Tullius* is *Cicero.*

(44) *It is not the case that Cicero is Tullius.*

Consider the second sentence. It says of the individual named *Cicero* that he is not the same as Tullius. It seems to say (for many) that there is someone else who is. In the present case this is trivially given: it is Cicero. The aboutness is here cashed in as a supposition that some object has a property. The sentence is about Cicero: it starts with the assumption that *x* is named *Cicero* (you may also think of it as an assignment of *x* to Cicero, it does not matter). It then forms the claim that *x* is not called *Tullius.* In the same vein the third sentence is about both Tullius and Cicero and it says that they are different.

6 Pheme, evidentiality and speech act

There is an oscillation between reading $\vdash$ as "is true", "*P* judges true", "*P* believes" and other judgements. It follows that the true nature of the pheme very often has to be found out (if it is not signalled). Also, as we discussed earlier, the transition from speaker to hearer is often accompanied by a tacit substitution of "speaker judgement" by "hearer judgement". The hearer will see if he can support what is said. The dependency on speaker is often not marked (but notice the category of evidentials and epentheticals such as *I think*). This has the consequence that people believe much of what other people say because they somehow think that other people speak with objective authority. Languages without explicit evidential marking make that easy.

I should stress that some grammatical expressions, for example the attitude verbs *believe* and *doubt* do not carry the phatic act; they only *report* an attitude. Similarly, the expression *is true* reports a state of affairs and is not in itself phatic. Mood comes closer to expressing a phatic act. In the end there is no one-to-one mapping between formal elements of the language and phatic acts; the problem has been discussed in pragmatics and need not be iterated here.

Notice also that phatic acts are different from traditional speech acts inasmuch as they include acts that pass under the radar of speech act theory, such as suppositions. This is because traditionally the attention has been going to the principal act. On the other hand, phatic acts studied above are a narrower class, which correspond to noetic acts. This excludes promises and requests. Obviously, a more comprehensive theory is needed.

7 Peirce's formula revisited

Let us return to Peirce's formula. If you apply DT you can reduce it to

(45) $$(p \to q) \to p \vdash p$$

No further reduction is possible. This is no accident: the internal calculus is complete for intuitionistic logic, and Peirce's formula is not valid in it. Its truth must be established by different principles. One candidate is obviously bivalence (that a proposition or its negation is true). The inability to disclose the initial part of the formula means that it remains gnostically opaque.[4] Gnostic opacity has many consequences such as lack of anaphoric binding.

8 Concluding remarks

The essence of the ideas go back to 1990. I had difficulties selling the idea to a bigger public. Part of it had to do with my inability to express my views with sufficient clarity; part of it was that topic and focus were quite unfashionable in semantics then. This is no longer the case, and my writing — I may hope — has gained some clarity. 8 Pages limit me to a mere sketch of my ideas. And a lot more needs to be done.

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[4] Notice that this applies to *If . . . then* inasmuch as $\to$ is considered its internal correlate. That need not be so. The opacity is a consequence of the fact that $\to$ is enacted in a particular way. One might envisage different enaction schemes. But I suggest that the enaction scheme is the *definition* of $\to$ and so cannot be changed.

Can focus accenting be eliminated in favor of deaccenting Given constituents?

Manfred Krifka
Humboldt-Universität Berlin
Zentrum für Allgemeine Sprachwissenschaft Berlin

1 Aims of this paper

What are the rules that govern the distribution of sentence accent? Among the various factors that have been discussed, such as word accent, rhythm rules and the formation of prosodic phrases, one has aroused particular interests among linguists: focus. The idea that focus is expressed by sentence accent can be traced back to Paul (1880), who argued that what he called the "psychological predicate" receives the main accent. Up to today, it has been assumed by most if not all researchers that putting an expression in focus means putting an accent on it (perhaps in addition to doing other things, such as moving it to a particular position in the sentence).

But there is also a general awareness that the focus accent rules can be distorted by other rules that require given expressions not to carry accents. Deaccenting rules, which have been introduced by Ladd (1980, 1996), figure in the work of many researchers, such as Selkirk (1984, 1995), Gussenhoven (1983, 1992), Uhmann (1991), Féry (1993) and Jacobs (1991). They do so most prominently in the influential theory of Schwarzschild (1999), who even proclaims:

> By establishing givenness as the mainstay of our theory, we break ranks with those who assume that focus provokes interpretation.

One question that has not been investigated yet, to the best of my knowledge, is whether we can eliminate rules of accenting focused expressions completely in favor of rules of deaccenting given expressions. In my own research, I found that the accent sensitivity of the interpretation of sentences with adverbial quantifiers, which is explained by focus rules in Rooth (1985, 1995) and Krifka (1995), to be better handled by deaccenting rules, cf. Krifka (2001). So there is a temptation to get rid of focus accent rules altogether, and just work with rules that deaccent given expressions.

The final result of this paper is that we should resist this temptation, even though working with deaccenting rules alone leads us farther than we may think. I will start with reminding readers of the theory of Schwarzschild (1999), who comes closest to a theory that works with deaccenting given constituents, but who does not quite go as far as suggesting a theory based solely on deaccenting. I will show that by eliminating the notion of focus, examples of the kind that he treats are actually explained in a way that is more congenial to his enterprise. At the end, though, a number of problems for Schwarzschild (1999) and the radical theory of Givenness will appear that, to my mind, suggest that we better work with both focus and givenness as basic notions that exert their influence on the prosody of sentences. Hence one result of this paper is that the great majority of researchers is indeed on the right track. I am aware that this affirmation of the received view is perhaps not earth-shattering, but I can promise that the excursion in the land without focus is worthwhile and that there will be new reasons to believe in

the received view. Also, patient readers will find an answer to the long-standing question why focus projects from the argument, and not from the head.

2 The theory of Schwarzschild (1999)

While Schwarzschild (1999) makes use of focus and givenness as basic notions, he has only one rule governing accentuation: Focus is expressed by accent. This is how the theory works.

First, the well-known focus projection rules of Selkirk (1984, 1995) are assumed according to which focus is expressed by a feature F that is licensed by accent and projected:

(1) a. F-Assignment: An accented word is F-marked.
b. F-Projection:
i. F-marking of the head of a phrase licenses F-marking of the phrase
ii. F-marking of the internal argument of the head licenses F-marking of the head.

In the following example, F-marking on *Bill* is licensed by accent, which in turn licenses F-marking on the head *praised,* which finally licenses F-marking on *praised Bill.*

(2) A: What did Mary do?
B: [She [praised$_{\text{F}}$ Bíll$_{\text{F}}$]$_{\text{F}}$]

Why does focus projection take the detour via the head, that is, why doesn't the argument project the focus directly? This is to account for cases like (3), where the direct argument *him* is given, and the absence of F-marking appears to indicate that.

(3) A: What did John's mother do?
B: [She [práised$_{\text{F}}$ him]$_{\text{F}}$]

However, as (4) shows, givenness is compatible with F-marking:

(4) A: What did John's mother do?
B: [She [praised hím$_{\text{F}}$]]

Schwarzschild proposes that (1) is supplemented by the following two rules:

(5) a. GIVENness: If a constituent is not F-marked, it must be GIVEN.
b. AVOIDF: F-mark as little as possible, without violating Givenness.

Notice that GIVENness allows for given constituents to be F-marked, as in (4). GIVENness also forces F-marking, as it allows for non-F-marking only in case constituents are GIVEN. It is crucial that GIVEN is defined for referential as well as for predicational or propositional constituents:

(6) a. An utterance U is GIVEN if it has a salient antecedent A such that
i. If U refers to an entity, then U and A corefer;
ii. otherwise, A entails the existential F-closure of U.

Case (6a-i), is evident. Case (6a-ii) presupposes that U has a meaning which is based on the type of truth values. It asks us to form the existential closure over all open arguments of the meaning of U, and to replace the focus expressions by variables and existentially close them as well. This could be done in the structured meaning account of focus (cf. von Stechow 1991) or in the account of Alternative semantics (cf. Rooth 1985, 1992); we disregard these distinctions here. For example, consider:

(7) Existential F-closure of [*praised Jóhn*$_{\text{F}}$]: $\exists y \exists x[\text{PRAISED}(y)(x)]$

The meaning of [*praised Jóhn*$_{\text{F}}$] is $\lambda x[\text{PRAISED}(\text{JOHN})(x)]$. Existential closure over its free argument position gives us $\exists x[\text{PRAISED}(\text{JOHN})(x)]$. Replacing the item in focus by a free variable leads to $\exists x[\text{PRAISED}(y)(x)]$; existential closure over this variable results in $\exists y \exists x[\text{PRAISED}(y)(x)]$.

The following examples illustrate how Schwarzschild's rules work, starting with narrow focus.

(8) a. A: Who did Mary praise?
b. B: [Mary [praised Jóhn$_{\text{F}}$]]

(8a) introduces the existence presupposition $\exists x[\text{PRAISED}(x)(\text{MARY})]$ (or, a point to which we will return in **section 4**, $\exists x[\text{PRAISED}(x)(\text{MARY}) \wedge \text{PERSON}(x)]$). GIVENness is applied on all syntactic nodes. As the whole answer is not F-marked, it must be GIVEN, which is the case as the existential closure of [*Mary* [*praised Jóhn*$_{\text{F}}$]]] is $\exists x[\text{PRAISED}(x)(\text{MARY})]$, which follows from the existence presupposition of the question. As the constituent [*praised Jóhn*$_{\text{F}}$] is not focused marked, it must be given as well, which is the case as its existential closure $\exists x \exists y[\text{PRAISE}(x)(y)]$ follows from the existence presupposition of the question. The constituent *Jóhn* is F-marked, hence GIVENness is not applicable, but we have to check whether, by AVOIDF, it has to be focus-marked. This is indeed the case, for the answer [*Mary* [*praised John*]], without any focus marking, would have to satisfy GIVENness, but it doesn't: Its existential closure PRAISED(JOHN)(MARY) does not follow from the presupposition of the question. Could we place F somewhere else, on *Mary* or on *praised*? No. For example, [*Máry*$_{\text{F}}$ [*praised John*]] would have as its existential closure $\exists y[\text{PRAISED}(\text{JOHN})(y)]$, which does not follow from the presupposition of the question. We could try out wide focus on the VP, which is generated as [*Mary* [*praised*$_{\text{F}}$ *Jóhn*$_{\text{F}}$]$_{\text{F}}$] according to Selkirk's rules. The existential closure for this sentence is $\exists P[P(\text{MARY})]$, i.e., Mary has some (contextually restricted) property, and this certainly follows from the existential presupposition. However, AVOIDF filters out VP focus, as it involves more foci than the original answer in (8).

The following example illustrates that a given expression can be F-marked. The argument is exactly parallel to the one given in (8). Notice that nothing prevents F-marking on a given constituent.

(9) A: Who did John's mother praise?
B: [She [praised him$_{\text{F}}$]]

Consider now an example involving VP focus:

(10) A: What did Mary do?
B: [She [praised$_{\text{F}}$ Jóhn$_{\text{F}}$]$_{\text{F}}$]

(10) presupposes that Mary did something: $\exists P[P(\text{MARY}) \wedge \text{ACTIVITY}(P)]$. The sentence is not F-marked, which is fine as it is given: It's existential F-closure is $\exists P[P(\text{MARY})]$, or perhaps more specifically $\exists P[P(\text{MARY}) \wedge \text{ACTIVITY}(P)]$, and this clearly is entailed by the presupposition of the question. The VP is F-marked, which is required by GIVENness. To see this, first consider the case without any F-marking, [*She* [*praised Jóhn*$_{\text{F}}$]]. The existential F-closure is the proposition PRAISED(JOHN)(MARY), which does not follow from the presupposition of (9). Second, consider the case that there is F-marking only on *John,* as in [*She* [*praised Jóhn*$_{\text{F}}$]]. Existential F-closure leads to $\exists x[\text{PRAISED}(x)(\text{MARY})]$,

which again does not follow from the presupposition. Now consider F-marking only on *praised,* as in [*She* [*práised*$_{\text{F}}$ *John*]. Existential F-closure leads to $\exists R[R(\text{JOHN})(\text{MARY})]$, that is, Mary and John stand in some relation to each other, which again does not follow from the presupposition of the question. Next consider F-marking on *praised,* projected to the VP: [*She* [*práised*$_{\text{F}}$ *John*]$_{\text{F}}$]. Now *John* is not F-marked, hence it must be given, but in fact it isn't, as it is not mentioned in the previous discourse. Let us finally try [*Mary* [*práised*$_{\text{F}}$ *Jóhn*$_{\text{F}}$]]. This leads to an existential F-closure $\exists x \exists R[R(x)(\text{MARY})]$, that Mary stands in some relation to some individual x, which again does not follow from the presupposition of the question. Hence we are forced to assume the three foci in the answer of (10), as only then all conditions can be satisfied.

What will happen in case the argument is given, as in the following example:

(11) A: What did John's mother do?
B: [She [práised$_{\text{F}}$ him]$_{\text{F}}$]

The argumentation is the same as in the previous example, with the only difference that *him* is given. Now we can drop F-marking on *him,* following AvoidF. In contrast to Selkirk's proposal, we do not need a separate treatment of F-marked constituents within other F-marked constituents.

3 A Givenness theory of accentuation

Schwarzschild's explanation of sentence accent is remarkable because of the important role it assigns to Givenness, whereas previous theories mostly considered Focus as the decisive factor. For Schwarzschild, Givenness is nearly complementary to Focus: What is not F-marked must be Given, according to rule (5a). Furthermore, he states that the marking of Focus should be avoided (5b), which can be taken as saying that Givenness should be expressed. This suggests a reformulation of Schwarzschild's rules that essentially build on Givenness instead of Focus to describe the distribution of accents. Instead of (5a,5b), we can try out the following rules, which have the advantage of being formulated as positive statements:

(12) a. Givenness$_{\text{D}}$: If a constituent is D-marked, then it is Given$_{\text{D}}$.
b. Deaccent!: D-mark as much as possible.

Something like (12a) has been tentatively suggested by Büring (2006), in a contraposed form: "If a constituent is not GIVEN, it must be prominent" (i.e., not D-marked). The formulation here goes one step farther, as it works with *non*-prominence, or D-marking, as a basic notion.

F-marking doesn't play a role in the rules (12), and it does not figure in the revised notion of givenness either, which is simpler than the one in (6):

(13) a. An utterance U is Given$_{\text{D}}$ if it has a salient antecedent A such that
i. If U refers to an entity, then U and A corefer;
ii. otherwise, A entails the existential closure of U.

D-marking results in deaccentuation. These rules assume a new view of how accent is determined. As mentioned, most researchers, including Selkirk (1984, 1995), Gussenhoven (1983) and Jacobs (1991) consider accent a result of focus marking: Constituents that are focused are accented. In the current rule system, the position of accents follows from rules that identify constituents that are to be deaccented; constituents that cannot be deaccented emerge as the ones that are accented.

Just as with F-marking, D-marking projects. In contrast to the rules of Selkirk in (1), the rules governing the projection of givenness is simple and intuitive:

(14) If all the subconstituents of a complex constituent are D-marked, then this constituent is D-marked. That is, $[\alpha_D\, \beta_D] \Rightarrow [\alpha_D\, \beta_D]_D$.

But we will need one additional rule to deal with the argument/head asymmetry. Before we introduce that, let us discuss how the Givenness theory of accentuation works. We begin with example (8), repeated here under its new analysis.

(15) A: Who did Mary praise?
B: [She$_D$ [praised$_D$ Jóhn]]

Mary and *praised* carry a deaccentuation feature D that leads to a suppression of accent; *John* does not carry this feature, and therefore it will carry accent. The D-marking in (15) is the only one that is compatible with the rules (12): First, notice that the D-marking is indeed compatible with the rules. *She* and *praised* are D-marked, and both constituents are GIVEN$_D$. In the case of *she,* an expression of type e, there is a salient expression that refers to the same entity, namely Mary. In the case of *praised,* the existential closure, $\exists x \exists y[\text{PRAISED}(x)(y)]$, follows from the presupposition of the question. Second, notice that D-marking of *John* is not possible; this would violate GIVENness$_D$, as *John* is not given. Third, while lack of D-marking on *praised* or *Mary* would be compatible with GIVENness$_D$, it would violate DEACCENT!, as deaccenting would not be maximized. Of course, D-marking on the VP or on the whole sentence is not possible either, as the constituents [*praised*$_D$ *Jóhn*] and [*she*$_D$ [*praised*$_D$ *Jóhn*]] are not GIVEN$_D$.

Next consider an example with an accented constituent that is given:

(16) A: Who did John's mother praise?
B: [She$_D$ [praised$_D$ hím]$_F$]

Lack of D-marking on *him* is compatible with GIVENness$_D$, as this only states something about D-marked constituents. Is lack of D-marking also required? Yes indeed: Assume that *him* were D-marked, as in [*praised*$_D$ *him*$_D$]; then the whole VP would be D-marked, following (14), resulting in a structure [*praised*$_D$ *him*$_D$]$_D$. Following GIVENness$_D$, this VP must be GIVEN$_D$, but its existential closure $\exists x[\text{PRAISED}(\text{JOHN})(x)]$ does not follow from the presupposition of the question. The necessity to D-mark *she* and *praised* follows from the same reasons as the ones discussed for (15).

Now let us reconsider example (11) that we have described as one with broad focus:

(17) A: What did Mary do?
B: [She$_D$ praised Jóhn]]

It is evident that this is the only D-marking compatible with the rules. *She* can be D-marked, following GIVENness$_D$, and it has to be D-marked, following DEACCENT!. Furthermore, other constituents could not be deaccented. For example, [*praised*$_D$ *Jóhn*] is not a possible D-marking, as it violates GIVENness$_D$. It would require *praised* to be GIVEN$_D$, that is, $\exists x \exists y[\text{PRAISED}(x)(y)]$ to be inferrable, from the context, which is not the case.

However, it now becomes evident that the rule system proposed so far is incomplete, as it does not predict that *praised* is realized as if it were deaccented, with *John* bearing the main accent. We obviously have to appeal to some equivalent to focus projection rules here, like the following:

(18) If in a constituent [α β] with a head and an internal argument neither α nor β are D-marked, then D-mark the head!

There is an obvious problem with this rule when we combine it with GIVENness$_{\mathrm{D}}$, as it is then required that the head α is GIVEN$_{\mathrm{D}}$. We have two options here. Either we can understand (18) as a rule that is operative only after GIVENness$_{\mathrm{D}}$ has been checked. Or, if we don't like extrinsic rule orderings, we can introduce the concept of d-marking and say that if [α β] is not D-marked, then the head is d-marked, where d-marking is interpreted prosodically just as D-marking, without being linked to givenness. As this latter way is notationally clearer, I will make use of it here, and replace (18) by the following rule:

(19) If in a constituent [α β] with a head and an internal argument neither α nor β are D-marked, then d-mark the head!

Example (17) then has to be analyzed as follows:

(20) A: What did Mary do?
B: [She$_{\mathrm{D}}$ [praised$_{\mathrm{d}}$ Jóhn]]

Rule (19) can be reformulated so that it can govern the accent distribution within a complex constituent whose subconstituents are D-marked, cf. (21), which leads to analyses as in (22).

(21) If in a constituent [α β] with a head and an internal argument both α and β have the same status as to D-marking, then d-mark the head!

(22) A: What did Mary do after she praised John?
B: After [she$_{\mathrm{D}}$ [praised$_{\mathrm{D,d}}$ Jóhn$_{\mathrm{D}}$]]$_{\mathrm{D}}$, she gave him a kiss.

The additional d-marking of *praised* leads to a relative accentuation of *John.* A recursive definition of d-marking appears possible that mimicks the recursive definition of focus marking in Jacobs (1991), but I will not attempt to implement this here.

Let us now consider example (11), under the Givenness analysis.

(23) A: What did John's mother do?
B: [She$_{\mathrm{D}}$ [práised him$_{\mathrm{D}}$]]

It is evident that D-marking on *she* and *him* is possible, following GIVENness$_{\mathrm{D}}$, as both expressions are given. It is also evident that D-marking on *praised* is not possible, as it is not GIVEN$_{\mathrm{D}}$; the presupposition of the question does not entail $\exists x \exists y$[PRAISED$(x)(y)$].

The Givenness theory of accentuation yields the right result in cases that have been analyzed as double focus (which Schwarzschild's theory can deal with as well):

(24) First John called Bill a Republican, and then [Bíll [insulted$_{\mathrm{D}}$ Jóhn]]

D-marking on *insulted* is justified if the first sentence is accommodated in such a way that, if x calls y a Republican, then x insults y. The existential closure of *insulted* is $\exists x \exists y$[INSULT$(x)(y)$], and this follows from the first clause. Could we also D-mark *Bill,* or *John,* or both, as they are given too? No: The VP [*insulted*$_{\mathrm{D}}$ *John*$_{\mathrm{D}}$] is not acceptable, as its existential closure, $\exists x$[INSULT(JOHN)(x)], is not entailed by the context. Neither is the existential closure of [*Bill*$_{\mathrm{D}}$ [*insulted*$_{\mathrm{D}}$ *Jóhn*]], nor the one of [*Bill*$_{\mathrm{D}}$ [*insulted*$_{\mathrm{D}}$ *John*$_{\mathrm{D}}$]], as can be easily checked.

4 A comparison of theories

Which of the two theories, Schwarzschild (1999) or the Givenness theory, is to be preferred? They make rather similar empirical predictions in many cases. Also, it appears that the interface rules that lead to spell-out of F-marked or D-marked constituents in prosody are of similar complexity. The possibility for a positive formulation of GIVENness$_{\mathrm{D}}$ by [D-marked(α) $\rightarrow$ GIVEN$_{\mathrm{D}}$(α)], instead of the negative formulation in Schwarzschild's original definition of GIVENness by [$\neg$F-marked(α) $\rightarrow$ GIVEN(α)], should be a considered a conceptual advantage of the Givenness theory. A more substantial advantage is the fact that the Givenness theory relies on a simpler theory of Giveness, namely GIVEN$_{\mathrm{D}}$, which does not refer to the F-feature at all (in fact, there is no F-feature in this theory). GIVEN$_{\mathrm{D}}$ can be expressed by simple existential closure, whereas GIVEN involves both replacing the focus expression by a variable and existential closure.

The Givenness theory might be considered more complex because it has to resort to either rule-ordering or a second feature d to deal with focus projection cases such as (20). But then this relatively simple rule replaces the two rules of focus projection (1b). Furthermore, on closer inspection, Schwarzschild's theory needs an addition rule as well. In Selkirk's rule projection, nothing prevents the accent structure of the following answer:

(25) A: What did Mary do?
B: [She [práised$_{\mathrm{F}}$ Jóhn$_{\mathrm{F}}$]$_{\mathrm{F}}$]

Here, *praised* is accented, which motivates the F feature that it would have gotten anyway by the fact that the argument *John* is in focus. Accent on *praised* is not excluded by AVOIDF, as this constrains only the assignment of F-features, not accentuation. Hence we would need an additional constraint, AVOID ACCENT. This constraint could not simply replace AVOIDF, as we need that, for example, to block the VP accent in cases of double focus, such as [*She* [[*práised*$_{\mathrm{F}}$ *Jóhn*$_{\mathrm{F}}$] *and* [*condémned*$_{\mathrm{F}}$ *Bíll*$_{\mathrm{F}}$]]]. It should be remarked that Schwarzschild himself, at the end of his paper, feels compelled to sketch an alternative version of his theory in which F-marking is free but checked by a violable constraint saying that heads are less prominent than arguments (his (59)); this is exactly what (19) wants to inforce, and Schwarzschild's constraint actually could replace (19). Büring (2006) has an equivalent rule of "horizontal" focus projection.

If we compare the two preference rules AVOIDF and DEACCENT!, it is difficult to argue that one is intrinsically better than the other. AVOIDF can be seen as a rule that avoids the linguistic complexity that is a result of F-marking, which results in F-marking only when necessary. DEACCENT! can be seen as a rule that prefers the greater linguistic simplicity that comes with deaccentuation, which is blocked only in case the addressee is to be directed to information that is not yet derivable from the context. I consider these two views equally plausible.

While the arguments discussed so far lead to the conclusion that both theories have similar complexity, there are some that show that Givenness theory may actually be simpler. First, consider non-accentable expressions such as *someone.*

(26) A: What did Mary do?
B: [She [práised$_{\mathrm{F}}$ someone$_{\mathrm{F}}$]$_{\mathrm{F}}$]

The direct argument *someone* cannot be accented, and hence it is not F-marked. Following GIVENness, it should be GIVEN. Applying Schwarzschild's definition of GIVEN requires us to form the existential closure over the meaning of *someone,* which is $\exists P$[PERSON $\cap P \neq \emptyset$],

which is true iff there is at least one person. This certainly follows from the presupposition of the question in (26), as Mary is a person. However, it does follow from the question of the following cases:

(27) A: What did the dog do?
B: [It [bít$_{F}$ someone$_{F}$]$_{F}$]

(28) A: What happened?
B: [Péter$_{F}$ [came in$_{F}$]]$_{F}$ vs. [Someone [came ín$_{F}$]]$_{F}$

Perhaps the presupposition that someone exists is a fairly innocent one that can always be assumed. Notice that indefinite NPs based on general nouns, such as *a person,* may behave in a similar way:

(29) A: What did the dog do?
B: [It [bít$_{F}$ [a person]]$_{F}$]/ [It [bit$_{F}$ [a pérson]$_{F}$]$_{F}$]

But this cannot be the whole story. The words *person* and *human being* presumably are extensionally equivalent for our purposes, but certainly *human being* can never be deaccented in *It bit a human being,* as an answer to (29). We better assume that it is a grammatical property of expressions like *someone,* and of certain uses of *a person,* that they cannot be accented. We can express this in Schwarzschild's theory by stipulating that they never can be focused, which prevents them from being accented, as focus on a word has to be licensed by accent. But then they do not satisfy the GIVENness condition ascribed to non-focused expressions. In the current theory we can stipulate that *someone* has the feature d as part of its lexical specification, which is irrelevant for GIVENness$_{D}$. We get the following analysis:

(30) A: What did Mary do?
B: [She$_{D}$ [práised someone$_{d}$]]

Notice that *praised* is not D-marked, and the VP [*práised someone*$_{d}$] is not D-marked either. We know that *praised* and [*práised someone*$_{d}$] could not be D-marked, as these constituents are not GIVEN$_{D}$. It appears that the Givenness theory can deal with non-accentable expressions like *someone* better, by the assignment of a d-feature which is needed for independent reasons.

Another type of instance that favors the Givenness theory are cases in which focus appears to project from an embedded constituent. Schwarzschild (1999) has discussed such cases, and Büring (2006) has added more that all show that, while focus on a complex expression must be "grounded" in a focused (and accented) word, the selection of this word is mainly determined by givenness. Schwarzschild's example receives the following analysis in the Givenness theory:

(31) A: John drove Mary's red convertible. What did he drive before that?
B: [He [drove [her blúe$_{F}$ convertible]]]

Schwarzschild would have focus on *blue,* and he argues that all other constituents are GIVEN. However, it is a pure coincidence that the chosen context entails the existential F-closure of the sentence, that John drove a convertible of Mary. In a context like *Mary drove her red convertible. What did John drive?,* the F-closure of the answer is not given, as it does not entail that John drove a convertible. Yet the same focus structure is required in this context. Here is what Givenness theory says:

(32) B: [He$_{\text{D}}$ [drove$_{\text{D}}$ [her$_{\text{D}}$ blúe convertible$_{\text{D}}$]]]

No other constituent is D-marked. That is, the sentence is not predicted to require a salient antecedent from which it follows that John drove one of Mary's convertibles. The D-markings in (32) are justified: There are salient antecedents for *he* and *her; drove* is GIVEN$_{\text{D}}$ because the context entails $\exists x \exists y$[DROVE$(x)(y)$]; and *convertible* is given as the context entails $\exists x$[CONVERTIBLE(x)]. We cannot D-mark *blue* because it does not have an antecedent. It also would lead to D-marking of all constituents, following (14), which in turn would require that the context already entails that John drove a blue convertible.

5 Why we need Focus, in addition to Givenness

In the last section I have tried to argue that a Schwarzschild-style theory can be more succinctly expressed in a theory that uses D-marking instead of F-marking. In this section I would like to show that we actually need both rules of deaccentuation and rules of accentuation, as a theory based only on Givenness leads to a number of problems.

1. The first problem is that we find deaccentuation in the absence of GIVEN$_{\text{(D)}}$ness, beyond the case of *someone* discussed above. Let us take up the convertible example, in the following form:

(33) As there weren't any red convertibles anymore, John drove a blúe convertible.

From the first clause it does not follow that there are convertibles, but both Schwarzschild's theory and the Givenness theory require that there is one, to account for the lack of accent on *convertible.* This suggests that *convertible* is not GIVEN$_{\text{(D)}}$ because its existential closure follows from the context, but simply because the concept 'convertible' has been mentioned before. This suggests that we should extend the notion of givenness. Following Webber (1978) we could assume that nouns introduce discourse referents for kinds, which can be taken up anaphorically by other nouns, where the life time of such discourse referents is not restricted by the scope of negation (cf. the use of *one*-anaphora, as in *John drove a blúe one*). But there are other cases where GIVEN$_{\text{(D)}}$ fails to determine deaccentuation. In the following example, *stood up* is clearly deaccented, although it is not GIVEN$_{\text{(D)}}$ (the context does not entail that anyone stood up).

(34) As none of her friends stood up, Máry stood up.

We have a similar problem in other cases of non-presupposing constructions:

(35) A: It is possible that Mary praised someone.
B: Yes, Mary praised Jóhn.

(36) A: I doubt that Mary praised anyone.
B: You're wrong, Mary praised Jóhn.

On closer inspection, even the constituent questions that motivated the accentuation theories turn out to be unconvincing, as it is not clear whether such questions generally come with an existence presupposition. Consider (37). Here, *praise* is not GIVEN$_{\text{(D)}}$, and *praised him* is not GIVEN$_{\text{(D)}}$, yet these constituents must be D-marked (or cannot be F-marked, in Schwarzschild's theory).

(37) A: Who, if anybody, praised John?
B: Máry praised him.

Perhaps we should extend the definition of GIVEN$_{(D)}$ such that everything that is mentioned in the immediately preceding context should count as given. For example, *stood up* is given in the second clause of (34) as this concept was mentioned in the first clause. With this we are heading towards the notion of c-construability of Rochemont (1986). However, this leads us into well-known problems, as in the Republican example (24), or in case the alternatives are explicitly given, as in (38):

(38) A: Who did Mary praise, Bill or John?
B: Mary praised Jóhn.

Here the concepts of 'John', of 'praised John', and of 'Mary praised John' are all c-construable, which predicts that we should not find any accent, contrary to fact. Rochemont (1986) dealt with such cases as a special type of focus, contrastive focus, which follows different rules. While I believe that there is contrastive focus as a separate case, I think that (38) is not an instance of that, as we do not find the usual hallmarks of contrastive focus, like more pronounced accent or the possibility of cleft constructions.

2. There are similar problems that have been pointed out by Féry & Samek-Lodovici (2006). For example, in (39) deaccenting on *farmer* and accent on *Canadian* is justified in Schwarzschild's theory (as well as in the Givenness theory), but the option of accenting *American* is not. Similarly, the option of focusing *red* in in (33) is not predicted. Schwarzschild has to resort to a special contrastive focus relation, just as Rochemont.

(39) An Américan farmer was talking to a Canádian farmer.

3. A slight variation of the examples like (9) that Schwarzschild has used to motivate focus rules, and I have used to motivate deaccentuation rules, results in wrong predictions:

(40) A: What did Mary praise?
B: *She praised Jóhn.

The answer does not satisfy the presupposition of the question, that Mary praised a thing. Nevertheless, neither Schwarzschild's theory nor the Givenness theory would consider this problematic. Here is why: (40) creates the presupposition $\exists x[\textsc{praised}(x)(\textsc{mary}) \wedge \textsc{thing}(x)]$. Under Schwarzschild's theory, (40) has the focus assignment [*She* [*praised Jóhn*$_{\mathrm{F}}$]]. As the VP and the sentence are not F-marked, their existential F-closure $\exists x \exists y[\textsc{praised}(x)(y)]$ and $\exists x[\textsc{praised}(x)(\textsc{mary})]$ should be GIVEN. And indeed they are, as they are not restricted to persons or things. In the Givenness theory, the answer has the deaccentuation pattern [*She*$_{\mathrm{D}}$ [*praised*$_{\mathrm{D}}$ *Jóhn*]], which requires that *praised* is GIVEN$_{\mathrm{D}}$; this is indeed the case, as $\exists x \exists y[\textsc{praised}(x)(y)]$ follows from the presupposition of the question, as before.

4. The most severe problem of a Givenness only theory is that it leaves the question-answer relation vastly underdetermined. While (41a) motivates the accent structure of (41b), what we have said so far in either theory cannot rule out answers like (41c).

(41) a. A: Who did Mary praise?
b. B: She praised Jóhn.
c. B: # She slépt.

The question introduces the presupposition $\exists x[\textsc{praised}(x)(\textsc{mary})]$, from which it does not follow that someone slept, hence the accentuation in (41c) is satisfied.

Can we use Givenness as a factor to determine what a congruent answer to a question is? The best I could come up with is the following, where (ii) is essentially what we have assumed so far.

(42) a. A question-answer pair Q—A is congruent iff:
   i. Q introduces an existential presupposition Q_{E}, and A entails Q_{E}.
   ii. the existential (F-)closure of all D-marked (non F-marked) constituents of A follow from Q_{E}.

For example, (41b) entails the existential presupposition of (41a), that Mary praised someone, but (41c) does not. This way of explaining question/answer congruence is problematic, however, in the case of non-presupposing questions, as in (37).

I have listed a number of problems that make it very questionable that a theory based on Givenness alone will be sufficient to describe all the effects that have been ascribed to focus and focus accent. As it is obvious that focus alone is not sufficient either, we need both concepts. How they interact is sketched in the final section.

6 How Focus accenting and Givenness deaccenting interact

Let us assume then a theory that has both F-marking and D-marking, where F-marking indicates the presence of alternatives, and D-marking indicates Givenness. (Such theories have been proposed before, most recently by Féry & Samek-Lodovici (2006), who also factor in constraints of phonological phrase formation). As a default assumption, F-marking and D-marking are maximal in the sense that whenever alternatives to a constituent play a role in interpretation, then it is F-marked, and whenever a constituent is given, it is D-marked.

Alternatives, and hence F-marking, can be used for a variety of functions, for example to express contrast, or to identify the domain of quantification of *only* by way of alternatives. In question-answer sequences, the alternatives introduced by the question must be identifiable with the alternatives of the answer. Using structured meanings that relate a background, a set of alternatives, and a focus to each other (cf. Krifka 2006), this can be illustrated as follows:

(43) a. A: Who did Mary praise? $\langle \lambda x[\textsc{praised}(x)(\textsc{mary})], \textsc{person}, * \rangle$
   b. B: She praised Jóhn. $\langle \lambda x[\textsc{praised}(x)(\textsc{mary})], A, \textsc{john} \rangle$

The question has an empty focus, $*$, as the question word *who* just identifies the set of alternatives. The answer has a variable A for the alternative set, as this is determined by the context. (43a–43b) is a coherent question-answer pair, as the backgrounds are identical, the identification of the alternative sets $\textsc{person} = A$ is possible, and $\textsc{john} \in A$ holds.

As for Givenness, I suspect that the relation 'given' based on entailment of existential (F-)closure is too narrow, as examples like (33) and (34) show. We probably will have to use a wider notion, such as Rochemont's c-construability.

Focus and Givenness are expressed in simple but contradictory ways (cf. also Féry & Samek-Lodovici 2006):

(44) a. FOCUS–ACCENT (to be revised): If a constituent is in Focus, it bears Accent.

b. GIVEN-DEACCENT: If a constituent is Given, it is Deaccentend.

The FOCUS-ACCENT rule is compatible with accent being assigned to non-focused expressions. We may refine it in such a way that it says that that it bears stronger accent than sister constituents that are not in focus, cf. Jacobs (1991), or that it bears the strongest accent in its focus domain which includes the background, cf. Truckenbrodt (1999) and Féry & Samek-Lodovici (2006).

The FOCUS-ACCENT rule outranks the GIVEN-DEACCENT rule (cf. Féry & Samek-Lodovici 2006). Hence an expression in focus that is given must be accented:

(45) A: Who did Mary praise?
B: She_{D} $\text{praised}_{\text{D}}$ $[\text{hím}_{\text{D}}]_{\text{F}}$

The focus-accent rule as stated in (44) is fairly unspecific, as it does not indicate how Accent is realized in complex constructions. As it is well-known since Gussenhoven (1983) and Selkirk (1984), we have to distinguish between head-argument constructions, which are often realized by one accent, and others such as head-adjunct constructions or coordination constructions, which are realized by multiple accent. It has been suggested (see Gussenhoven 1983, 1992, Jacobs 1991, Truckenbrodt 1999 and others) that the latter constructions have to form separate phonological phrases that each get an accent, whereas head-argument constructions can be integrated into one phonological phrase. I cannot go into the intricacies of phonological phrase formation, which also depends on the presence and absence of focus. However, it is clear that (44) should be specified as follows:

(46) FOCUS-ACCENT: If a constituent is in Focus, each of its phonological phrases bears Accent.

Finally, we turn to the question of accent realization in head-argument constructions that are integrated into a single phonological phrase. Here we have to state the well-known asymmetry:

(46) FOCUS-ACCENT: If a constituent is in Focus, each of its phonological phrases bears Accent.

(47) ACCENT-ARGUMENT: If an integrated constituent consisting of a head and an argument bears accent, then accent is realized on the argument.

The ACCENT-ARGUMENT rule is ranked lower than FOCUS-ACCENT or GIVEN-DEACCENT. This predicts the following data:

(48) A: What did Mary do?
B: She_{D} $[\text{praised Jóhn}]_{\text{F}}$

(49) A: What did John's mother do?
B: She_{D} $[\text{práised him}_{\text{D}}]$

In the latter case, accent has to be realized, due to FOCUS-ACCENT, but it cannot be realized on *him* due to DEACCENT-GIVEN, and hence has to be realized on *praised.* In case both constituents are given, then ACCENT-ARGUMENT re-emerges:

(50) A: Did you prepare a meal, or offer a drink?
B: I $[\text{offered}_{\text{D}}$ $[\text{a drínk}]_{\text{D}}]_{\text{F}}$

The view that DEACCENT-GIVEN counteracts ACCENT-ARGUMENT offers a way to understand why we have a rule like ACCENT-ARGUMENT to begin with, that is, why

accent by default percolates to the argument, and not the head. I think it is a plausible assumption that referential expressions are more often Given than non-referential ones, like predicates. If Deaccentuation signals Givenness, then the usefulness of this marking strategy is maximized if referential expressions are accented by default. This is the case if accent in a head-argument construction is realized by default on the argument, which is typically referential and often given, and not on the head, which is non-referential and more rarely given. Obviously, the differences between heads and arguments with respect to givenness stipulated here have to be checked in natural linguistic corpora, but it appears quite likely that the indicated tendency will indeed hold.

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Information structure, perspectival structure, diathesis alternation, and the Russian Genitive of Negation

Barbara H. Partee and Vladimir Borschev†*
**University of Massachusetts, Amherst*
† VINITI RAN and University of Massachusetts, Amherst

1 Introduction and background

The Russian Genitive of Negation construction (Gen Neg) involves case alternation between Genitive and the two structural cases, Nominative and Accusative.[1] The factors governing the alternation have been a matter of debate for many decades, and there is a huge literature. Here we focus on one central issue and its theoretical ramifications.

The theoretical issue is the following. The same truth-conditional content can often be structured in more than one way; we believe that there is a distinction between choices in how to structure *a situation to be described,* and choices in how to structure *a sentence describing the (already structured) situation.* The distinction may not always be sharp, and the term Information Structure may perhaps cover both, but we believe that the distinction is important and needs closer attention.

Babby (1980), in a masterful work on the Russian Genitive of Negation, argued that the choice depended principally on Theme-Rheme structure; after initially following Babby (Borschev & Partee 1998), we later argued (Borschev & Partee 2002a,b) that the choice reflects not Theme-Rheme structure but a structuring of the described situation which we call Perspectival Structure.

Here we briefly review the phenomenon, Babby's Theme-Rheme-based analysis, and our arguments for a different analysis. We then consider Hanging Topics, partitive Genitives, and broader licensing conditions of Genitive case, raising the possibility that our counterexamples to Babby's use of Theme-Rheme structure might be explained away as examples involving Hanging Topics rather than (Praguian) Themes. We argue against that idea as well, but leave open the possibility that our Perspectival Structure may eventually be construable as a kind of information structure itself, if that notion can include some kinds of structuring of the situation as well as of the discourse.

1.1 The Genitive of Negation construction

The Russian Gen Neg construction involves substituting Genitive case for Accusative or Nominative optionally with many verbs when the whole sentence is negated (Borschev & Partee 2002a; Partee & Borschev 2002, 2004). Most researchers have held that a Gen-marked NP under negation, as in (1b) and (2b) below, may have narrow scope with

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respect to negation, while a Nom- or Acc-marked NP must be interpreted outside the scope of negation.

(1) a. Otvet iz polka ne prišel.
Answer-NOM.M.SG from regiment NEG arrived-M.SG
'The answer from the regiment has not arrived.'

b. Otveta iz polka ne prišlo.
Answer-GEN.M.SG from regiment NEG arrived-N.SG
'There was no answer from the regiment.'

(2) a. On ne polučil pis'mo.
he NEG received letter-ACC.N.SG
'He didn't receive the (or 'a specific') letter.'

b. On ne polučil pis'ma.
he NEG received letter-GEN.N.SG
'He didn't receive any letter.'

A Nom- or Acc-marked NP is more likely to be interpreted as definite or specific,[2] while a Gen Neg NP often has 'decreased referentiality' and tends to be '(existentially) quantificational' (Babby 1980; Jakobson 1971; Neidle 1988; Pesetsky 1982; Timberlake 1975) if the NP permits it; but even pronouns and proper names sometimes alternate. Sentence (3a) suggests that Masha is present but hidden, (3b) that she is not present.

(3) a. Maša ne vidna.
Masha-NOM.F.SG NEG seen-F.SG
'Masha isn't visible.'

b. Maši ne vidno.
Masha-GEN.F.SG NEG seen-N.SG
'Masha isn't to be seen.'

Especially for Object Gen Neg, many factors contribute to the (probabilistic) choice of Gen, including decreased 'individuation' of NP, decreased transitivity of verb (Mustajoki & Heino 1991; Timberlake 1975; Ueda 1993). A detail that will be important later is that in the case of subject Gen Neg, the sentence becomes 'impersonal' and the verb is invariantly Neuter singular, as in (1b) and (3b).

1.2 Babby's 1980 Theme-Rheme-based analysis

Babby (1980) concentrated on subject Gen Neg, i.e., the alternation of Nom and Gen with intransitive verbs, arguing that subject Gen Neg sentences are almost always existential. He argued that Gen vs. Nom marking indicates that the NP is inside vs. outside the scope of negation, and that this in turn follows from whether the NP is part of the Rheme or is the Theme. His thesis that Theme-Rheme structure is crucial gains support from affirmative sentences, where the subject is invariably Nominative and existential sentences are distinguished only by their word order. Compare (1a–b) above with affirmative (4a–b).

(4) a. Otvet iz polka prišel.
Answer-NOM.M.SG from regiment arrived-M.SG
'The answer from the regiment has arrived.'

[2] Although not obligatorily so. To conserve space, we omit quite a lot of details and caveats, focusing on what is most relevant for this paper. See our other cited papers for fuller descriptions.

b. Prišel otvet iz polka.
Arrived-M.SG answer-NOM.M.SG from regiment
'There was an answer from the regiment.'

As (4a–b) show, Russian affirmative existential sentences appear to differ from predicative sentences only in word order, which Babby (1980) took to indicate a difference primarily in Theme-Rheme structure. Many others (starting with Chvany 1975; Perlmutter 1978; Pesetsky 1982) have taken (4b) to have Unaccusative syntax with VP-internal 'subject' in direct object position, and (4a) showing NP in canonical subject position. Babby (2001) argues that the NP in (4b) is not an object but a non-canonical subject, with the syntactic differences between (4a) and (4b) reflecting Theme-Rheme difference.

Babby also argued that intransitive (existential) Gen Neg sentences are thetic sentences, whereas their Nominative counterparts, with NP subject as Theme, are categorical.

Babby's analysis of object Gen Neg also assumed a Theme-Rheme distinction: Thematic Acc-NPs remain outside the scope of negation, and Rhematic Gen-NPs fall within it. Those who analyze subject Gen Neg as Unaccusative hold that Gen Neg is in general restricted to underlying objects, which either stay *in situ* under negation (Genitive) or move to some position outside the scope of negation and are marked Accusative.

2 Arguments against the Theme-Rheme analysis and for Perspectival Structure

We have argued in several papers (Borschev & Partee 2002a,b; Partee & Borschev 2002) against ascribing the Gen-Nom and Gen-Acc distinctions to the postulated difference in Theme-Rheme structure. Our main argument has been the existence of Gen Neg examples in which the NP in the genitive can be argued to be the Theme, or part of the Theme, rather than the Rheme. Thus in Arutjunova's (5) and our (6), the words *sobaki* 'dog-GEN.F.SG', and *kefira* 'kefir-GEN.M.SG' are the Themes (or part of the Theme) of these sentences. Both their most natural intonation pattern and their (most likely) interpretation in the given contexts support this point of view, which argues against Babby's generalization.

(5) Sobaki u menja net. (Arutjunova 1976)
dog-GEN.F.SG at I-gen not.is
'I don't have a dog.' [Context: talking about dogs, perhaps about whether I have one.]

(6) [Ja iskal kefir.] Kefira v magazine ne bylo.
[I looked-for kefir-ACC.M.SG Kefir-GEN.M.SG in store NEG was-N.SG
'[I was looking for kefir.] There wasn't any kefir in the store.' (Borschev & Partee 2002a)

A second, indirect, argument concerns Babby's theses that the main determinant of Gen Neg is scope of negation, and that Theme is outside the scope of negation, Rheme inside. But there are examples of Nom/Gen alternation in NPs with the NPI *ni odin* 'not a single', which occurs only under clausemate negation. The following (from Partee & Borschev 2002) are both to be read in the context of a preceding sentence like *My nadejalis', čto na seminare budut studenty* 'We hoped that (some of the) students would be at the seminar'.

(7) No ni odin student tam ne byl.
But NI one-NOM.M.SG student-NOM.M.SG there NEG was-M.SG
'But not a single one of the students was there.'

(8) No ni odnogo studenta tam ne bylo.
But NI one-GEN.M.SG student-GEN.M.SG there NEG was-N.SG
'But there was not a single student [or: not a single one of the students] there.'

The difference in interpretation is that (7) presupposes a specific group of students to be quantified over, whereas (8) does not; but both are clearly under the scope of negation. So either Theme/Rheme does not determine Nom/Gen, or it does not correlate with outside/inside scope of negation.

Our alternative analysis (Borschev & Partee 2002a,b) invokes a different kind of structure, which we call Perspectival Structure. Starting with an analysis of existential vs. predicative sentences with a verb taking a 'THING' argument and an explicit or implicit 'LOCation' argument, as in examples (1a–b), (3a–b), and (7–8), we have argued that the sentences differ in diathesis choice, reflecting two different ways to structure the described situation. In a predicative sentence (1a, 3a, 7), THING is the Perspectival Center; in an existential sentence (1b, 3b, 8), LOC is the Perspectival Center. We give the analogy of 'what the camera is tracking': the protagonist when THING is Perspectival Center, the 'scene' when LOC is perspectival center.

Positing LOC as Perspectival Center in existential sentences, even when it is not explicit in the sentence, helps to explain the fact that Russian existential sentences can have proper names or pronouns as subjects; we argue that the 'existence' relevant to these sentences is always existence *relative to a given location,* namely the Perspectival Center location. Consider the following pair, where a pronoun shows Nom/Gen alternation.

(9) [Ja iskal Petju.] On ne byl na lekcii.
[I looked.for Petja.] He-NOM.M.SG NEG was-M.SG at lecture
'[I looked for Petja.] He wasn't at the lecture.

(10) [Ja iskal Petju.] Ego ne bylo na lekcii.
[I looked.for Petja.] He-GEN.M.SG NEG was-N.SG at lecture
'[I looked for Petja.] He wasn't at the lecture.

In this pair of sentences,[3] the sentence-initial Theme is the same (*on/ego* 'he-NOM/he-GEN'), anaphorically referring to the Rheme *Petja* 'Petja' of the preceding sentence. In (9), the THING Petja is chosen as the Perspectival Center: we consider Petja, and where he was, and we give the partial information that he was not at the lecture. In (10) the LOCation is the Perspectival Center; this suggests that either in or before my search for Petja, I went to the lecture expecting to find him, but Petja was not among those at the lecture.[4]

Our analysis is in many ways still close to Babby's, and our Perspectival Structure has much in common with information structure. And since our distinction in Perspectival

[3] We have given (9) and (10) the same translations, because the difference felt between them by a native speaker does not easily translate into English (see Chvany 1975: 157–158). We consider (10) an existential sentence (Borschev & Partee 2002a), but English does not permit a *there*-sentence with pronominal NP pivot.

[4] Examples of this kind are also given by Padučeva (1992, 1997) to illustrate her distinction between 'retrospective Observer' (in (9)) and 'synchronous Observer' (in (10)); her synchronous Observer corresponds to the cases in which for us the LOCation is the Perspectival Center.

Structure does not correspond exactly to any established linguistic distinction, as far as we know, we do not consider the debate to be settled. In Borschev & Partee (2002a) we discuss several possible lines of defense for a position closer to Babby's.

Babby's own account of examples like (1b), (5), or (6) is that since Gen Neg marks an NP as part of the Rheme, word order can be used to mark something else, in this case Given vs. New; so the Gen Neg NPs we have called Theme, he would call Rhematic but Given. Similarly, Erteschik-Shir (1997 and p.c.) would propose that in any existential sentence the real Topic is an implicit 'Stage-topic' (including a possible overt LOC), and within the Focus there may be subordinate information structure, with *kefira* in (6) a 'subordinate Topic'.

A similar idea is found in Padučeva (1996: 119–120), citing Kovtunova (1976). Padučeva discusses the 'dislocation of part of a complex rheme', in which the 'rheme proper' is left at the end of the sentence with the main accent, and the remainder of the Rheme is dislocated leftward, usually to sentence-initial position, receiving secondary stress with falling intonation. Padučeva (p.c.) holds that example (6) can have two communicative structures: in the context in (6), *kefira* would indeed be Theme and unaccented, but the same sentence could occur with no prior mention of *kefir,* only of the store, and then *kefira* would be a dislocated part of the Rheme, with secondary falling stress. But we note that if Padučeva is correct about that, it would not support Babby's approach, because on Padučeva's approach, if *kefira* is a dislocated part of the Rheme it represents 'new' information, and it is only when *kefira* is part of the Theme that it would be interpreted as 'given'. Babby was trying to account for a 'given' interpretation still being part of the Rheme.

Tests for possible contrast suggest that the LOCation in (6) is still a Theme; so if *kefira* is also Theme, what is the Rheme? The sentence might be a case of Verum-focus, and these have special properties; see our discussion in Borschev & Partee (2002a), where we examine an extended paradigm of Gen vs. Nom examples varying in word order (LOC (NEG) V THING vs. THING (NEG) V LOC), various properties of the subject NP, and varying the LOC from more situation-like ('at the lecture') to more static ('in the store across the way'). We note there that not all of the examined word orders are equally felicitous with 'neutral intonation', which we have tried to keep as the intended intonation for all of our examples. In some cases in which we put a Gen Neg NP in initial (presumably Theme) position, informants tend to want the LOC to precede the negated verb as well, as it does in (6), suggesting that even if the THING can be Theme in a Gen Neg sentence, the LOC must be part of the Theme as well. In Borschev & Partee (2002a), we left these issues open.

One possible advantage of Babby's analysis was that it provided a source for the greater presuppositionality of NPs marked Nom or Acc, since Themes are generally taken to be more presuppositional than Rhemes (Hajičová 1973, and many other authors). We make a similar claim for Perspectival Center with a similar basis: in order to structure a sentence from the perspective of some participant of a situation, that participant must be presupposed to exist. We believe, however, that it is easier to extend our analysis to the kind of presupposition found in the *ni odin* 'not a single one' examples (7–8), where it is the domain of quantification that must be presupposed to exist and be familiar, than to accept such a negatively quantified expression as a Topic or Theme.

3 Hanging Topics and a re-examination of 'Topic Gen Neg' examples

In our arguments against Babby's claim that Theme-Rheme structure was crucial for Russian Gen Neg, we, like Babby, and like most of the Russian literature, relied on a conception of Theme-Rheme structure with Praguian roots. We are aware that there are diverse conceptions of information structure, and that the situation might look different under other conceptions. We have recently learned[5] of relevant work on 'Hanging Topics', topics which are not necessarily integrated into a given sentence, like the well-known Japanese *wa*-topic in (11).

(11) Sakana-wa tai-ga oishi-i.
fish-TOPIC red snapper-SUBJECT be delicious-NONPAST
'As for fish, red snapper is delicious.'
(`http://en.wikipedia.org/wiki/Topic-prominent_language`)

Maslova & Bernini (2006), drawing on Langacker (1993), argue that Hanging Topics often involve a possessive-like relation (possession, part-whole, kinship, arguments of relational nouns) to a participant in the comment, such that the description in the comment is likely to give relevant information about the entity or concept in the topic. This observation suggests a possible basis for the generalization observed by Polinsky (p.c.) that nominals in the base generated Hanging Topic position are often marked with oblique case, especially tending toward genitive/partitive.

What is important for our concerns is that Russian apparently allows genitive Hanging Topics, some of which look similar to examples we have used in arguing against Babby. If genitive case may be licensed by the Hanging Topic construction itself, then it is possible that what we took to be a 'Gen Neg' genitive topic in the *kefira* example might alternatively be an independently generated Hanging Topic and not a counterexample to Babby's claim about Gen Neg.

Polinsky (p.c.) mentions known examples of genitive topics in Russian which cannot be the result of movement because they would be ungrammatical in the putative source position.

(12) a. Teatrov v gorode bylo dva.
theater-GEN.PL in town was-N.SG two
'Of theaters, there were two in town.'

b. dva teatra
two theater-GEN.SG

c. *dva teatrov
two theater-GEN.PL

The numeral *dva* 'two' in Russian governs genitive singular on the noun; hence the genitive plural *teatrov* 'of theaters' must be a Hanging Topic generated *in situ*. But Hanging Topics do not necessarily manifest incompatibilities with a possible base position inside the sentence; if we replace *dva* 'two' in the example above by *pjat'* 'five' or *mnogo* 'many', which govern genitive plural, the sentence would be ambiguously analyzable as having a fronted topic or a Hanging Topic.

[5] We are grateful to Maria Polinsky for bringing hanging topics to our attention; references to Polinsky (p.c.) below refer to e-mail correspondence in March-April 2006.

Looking back at examples of ours and Arutjunova's that showed Gen Neg topics, we have to try to tell whether they could be Hanging Topics by seeking variants like (12a). In addition to (5), (6) and (10), our previous examples include the following:

(13) [Ja napisal emu i ždal otveta.] Otveta ne prišlo.
[I wrote him and waited.for answer-GEN] Answer-GEN.M.SG NEG came-N.SG
'[I wrote to him and waited for an answer.] No answer came.' (Borschev & Partee 2002a: 193)

(14) [Myši v dome est'?] — Net, myšej v dome net.
[mouse-NOM.F.PL in house is?] No, mouse-GEN.F.PL in house not.is
'[Are there mice in the house?] — No, there are no mice in the house.' (Arutjunova 1997)

These seem to fall into two classes. Examples (10) and probably (13) do not seem to be Hanging Topics; the topic is an essential participant of the sentence. Similarly for Babby's (15), though he analyzes the genitive pronoun not as Theme but as 'given', within the Rheme.

(15) Navodčik ... ždal komandy. No eë ne posledovalo.
gunner waited command but it.GEN.F.SG NEG followed-N.SG
'The gunner waited for the command (to fire). But it didn't come.' (Babby 1980: 118)

But (5), (6) and (14) may be amenable to a Hanging Topic analysis. One can construct examples similar to our *kefira* example (6) without negation, and one can find examples with or without negation in which the topic genitive expression would be ungrammatical inside the sentence. The examples use the genitive plural *deneg* 'money' and the mass genitive singular *vodki* 'vodka'.

(16) a. Deneg u nego bylo mnogo / malo.
money-GEN.PL at him-GEN was-N.SG much / little
'He had a lot of/little money.' or 'Of money, he had a lot/little.'

b. Deneg u nego sovsem ne bylo.
money-GEN.PL at him-GEN altogether NEG was-N.SG
'He didn't have any money at all.' or 'Of money, he didn't have any at all.'

c. Deneg u nego do čërta. (Also OK: U nego do čërta deneg.)
money-GEN.PL at him-GEN to devil
'He has a hell of a lot of money.' or 'Of money, he has a hell of a lot.'

d. Vodki bylo zalejsja. (??Bylo zalejsja vodki.)
vodka-GEN.F.SG was-N.SG pour-your-fill-IMP.SG
'Of vodka there was 'pour-your-fill'.'

e. Vodki bylo kot naplakal. (*Bylo kot naplakal vodki.)
vodka-GEN.F.SG was-N.SG cat wept
'Of vodka there was [so little that] the cat wept.'

The examples in (16) may support the hypothesis that the genitive NP in (5), (6) and (13) could be a Hanging Topic. What is clearest is that there is no felt difference in kind between the affirmative (16a) and the negative (16b). Examples (16a–e) all seem to

involve predications of amounts — how much money he had, how much vodka there was. The amount 'predicates' include both common quantifiers *mnogo, malo* 'much, little', which routinely take Gen-marked noun complements, and idiomatic quantity expressions (a PP in (16c), an imperative verb in (16d), and a clause in (16e)) which vary in the degree to which they can be used as derived quantifiers from easily to not at all. *Vodki* 'of vodka' in (16d–e) must be a Hanging Topic if it is a Topic at all,[6] and the NP in (16a–c) presumably can be. The variations on (8) in (17a–c) below include what may be a plural Hanging Topic: the plural genitive form in (17a–b) would be ungrammatical in construction with *odnogo* 'one-GEN', but on the other hand the second author notes that (17b) is the most natural of the three and that it should not have a comma intonation.

(17) a. ?No studentov, ni odnogo tam ne bylo.
But student-GEN.M.PL NI one-GEN.M.SG there NEG was-N.SG
'But as for (the) students, there was not a single one there.'

b. No studentov tam ne bylo ni odnogo.
But student-GEN.M.PL there NEG was-N.SG NI one-GEN.M.SG
'But there was not a single one of (the) students there.'

c. ?No studenta ni odnogo tam ne bylo.
But student-GEN.M.SG NI one-GEN.M.SG there NEG was-N.SG
'But there was not a single student [or: not a single one of the students] there.'

Polinsky (p.c.) raised the interesting possibility that the Hanging Topic construction might itself provide a non-veridical operator licensing Genitive, given that in Russian certain intensional verbs, modals, imperatives license genitive/partitives; this would add the Hanging Topic construction to the family of non-veridical operators licensing Genitive explored by Neidle (1988), Bailyn (2004), and in our current work. As Babby (1980) noted, following Jakobson (1971), there is a range of meanings for partitive genitive NPs in argument position that is broader than simply 'partitive', all of them in a sense less directly referential and more quantificational. And Timberlake (1975) had observed that Gen Neg fits this pattern by indicating that 'none' of the entity participates in the action.

But while this latter set of examples, (5), (6), (13) and (16), with their partitive-like or kind-like NPs, may look like Hanging Topics, all those examples have neuter singular (impersonal) verbs, even (16d–e). Babby (1980) observed that not only Gen Neg subjects give rise to impersonal verbs, but so do partitive subjects licensed by a modal or used to focus on quantity rather than referential identity, i.e., all Genitive 'subjects'.[7] This fact argues that the genitive NP in these examples is still the subject: its genitive case is essentially linked with the verb's being impersonal.

This observation leads to a deeper question: if *kefira* in (6) were a Hanging Topic, then would (6) cease to be an existential Gen Neg sentence? Suppose the structure were as in (18) below.

[6] It 'feels' to the second author as if the construction in all of (16a–e) is actually subject plus 'amount predicate', not a Hanging Topic construction. Babby (1980: Ch. 4) discusses 'quantificational' genitives, which, like Gen Neg, fill roles otherwise filled by Nom subjects of intransitives or Acc objects of transitives.

[7] In what respects genitive 'subjects' are 'subjects' is a topic of much debate; but since for the Hanging Topic discussion the relevant distinction is between an NP with a syntactic role in the sentence and one that is only a base-generated topic, we can just call them subjects.

(18) [Kefira]$_{\text{HTopic}}$ [v magazine ne bylo]$_{\text{IP}}$
Kefir-GEN.M.SG in store NEG was-N.SG

What is the structure of the clause to which the Hanging Topic is adjoined? It is still a (remnant of an) existential sentence, not a predicative sentence; that is evident from the impersonal form of the verb. For it to be well-formed, it needs a Gen-marked NP with the role *kefira* would have if it were inside the clause; if we posit a null NP (stipulatively at best), it could hardly be the Rheme if it is null and coindexed with a Hanging Topic, so it would still violate Babby's generalization that the subject of existential sentences is always the Rheme. We conclude *kefira* in (6) is almost certainly not a Hanging Topic after all, and that even if it were there would still be problems for Babby's generalization.

So many if not all Thematic Gen Neg examples are resistant to reanalysis as Hanging Topics. The examples that look most like Hanging Topic involve partitivity, which may reflect the likelihood that Gen Neg evolved out of the partitive genitive (Levinson 2005).

What makes these examples look like Hanging Topics is the 'disagreeing morphology' we see in examples (12), (16d–e) and (17a–b). The 'disagreeing morphology' shows that they cannot be derived by movement of the noun out of a quantifier phrase, but it does not show that they could not themselves be partitive subjects.[8] As Jakobson (1971) and others have argued, Genitive NPs have a range of interpretations tending toward 'quantitative', 'partitive', and 'kind' or 'property' meanings, as opposed to the more 'referential', 'individuated' meanings of Nom/Acc NPs. Examples like (16a–e) need more work to show whether they involve a kind of quantity-predication on a Genitive subject.

We conclude then by reaffirming our thesis that the Theme-Rheme distinction does not make quite the right distinction for the licensing of Gen Neg. Our next task will be to investigate alternative notions of information structure such as those described in Maslova & Bernini (2006) to see if our Perspective Structure coincides with any of them. In our other work we have argued that the Nom/Gen and Acc/Gen alternations reflect a diathesis alternation which in turn reflects different ways of structuring the described situation rather than different ways of structuring a sentence, but Maslova and Bernini argue convincingly that both kinds of structuring are essentially involved in many kinds of topic constructions, so there may be a way to construe our Perspective Structure as a kind of information structure in the end.

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[8] See footnote 6.

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Theticity in a bidirectional theory of focus

Kjell Johan Sæbø
ILOS
University of Oslo

It is well known that a verb and an argument can be in focus *together*, forming one focus domain with one accent. Thus a verb can be in focus, conveying new information, even though it does not carry an accent. The phenomenon is known, e.g., as a case of **focus projection** (Höhle 1982), **integration** (Jacobs 1991), or **informational nonautonomy** (Jacobs 1999); or, if the argument is indefinite, as a case of **semantic incorporation**.[1] If the sentence only contains the predicate and the argument, it is a **thetic** sentence.[2]

(1) (David had just come home late:) [the TRAIN was delayed]$_F$.

(2) [SCAFfolding was erected]$_F$ (before the sun was fully up).

The phenomenon is constrained in several ways. Predicate and argument should be sisters, and the latter should be a theme (Jacobs 1999: 75).[3] Semantically and pragmatically, the two must form one informational unit, being processed in one step (Jacobs 1999: 68). This notion is difficult to define. There should be "c-construability" (Rochemont 1986), "lexical integrity" (Szabolcsi 1986) or "semantic agreement" (Sasse 1995). But although there seems to be a "common core of theticity-relevant states of affairs cross-linguistically" (Sasse 1995), the boundaries to the area have so far not been mapped in a formal theory.

1 Constraints on informational integration

Among the facts that have remained ill-understood are:

1 A broad focus can be felicitous in some contexts but not in others, even though the grammatical conditions for broad focus are met.

2 A broad focus can be infelicitous even though the grammatical and the contextual conditions for broad focus are met.

Fact **1** concerns contexts where two foci are preferred over one broad focus as opposed to contexts where one focus is the preferred option.

(3) a. — What happened to make you leave home?
— [My MOTHER died]$_F$.
b. # — What became of your parents? — [My MOTHER died]$_F$(...)
c. — What became of your parents? — [My MOTHER]$_F$ [DIED]$_F$(...)

The question context in (3b) fails to provide a justification for the broad focus answer, although the same context evidently serves to justify the two narrow foci in (3c). A context as "unspecific" as the one in (3a) seems to be what the broad focus answer requires.

[1] van Geenhoven (1996); Bende-Farkas (1999); Farkas & de Swart (2003).

[2] Kuroda (1972); Ladusaw (1994); McNally (1998); Jäger (2001).

[3] But, contra structural accounts of focus projection (e.g., Selkirk 1984), it does not have to be an internal argument as long as it has some protopatient property (Jacobs 1999) or "the perspective on the event admits a presentational interpretation" (Kennedy 1999).

Fact **2** refers to predicates that resist integration irrespectively of the context:

(4) a. [CHAMPAGNE had been offered]$_{\mathrm{F}}$.
b. # [CHAMPAGNE had been declined]$_{\mathrm{F}}$.
c. [CHAMPAGNE]$_{\mathrm{F}}$ [had been DECLINED]$_{\mathrm{F}}$.

The only way to justify the absence of an accent on the verb in (4b) is to interpret it as given information, out of focus: [CHAMPAGNE]$_{\mathrm{F}}$ had been declined.

I will concentrate on sentences consisting of a predicate and one argument, where focus encompasses the whole, in which case we have one accent and a thetic judgment, normally on the argument, or where there is one focus for each, in which case we have two accents and a categorical judgment; cf. (5a)/(5b).

(5) a. [ARGument predicate]$_{\mathrm{F}}$.
b. [ARGument]$_{\mathrm{F}}$ [PREdicate]$_{\mathrm{F}}$.

Here, I will assume, sentential focus, informational integration, and theticity concur. In the general case, though, sentential focus is necessary, but not sufficient, for integration and theticity. So what I set out to account for is a subset of the conditions for the latter.

Theticity has been described, over and above sentential focus with one accent, in terms of a dichotomy as to what the statement is about: A thetic statement has a covert situation argument, not an object argument, as its topic (e.g., Borschev & Partee 2002). While such characterisations may be valid generalisations, I hypothesise that the reasons for the constraints on thetic statements shown above lie in their property of broad focus.

2 Inverse focus presuppositions

I base my account on

1 the theory of Focus Interpretation (Rooth 1992) and

2 Bidirectional Optimality Theory (Blutner 1998, ..., 2006),

utilising the idea that broad focus competes with two narrow foci, implicating that there are no salient alternatives to predicate and argument separately. By focusing the merge of verb and argument, we do not just not communicate what we would communicate if we were to focus verb and argument separately; we positively communicate the opposite.

2.1 Alternative Semantics and its limits

I assume a version of Rooth's theory where the focus presupposition is defined directly, not via the focus semantic value, generally for focus on any n-tuple:[4]

Semantics of $\mathcal{F}$ (based on Rooth 1992)

$\mathcal{F}^* = \lambda\vec{\sigma}\lambda\varphi\ \varphi$ + the presupposition that

for all $\sigma \in \vec{\sigma}$ there is a set of propositions Ψ such that

$$\Psi \subseteq \{\psi \mid \exists\vec{\tau} \simeq \vec{\sigma}[\psi = \hat{}\varphi[\vec{\sigma}/\vec{\tau}]]\} \text{ and}$$

there is a $\psi \in \Psi$ such that $\sigma \not\sqsubseteq \psi$.

[4] Such a formulation solves a potential problem of over-focussing noted by Krifka (2001 and 2004).

Focus, $\mathcal{F}$, takes two arguments, the tuple in focus, $\vec{\sigma}$, and the phrase where focus is interpreted, here a sentence, φ. $\vec{\tau} \simeq \vec{\sigma}$ means that the τ and the σ members of $\vec{\tau}$, $\vec{\sigma}$ are pairwise **alternatives** and that they may differ in any member. In words, focus on a pair presupposes a set of propositions where the two members are replaced by alternatives (for each member, a set where it is replaced by a real alternative in some element).

Consider a simple example, (3c). The answer generates the presupposition that there are some propositions where "died" and possibly "mother" are replaced by alternatives and some where the converse is the case. One may reasonably assume this presupposition to be verified in the context of the question, taken to denote this set:

{ mother died , mother emigrated , father died , father emigrated }

As it stands, Alternative Semantics cannot explain the infelicity of (3b) or (4b).[5] In fact, any context verifying the focus presupposition of two narrow foci will also verify that of one broad focus, so a one-focus sentence should be appropriate whenever a corresponding two-foci sentence is. The reason is that if we replace one or the other member, or both, then we also replace the corresponding singleton; any substitution for "mother", or "died", or both, is at the same time a substitution for "mother died".

2.2 Inverse focus presupposition: Contextual case

Intuitively, (3b) is inappropriate because a topic—comment (theme—rheme) structure is appropriate (Jacobs 2001; Steedman 2000). Generally, we observe that a thetic sentence is out when the categorical sentence is in; when the two-foci presupposition is verified. Reconsider (3a–c). In (3c), the context supplies a set of propositions based on pairwise alternatives to predicate and argument. Not so in (3a). It is of course difficult to specify the denotation of the question in (3a). But a reasonably realistic instance might be:

{ mother died , mother emigrated , father died , father emigrated ,
there was a fire , there was a drought , we lost our money ,
the mill closed down , the market slumped }

We observe that there are propositions here which are not built from pairwise alternatives to "mother" and "died". This appears to be the decisive factor: For focus on Pa (P for predicate, a for argument) to be felicitous, the given set must contain some propositions that do not split into pairs $\langle P', a' \rangle$ such that P', P and a', a are alternatives.

To be sure, there is a vagueness involved. As has often been observed, many contexts leave a choice between broad focus, $\mathcal{F}(\langle Pa \rangle)(\varphi)$, and two narrow foci, $\mathcal{F}(\langle P, a \rangle)(\varphi)$. Thus the answer in (3c) is okay in the context of the question in (3a), beside the answer in (3a). The reason is that focus presuppositions, like many other presuppositions, can be **accommodated**: One and the same context can motivate $\mathcal{F}(\langle Pa \rangle)(\varphi)$ because it does not strictly verify the presupposition of $\mathcal{F}(\langle P, a \rangle)(\varphi)$ and motivate $\mathcal{F}(\langle P, a \rangle)(\varphi)$ because this presupposition can get accommodated in it.

2.3 Inverse focus presupposition: Lexical case

In (4c), the meaning of the verb is what provides separate alternatives. Generally, we can observe that if the context fails to block a broad focus, it can still be blocked by the mere fact that the predicate is not sufficiently predictable from the argument.

[5] Note that this is not the underfocussing effect discussed by Krifka (2001); as shown by Krifka (2004), Alternative Semantics can cope with something being incongruously out of focus.

It is surprising that sometimes, broad focus is dispreferred in (relatively) empty, out-of-the-blue contexts, where (practically) all is new, cf. (4b) or (6b) — it is hard to see how another focus presupposition than the all-focus one can be justified then.

(6) a. [STOCKS]$_F$ [FELL]$_F$ (yesterday), ... (as a news headline)
b. ?[STOCKS fell]$_F$ (yesterday), ...

Two distinct foci, one on "stocks" and another on "fell", are possible and in fact preferred. One cannot motivate the two foci by arguing that alternatives to "stocks" and to "fell" are available in the context or the common ground. However, the 'intrinsic' existence of such alternatives seems to be what motivates the double focus and renders the version with a broad focus less natural. The mention of the noun and verb in the utterance situation gives rise to a set of propositions more or less of the following form:

$$\left\{ \left\{ \begin{array}{l} \text{bond prices} \\ \text{stocks} \\ \text{oil prices} \\ \text{interest rates} \end{array} \right\} \left\{ \begin{array}{r} \text{surged} \\ \text{rose} \\ \text{fell} \\ \text{slumped} \end{array} \right\} \right\}$$

As it appears, alternatives are available by virtue of the words — not in the discourse or the common ground, but in the common store of lexical and encyclopaedic knowledge. The focus presupposition can have varying degrees of anaphoricity and in 'empty', 'out of the blue' contexts, it isn't anaphoric at all (if it were, we would only expect broad focus); it is interpreted as: 'There is a set of propositions involving a *salient* (or even *plausible*) *lexical* alternative'. Contrast is, we may say, not to alternatives that have been mentioned but to alternatives that might be mentioned instead.

But a slight change in the utterance situation can make a broad focus felicitous:

(6) c. (As a result,) STOCKS fell.

The reason seems to be that the pairing of the verb *fell* with the noun is presented as predictable, consequently, these two words fail to contrast pairwise with other nouns and verbs in the given set of propositions:

$$\left\{ \begin{array}{l} \text{bond prices fell} \\ \text{stocks fell} \\ \text{inflation rose} \\ \text{strikes broke out} \end{array} \right\}$$

The sentence 'inflation rose' may be an alternative to 'stocks fell', but 'rose' or 'inflation' is not an alternative to 'fell' or 'stocks', because 'fell' counts as predictable in the context. Predictability, in turn, depends on typicality, and ultimately on the situation of utterance. Consider (7a) (from Drubig 1992) and the less acceptable (7b).

(7) a. They've painted the BARN red.
b. # They've painted the BARN black.

Because red is the normal colour of barns, 'red' does not contrast with other colour terms and 'paint red' does not contrast with other verbs in the context of (7a); however, by the same token, 'black' does contrast with other colour terms and 'paint black' does contrast with other verbs in the context of (7b).

Often, discourse relations serve to make the predicate predictable and to reduce the relevance of alternatives. In fact, this seems to be an important function of the 'discourse functions' and 'associated semantic areas' identified by Sasse (1995: 23f.): suspending alternatives. In the given context, there is no proper alternative to the predicate:

(8) I have to go to the Police Station. Don MILLER has escaped. (Sasse 1995: 24)

(9) Tread softly! The ICE is thin.

To sum up, in out of the blue contexts, where $\mathcal{F}(\langle P, a\rangle)(\varphi)$ competes with $\mathcal{F}(Pa)(\varphi)$, the former is felicitous to the degree that the mention of Pa in the given situation of utterance gives rise to a set of propositions based on pairwise alternatives to P and a, $\{Pa, P'a', P''a'', \ldots\}$. This is correlated with how rich or poor in content P or a is; broad focus is especially compelling in cases like the following.

(10) GOLD (has been discovered)!

Of course, the intuition has been there all along (cf., e.g., Jacobs 1991: 18, Sasse 1995: 24) that broad focus (integration, theticity) depends on P and a not being independent; on P being 'c-construable' (Rochemont 1986), or a presentational interpretation (Kennedy 1999); the present analysis relates these notions to Alternative Semantics.

This semantically and pragmatically based analysis can throw light on the grammatical conditions for single focus as well, as it can help explain the following two observations:

– Focus encompassing predicate and adjunct is impossible

– Focus over predicate and argument presupposes a theme argument

These generalisations can be subsumed under the general constraint on broad focus once it is observed that *adjuncts and agents tend to generate alternative sets*. A verb can be more or less predictable from its theme argument, but it is rarely predictable from its agent or from an adjunct. These grammatical constraints thus emerge as effects of the criterion that pairwise alternatives should not be salient. We may then expect exceptions, and this is borne out: alternatives can be contextually deactivated, as in (11) and (12).

(11) — Hast du dein schönes Kleid selbst geschneidert?
— Nein, ich habe es [in PARIS gekauft]$_{\mathrm{F}}$. (German, from Lötscher 1985)

(12) — Did you buy that dress (in Paris)?
— No, [my GRANDFATHER made]$_{\mathrm{F}}$ it. He's a tailor.

Here, the verb is in the sketched situation relatively predictable on the basis of the adjunct and the agent. Kennedy (1999) discusses several cases where the speaker's perspective on the event (the 'event view') enables external arguments to join the verb in a broad focus.

2.4 Bidirectional Optimality Theory

In general, it seems, a broad focus is appropriate iff the presupposition of one or two narrow foci is not verified, contextually or lexically. This suggests a pragmatic account: When the presupposition of one or two narrow foci is verified, this ought to be signalled; by not signalling it, you implicate that it is not verified.

I will model this as a conversational implicature in Bidirectional Optimality Theory (BOT, Blutner 1998, 2000, 2002, 2004, 2006).

BOT assumes that the intended content of a linguistic form can be one among a range of possible specifications of its meaning, and that it is selected through a competition with alternative forms and alternative contents. For a form—content pair to be optimal, it must be no worse than any pair with an alternative form or an alternative content.

Strong Optimality

A pair $\langle f, c\rangle$ is strongly optimal iff f is at least as good for c as any candidate form f' and c is at least as good for f as any candidate content c'.

The ordering relation over form—content pairs has been understood in various ways; I will follow Blutner (1998) in defining it in terms of (complexity of the form and) **conditional informativity.** The conditional informativity of a form—content pair $\langle f, c\rangle$ is defined through the probability of c given the semantics of f — the surprise held by c if f is true:

$$\mathbf{inf}(c/[\![f]\!]) = -\log_2 P(c/[\![f]\!]) \text{ (should be as low as possible)}$$

2.4.1 Candidate forms

To identify a more specific interpretation for broad focus on a predicate and its argument, we must identify 1) a class of candidate forms as well as 2) a class of candidate contents. There are four ways to distribute focus over a phrase consisting of a predicate P and its argument a: focus on P only, $\mathcal{F}(\langle P\rangle)(\varphi)$, on a only, $\mathcal{F}(\langle a\rangle)(\varphi)$, on both P and on a separately, i.e., $\mathcal{F}(\langle P, a\rangle)(\varphi)$, and, finally, broad focus, $\mathcal{F}(\langle Pa\rangle)(\varphi)$. Thus the forms to be compared in view of focus interpretations are:

$\mathcal{F}(\langle P, a\rangle)(\varphi)$
$\mathcal{F}(\langle P\rangle)(\varphi)$
$\mathcal{F}(\langle a\rangle)(\varphi)$
$\mathcal{F}(\langle Pa\rangle)(\varphi)$

2.4.2 Candidate contents

To determine the set of interpretations, it is useful to note that the focus presupposition of the topmost form can be decomposed into two subpresuppositions, πP and πa:

$$\pi P = \exists\Psi \subseteq \{\psi \mid \exists\vec{\tau} \simeq \langle P, a\rangle[\psi = \varphi[\langle P, a\rangle/\vec{\tau}]]\}[\exists\psi \in \Psi[P \not\sqsubseteq \psi]]$$
$$\pi a \ = \exists\Psi \subseteq \{\psi \mid \exists\vec{\tau} \simeq \langle P, a\rangle[\psi = \varphi[\langle P, a\rangle/\vec{\tau}]]\}[\exists\psi \in \Psi[a \not\sqsubseteq \psi]]$$

By way of conjunction and negation, these two subpresuppositions serve to distinguish between four mutually exclusive scenarios:

$\pi P \wedge \pi a$	$\pi P \wedge \neg\,\pi a$	$\neg\,\pi P \wedge \pi a$	$\neg\,\pi P \wedge \neg\,\pi a$

The first cell represents the scenario where $\mathcal{F}(\langle P, a\rangle)(\varphi)$ has its presupposition verified. Assuming that the context generally provides at most one relevant set of propositions, this scenario is incompatible with the focus presupposition of $\mathcal{F}(\langle P\rangle)(\varphi)$ or $\mathcal{F}(\langle a\rangle)(\varphi)$; the two next cells represent the scenarios where these two presuppositions are verified.

In the fourth scenario, there may be a set of propositions varying in Pa, but not in P and/or a throughout — there are not pairwise alternatives P', a' "in" all the propositions.

2.4.3 Optimal contexts for thetic judgments

The below table displays the conditional informativity values of the pairings between the four candidate forms and the four candidate contents. As $\pi P \wedge \pi a$ is the only verification for $\mathcal{F}(\langle P, a\rangle)(\varphi)$, this pair receives the value 0, reflecting that the probability of this content given this form is 1 (which due to accommodation is not quite true). Since (on the assumption that there is just one relevant set of propositions) $\pi P \wedge \neg\pi a$ / $\neg\pi P \wedge \pi a$ is the only verification for $\mathcal{F}(\langle P\rangle)(\varphi)$ / $\mathcal{F}(\langle a\rangle)(\varphi)$, these two pairs also receive a 0.

inf$(\cdot/\cdot)$	$\pi P \wedge \pi a$	$\pi P \wedge \neg\, \pi a$	$\neg\, \pi P \wedge \pi a$	$\neg\, \pi P \wedge \neg\, \pi a$
$\mathcal{F}(\langle P, a\rangle)(\varphi)$	$\Rightarrow 0$	∞	∞	∞
$\mathcal{F}(\langle P\rangle)(\varphi)$	∞	$\Rightarrow 0$	∞	∞
$\mathcal{F}(\langle a\rangle)(\varphi)$	∞	∞	$\Rightarrow 0$	∞
$\mathcal{F}(\langle Pa\rangle)(\varphi)$	2	2	2	$\Rightarrow 2$

Prima facie, the focus presupposition of $\mathcal{F}(\langle Pa\rangle)(\varphi)$ is just as (un-)informative in relation to $\pi P \wedge \pi a$ as to any other scenario; it is verified in all four scenarios (assuming that it is indeed verified in the fourth scenario). But only one pair is strongly optimal: the pair $\langle \mathcal{F}(\langle Pa\rangle)(\varphi), \neg\pi P \wedge \neg\pi a\rangle$. Broad focus, on Pa, emerges as the optimal form for the 'content' that there is neither a set of propositions varying in P nor one varying in a, and vice versa, so this is communicated as an implicature.[6]

Because contexts can admit accommodation of focus presuppositions, the cells are in reality not as sharply bounded as they appear. Especially in 'out of the blue' contexts, there is abundant room for accommodation; what counts as alternatives does not only depend on lexical and encyclopaedic knowledge and the situation of utterance but in the last instance on the speaker's intentions — within limits, speakers can choose whether to represent an argument—predicate pair as an element of a set of alternative pairs.

3 Conclusion

Jacobs (1999) made a plea for investigating the pragmatical prerequisites of informational autonomy. I have argued that some central prerequisites of nonautonomy follow from contextual and lexical constraints on broad focus in Rooth's theory of focus interpretation supplemented by a pragmatic, OT component. Although the question what informational integration and, in particular, theticity consist in may not have been answered in full, the partial answer given here, concerning the conditions for sentential focus as conditions for theticity, lays bare a close relation to the notion of alternatives to constituents in focus. According to this answer, an essential part of what is communicated by a thetic judgment is: There are no clear alternatives to the two foci of the corresponding, competing categorical judgment; the only clear alternatives are alternatives to the judgment itself.

[6] A comparison with two other theories — the enriched Alternative Semantics developed by Büring (2003) and the theory of Structured Meanings (e.g. Krifka 2001 and 2004) — shows that the former is as weak as Rooth's theory as it stands with regard to constraints on broad focus, while the latter does make more adequate predictions — about contextual, but not about lexical constraints.

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Be articulate!
A pragmatic solution to the projection problem

Philippe Schlenker
UCLA & Institut Jean-Nicod

0 Introduction

Heim (1983) suggested that the analysis of presupposition projection requires that the classical notion of **meanings as truth conditions** be replaced with a dynamic notion of **meanings as Context Change Potentials.**[1] But as several researchers later noted, the dynamic framework is insufficiently predictive: it allows one to state that, say, the dynamic effect of F *and* G is to *first* update a Context Set C with F and *then* with G (i.e., $C[F \textit{ and } G] = C[F][G]$), but it fails to explain why there couldn't be a 'deviant' conjunction *and** which performed these operations in the opposite order (i.e., $C[F \textit{ and}^* G] = C[G][F]$) (Soames 1989; Heim 1990, 1992). We provide a formal introduction to a competing framework, the **Transparency** theory (Schlenker 2006b), which addresses this problem. Unlike dynamic semantics, our analysis is *fully classical*, i.e., bivalent and static. And it *derives* the projective behavior of connectives from their bivalent meaning and their syntax. We concentrate on the formal properties of a simple version of the theory, and we prove that (i) full equivalence with Heim's results is guaranteed in the propositional case (Theorem 1), and that (ii) the equivalence can be extended to the quantificational case (for any generalized quantifiers), but only when certain conditions are met (Theorem 2).

1 The Transparency theory

The intuition we pursue is that the presupposition p of a clause $\underline{p}p'$ is simply a distinguished part of a bivalent meaning, one which is conceptualized as a 'pre-condition' of the entire meaning. We do not seek to explain how certain parts of the meaning of a constituent are conceptualized as being its 'pre-conditions'. This is another form of the old 'triggering problem' for presuppositions, i.e., the problem of determining how elementary clauses come to have presuppositions to begin with. Since we are interested in the projection problem rather than in the triggering problem, we simply stipulate in the syntax of the object language that a clause represented as $\underline{p}p'$ has the truth-conditional content of the conjunction p *and* p', but that p is conceptualized as being the pre-condition of the entire meaning. On the other hand, our goal is to give an explanatory account of presupposition projection. The crucial intuition is that a general pragmatic principle (presumably a Gricean maxim of manner, which we call *Be articulate!*) requires that, *if possible*, the special status of the pre-condition should be articulated, and thus that one should say p *and* $\underline{p}p'$ rather than just $\underline{p}p'$. To illustrate, the principle requires that, *if*

[1] A full version of the paper is available as Schlenker (2006a). I wish to thank the following for critical comments and suggestions: Richard Breheny, Emmanuel Chemla, Danny Fox, Bart Geurts, Irene Heim, Uli Sauerland, Barry Schein, Roger Schwarzschild, Ken Shan, Benjamin Spector, Dan Sperber, Anna Szabolcsi, Deirdre Wilson, as well as audiences in Paris (Institut Jean-Nicod), Berlin (Semantiknetzwerk), London (University College London), Gargnano (Milan Meeting 2006) and Rutgers University. The author gratefully acknowledges the financial support of the American Council of Learned Societies ('Ryskamp Fellowship') and of UCLA.

possible, one should say *It is raining and John knows it* rather than just *John knows that it is raining.*

If we were to stop here, we would make the absurd prediction that *John knows that p* is never acceptable unless immediately preceded by *p and* __. But there are independent pragmatic conditions that sometimes rule out the full conjunction. *It is precisely when these conditions are met that John knows that p is acceptable on its own.* In this paper we will only consider cases in which the full conjunction is ruled out *because the utterance of the first conjunct is certain to be dispensable no matter what the end of the sentence turns out to be* (see Schlenker 2006c for a sketch of further conditions, with several new predictions). This constraint is motivated by facts that have nothing to with presupposition projection:

(1) a. Context: Everyone is aware that Pavarotti has cancer.
   i. ?*Pavarotti is sick and he won't be able to sing next week.*
   ii. *Pavarotti won't be able to sing next week.*
   b. Context: Nothing is assumed about Pavarotti's health.
   i. # *Pavarotti has cancer and he is sick and he won't be able to sing next week.*
   ii. *Pavarotti has cancer and he won't be able to sing next week.*
   c. Context: Nothing is assumed about Pavarotti's health.
   i. # *If Pavarotti has cancer, he is sick and he won't be able to sing next week.*
   ii. *If Pavarotti has cancer, he won't be able to sing next week.*

The infelicitous examples are all cases in which one can determine as soon as one has heard *Pavarotti is sick and* that *no matter how the sentence will end*, these four words will have been uttered in vain because they could not possibly affect the truth-conditions of the sentence relative to the Context Set. Specifically, in a Context Set C in which it is assumed that Pavarotti has cancer, we can be sure that no matter what the second conjunct γ is, *Pavarotti is sick and* γ is equivalent in C to γ. We will say that given C these two sentences are **contextually equivalent** (i.e., $C \models$ (*Pavarotti is sick and* γ) $\Leftrightarrow \gamma$). Similarly, in any Context Set in which it is assumed that cancer is a disease, *Pavarotti has cancer and he is sick and* γ is contextually equivalent to *Pavarotti has cancer and* γ; and by the same reasoning, *If Pavarotti has cancer, he is sick and* γ is contextually equivalent to *If Pavarotti has cancer,* γ. In all these cases, then, one can ascertain as soon as one has heard *he is sick and* that these words were uttered in vain. Any reasonable pragmatics should presumably rule this out, as suggested by (1) above.[2]

These observations lead us to the following definition:

(2) Given a Context Set C, a predicative or propositional occurrence of d is **transparent** (and hence infelicitous) at the beginning of a sentence α *(d and* just in case for any expression γ of the same type as d and for any sentence completion β, $C \models \alpha(d \textit{ and } \gamma)\beta \Leftrightarrow \alpha\gamma\beta$.

[2] Note, however, that we don't want to make the prohibition against redundant material too strong. For it is sometimes permissible to include a conjunct that turns out to be dispensable, but just in case one may only determine *later* in the sentence that the conjunct in question was eliminable. This scenario is illustrated in (i):

Our observations can now be summarized by noting that $\alpha(d \textit{ and } d')\ldots$ is semantically deviant if d is transparent. Going back to the analysis of presupposition, it is clear that when d is transparent, a full conjunction *(d and* $\underline{d}d'$*)* will be systematically ruled out, which will leave $\underline{d}d'$ as the sole contender, and thus as the 'winner' in the competition process. Assuming for simplicity that Transparency is the *only* pragmatic principle that can rule out a full conjunction *(d and* $\underline{d}d'$*),* we are finally led to our formula for presupposition projection:

(3) **Principle of Transparency**
Given a Context Set C, a predicative or propositional occurrence of $\underline{d}d'$ is acceptable at the beginning of a sentence $\alpha\underline{d}d'$

if and only if the 'articulated' competitor $\alpha(d \textit{ and } \underline{d}d')$ is ruled out because d is transparent;

if and only if for any expression γ of the same type as d and for any sentence completion β, $C \models \alpha(d \textit{ and } \gamma)\beta \Leftrightarrow \alpha\gamma\beta$.

We now show that the Principle of Transparency is sufficient to derive almost all of Heim's projection results (in ongoing research (Schlenker 2006c), we explore extensions of Transparency which make different predictions from Heim's and address some of the criticisms that were raised against her account).

2 Formal systems

2.1 Syntax

To make our analysis precise, we define a syntax in which the presuppositions of atomic clauses are underlined (the parts in bold do not belong to the object language but will be used in the meta-language):

(4) **Syntax**

- Generalized Quantifiers: $Q ::= Q_i$;
- Predicates: $P ::= P_i \mid \underline{P_i}P_k \mid (\mathbf{P}_i \textbf{ and } \mathbf{P}_k)$;
- Propositions: $p ::= p_i \mid \underline{p_i}p_k$;
- **Individual variables: $\mathbf{d} ::= \mathbf{d}_i$;**
- Formulas: $F ::= p \mid (\textit{not } F) \mid (F \textit{ and } F) \mid (F \textit{ or } F) \mid (\textit{if } F.\ F) \mid (Q_i P.P)$ $\mid \mathbf{P}(\mathbf{d}) \mid \forall\mathbf{dF} \mid \exists\mathbf{dF} \mid [\mathbf{F} \Rightarrow \mathbf{F}] \mid [\mathbf{F} \Leftrightarrow \mathbf{F}]$.

Terminology: We will say that p_i, $\underline{p_i}p_k$ are 'atomic propositions' and that P_i, $\underline{P_i}P_k$ are 'atomic predicates'.

The following Lemma will be useful (the proof is omitted for brevity):

(i) a. John resides in France and he lives in Paris.

b. If he is in Europe, John resides in France and he lives in Paris.

In both examples the contextual meaning of the sentence would be unaffected if we deleted the words *John resides in France and.* However this is something that can only be ascertained *after* one has heard the end of the sentence. Thus in (b) one needs to hear the entire sentence to determine that the first conjunct *John resides in France* was redundant (if the end of the sentence had been *... and he is happy,* the first conjunct would not have been redundant).

(5) **Syntactic Lemma**

a. If α is the beginning of a constituent in a string F, then α is the beginning of a constituent in any well-formed string that contains α.

b. If a formula F starts with $(s$, where s is a symbol different from a parenthesis, then the smallest initial string C of F which is a constituent is F itself.

2.2 Semantics

2.2.1 Framework and interpretation of lexical items

We define the semantics for a (possibly infinite) domain of possible worlds W, each of which has a domain of individuals D^w of a fixed finite size n. We write $[A \rightarrow B]$ to denote the set of functions with domain A and codomain B, and we use standard type-theoretic notation wherever useful (e.g., $\langle s,t\rangle$ is the type of propositions, i.e., of functions from possible worlds to truth values; and $\langle s,\langle e,t\rangle\rangle$ is the type of properties, i.e., of functions from possible worlds to characteristic functions of sets).

(6) **Interpretation of lexical items**

We define a static interpretation function I. For all $i \geq 0$,

a. Q_i is a generalized quantifier satisfying Permutation Invariance, Extension and Conservativity (Keenan 1996). Its value is entirely determined by a numerical function f_i in $[\mathbb{N}\times\mathbb{N} \rightarrow \{0,1\}]$, which we call the 'tree of numbers' of Q_i (van Benthem 1986). Thus for all $w \in W$, $I_w(Q_i)$ is of type $\langle\langle e,t\rangle,\langle\langle e,t\rangle,t\rangle\rangle$, and for all A, B of type $\langle e,t\rangle$, $I_w(Q_i)(A)(B) = 1$ iff $f_i(|A \setminus B|, |A \cap B|) = 1$;

b. $I_w(P_i) \in [W \rightarrow [D \rightarrow \{0,1\}]]$ (i.e., it is of type $\langle s,\langle e,t\rangle\rangle$);

c. $I_w(p_i) \in [W \rightarrow \{0,1\}]$ (i.e., it is of type $\langle s,t\rangle$).

Notation: We write F^w instead of $I_w(F)$. When some elements are optionally present in the syntax, we write them between curly brackets, and write the corresponding part of the truth conditions inside curly brackets as well.

2.2.2 Dynamic semantics

Next, we define a dynamic semantics which is precisely that of Heim (1983), augmented by the analysis of disjunction offered in Beaver (2001) (Heim did not discuss disjunction).

(7) **Dynamic (Trivalent) Semantics**

Let C be a subset of W.

- $C[p] = \{w \in C\colon p^w = 1\}$;
- $C[\underline{pp}'] = \#$ iff for some $w \in C$, $p^w = 0$; otherwise, $C[\underline{pp}'] = \{w \in C\colon p'^w = 1\}$;
- $C[(not\ F)] = \#$ iff $C[F] = \#$; otherwise, $C[(not\ F)] = C \setminus C[F]$;
- $C[(F\ and\ G)] = \#$ iff $C[F] = \#$ or $(C[F] \neq \# \wedge C[F][G] = \#)$; otherwise, $C[(F\ and\ G)] = C[F][G]$;
- $C[(F\ or\ G)] = \#$ iff $C[F] = \#$ or $(C[F] \neq \# \wedge C[not\ F][G] = \#)$; otherwise, $C[(F\ or\ G)] = C[F] \cup C[not\ F][G]$;
- $C[(if\ F.\ G)] = \#$ iff $C[F] = \#$ or $(C[F] \neq \# \wedge C[F][G] = \#)$; otherwise, $C[(if\ F.\ G)] = C \setminus C[F][not\ G]$;

- $C[(Q_i\{\underline{P}\}P'.\{\underline{R}\}R') = \#$ iff {for some $w \in C$, for some $d \in D$, $\underline{P}^w(d) = 0$} or {for some $w \in C$, for some $d \in D$, {$\underline{P}^w(d) = 1$ and} $P'^w(d) = 1$ and $\underline{R}^w(d) = 0$}. Otherwise, $C[(Q_i\{\underline{P}\}P'.\{\underline{R}\}R')] = \{w \in C: f_i(a^w, b^w) = 1\}$ with $a^w = \{d \in D : P'^w(d) = 1 \wedge R'^w(d) = 0\}, b^w = \{d \in D: P'^w(d) = 1 \wedge R'^w(d) = 1\}$.

2.2.3 Static semantics

Sincd our goal is to show that the results of Heim's dynamic semantics can be obtained in a fully classical logic, we should specify a classical interpretation for the language defined in Section 2.1.

(8) **Static (Bivalent) Semantics**

- $w \models p$ iff $p^w = 1$;
- $w \models \underline{p}p'$ iff $p^w = p'^w = 1$;
- $w \models (not\ F)$ iff $w \not\models F$;
- $w \models (F\ and\ G)$ iff $w \models F$ and $w \models G$;
- $w \models (F\ or\ G)$ iff $w \models F$ or $w \models G$;
- $w \models (if\ F.\ G)$ iff $w \not\models F$ or $w \models G$;
- $w \models (Q_i\{\underline{P}\}P'.\{\underline{Q}\}Q'$ iff $f_i(a^w, b^w) = 1$ with $a^w = \{d \in D: \{\underline{P}^w(d) = 1$ and$\}$ $P'^w(d) = 1$ and $(\{\underline{R}^w(d) = 0$ or$\}$ $R'^w(d) = 0)\}$, $b^w = \{d \in D: \{\underline{P}^w(d) = 1$ and$\}$ $P'^w(d) = 1$ and $\{\underline{R}^w(d) = 1$ and$\}$ $R'^w(d) = 1\}$.

3 Propositional case

We now prove that in the propositional case Transparency Theory is equivalent to Heim's system. We assume that the language is sufficiently expressive to include tautologies and contradictions.

Theorem 1

Consider the propositional fragment of the language defined above. For any formula F and for any $C \subseteq W$:

(i) Transp(C, F) iff $C[F] \neq \#$.

(ii) If $C[F] \neq \#$, $C[F] = \{w \in C: w \models F\}$.

We start with a useful lemma (the proofs are omitted for brevity):

(9) **Transparency Lemma**

a. If for some formula G and some sentence completion δ, Transp$(C, (G\delta)$, then Transp(C, G).

b. If for some formula G and some sentence completion δ, Transp$(C, (if\ G\ .\ \delta)$, then Transp(C, G).

We can now proceed to the proof of Theorem 1 (by induction on the construction of formulas).

a. $F = p$

(i) $C[F] \neq \#$ and Transp(C, F).

(ii) It is also clear that $C[F] = \{w \in C\colon p^w = 1\} = \{w \in C\colon w \models F\}$.

b. $F = \underline{p}p'$.

(i) If Transp(C, F), for any formula γ and for any sentence completion β,

$$C \models (p\ \textit{and}\ \gamma)\beta \Leftrightarrow \gamma\beta,$$

hence in particular $C \models (p\ \textit{and}\ \delta) \Leftrightarrow \delta$ for some tautology δ, and thus $C \models p$. Therefore $C[F] \neq \#$.

Conversely, if $C[F] \neq \#$, $C \models p$ and thus for any clause γ, $C \models (p\ \textit{and}\ \gamma) \Leftrightarrow \gamma$. It follows that for any clause γ and for any sentence completion β, $C \models (p\ \textit{and}\ \gamma)\beta \Leftrightarrow \gamma\beta$.[3]But this shows that Transp(C, F).

(ii) If $C[F] \neq \#$, $C \models p$ and $C[F] = \{w \in C\colon p'^w = 1\} = \{w \in C\colon p'^w = p^w = 1\} = \{w \in C\colon w \models \underline{p}p'\}$.

c. $F = (\textit{not}\ G)$.

(i) Suppose that Transp(C, F) and suppose, for contradiction, that $C[F] = \#$. Then $C[G] = \#$ and by the Induction Hypothesis not Transp(C, G), i.e., for some initial string $\alpha\underline{d}d'$ of G, for some appropriate expression γ, for some sentence completion β, and for some world $w \in C$,

$$w \not\models \alpha(d\ \textit{and}\ \gamma)\beta \Leftrightarrow \alpha\gamma\beta.$$

But if so, $w \not\models (\textit{not}\ \alpha(p\ \textit{and}\ \gamma)\beta) \Leftrightarrow (\textit{not}\ \alpha\gamma\beta)]$, and hence not Transp$(C, F)$. Contradiction.

For the converse, suppose that $C[F] \neq \#$. Then $C[G] \neq \#$, and by the Induction Hypothesis Transp(C, G). Now suppose, for contradiction, that not Transp(C, F). Then for some initial string $\alpha\underline{d}d'$ of G, for some appropriate expression γ, for some sentence completion β, and for some $w \in C$,

$$w \not\models (\textit{not}\ \alpha(d\ \textit{and}\ \gamma)\beta \Leftrightarrow (\textit{not}\ \alpha\gamma\beta.$$

By clause (b) of the Syntactic Lemma in (5), $(\textit{not}\ \alpha(d\ \textit{and}\ \gamma)\beta$ is the smallest initial string of itself which is a constituent. It follows that β is of the form $\delta)$, and thus:

$$w \not\models (\textit{not}\ \alpha(d\ \textit{and}\ \gamma)\delta) \Leftrightarrow (\textit{not}\ \alpha\gamma\delta)$$

and, therefore,

$$w \not\models \alpha(d\ \textit{and}\ \gamma)\delta \Leftrightarrow \alpha\gamma\delta.$$

But this shows that not Transp(C, G). Contradiction.

(ii) If $C[F] \neq \#$, $C[F] = C \setminus C[G]$. By the Induction Hypothesis, $C[G] = \{w \in C\colon w \models G\}$ and thus $C[F] = C \setminus \{w \in C\colon w \models G\} = \{w \in C\colon w \models (\textit{not}\ G)\}$.

[3] In fact, the syntax in **2.1** guarantees that the only acceptable sentence completion is one in which β is the null string.

d. $F = (G \textit{ and } H)$.

(i) Suppose that Transp(C, F). By the Transparency Lemma (part (a)), Transp(C, G). By the Induction Hypothesis, $C[G] \neq \#$, and by the Induction Hypothesis (part (ii)) $C[G] = \{w \in C\colon w \models G\}$. Calling $C' = \{w \in C\colon w \models G\}$, we claim that Transp$(C', H)$. For suppose this were not the case. For some initial segment $\alpha\underline{d}d'$ of H, for some appropriate expression γ, for some sentence completion β, and for some world $w' \in C'$, we would have $w' \not\models \alpha(p \textit{ and } \gamma)\beta \Leftrightarrow \alpha\gamma\beta$. But then w' would refute Transp$(C, (G \textit{ and } H))$ because we would have $w' \not\models (G \textit{ and } \alpha(d \textit{ and } \gamma)\beta) \Leftrightarrow (G \textit{ and } \alpha\gamma\beta)$ with $w' \models G$. So Transp(C', H), and thus by the Induction Hypothesis (Part (i)) $C'[H] \neq \#$, i.e., $C[G][H] \neq \#$. For the converse, suppose that $C[F] \neq \#$. Then $C[G] \neq \#$ and $C[G][H] \neq \#$. By the Induction Hypothesis, Transp(C, G), $C[G] = \{w \in C\colon w \models G\}$ (a set we call C'), and Transp(C', H). Suppose, for contradiction, that not Transp(C, F), and let $w \in C$ satisfy $w \not\models \alpha(p \textit{ and } \gamma)\beta \Leftrightarrow \alpha\gamma\beta$, where $\alpha\underline{d}d'$ is an initial string of $(G \textit{ and } H)$.

- Let us first show that this occurrence of $\underline{d}d'$ is not part of G. For suppose, for contradiction, that it is. Then for some initial string α' of G we have $w \not\models (\alpha'(d \textit{ and } \gamma)\beta \Leftrightarrow (\alpha'\gamma\beta$. $\alpha'\underline{d}d'$ is the beginning of a constituent in G, and thus by the Syntactic Lemma (part (a)), it is the beginning of a constituent in $(\alpha'\underline{d}d'\beta$. Let β' be the smallest initial string of β for which $\alpha'\underline{d}d'\beta'$ is a constituent. Since $w \not\models (\alpha'(d \textit{ and } \gamma)\beta \Leftrightarrow (\alpha'\gamma\beta$, it must also be that $w \not\models \alpha'(d \textit{ and } \gamma)\beta' \Leftrightarrow \alpha'\gamma\beta'$. But this shows that not Transp(C, G), contrary to what was shown earlier.
- So this occurrence of $\underline{d}d'$ appears in H. Thus for some initial string $\alpha'\underline{d}d'$ of H, for some appropriate expression γ and for some sentence completion β, we have:

  $$w \not\models (G \textit{ and } \alpha'(d \textit{ and } \gamma)\beta \Leftrightarrow (G \textit{ and } \alpha'\gamma\beta.$$

  Since $\alpha'\underline{d}d'$ is the beginning of a constituent in H, $\alpha'\underline{d}d'$ is also the beginning of a constituent in $\alpha'\underline{d}d'\beta$ (Syntactic Lemma, part (a)). Furthermore, since G is a constituent, $(G \textit{ and } \alpha'(d \textit{ and } \gamma)\beta$ and $(G \textit{ and } \alpha'\gamma\beta$ must be of the form $(G \textit{ and } \alpha'(d \textit{ and } \gamma)\beta')$ and $(G \textit{ and } \alpha'\gamma\beta')$, respectively. It follows that G must be true at w, for otherwise both formulas would be false and they would thus have the same value at w, contrary to hypothesis. So $w \models G$. But since $w \not\models (G \textit{ and } \alpha'(d \textit{ and } \gamma)\beta') \Leftrightarrow (G \textit{ and } \alpha'\gamma\beta')$, so it must be that $w \not\models \alpha'(d \textit{ and } \gamma)\beta' \Leftrightarrow \alpha'\gamma\beta'$. But then it follows that not Transp(C', H), since $w \in C'$ and $\alpha'\underline{d}d'$ is an initial segment of H. But this contradicts our hypothesis. Thus Transp$(C, (G \textit{ and } H))$, i.e., Transp$(C, F)$.

(ii) If $C[F] \neq \#$, $C[F] = C[G][H] = \{w \in C\colon w \models G\}[H] = \{w \in C\colon w \models (G \textit{ and } H)\}$.

e. $F = (G \textit{ or } H)$.

(i) Suppose that Transp(C, F). Then, by the Transparency Lemma (part (a)), it is also the case that Transp(C, G). By the Induction Hypothesis, $C[G] \neq \#$, and $C[G] = \{w \in C\colon w \models G\}$. Therefore $C[(\textit{not } G)] = C \setminus C[G] = \{w \in C\colon w \not\models G\}$ (call this set C'). It follows that Transp(C', H), because otherwise for some initial

segment $\alpha\underline{d}d'$ of H, for some appropriate expression γ, for some sentence completion β and for some $w' \in C'$, we would have:

$$w' \not\models \alpha(d \textit{ and } \gamma)\beta \Leftrightarrow \alpha\gamma\beta.$$

But since $w' \not\models G$,

$$w' \not\models (G \textit{ or } \alpha(d \textit{ and } \gamma)\beta) \Leftrightarrow (G \textit{ or } \alpha\gamma\beta),$$

and thus not Transp$(C, (G \textit{ or } H))$, contrary to hypothesis. So Transp(C', H) and, by the induction hypothesis, $C'[H] \neq \#$, i.e., $C[(\textit{not } G)][H] \neq \#$. By the dynamic semantics of *or,* $C[(G \textit{ or } H)] \neq \#$. For the converse, suppose that $C[(G \textit{ or } H)] \neq \#$. Thus $C[G] \neq \#$ and $C[(\textit{not } G)][H] \neq \#$. By the Induction Hypothesis, Transp(C, G) and Transp(C', H) with $C' = C[(\textit{not } G)]$. Suppose, for contradiction, that not Transp(C, F), and let $w \in C$ satisfy $w \not\models \alpha(d \textit{ and } \gamma)\beta \Leftrightarrow \alpha\gamma\beta$, where $\alpha\underline{d}d'$ is an initial string of $(G \textit{ or } H)$.

- Let us first show that this occurrence of $\underline{d}d'$ is not part of G. Suppose, for contradiction, that it is. Then for some initial string $\alpha'\underline{d}d'$ of G, for some appropriate expression γ, for some sentence completion β and for some $w \in C$, we have

  $$w \not\models (\alpha'(d \textit{ and } \gamma)\beta \Leftrightarrow (\alpha'\gamma\beta.$$

  $\alpha'\underline{d}d'$ is the beginning of a constituent in G, and thus, by the Syntactic Lemma (part (a)), it is the beginning of a constituent in $(\alpha'\underline{d}d'\beta$. Let β' be the smallest initial string of β for which $\alpha'\underline{d}d'\beta'$ is a constituent. Since $w \not\models (\alpha'(p \textit{ and } \gamma)\beta \Leftrightarrow (\alpha'\gamma\beta$, it must also be that $w \not\models \alpha'(p \textit{ and } \gamma)\beta' \Leftrightarrow \alpha'\gamma\beta'$. But this shows that not Transp(C, G), contrary to what was shown earlier.
- So this occurrence of $\underline{d}d'$ appears in H. Thus for some initial string $\alpha'\underline{d}d'$ of H, for some appropriate expression γ, for some sentence completion β and for some $w \in C$ we have:

  $$w \not\models (G \textit{ or } \alpha'(p \textit{ and } \gamma)\beta \Leftrightarrow (G \textit{ or } \alpha'\gamma\beta.$$

  Since $\alpha'\underline{d}d'$ is the beginning of a constituent in H, $\alpha'\underline{d}d'$ is also the beginning of a constituent in $\alpha'\underline{d}d'\beta$ (Syntactic Lemma, part (a)). Furthermore, since G is a constituent, $(G \textit{ or } \alpha'(d \textit{ and } \gamma)\beta$ and $(G \textit{ or } \alpha'\gamma\beta$ must be of the form $(G \textit{ or } \alpha'(d \textit{ and } \gamma)\beta')$ and $(G \textit{ or } \alpha'\gamma\beta')$, respectively. It follows that G must be false at w, for otherwise both formulas would be true and they would thus have the same value at w, contrary to hypothesis. So $w \not\models G$. But since $w \not\models (G \textit{ or } \alpha'(d \textit{ and } \gamma)\beta') \Leftrightarrow (G \textit{ or } \alpha'\gamma\beta')]$, it must be that $w \not\models \alpha'(d \textit{ and } \gamma)\beta' \Leftrightarrow \alpha'\gamma\beta'$. But then it follows that not Transp(C', H), since $w \in C'$ and $\alpha'\underline{p}p'$ is an initial segment of H. But this contradicts our hypothesis that Transp(C', H). Thus Transp$(C, (G \textit{ and } H))$, i.e., Transp$(C, F)$.

(ii) If $C[F] \neq \#$, then $C[G] \neq \#$, $C[(\textit{not } G)][H] \neq \#$, and $C[F] = C[G] \cup C[(\textit{not } G)][H]$. By the Induction Hypothesis, $C[G] = \{w \in C : w \models G\}$, $C[(\textit{not } G)] = \{w \in C : w \not\models G\}$, and $C[(\textit{not } G)][H] = \{w \in C : w \not\models G \wedge w \models H\}$. Therefore, $C[F] = \{w \in C : w \models G\} \cup \{w \in C : w \not\models G \wedge w \models H\} = \{w \in C : w \models (G \textit{ or } H)\}$.

f. $F = (\mathit{if}\ G.\ H)$.

(i) Suppose Transp(C, F). By the Transparency Lemma (part (b)), it must also be the case that Transp(C, G). Let us now show that Transp(C', H) with $C' = C[G]$. Suppose, for contradiction, that this is not the case. Then for some initial segment $\alpha\underline{d}d'$ of H, for some appropriate expression γ, for some sentence completion β, and for some $w' \in C'$,

$$w' \not\models \alpha(d\ \mathit{and}\ \gamma)\beta \Leftrightarrow \alpha\gamma\beta.$$

Since $w' \in C'$, it must also be the case that

$$w' \not\models (\mathit{if}\ G.\ \alpha(d\ \mathit{and}\ \gamma)\beta) \Leftrightarrow (\mathit{if}\ G.\ \alpha\gamma\beta),$$

hence not Transp$(C, (\mathit{if}\ G.\ H))$, contrary to hypothesis. So Transp(C', H), and thus $C[G][H] \neq \#$. Since $C[G] \neq \#$, and $C[G][H] \neq \#$, $C[(\mathit{if}\ G.\ H)] \neq \#$. For the converse, let us assume that $C[F] \neq \#$. Then $C[G] \neq \#$ and $C[G][H] \neq \#$. Hence Transp(C, G) and Transp(C', H) with $C' = C[G]$, from which it also follows that Transp$(C', \mathit{not}\ H)$.

Now suppose, for contradiction, that not Transp$(C, (\mathit{if}\ G.\ H))$. Then for some initial segment $\alpha\underline{d}d'$ of $G.H$, for some appropriate expression γ, for some sentence completion β, and for some $w \in C$, we have

$$w \not\models (\mathit{if}\ \alpha(d\ \mathit{and}\ \gamma)\beta \Leftrightarrow (\mathit{if}\ \alpha\gamma\beta.$$

– It could not be the case that this occurrence of $\underline{d}d'$ is in G, because in that case we would have for some strings β' and β'':

$$w \not\models (\mathit{if}\ \alpha'(d\ \mathit{and}\ \gamma)\beta'.\ \beta'' \Leftrightarrow (\mathit{if}\ \alpha'\gamma\beta'.\ \beta'',$$

which could only be the case if $w \not\models \alpha'(d\ \mathit{and}\ \gamma)\beta' \Leftrightarrow \alpha'\gamma\beta'$, and hence if not Transp(C, G), contrary to what we showed earlier.

– Now suppose that this occurrence of $\underline{d}d'$ is in H. For some initial string $\alpha\underline{d}d'$ of H, for some appropriate expression γ, for some sentence completion β, and for some $w \in C$, we have

$$w \not\models (\mathit{if}\ G.\ \alpha(d\ \mathit{and}\ \gamma)\beta) \Leftrightarrow (\mathit{if}\ G.\ \alpha\gamma\beta).$$

But then it must also be the case that $w \models G$, for otherwise both sides of the biconditional would be true at w. Furthermore, it must be the case that $w \not\models \alpha(d\ \mathit{and}\ \gamma) \Leftrightarrow \alpha\gamma\beta$, because otherwise we would have

$$w \models (\mathit{if}\ G.\ \alpha(d\ \mathit{and}\ \gamma)\beta) \Leftrightarrow (\mathit{if}\ G.\ \alpha\gamma\beta).$$

But this shows that not Transp(C', H), contrary to what we showed earlier. In sum, Transp(C, F).

(ii) If $C[F] \neq \#$, $C[F] = C \setminus C[G][\mathit{not}\ H]$. But, by the Induction Hypothesis, $C[G] = \{w \in C\colon w \models G\}$ and $C[G][\mathit{not}\ H] = \{w \in C\colon w \models G\}[\mathit{not}\ H] = \{w \in C\colon w \models (G\ \mathit{and}\ (\mathit{not}\ H))\}$, and thus $C[F] = \{w \in C\colon w \not\models (G\ \mathit{and}\ (\mathit{not}\ H))\} = \{w \in C\colon w \models (\mathit{if}\ G.\ H)\}$.

4 Quantificational case

We now turn to the quantificational case, which we treat separately because it involves additional complications and leads to weaker equivalence results than the propositional case. Heim's claim is that for any generalized quantifier Q,

(i) $(Q\underline{P}P'.R)$ presupposes that every individual in the domain satisfies P, and

(ii) $(QP.\underline{R}R')$ presupposes that every individual in the domain that satisfies P also satisfies R.[4]

We will find conditions under which these predictions are indeed derived from our system. We start by stating the conditions, and then we construct the proof in two steps: first, we obtain the desired result for quantificational formulas that are unembedded; second, we integrate the argument into a proof by induction that extends to all formulas of the language.

4.1 Non-triviality and constancy

The equivalence with Heim's result turns out to be weaker than in the propositional case; it holds only when the Context Set satisfies additional constraints. To see why a weaker result is obtained, let us note that there could be a world w in which Transparency is satisfied because Q has a degenerate semantics. Consider the following scenario:

- In w, there are exactly 2 P-individuals, one of whom satisfies R and one of whom does not.
- The sentence uttered is $(QP.\underline{R}R')$ with $Q =$ *less than three*.

Even though it is not the case that each P-individual satisfies R in w, Transparency is trivially satisfied with respect to w, because for any predicative expression γ,

$$w \models (QP.(R \textit{ and } \gamma)) \Leftrightarrow (QP.\gamma).$$

Of course, the equivalence holds because *no matter what the nuclear scope Y is*, $(QP.Y)$ is true in w: since there are exactly two P-individuals, *a fortiori* there are less than three individuals that satisfy both P and Y.

We will solve the problem by making two assumptions:

(i) First, we require that each quantificational clause should make a non-trivial contribution to the truth conditions (= Non-Triviality). Specifically, we require that for each initial string αA of any sentence uttered in a Context Set C, where A is a quantificational clause (i.e., a clause of the form $(Q_iG.H)$), there is at least one sentence completion β for which A makes a semantic contribution that could not be obtained by replacing A with a tautology T or a contradiction F. Thus Non-Triviality requires that for some sentence completion β,

$$C \not\models \alpha A\beta \Leftrightarrow \alpha T\beta;$$
$$C \not\models \alpha A\beta \Leftrightarrow \alpha F\beta.$$

[4] Heim (1983) observes that special provisions are needed for indefinites, which trigger extremely weak presuppositions. Thus *A fat man was pushing his bicycle* certainly doesn't presuppose that every fat man had a bicycle. We disregard this point in what follows (see Schlenker 2006b for a remark on the treatment of indefinites in the Transparency framework).

If the Context Set only includes worlds with less than three P-individuals, Non-Triviality will automatically rule out any sentence of the form $\alpha(QP.\underline{R}R')\beta$ for Q = *less than three*. This is because when one has heard $\alpha(QP.\underline{R}R')$, one can determine that one can replace $(QP.\underline{R}R')$ with T without modifying the contextual meaning of the sentence, no matter how it ends.

(ii) This measure won't be enough, however. Suppose that $C = \{w, w', w''\}$, where w is the world mentioned earlier in which there are exactly two P-individuals, while w' and w'' are worlds that have exactly four P-individuals, with the following specifications:

w': all P-individuals satisfy R and R'.
w'': all P-individuals satisfy R but no P-individual satisfies R'.

Consider the sentence $(QP.\underline{R}R')$. As before, Transparency is satisfied in w (despite the fact that in w some P-individual does not satisfy R). Furthermore, Transparency is also satisfied in w' and w'', because in these worlds each P-individual satisfies R. Contrary to the case we considered in (i), however, *this situation is not ruled out by Non-Triviality:*

$w' \not\models (QP.\underline{R}R') \Leftrightarrow T$ (the left-hand side is false, but the right-hand side is true);
$w'' \not\models (QP.\underline{R}R') \Leftrightarrow F$ (the left-hand side is true, but the right-hand side is false).

In this counter-example, however, it is crucial that the extension of P does not have the same size in w ($|P^w| = 2$) and in w' and w'' ($|P^{w'}| = |P^{w''}| = 4$). We will see that this property is indeed essential to construct the problematic examples, and that when Non-Triviality is combined with the requirement ('Constancy') that the size of the extension of each restrictor be fixed throughout the Context Set, the equivalence with Heim's theory can indeed be achieved.

Before we prove our (limited) equivalence result, let us give a precise statement of Non-Triviality:

(10) **Definition of Non-Triviality** Let C be a Context Set, and let F be a formula. $\langle C, F\rangle$ satisfies Non-Triviality just in case for any initial string of the form αA, where A is a quantificational clause (i.e., a formula of the form $(Q_iG.H)$), there is a sentence completion β such that:

$$C \not\models \alpha A\beta \Leftrightarrow \alpha T\beta;$$
$$C \not\models \alpha A\beta \Leftrightarrow \alpha F\beta,$$

where T is a tautology and F is a contradiction.

An immediate consequence of the definition will turn out to be useful:

(11) **Non-Triviality Corollary** Let Q_i be a generalized quantifier with the associated tree of numbers f_i. Consider a formula $(Q_iG.H)$, evaluated in a Context Set C. Then:

(i) If $\langle C, (Q_iG.H)\rangle$ satisfies Non-Triviality and if in C the domain of individuals is of constant finite size n, then

$$\{f_i(a,b)\colon a, b \in \mathbb{N} \wedge a + b \leq n\} = \{0, 1\};$$

(ii) If $\langle C, (Q_iG.H)\rangle$ satisfies Non-Triviality and if in C the extension of G is of constant finite size g, then

$$\{f_i(a,b)\colon a, b \in \mathbb{N} \wedge a + b = g\} = \{0, 1\}.$$

4.2 Sketch of the proof

As announced, the proof proceeds in two steps. First, we show that under the assumptions of Constancy and Non-Triviality, the Transparency framework makes the same predictions as Heim's system for unembedded quantificational sentences. Second, we integrate this result to a proof by induction that applies to all sentences of the language.

Lemma 1

Let Q_i be a generalized quantifier with the associated tree of numbers f_i.

(i) Suppose that
   (a) throughout C, the domain of individuals is of constant finite size n;
   (b) any property over the domain can be expressed by some predicate; and
   (c) $\{f_i(a,b)\colon a,b \in \mathbb{N} \wedge a+b \leq n\} = \{0,1\}$.
   Then Transp$(C, (Q_i \underline{P} P'.R))$ iff $C \models \forall d P(d)$.

(ii) Suppose that
   (a) throughout C, the extension of P is of constant finite size p;
   (b) any property over the domain can be expressed by some predicate; and
   (c) $\{f_i(a,b)\colon a,b \in \mathbb{N} \wedge a+b = p\} = \{0,1\}$.
   Then Transp$(C, (Q_i P.\underline{R} R'))$ iff $C \models \forall d[P(d) \Rightarrow R(d)]$.

Remark: By the Non-Triviality Corollary:
(i.c) can be replaced with '$\langle C, (Q_i \underline{P} P'.R)\rangle$ *satisfies Non-Triviality*', and
(ii.c) can be replaced with '$\langle C, (Q_i P.\underline{R} R')\rangle$ *satisfies Non-Triviality.*'
Proof: Omitted for brevity. We note that in (i) and (ii) the *if* part is immediate (for (ii), because of Conservativity), and thus only the *only if* part needs to be discussed. See the full paper for a proof, in which crucial use is made of the fact that Q_i can be represented in terms of the tree of numbers $f_i(a,b)$, for variable a and b.

We must now combine Lemma 1 with the equivalence proof developed for the propositional case to yield a result that holds of quantificational languages. We will do so in two steps:

(i) First, we show, in Lemma 2, that if $\langle C, F\rangle$ satisfies Non-Triviality, then all the pairs $\langle C', F''\rangle$ which must be 'accessed' (in a sense to be made precise) in the computation of $C[F]$ also satisfy Non-Triviality.

(ii) Second, we combine the results of Lemma 1 and Lemma 2 to provide a general equivalence result between Transparency and Heim's results for quantificational languages.

We start by defining the pairs $\langle C, F\rangle$ which must be 'accessed' in the computation of $C[F]$.

Definition 1

Let C be a Context Set, and F be a formula. We simultaneously define the relation $\langle C', F'\rangle$ **is accessed by** $\langle C, F\rangle$ and $\langle C'', F''\rangle$ **is a parent of** $\langle C', F'\rangle$ by the following induction:

(i) $\langle C, F\rangle$ is accessed by $\langle C, F\rangle$;

(ii) If $\langle C', (\mathit{not}\ F')\rangle$ is accessed by $\langle C, F\rangle$, then $\langle C', F'\rangle$ is accessed by $\langle C, F\rangle$ and $\langle C', (\mathit{not}\ F')\rangle$ is the parent of $\langle C', F'\rangle$.

(iii) If $\langle C', (G\ \mathit{and}\ H)\rangle$ is accessed by $\langle C, F\rangle$, then $\langle C', G\rangle$ is accessed by $\langle C, F\rangle$ and $\langle C', (G\ \mathit{and}\ H)\rangle$ is the parent of $\langle C', G\rangle$; and if $C'[G]$ is defined, $\langle C'[G], H\rangle$ is accessed by $\langle C, F\rangle$ and $\langle C', (G\ \mathit{and}\ H)\rangle$ is the parent of $\langle C'[G], H\rangle$.

(iv) If $\langle C', (G\ \mathit{or}\ H)\rangle$ is accessed by $\langle C, F\rangle$, then $\langle C', G\rangle$ is accessed by $\langle C, F\rangle$ and $\langle C', (G\ \mathit{or}\ H)\rangle$ is the parent of $\langle C', G\rangle$; and if $C'[G]$ is defined, $\langle C'[(\mathit{not}\ G)], H\rangle$ is accessed by $\langle C, F\rangle$ and $\langle C', (G\ \mathit{or}\ H)\rangle$ is the parent of $\langle C'[(\mathit{not}\ G)], H\rangle$.

(v) If $\langle C', (\mathit{if}\ G.\ H)\rangle$ is accessed by $\langle C, F\rangle$, then $\langle C', G\rangle$ is accessed by $\langle C, F\rangle$ and $\langle C', (\mathit{if}\ G.\ H)\rangle$ is the parent of $\langle C', G\rangle$; and if $C'[G]$ is defined, $\langle C'[G], H\rangle$ is accessed by $\langle C, F\rangle$ and $\langle C', (\mathit{if}\ G.\ H)\rangle$ is the parent of $\langle C'[G], H\rangle$.

Lemma 2

Suppose that $\langle C, F\rangle$ satisfies Non-Triviality. Then if $\langle C', F'\rangle$ is accessed by $\langle C, F\rangle$, $\langle C', F'\rangle$ satisfies Non-Triviality as well.

Proof: One shows by induction that if $\langle C', F'\rangle$ is accessed by $\langle C, F\rangle$ and violates Non-Triviality, then either $\langle C', F'\rangle = \langle C, F\rangle$, or $\langle C', F'\rangle$ has a parent that also violates Non-Triviality. A trivial induction on the definition of pairs $\langle C', F'\rangle$ that are accessed by $\langle C, F\rangle$ will then yield the Lemma.

Theorem 2

Let C be a Context Set and F be a formula. Suppose that (i) the domain of individuals is of constant size over C; (ii) the extension of each restrictor that appears in F is of constant size over C; and (iii) $\langle C, F\rangle$ satisfies Non-Triviality. Then for every $\langle C', F'\rangle$ which is accessed by $\langle C, F\rangle$ (including $\langle C, F\rangle$ itself):

(i) $\mathrm{Transp}(C', F')$ iff $C'[F'] \neq \#$.

(ii) If $C'[F'] \neq \#$, $C'[F'] = \{w \in C' : w \models F'\}$.

Proof: Omitted for brevity. The argument is by induction on the construction of F'. It is similar to the proof of Theorem 1, with some additions to steps (a–f) and one additional step (for the quantificational case).

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Non-restrictive modification and backgrounding

Carla Umbach
University of Osnabrück

1 Introduction

Non-restrictive modifications are commonly said to provide information which is irrelevant to the denotation or reference of the modified phrase. It expresses a property of the referent or denotation which is supposed to be evident in the context in which the sentence is uttered thus providing information which is intuitively backgrounded. Non-restrictive modifications may appear in various forms, e.g. as relative clauses, appositions, or attributive adjectives. In this paper the focus is on attributive adjectives. The example in (1) is from a newspaper article referring to an anti-aircraft defense bill dismissed by the German constitutional court. The prominent interpretation of the NP *unschuldige Passagiere* 'innocent passengers' is such that the modification by *unschuldige* 'innocent' is non-restrictive. According to this interpretation passengers in the context of an aircraft hijacking are generally viewed as innocent and are contrasted with kidnappers. There is also a restrictive interpretation of *unschuldige Passagiere* such that kidnappers are regarded as non-innocent passengers, which is, however, marginal.

(1) Ein Abschuss eines gekaperten Flugzeuges, in dem sich neben den Entführern unschuldige Passagiere befinden, ist und bleibt verboten.
'Shooting down a kidnapped aircraft that has innocent passengers on board in addition to the kidnappers is illegal.'

In distinguishing between the restrictive and the non-restrictive interpretation of (German) attributive adjectives intonation plays a crucial role. Consider the NP *bunte Blumen* 'colorful flowers' in (2). Since according to general world knowledge flowers are always colorful, the modifier has to be interpreted non-restrictively. An accent on the modifier, as in (2b), would induce a restrictive interpretation triggering a set of alternatives Rooth (1992) including colorless flowers, which is ruled out by world knowledge. Obviously, the non-restrictive interpretation requires the modifier to be deaccented. This suggests to regard the modifier as background, as in (2c). A narrow focus on the noun would, however, induce a set of alternatives comprised of colorful things, which is clearly not the intended reading. This leaves the option of an NP-wide focus, as in (2d), which does trigger the intended set of alternatives, e.g. vegetables and trees. It is in conflict, however, with the intuition that a non-restrictive modifier expresses information evident in the context and thus backgrounded.

(2) a. In Annas Garten sind bunte Blumen, aber kein Gemüse und keine Bäume.
'In Anna's garden there are colorful flowers, but no vegetables and no trees).'
b. ?? In Annas Garten sind $[\text{BUNTE}]_F$ Blumen (... aber keine farblosen Blumen).
'In Anna's garden there are colorful flowers (... but no colorless flowers')
c. ?? In Annas Garten sind bunte $[\text{BLUMEN}]_F$ (... aber kein buntes Gemüse und keine bunten Bäume)
'In Anna's garden there are colorful flowers (... but no colorful vegetables and no colorful trees')

d. In Annas Garten sind [bunte BLUMEN]$_F$ (... aber kein Gemüse und keine Bäume)
'In Anna's garden there are colorful flowers (... but no vegetables and no trees').

Although, as shown above, a non-restrictive interpretation requires the modifier to be deaccented, it should be clear that the converse does not hold — deaccenting does not entail a non-restrictive interpretation. This is evident from (2c) and is confirmed by (3). In Edna's reply the modifier *rot* 'red' is deaccented due to the previous mentioning of *rot* in Tom's statement, but it must be interpreted restrictively, as indicated by the contrast in the subsequent sentence.

(3) a. Tom: Ich habe für unsere neue Wohnung einen roten Teppich gekauft.
'I bought a red carpet for our new apartment.'
b. Edna: Das ist ja großartig. Chuck hat gesagt, dass er mir einen roten [SESSEL]$_F$ schenkt. Dann schmeißen wir den grünen endlich weg.[1]
'This is great. Chuck said that he will give me a red armchair. We will then get rid of the green one.'

The examples in (2) and (3) demonstrate that a non-restrictive modifier does not constitute background information, and a backgrounded modifier need not be interpreted as a non-restrictive one, clearly showing that there is no correspondence between non-restrictive modification and backgrounding in the sense of focus/background. Still, a non-restrictively interpreted modifier cannot carry a narrow focus and it does not qualify as background information applying to other alternatives. This gives rise to the supposition that the concept of focus vs. background and the concept of restrictive vs. non-restrictive modification are not just orthogonal but that non-restrictive modification does not take part in the focus/background partition of the sentence.

In the remainder of this paper I will, first, consider various cases of non-restrictively interpreted attributive adjectives in indefinite and definite noun phrases addressing the question of what is modified by a non-restrictive modification. Secondly, examples like the ones in (2) will be re-examined in order to clarify the interaction of focus/background and the non-restrictive interpretation of attributive adjectives. In the third section, the presupposition interpretation of non-restrictive modification and the conventional implicature analysis proposed by Potts (2005) will be considered. It will turn out, that there is an essential difference between so-called expressives, like *damn*, and regular adjectives like *unschuldig*'innocent' in (1). While both types of attributes on a non-restrictive interpretation have widest scope, the former but not the latter is "attached to the speaker" such that it cannot be picked up by the next speaker. This will lead to the conclusion that expressives do establish a separate meaning dimension expressing a public commitment of the speaker in the sense of Gunlogson (2003) which is not part of the common ground.

2 Non-restrictive interpretation of attributive adjectives

In the case of indefinite NPs, licensing of a non-restrictive interpretation seems to depend on the lexical meaning of the adjective and the noun. In *weiße Schimmel* 'white white horses' a restrictive interpretation of the attribute is not available because *Schimmel*

[1] Foci are indicated only if relevant to the argument. There may be additional foci not indicated in the examples.

means 'white horse' and the attribute *weiß* 'white' has no influence on its denotation. In *bayrische Beamte* 'Bavarian officers' a non-restrictive interpretation of the attribute is ruled out because *Beamte* 'officers' are not generally Bavarians. In *unschuldige Passagiere* 'innocent passengers', as in (1), the situation is more complicated, since we may regard passengers in general to be innocent, but we may also take the view that every person purchasing a ticket is a passenger, including kidnappers. This amounts to two readings, $passenger_1$ and $passenger_2$ where one corresponds to the non-restrictive and the other one to the restrictive interpretation of the modifier.

Adjectives like *weiß* 'white', *bayrisch* 'Bavarian' and *unschuldig* 'innocent' differ from adjectives like *dreckig* 'dirty', *süß* 'sweet' and *dämlich* 'stupid' in that the latter are "expressive" (expressing the speaker's anger or approval etc.). Expressives must be interpreted non-restrictively (Huddleston & Pullum 2002), but in most cases they come with a regular counterpart which has a restrictive interpretation. In *dreckige Gauner* 'dirty crooks', for example, the adjective may be interpreted non-restrictively meaning something like *mean*, but it may also be interpreted restrictively meaning *covered with dirt*. Similarly, in *süße Kätzchen* 'sweet kittens' the adjective has a regular as well as an expressive meaning, but due to selectional restrictions (kittens cannot be sweet in the sense of taste) this NP requires a non-restrictive interpretation of the attribute. Finally, there are adjectives which have only an expressive meaning, like *damn* or *dämlich* 'stupid' enforcing a non-restrictive interpretation.

In the case of indefinite NPs the modifier clearly combines with the noun. Simplifying matters considerably, the restrictive interpretation leads to the intersection of adjective and noun denotation, while on the non-restrictive interpretation the modifier applies to the kind denoted by the noun. In the case of definite NPs on a non-restrictive interpretation the modifier may also apply to the referent. Assuming that definiteness indicates uniqueness (and neglecting pronominal interpretations relating to familiar referents, cf. Umbach 2002) the NP *der bayrische Beamte* 'the Bavarian officer' will refer to the unique individual in the intersection of Bavarians and officers, which has to be a singleton set. If the noun already denotes a singleton, as in *der blonde Schachweltmeister* 'the blond chess world champion' the attribute is clearly non-restrictive since it does not affect the choice of the referent. This type of non-restrictive interpretation entails that the unique individual that is the chess world champion is blond, but it does not entail that chess world champions in general are blond.

If licensed by the lexical meanings of the noun and the adjective, definite NPs may, in addition to the restrictive reading, allow for the kind-related and for the referent-related non-restrictive interpretation. Thus the NP *der kleine Pekinese* 'the small Pekinese' may either refer to the unique Pekinese dog that is small (restrictive), or to the unique Pekinese dog (in the given situation) entailing that Pekinese dogs are generally small (kind-related non-restrictive), or to the unique Pekinese dog (in the given situation) entailing that this dog is small (referent-related non-restrictive). Expressive adjectives modifying a definite NP, although excluding a restrictive interpretation, do allow for both types of non-restrictive interpretation. *Der dämliche Beamte* 'the stupid officer', for example, may either be interpreted entailing that officers in general are stupid or entailing that the unique officer in the given situation is stupid. In order to avoid side issues, I will leave the referent-related type of non-restrictive modification out of consideration in the remainder of the paper and instead focus on the kind-related type. Simplifying matters again, *Ein/der kleine(r) Pekinese bellt* 'A/the small Pekinese barks' will, on its non-restrictive reading, be interpreted as entailing that Pekinese dogs are in general small,

$\exists x/\exists!x.\text{pekinese}'(x)$ & $\text{small}'(\cap(\text{pekinese}'))$ & $\text{bark}'(x)$ (where $\cap$ represents the nominalization function mapping a predicate to a kind).

Although expressive adjectives like *dämlich* 'stupid' must be interpreted non-restrictively, it is not the case that all adjectives that allow for a non-restrictive interpretation are expressives. Many regular adjectives shift to an expressive meaning when interpreted non-restrictively (cf. *süß* 'sweet'), but there are also adjectives that license a non-restrictive interpretation without changing into an expressive, e.g., *weiß* 'white' and *unschuldig* 'innocent', indicating that the analysis of non-restrictive attributive adjectives should not be restricted to expressives.

3 Focus/Background

As indicated in the beginning of the paper, non-restrictive attributive adjectives exhibit a particular behavior with respect to focus and background. In (4) and (5) there is a narrow focus on the modifier. (4a) will be licensed by a preceding discourse such as *In dem Zimmer waren zwei Beamte, ein blonder und ein rothaariger.* 'There were two officers in the room, one was blond and the other one red-haired', inducing a restrictive interpretation. In the case of (4b), it is hardly possible to come up with a licensing context. Only contexts explicitly mentioning the expressive seem to license this focus, e.g., *Der eine Beamte war faul und der andere dämlich* 'One of the officers was lazy and the other one was stupid'. In such contexts the focused expressive appears like a quotation ("the officer who was called stupid"). In contrast to the restrictive modifier in (4a), which triggers a set of alternatives, e.g., {red-haired, blond, black, brown, ...}, the expressive in (4b) seems unable to induce alternatives. In the quotation-like context above we might think of *dämlich* 'stupid' and *faul* 'lazy' as alternatives, but these alternatives are only available because they have been mentioned before, which is atypical for alternatives evoked by focus.

(4) a. Der [ROTHAARIGE]$_F$ Beamte fragte nach meinem Ausweis.
b. ?? Der [DÄMLICHE]$_F$ Beamte fragte nach meinem Ausweis.
'The red-haired/stupid officer asked for my passport.'

While the modifier in (4b) has only an expressive meaning, the one in (5a) is ambiguous and the one in (5b) has only a regular meaning. Being focused, *dreckig* 'dirty' allows only for the *covered with dirt* reading and has to be interpreted restrictively. Focusing *unschuldig* 'innocent' requires a reading of *Passagiere* 'passengers' including non-innocent passengers and is also interpreted restrictively. Evidently, expressives as well regular adjectives on a non-restrictive interpretation resist focus. Regular adjectives and ambiguous ones switch to a restrictive interpretation when focused, while expressives make the sentence unacceptable (unless used in a quotation-like manner).

(5) a. Der [DRECKIGE]$_F$ Gauner hat mein Fahrrad gestohlen.
'The dirty crook stole my bike'
b. Am Heck der Maschine stand ein [UNSCHULDIGER]$_F$ Passagier.
'There is an innocent passenger at the rear end of the plane'

In (6) and (7) the focus is on the noun. (6a) will, e.g., be licensed by a context such as *In Raum 311 sprach ein Beamter mit einem Antragsteller, beide hatten feuerrote Haare* 'In room 311 there was an officer talking to an applicant, both red-haired'. In the case of (6b), it is again hard to perceive of a licensing context. Even in a quotation like use

of the expressive narrow focus on the noun seems infelicitous. Similarly, in (7) narrow focus on the noun enforces a restrictive reading of the modifier. *Dreckig* 'dirty' in (7a) adopts the *covered with dirt reading*, and *Passagiere* 'passengers' in (7b) must be read as including non-innocent passengers. The examples in (4)-(7) clearly show, that expressives as well regular adjectives on a non-restrictive interpretation do not take part in the focus/ background partition of the sentence: (i) They cannot carry a narrow focus and (because?) they are unable to raise alternatives, and (ii) they do not qualify as background and (because?) they are unable to constrain the alternatives evoked by the focus. While the inability to raise alternatives is at least intuitively plausible, the resistance to constrain alternatives is really surprising. Assuming that a non-restrictive adjective combines with the kind denoted by the noun, there is no obvious reason why it should not be able to apply to alternative kinds.

(6) a. Der rothaarige [BEAMTE]$_F$ hatte ein rosanes Hemd an.
b. ?? Der dämliche [BEAMTE]$_F$ hatte ein rosanes Hemd an.
'The red-haired/stupid officer was wearing a pink shirt.'

(7) a. Der dreckige [GAUNER]$_F$ traf den dreckigen [POPEN]$_F$.
'The dirty crook met the dirty priest.'
b. Am Heck der Maschine stand ein unschuldiger [PASSAGIER]$_F$.
'There is an innocent passenger at the rear end of the plane'

As already shown in the beginning of this paper, the only focus compatible with a non-restrictive attributive adjective is a focus including (at least) the adjective and the noun, as in *der [dämliche BEAMTE]*$_F$ 'the stupid officer'. This focus yields alternatives such as {stupid officer, applicant, ...}, which is intuitively correct. But it disproves the intuitive idea that non-restrictive modification expresses some kind of background.

4 Presupposition or conventional implicature?

It is generally agreed that a non-restrictive modification triggers an entailment such that the modifying property applies to the modified argument. Since this entailment it is not blocked by, e.g., negation and modals, it is usually regarded as a presupposition giving rise to a truth value gap in case of inconsistency with the common ground (cf. Umbach 1996). The presupposition interpretation has been challenged by data suggesting that it is possible for the hearer to ignore the entailment triggered by a non-restrictive modification if it is in conflict with the common ground, especially in the case of adjectives and appositions. Another argument against the presupposition interpretation is provided by the fact that, unlike regular presupposition, the entailments triggered by non-restrictive modifications project out of, e.g., indirect quotation contexts. For this reason Geurts (1999) proposed a buoyancy principle which allows for global accommodation of backgrounded material (where the notion of background in Geurts' paper includes the entailments of non-restrictive modifications as well as background as opposed to focus).

In Potts (2005) a range of phenomena is investigated including non-restrictive relative clauses, parentheticals, appositions, discourse adverbials, epithets and expressives. The basic idea is that by using such expressions the speaker makes a comment upon (part of) the asserted content of the utterance, and that these comments are conventional implicatures (cf. Grice 1975). Conventional implicatures are characterized as commitments made by the speaker by virtue of the meaning of the words he chooses which are logically

and compositionally independent of "what is said". Following Potts, conventional implicatures constitute a separate dimension of meaning, in addition to the "at-issue" meaning of the utterance (i.e. the assertional meaning in the case of declarative sentences). To represent conventional implicatures Potts suggests a multidimensional semantics such that the meaning of a sentence is represented by a tuple consisting of the asserted proposition and a (possibly empty) list of propositions representing conventional implicatures. The interaction between these two dimensions is restricted such that conventional implicatures can never be argument to an asserted expression and must take asserted contents as their arguments.

In Potts' analysis focus is not considered. Although he admits that intonation has some kind of effect — non-restrictive relative clauses, for example, are distinguished by their so-called comma-intonation — he refers to focus semantics merely as a "campaign point" supporting the multidimensional view of meaning. In the face of the findings above indicating that non-restrictive adjectives do not take part in the focus/background division a separate dimension of meaning appears tempting. It is unclear, however, how the conventional implicature dimension relates to the focus dimension of meaning in the sense of, e.g., Rooth (1992) or Krifka (1992). Moreover, its role in communication is far from obvious — does it, e.g., enter the common ground of the discourse participants?

By interpreting non-restrictive modifications as conventional implicatures instead of presuppositions Potts accounts for the fact that they (i) are attributed to the speaker of the utterance even if embedded in indirect quotation, (ii) do not necessarily give rise to truth value gaps in case of inconsistency with the common ground, (iii) do not necessarily lead to accommodation and (iv) in the majority of cases require informativeness. The evidence for these facts stems from different constructions within the range of conventional implicature phenomena. The question is, however, whether all of these phenomena behave similarly with respect to the above listed properties.

Regarding accommodation, there seems to be a difference between regular adjectives and expressives. Let us assume that in (8a) A uses the reading of *Passagier* 'passenger' compatible with the non-restrictive interpretation of *unschuldig* 'innocent'. In his response B simply ignores the modifier and uses the other reading, which makes the answer incoherent. For a successful communication B would have to use the reading intended by A and thus accommodate A's presupposition that passengers are innocent. In (8b) there is no accommodation required for the answer to be coherent — B even contradicts A's view that officers are stupid. This suggests that, while regular adjectives on a non-restrictive interpretation do require accommodation, expressives do not.

(8) a. [A:] Nehmen Sie an, in dem Flugzeug befinden sich unschuldige Passagiere.
'Let us assume that there are innocent passengers on board.'
[B:] ?? Unter den Passagieren könnten auch Entführer sein.
'There might be kidnappers among the passengers.'

b. [A:] Hat heute schon wieder ein dämlicher Beamter angerufen?
'Was there a call by some stupid officer again?'
[B:] Ja, heute hat einer von der Stadtverwaltung angerufen. Er war übrigens durchaus vernünftig.
'Yes, someone from the city administration called. He was quite sensible.'

Let us finally consider scope issues. Non-restrictive adjectives, regular ones as well as expressives, undoubtedly take widest scope even if occurring in a position which is a

presupposition plug, e.g., in an indirect quotation context. The sequence in (9a) appears inconsistent because assuming that *unschuldig* is used non-restrictively the reading of *Passagier* in the embedded sentence differs from the one in the subsequent sentence. The example in (9b) is from Potts (2005). Although embedded in indirect quotation, the use of *lovely* indicates that Edna thinks that red vases are beautiful.

(9) a. ?? Der Einsatzleiter sagte dem Minister, dass sich unschuldige Passagiere an Bord der Maschine befinden. Vermutlich sind unter den Passagieren auch Entführer.
'The head of operations said that there are innocent passengers on board. Maybe there are kidnappers among the passengers.'

b. (Chuck thinks that all his red vases are ugly, and tells Edna that she can take on of them. Edna likes red vases, selects on and returns home to her housemate:)
'Chuck said, I could have one of his lovely vases!'

The fact that they invariably take widest scope in the utterance seems to be a hallmark of non-restrictive modifications. It is one of the main reasons for Potts to regard them as comments by the speaker and reject a presuppositional analysis. Surprisingly, the scope behavior of expressives and regular non-restrictive adjectives seems to differ when taking dialog into account. In (10) the non-restrictive adjective in A's utterance is picked up in B's utterance without appearing marked. In (11), however, picking up the expressive used in the preceding turn has a quotation-like flavor. Edna's statement implicates that she likes Chuck's paintings (whereas Chuck might like them or not). When Tom repeats her expression *wunderbar* 'wonderful' it seems like a quote indicating irony. This suggests that expressives do not only take widest scope but are, in addition, plugged by the turn they are used in, which is plausible taking into account that they express the speaker's attitude.

(10) [A:] Bitte bedenken Sie, dass sich neben den Entführern unschuldige Passagiere an Bord befinden.
'Please keep in mind that there are innocent passengers on board'

[B:] Selbstverständlich werden wir nichts tun, was (die) unschuldige(n) Passagiere gefährden könnte.
'We will of course not do anything that might endanger (the) innocent passengers.'

(11) [Edna:] Chuck hat gesagt, dass er mir eins seiner wunderbaren Bilder geben will.
'Chuck said that he will give me one of his wonderful paintings.'

[Tom:] Aber häng das wunderbare Bild bitte nicht in den Flur.
'But please do not hang the wonderful picture in the hall.'

5 Conclusion

The framework presented in Gunlogson (2003) makes it possible to distinguish between the speaker's and the hearer's commitments. Commitments are public in the sense that they are mutually recognized. If the speaker is committed to a proposition p then the common ground includes the proposition that 'the speaker believes p', while p itself need not be part of the common ground. This framework suggests itself for the analysis of expressives. Although the entailments induced by the use of expressives (e.g. that Chuck's pictures

are wonderful) are public commitments of the speaker, they are obviously not meant to be adopted by the hearer, which is, e.g., implicated by the lack of accommodation and the resistance to be picked up across turns. In Gunlogson's framework the entailments induced by expressives can be analyzed as commitments of the speaker which do not enter the common ground.

To conclude, the fact that non-restrictively used attributive adjectives do not take part in the focus/background partition of the sentence strongly suggests to follow Potts in representing the entailments resulting from non-restrictively used adjectives separate from the assertional part of the utterance. But if these entailments are subsumed under the conventional implicature dimension, we will have to assume that all of the conventional implicature phenomena behave similarly with respect to focus/background, which is unlikely taking the range of phenomena into account. For expressives Gunlogson's framework offers a convincing solution. As for the rest, including regular non-restrictive adjective, there is at the moment no conclusive answer.

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Some modifiers of conditionals

Richard Zuber
CNRS, Paris

1 Introduction

Conditional sentences are difficult to analyse and the literature on this topic is so abundant that I do not dare to mention any title except for those mentioned for the specific purposes of this paper. The difficulty starts already at classificational and typological levels. The purpose of this paper is to analyse conditional sentences (CSs, for short) in which specific items, so-called *categorially polyvalent particles*, CCPs for short, occur. CPPs are functional expressions which can have as their possible arguments expressions of different grammatical categories. Grammatically such expressions are usually *modifiers*, that is functional expressions of the category C/C for various categories C.The interest of CCPs is that in spite of the fact that they can apply to expressions of various categories (in that sense they are *categorially polyvalent*) they usually have in some sense a constant meaning across categories. So it might be interesting to see whether this constancy of meaning is preserved in the context of CSs as well.

My analysis will be carried in the framework of Boolean semantics and the reason is that it is precisely in this framework that the notion of categorial polyvalency and of categorially polyvalent modification get their clear meaning.

The classical cases of such categorially polyvalent modifiers are items like *only, also* and *even* as shown in the following examples:

(1) a. (Only/also/even Leo) danced on weekdays with Lea in the garden.
b. Leo (only/also/even danced) on weekdays with Lea in the garden.
c. Leo danced (only/also/even on weekdays) with Lea in the garden.
d. Leo danced on weekdays (only/also/even with Lea) in the garden.
e. Leo danced on weekdays with Lea (only/also/even in the garden).

(2) Leo danced on weekdays with Lea in the garden.

The above examples show that classical CPPs are categorially polyvalent modifiers: they can apply to expressions of various categories and the resulting expression is of the same category as the argument expression. For instance in (1a) they apply to NPs and give as a result NPs, in (1b) they modify verbs, in (1c) they modify adverbials and so on. From the semantic point of view we observe for the moment that they den ote restrictive functions in the sense that they complex unit resulting from their application entails the modified argument. In the above case all sentences in (1) entail (2).

Of course, as we will see in some detail, classical CPPs can also modify CSs. Various analyses of CSs modified by some classical CPPs, in particular by *even*, have been proposed (Abott 2005; Lycan 1991; Berckmans 1993). We will see, and this is an empirical contribution of this paper, that there are many other categorially polyvalent CPPs which also can modify CSs. Furthemore, it will be shown that classical CPPs, at least *only* and *even*, are logically basic in the sense that many other 'non-classical' CPPs can be obtained from classical ones by Boolean operations.

2 Other cases

In this section we present some other, less often discussed and probably less known, cases of categorially polyvalent modifiers. We will see that they also can modify CSs and some of them will be analysed in this context . First notice the following examples given here just as an illustration:

(3) a. Some teachers, in particular/especially Leo, think that ...
b. Yesterday he did many things, in particular he finished his paper.
c. He sings everywhere, in particular in his bathroom.

(4) a. Leo will not come, let alone Lea.
b. Leo does not work on Saturdays, let alone on Sundays.
c. Leo does not smoke, let alone drink.

Surprisingly, *at least, at most* usually considered as modifiers of numerals are in fact categorially polyvalent modifiers:

(5) a. At least/at most Lea will pass the examination.
b. Lea sings at least/at most in the bathroom.
c. At least/at most five teachers were there.
d. At most/at least he can walk.

In (5a) we have a modification of an NP by *at least, at most* , in (5b) these items modify adverbials and in (5c) they modify a VP.

Many CPPs occur in CSs. The cases *only, also* and *even* are well-known (cf. *only if, also if* and *even if* . In (6c) we have a modification of an *if*-clause by *at least* and (6d) shows that such a modification by *at most* is impossible:

(6) a. Lea will be happy, in particular if Leo calls.
b. Lea will not be happy if it rains, let alone if it snows.
c. Lea will call, at least if it rains.
d. *Lea will call, at most if it rains.

There are similarities and differences between various CPPs and they should be taken into account in the final an analysis of these particles considered as categorially polyvalent. One observes for instance *only, also* and *even*, *at least* and *at most* need not occur with additional lexical material when applying to a particular argument. This does not seem to be the case with particles like *especially* and *in particular*. Furthermore, there is a systematic semantic relationship between the additional lexical material and the argument of these particles suggesting that the explicitly required lexical material plays a role of an anaphora-antecedent like element:

(7) a. *In particular/especially Leo will call.
b. Some students, in particular Leo, will call.
c. Some students and in particular Leo, will call.
d. *He sings in his office, in particular/especially in the bathroom.

(8) a. He sings everywhere, in particular in his bathroom.
b. He sings in his office and in particular in his bathroom.
c. *He likes wine, in particular chocolate.

d. He likes wine, in particular champagne.

e. He likes wine and in particular chocolate.

In addition to these differences there are also similarities concerning the semantic contribution of some CPPs independently on whether they apply to conditional or non-conditional arguments. One of them concerns the so-called consequent entailment problem in *even if* conditionals. It has been claimed that *even if* conditionals should not be considered semantically as conditionals since such conditionals assert the truth of the consequent unconditionally: the speaker who asserts P *even if* Q seems to be asserting that P holds independently of Q. For instance (9a) seems to entail (9b):

(9) a. Leo will leave even if he is tired.

b. Leo will leave.

Notice now that something similar happens in the case when *even* modifies arguments of other categories. For instance (10a) seems to entail (10b):

(10) a. Even Leo danced.

b. Everybody danced.

The similarity is obvious: in both cases, in (9) and in (10), there seems to be a hidden universal quantifier which in some way imposes an unrestricted reading.

The data are a bit more complex, however. Consider the following examples:

(11) Leo will leave if it rains and even if he is tired.

(12) Lea and even Leo danced.

The supposed entailment we had in (9) or in (10) does not hold anymore in (11) and (12). Thus the truth of (11) does not force us to consider (9b) as true and (12) does not entail (10b).

The above examples show that a complete analysis of CPPs should take into account differences and similarities between various CCPs. In this paper I am basically interested in similarities between various particles and I show that it is possible to it is possible to analyse CPPs in an uniform way using algebraic tools of the Boolean semantics.

3 Boolean semantics

Boolean semantics (Keenan & Faltz 1985) is a version of formal semantics which explicitly assumes that the semantic types have Boolean structure. Thus for any category C there is a corresponding denotational Boolean algebra D_C of possible denotations of expressions of category C. The algebra $D_{A/B}$ has as elements functions from D_B to D_A. D_C are atomic. Atoms of the algebra $D_{A/B}$ are determined by atoms and/or elements of the resulting algebra D_A.

We are interested here basically in the denotational algebras of modifiers. A modifier is a functional expression of category C/C for various choices of C. Modifiers of category C/C denote in the denotational algebra of restrictive functions RESTR(C), which is a subset of the set of functions from D_C onto D_C. The set RESTR(C) of restrictive functions $f_c \in D_{C/C}$, is the set of functions satisfying the condition $f_c(x) \leq x$, for any $x \in D_C$ (Keenan & Faltz 1985). The set of restrictive functions forms a Boolean algebra:

Proposition 1 *Let B be a Boolean algebra. Then the set of functions f from B onto B satisfying the condition $f(x) \leq x$ forms a Boolean algebra RESTR(B) with the Boolean*

operations of meet and join defined pointwise and where $0_{RESTR(B)} = 0_B$, $1_{RESTR(B)} = id_B$, $f'(x) = x \cap (f(x))'$.

Proposition 1 shows how to form the restrictive Boolean algebra RESTR(B) from the algebra B. What is important here is the fact that the Boolean complement is relativised to the one element of the algebra which is just the identity function.

Restrictive algebras are also atomic:

Proposition 2 *If B is atomic so is RESTR(B). For all $b \in B$ and all atoms α of B such that $\alpha \leq b$, functions $f_{b,\alpha}$ defined by $f_{b,\alpha}(x) = \alpha$ if $x = b$ and $f_{b,\alpha}(x) = 0_B$ if $x \neq b$ are the atoms.*

There is an important sub-class ABS(B) of restrictive functions (relative to a given Boolean algebra B): these are the so-called *absolute functions*. By definition $f \in$ ABS(B) iff for any $x \in B$, we have $f(x) = x \cap f(1_B)$. One can show that ABS(B) is a sub-algebra of R_B.The atoms and co-atoms of ABS(B) are indicated in:

Proposition 3 *If B is atomic so is ABS(B). For all atoms α of B, functions f_α, defined by $f_\alpha(x) = \alpha \cap x$ are the atoms of ABS(B). For all atoms α of B, functions f_α, defined by $f_\alpha(x) = x \cap \alpha'$ are the co-atoms of ABS(B).*

Atoms of both algebras, the algebra R_B and the algebra ABS(B) will be used to interpret CPPs. The algebra B corresponds to the denotational algebra of the argument to which the CPP applies.

4 The meaning of CPPs

How it is possible that CPPs keep their general meaning constant across categories. I propose to explain this meaning constancy of CPPs across categories by relating their denotations to atomicity of corresponding denotational algebras. Thus, in the simplest case an expression with a CPP denotes an atom in the algebra whose type is determined by the category of the argument of the particle. Other particles denote Boolean combinations of atoms and, possibly, of 'variables' of appropriate category. For instance expressions denoting co-atoms, that is Boolean complements of atoms, can also be considered as having a general, category independent meaning given that Boolean complements have such a meaning as well. Similarly a function of the form $f_c(x_c) = x_c \vee {}_c at_c$, can be considered as having a general meaning independent of category c because in its definition category independent operations are used.

Let us consider first the classical CPPs *only, also* and *even*. We observe that all these particles are semantically modifiers denoting restrictive functions. This means in particular that the sentences with a particle entail the corresponding 'particle-less' sentence. Their meaning constancy is due to the fact that their denotations are linked to atomicity. The case of *only* is relatively easy. We can explain its meaning constancy across categories by saying that *only* always denotes atoms of the denotational algebras of modifiers (Zuber 2001). Which exact atom and in which algebra depends on the category and value of the argument of *only*. Thus *only* in *only NP* denotes an atom in $D_{\mathrm{NP/NP}}$, *only* in *only yesterday* denotes an atom in $D_{\mathrm{VP/VP}}$, *only* in *only five* denotes an atom in the denotational algebra of modifiers of numerals (or determiners), etc.

This proposal concerning the relationship between *only* and atomicity can be justified more easily for some categories than for others. One can give an 'almost formal' proof that

only NP denotes an atom of D_{NP} using the fact that there is an isomorphism between the algebra D_{INT} of intersective determiners and the algebra D_{NP} (Zuber 2001).

Recall that there are at least two types of modifiers, those denoting in restrictive algebras and those denoting in absolute algebras. The particle *only* in its 'usual' meaning denotes an atom of an absolute algebra. It is possible, however, that in some uses *only* has also a scalar meaning (for instance in MSCCs) and in this case it denotes an atom of a restrictive algebra.

Let us see now some other particles. There are some arguments (Zuber 2004) showing that *also* is the Boolean complement of *only*:

$$\mathrm{ALSO}(X) = \mathrm{ONLY}'(X).$$

Indeed *not only Leo* cross-categorially entails *also Leo* and *also Leo* cross-categorially entails *not only Leo*.

CPP *even* can be analysed as denoting an atomic function of the algebra of restrictive non-absolute modifiers. As indicated above, such functions are determined by two indices: an element of the denotational algebra of arguments of *even* and an atom included in this element. When the arguments are NPs atoms of the corresponding denotational algebras are singletons containing a property as a unique element. We obtain this property by taking the property corresponding to the VP of the sentence in which the subject NP is modified by *even* and intersecting it with the property pragmatically incompatible with it. There are two arguments for such a move. First, a conjunction of two NPs modified by *even* is impossible: **even Leo and even Lea*. Second, quantified NPs with *even* exhibit quantifier constraint in the same way as exception NPs (which are related to atoms). Thus we do not have **most/*some students, except Leo; *most/*some students,even Leo* but we do have *every student except Leo; every student, even Leo*. Given this (13) can be analyzed as in (14):

(13) Even Leo danced.

(14) EVEN L DANCED = ONLY L IS $D \cap \mathrm{Inc}(D)$

The description in (14) is given in the appropriate matalanguage. Informally it means that Leo is the only dancer who has a property incompatible with dancing. This uniqueness related the meaning of *even* to atomicity and, at the same time, gives rise to the surprise effect usually associated with the meaning of *even*.

Using the above description of classical CPPs we can define the meaning of other CPPs. Thus the meaning of *et least* is given in (15) and the meaning of *at most* is given in (16):

(15) AT-LEAST(X) = X OR NOT-ONLY(X)

(16) AT-MOST(X) = ONLY(X) OR NOT-EVEN(X)

Notice that descriptions in (15) and (16) are category (type) independent. This means that the variable X above can be of any (major) category. For instance *at most Leo* "means" 'Only Leo or not even Leo'.

5 Conditionals

Before extending the above description of CPPs to the case when they modify conditional sentences I need to mention a class of conditional sentences which are excluded from this analysis and which seem to be related to conditionals in which a modification by a CPP

occurs. The conditionals I will not discuss here are so-called *minimal sufficient condition conditionals*, MSCC, that is conditionals which express *minimal sufficient conditions* (cf. Zuber 2006b). Roughly speaking MSCCs are conditional sentences of the form P IF ONLY Q. In other words the conditional connector in this case is the connector IF ONLY (and not ONLY IF).

An English example of MSCC would be *He would be happy of only he had a bottle of wine*. In fact such constructions seem rather restricted in English since apparently IF ONLY clauses are preferably used in English in counterfactuals and in 'incomplete conditionals' expressing wishes (as in *If only she were intelligent*). Conditional constructions corresponding to MSCCs are very productive in many other languages, in Slavic languages in particular. In addition in these languages exist temporal MSCCs constructed with ONLY WHEN clauses. Many MSCCs expressed in other languages are not easily translatable into English.

The reason that MSCCs should be considered as conditionals modified by CPPs is not only the use of the connector IF ONLY in MSCCs. One observes in addition that both types of conditionals the 'adverbial' *then* cannot occur (importance of this fact for the analysis of ONLY IF conditionals has been noticed in Iatridou n.d.). Furthermore, in Japanese the CCP used in MSCCs is not ONLY but the particle corresponding to EVEN (*sae* in Japanese).

We can now apply the above description of CPPs to analyse conditionals modified by CPPs. Such an application is in principle independent of any particular theory of conditionals, even if a theory of conditionals in the framework of Boolean semantics would be more appropriate. In Zuber (2003) it is shown that conditional sentences have in fact a Boolean structure. In particular it is shown that the conjunction of two conditional clauses, IF P AND IF Q, should not have the same interpretation as the of the conditional operator applied to a conjunction of two sentences (that is it should be different from IF (P and Q)). Furthermore, the if-clause can be interpreted as a modifier of the consequent clause. This modifier can be said to be dual to the restrictive modifiers presented above since, roughly, in this case the argument entails the modified argument.

The extension of the analysis of CPPs applying to non-conditional arguments, as illustrated in particular in examples (13–16), to conditional arguments gives the following results for modified conditional sentences:

(17) P ALSO IF $Q = P$ NOT-ONLY IF Q

(18) P AT LEAST IF $Q = P$ IF Q OR P NOT-ONLY IF Q

(19) $^*P$ AT MOST IF $Q = P$ ONLY IF Q OR P NOT EVEN IF Q

Notice that the description of conditional sentences with *at most* given in (19) indicates that they are uninformative hence probably their ungrammaticality. Furthermore, concerning *even* it follows from my proposal that *even if* conditionals do not entail their consequent and thus the consequent entailment thesis is false. This is because, as indicated above, (20) does not entail that that Leo will dance (in the same way as (21) does not entail that everybody danced , even when the involved set of participants is contextually restricted):

(20) Leo will dance if it rains and even if it snows.

(21) Leo and even Lea will dance.

As far as I can tell the above results are in agreement with our basic intuition concerning the meaning of conditional sentences in general and conditional sentences modified by CCPs in particular.

6 Conclusions

Using the Boolean semantics and in particular the fact hat denotational algebras are atomic we analysed CPPs in an unified way which allows us to understand why such particles keep their meaning constant independently of the category of the argument to which they apply, even if they apply to such complex objects as CSs. This is possible because in the Boolean semantics one can naturally use category (type) independent notions such as Boolean operations and atoms. In this paper an additional attempt has been made to explain the surprise effect induced by some CPPs (*even, in particular*): it is proposed that the surprise effect is due to exceptionality of atomic elements in restrictive (non-absolute) algebras. A full analysis of this problems necessitates additional tools since items inducing the surprise effect seem also to induce intensionality (Zuber 2006a). For instance the following two sentences need not have the same truth-value even if the set of dancers and singers is the same:

(22) a. Even Leo is dancing.
b. Even Leo is singing.

Similarly the conditional sentences of the form 'P even if/in particular if Q' and 'P even if /in particular if Q'' need not have the same truth-value in the case when Q and Q' have the same truth-value.

Notice finally that my proposal applies also to various non-declarative conditional sentences:

(23) Open the window only /even/in particular if it rains.

(24) Will you leave even/also if she stays?

I believe that an analysis of such non-declarative conditional sentences along the lines suggested here will not only tell us something about conditionals but also about the meaning of non-declarative sentences.

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A semantic constraint on the logic of modal conditionals

Zsófia Zvolenszky
Logic Department, Humanities Faculty at Eötvös University (ELTE), Budapest

1 Introduction

Capturing the semantics of modal discourse (talk of what's necessary/possible or required/allowed) hardly seems possible without possible worlds.* And yet one of their most basic applications turns out to be irreparably flawed when it comes to certain modal conditionals. If we want to make amends, we have to fundamentally revise the semantics of modal conditionals.

My focus is on *deontic* logic, a special kind of modal logic about what laws/norms allow and require, be they traffic laws, moral laws, or health considerations. But the arguments carry over to bouletic modality, about what someone's desires allow and require, as well as circumstantial (or dynamic) modality, about what a given set of circumstances require. Conversational context decides various details about interpreting modal expressions (Kratzer 1977, 1981, 1991): whether the modal expression at hand is deontic, epistemic, bouletic, or some other; and if it is, say, an epistemic modal, whether the relevant epistemic background concerns my knowledge, or someone else's.

Three lead characters are featured: Symptom, Culprit, and Link. In their order of appearance:

- ▷ *Symptom* — a kind of conditional whose truth is guaranteed within the standard semantics: any conditional of the form *if p then it must be that p*; more generally, any conditional of the form *if p then it must be that q where q follows from p* is automatically true.

- ▷ *Culprit* — a long-standing tradition, a mainstay of possible worlds semantics: necessity, requirements are spelled out in terms of universal adherence to those requirements in a selected range of possible worlds—a requirement to eat vegetables in terms of vegetables being eaten across the worlds that count. *It must be that p* is true just in case in all possible worlds that count, *p* is true. (Which worlds count is an important issue taken up in Act I.)

- ▷ *Link* — a semantic expectation linking conditional and unconditional requirements. According to it, in worlds/situations in which I eat marshmallows, the conditional requirement *If you eat marshmallows, you must brush your teeth* functions the same way as the unconditional (or absolute) requirement *You must brush your teeth* would.

Act I: In working out a semantics for deontic modality (along with its bouletic and circumstantial cousins) we encounter Symptom, which has plagued deontic logic from its inception, but went largely unnoticed apart from Frank (1997), Jackson (1985), and Zvolenszky (2002). Symptom arises from the combination of just two features—Culprit and the non-negotiable assumption Link. To remove Symptom, Culprit has to go.

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Act II: Symptom makes relatively harmless solo appearances elsewhere. In the case of epistemic modality (about what's required by/consistent with someone's knowledge), it is associated with a dispensable culprit that is easily removed. One way to do this is by following Frank's suggestion—modal conditionals treated as doubly modalized—to improve on Kratzer's semantics (Frank 1997; Kratzer 1981, 1991). Certain conditionals related to *teleological* modality (about what someone's goals require/allow) also exhibit Symptom, but that is just what we expect of them (see von Fintel & Iatridou 2005 on so-called anankastic conditionals). So we can let them be, there is no need to look for a culprit to be removed.

Act III: Attempts at rescuing Culprit (by Jackson 1985, Geurts 2004) serve only to undermine it in the end, so alleviating Symptom still involves giving up on Culprit.

2 Symptom and deontic modality

Our troubles begin: *any conditional statement of the form if p then it must be that p is automatically true*, even though some instances of this schema are clearly false; witness the following:

(1) A specific deontic background is assumed: Hungarian traffic laws. (*speed* is short for *exceed the speed limit*)

a. (As Carl rides along the M3 motorway headed for Besenyőtelek,...)
...if Carl speeds, then he must speed.

That is, *...if Carl speeds, then traffic laws require him to speed.*

b. (As Carl rides along the M3 motorway headed for Besenyőtelek,...)
...if Carl blinks, then he must blink.

That is, *...if Carl blinks, then traffic laws require him to blink.*

Both conditionals are naturally read as false. For clearly, Hungarian traffic laws do not condone, let alone require Carl's speeding, even if he happens to speed. And the same laws are altogether silent about blinking, even if Carl happens to blink.

A more general version:

Symptom: Any conditional statement of the form *if p then it must be that q* where *q* follows from *p* is automatically true.

There are plenty of counterexamples to this, too. In addition to the examples in (1), consider the following (assuming the same deontic background):

(2) (As Carl rides along the M3 motorway headed for Besenyőtelek,...)
if Carl talks on his mobile then: *he must have a mobile.*
he must move his lips.
he must be awake.
he must be breathing.

That is, *...if Carl talks on his mobile then traffic laws require him to have a mobile/move his lips/be awake/be breathing.*

(I formulated Symptom based on the modal notion of *ought to be/must be*, but there is also the issue of what an agent *ought to do*. Symptom would arise for the latter notion as well, see Jackson 1985: pp. 192-195.).

What gives rise to Symptom? It appears as soon as we assume two very basic components, neither of which has stirred much controversy. One of them is Culprit: the enduring, ubiquitous assumption that we represent *it is necessary/must/can/ought/have to be that p* based on whether p holds across the worlds that count. For example, the requirement to obey the speed limit is cashed out in terms of the speed limit being obeyed in every one of the worlds that count.

Culprit: For any modal modifier m, the meaning of $m(p)$ is a function of p holding in the possible worlds that count:
- ▷ if m = *must/should/ought to/have to*, then $m(p)$ is true just in case p is true in every one of the worlds that count.
- ▷ if m = *can be/might/may*, then $m(p)$ is true just in case p is true in at least one of the worlds that count.

(On a side note: consider a true utterance of *You ought to take the train but you don't have to*. Examples like this indicate that the force of *ought* and *have to* cannot be identical; this issue is taken up in Sloman (1970) and von Fintel & Iatridou (2005); for the purposes of this paper, I gloss over the difference.)

The definition for Culprit does not attempt to analyze away modality; because modal notions like accessibility and closeness are needed to delineate the worlds that count:

Accessibility: Worlds count if they are accessible from the actual world based on some dimension of accessibility.

Examples:

deontically accessible worlds:	the law-abiding worlds (worlds that obey relevant laws of the actual world);
epistemically accessible worlds:	those consistent with what someone knows.

Closeness: Worlds count if they are closest to the actual world based on some dimension of closeness.

Examples:

deontically closest worlds:	the most law-abiding among the worlds (chances are the actual world is not included);
bouletically closest worlds:	those that fulfill most of the relevant desires.

Kratzer (1981, 1991) implements both accessibility and closeness in her doubly-relativized framework: the accessible worlds comprise the modal base out of which the closest worlds are selected by an ordering source. An example:

(3) Carl should not exceed 130 km/h.

Here, the modal base includes worlds where relevant circumstances—Carl's riding along the motorway (as opposed to a town)—match those of the actual world; Hungarian traffic laws act as the ordering source: the more a world obeys the laws, the closer it is to the actual world.

We have so far seen two varieties of modal statements: absolute requirements of the form *it must/should (etc.) be that p*, and conditional requirements of the form *if p then it must/should be that q*. How do we parse and interpret conditional requirements? This was one of the first debates sparked by von Wright (1951)'s proposal that we treat deontic notions within a modal logic framework. Do we construe modal conditionals as $\Box(p \supset q)$ or as $p \supset \Box q$? Or do we assign them a structure that is altogether different—a dyadic operator $O(-/-)$ taking two arguments, one for the antecedent, one for the consequent (von Wright 1956, van Fraassen 1972, and Lewis 1974)? O stands for *ought* and obligation; $O(q/p)$ is read as *It ought to be that q given p*. The dyadic notation allows neutrality about the specific semantics and syntax of conditional requirements; I will adopt it for this reason, showing that Symptom arises independently of the specific syntax and semantics we assign to conditional requirements. I mentioned already that inducing Symptom takes two features: Culprit and ...

There is one very attractive link that suggests itself between absolute requirements and conditional ones:

Link: Conditional requirements are just like corresponding absolute requirements in worlds in which their antecedents obtain.

This is supposed to be at the foundation of the semantics for conditional requirements. Consider a garden-variety conditional unlike the Symptomatic conditionals in (1) and (2):

(4) Deontic background: directions for getting to Besenyőtelek.
If you are riding a motorbike from Budapest to Besenyőtelek, you should take the Füzesabony exit off the M3 motorway.
That is, *Directions to Besenyőtelek require you to take the Füzesabony exit off M3 if you are riding a motorbike from Budapest to Besenyőtelek.*

Intuitively, (4) applies to Besenyőtelek-bound, motorbike-riding situations, requiring that in such situations one take the exit in question. Link has it that in these scenarios, the conditional requirement in (4) function the same way as the absolute requirement *You should take the Füzesabony exit off the M3 motorway* would.

We should not confuse Link with the syntactic rule (or derivation) of Detachment, which parallels Link: for worlds in which our premises include some conditional requirement and its antecedent, we can derive an absolute requirement involving the consequent:

$$\frac{O(q/p),\ p}{\therefore O^*(q)} \qquad \text{(Detachment)}$$

$O^*(-)$ is the one-place *ought* operator for absolute requirements (of course, we could define it in terms of the two-place O as $O(-/A \supset A)$).

According to Jackson, "[d]etachment is plausible. If it ought to be that Attila goes to jail given that he has raped and pillaged, and he has raped and pillaged, then it ought to be that Attila goes to jail." (Jackson 1985: p. 191) Tomberlin (1989: p. 110) concurs: such inferences have to be valid "...for statements of conditional obligation to play a genuine role in the normative guidance of conduct". Still, it is important to distinguish Detachment from Link because the latter is even more general. For example, in van Fraassen (1972)'s framework, Detachment cannot be derived (see Tomberlin 1989); nonetheless, he adheres to the semantic expectation (see van Fraassen (1972: p. 421)).

Here is how Symptom is induced by Link and Culprit. Consider a Symptomatic conditional that is intuitively false and yet Link and Culprit together guarantee its truth:

(5) Deontic background: again, directions for getting to Besenyőtelek.
If you are riding a motorbike from Budapest to Besenyőtelek, you ought to ride a motorbike.
That is, *Directions to Besenyőtelek require you to ride a motorbike if you are riding one from Budapest to Besenyőtelek.*

The evaluation of the plausibly true (4) and the plausibly false (5) starts out the same way: Link instructs us to look at Besenyőtelek-bound, motorbike-riding situations; the result we want: in every such situation,

i. *You ought to take the Füzesabony exit off M3* is true, and

ii. *You ought to ride a motorbike* is false.

But Culprit thwarts this combination. Recall that for (i), all possible worlds (situations) that count have to be ones in which the Füzesabony exit is taken to get off the M3. The situations that count are ones where directions to get to Füzesabony are followed (or followed more than in the other situations under consideration). The all-important question is: which of two ways do we go—Exclusive or Inclusive?

Exclusive approach:	Restrict our attention to only those scenarios that satisfy the conditionals' antecedent—riding a motorbike from Budapest to Besenyőtelek—and disregard situations that involve say, an Eger to departure, or a car ride, rather than a motorbike ride; or
Inclusive approach:	Look more broadly at situations of all sorts—Eger and Budapest departures alike—as long as they are situations in which the driving instructions are followed.

The Exclusive approach does deliver (i): in every one of the situations in which the driving directions are followed, the Füzesabony exit is taken off the M3. But the Inclusive approach is out: if we consider a broader range of "directions-abiding" situations, including ones with people approaching Besenyőtelek from Eger, then in those situations, following directions involves avoiding the M3 motorway altogether. That in turn would make it so it's no longer true that in every situation that counts, the Füzesabony exit is taken off M3. So *You ought to take the Füzesabony exit off M3* comes out false by Culprit, making (4), which should have been true, come out false. Foundering on garden-variety conditionals like (4) in this way is unacceptable given Link. Our only option therefore is the Exclusive one which, however, fails to deliver (ii): *every* situation in the restricted range of worlds that count involves riding a motorbike, so by Culprit, *One ought to ride a motorbike* is true. (5), along with other Symptomatic conditionals is true then. Could we perhaps retain both approaches and apply the Inclusive one to Symptomatic conditionals while keeping the Exclusive one for garden-variety conditionals like (4)? I will revisit this possibility (independently suggested by Jackson 1985 and Geurts 2004) towards the end of the paper, showing that it is tantamount to giving up Culprit.

Why worry about being saddled with Symptom? Logicians have tried not to:

> A [...] point of criticism concerns the formula $O(B/B)$. This is almost always true... 'Rightly understood' of course, it is true; if we have put ourselves in a situation in

which a certain ideal can no longer be attained, then doing the best one can will involve not attaining that ideal. No use crying over spilt milk. (van Fraassen 1972: p. 437)

I wondered about the normative status of unalterables. Sometimes it seemed to me that it would be best to say that if a state of affairs is unalterable for a person at a time, then that state of affairs has no normative status for the person at the time. ... My impression then (and now) is that the cost of [the resulting] complexity exceeds the alleged benefit of getting a more intuitive truth value assignment for unalterables. I prefer to say that whatever is unalterable for a person at a time is therefore, somewhat degenerately, obligatory. There is no need to be concerned about all the obligations thereby induced. Since these things occur in every world accessible to the relevant individuals, it will be impossible for them to fail to fulfill these obligations, no matter what they do. (Feldman 1990: p. 329)

Still, Jackson is right:

... 'It ought to be that there are spies and I catch some given there are spies' strikes us as false, as does 'It ought to be that there are spies given there are spies'. (The fact that some theories of conditional obligation would make the latter true is an *objection* to them...) (Jackson 1985: p. 181; emphasis in the original)

Our account allows $O(A/A)$, as well as $O(\sim A/A)$ to be sometimes true and sometimes false... this seems right. 'It ought to be that I tell the truth given I tell the truth' seems true, while 'It ought to be that Hitler exterminated millions of Jews given he exterminated millions of Jews' seems false. By contrast, the standard view makes $O(A/A)$ always true. (Jackson 1985: p. 191)

An adequate account of deontic conditionals cannot afford maintaining the unintuitive truth-value assignments to Symptomatic conditionals—Symptom has to go then; Link is much too fundamental to be dispensable; so Culprit is the odd one out. And life without Culprit is livable. True, we can no longer analyze *It must be that p* in terms of possible worlds making p true, but it is unclear that necessity and requirements need an analysis in the first place. Maybe we could simply posit the requirements of a possible world (laws, obligations, duties, desires, etc.) the same way we posit its goings-on (motorbike rides, excursions to Besenyőtelek, vegetable consumption, etc.). Elsewhere (Zvolenszky 2002) I recommend this alternative but won't dwell on it here.

3 Epistemic and teleological modalities

Why haven't logicians and linguists recognized the gravity of the problem at hand? Building up an analogy will help explain:

Mischievous elves visited my household; they were struck by a similarity among three of my appliances: the reflective glass front shared by my television, my oven, and my microwave, and decided to carry the resemblance one step further: by making sure that the glass front stays fixed, unopenable on each appliance. With the TV, the elves did not have to do a thing, the glass was unopenable to begin with. With the microwave, the elves Scotch-taped it shut. With the oven, they decided on a more permanent solution: they welded the door shut.

> Consider a symptom that thanks to the elves is now multiply instantiated around my apartment: appliance fronts do not open. In particular, the symptom is instantiated by my TV, oven, and microwave. Despite the presence of the symptom, all is well with the TV: the reflective front has always been unopenable. With the microwave, the symptom signals a problem, but one that can be easily fixed—I simply remove the culprit: the Scotch tape. With the oven, things are far more complicated: to remove the culprit and make the welded door openable again, I will likely have to call an expert and pay heaps for repairs, replacement parts. A seemingly innocuous symptom—an unopenable front—that signaled no flaw in my TV, was easily fixed on my microwave, turns out to be a costly, complicated affair for my oven.

With respect to Symptom, various stripes of modality are like my various appliances:

- ▷ *epistemic modality* (about knowledge) is like my Scotch-taped microwave. Symptom arises in Kratzer (1981, 1991)'s framework; it is unwelcome but can be fixed easily with the help of a double modalization maneuver Frank recommends in her dissertation (Frank 1997). (The double modalization proposal also goes by the label 'nested modality'.)
- ▷ *conditionals related to teleological modality* (about goals) are like my TV. Symptom arises, but there is nothing wrong with the fact that it does. No need to fix what isn't broken.
- ▷ *deontic, bouletic and circumstantial modality* (about norms/desires/circumstances) are like my oven. Symptom has to go and removing it is costly—as we have already seen, it amounts to removing a basic tenet of possible worlds semantics: Culprit.

Epistemic modality is special in that the Detachment schema (described earlier in connection with Link) does not seem plausible for one sort of reading—about knowledge available to a subject:

(6) premise 1: If this is the M3 motorway then I must (given what I know and given my goal to get to Besenyőtelek) stay on it until the Füzesabony exit.
premise 2: This is the M3 motorway (whether or not I know it).
conclusion: I must (given what *I* know) stay on this road until the Füzesabony exit.

This should constitute invalid reasoning—given the two premises, situations in which I am somewhere in Eger could well be consistent with what I know (because for all I know, I could be in Eger), despite the fact that I am not in fact in Eger but on the M3; and in such situations, given the knowledge I have about driving directions, I do not take the Füzesabony exit (since from Eger, the directions tell me to avoid M3); so the conclusion does not follow.

We can fix the argument by replacing premise 2 with *I KNOW that this is the M3 motorway*. It is this idea that is exploited by Frank (1997: Section 2.2.3). In effect, we can think of her alternative account as one that makes room for the Inclusive approach, a move that would have been implausible for deontic modality (given Link and Detachment), but is plausible for epistemic modality. Frank suggests that we combine Kratzer (1991)'s treatment of modals and conditionals. Let's look at an epistemic reading of a Symptomatic conditional:

(7) Epistemic background: information I have about my whereabouts and about Hungarian geography.
If this is the M3 motorway, then it must be the M3 motorway.
That is, *If this is the M3, then I know that it is the M3.*

(7) is not the least bit trivial—figuring out that I'm on the M3 (and figuring out any truth about the world, for that matter) constitutes substantive knowledge. Yet it is only in passing that Kratzer (1991: p. 645) notes that her account (along with others) makes (7) true. On Kratzer's theory as well as Frank's version, we start out with a modal base comprising the epistemically accessible worlds (those compatible with what I know); in some, the road in question is M3, in others it isn't. The antecedent restricts the modal base to just those worlds where the road in question is M3. It is here that Frank departs from Kratzer: instead of checking if *This is M3* (part of the consequent) is true in every world of the modal base (which it is), Frank suggests that we evaluate *This must be M3* with respect to each world in the modal base. That involves checking for each world the worlds epistemically accessible from it. And at this point, we are free to include epistemically accessible worlds in which the road in question is not M3. This way, we can avoid making the Symptomatic conditional (7) automatically true. Frank's solution is a natural extension of Kratzer's theory; it is easy to implement—like removing Scotch tape.

Teleological modality: let us switch the deontic background for (5) (about obeying instructions) to a teleological one (about obtaining goals):

(8) Teleological background: the goal is to get to Besenyőtelek.
If you are riding a motorbike to Besenyőtelek, you must ride a motorbike.
That is, *Given your goal of reaching Besenyőtelek, you are required to ride a motorbike if you in fact are riding one to get there.*

This does not ring true because there are many optional details in the course of realizing a goal—hopping on a motorbike or taking a car; wearing sunglasses or not wearing any. Just because Carl happens to ride a motorbike, does not make his doing so a requirement given his target destination. This suggests that teleological modality belongs in the welded-oven group along with deontic modality. But notice that the following anankastic conditional does ring true (the 'anankastic' label signaling inevitability):

(9) If you want to get to Besenyőtelek by motorbike, you have to ride a motorbike.

A related sentence on which von Fintel & Iatridou (2005) (see especially p. 17) base their account of anankastic conditionals like (9) likewise seems true; uninformative, but true all the same:

(10) To get to Besenyőtelek by motorbike, you have to ride a motorbike.

When it comes to (9) and (10) then, Symptom is present but spells no trouble, and just like my TV, needs no fixing.

The fact that Symptom isn't bad news elsewhere does not make it better news for deontic, bouletic and circumstantial modality. Given that arriving at Symptom takes only Culprit and Link, we cannot expect any easy fixes such as switching to another account of conditionals, or changing a rule of inference. Yet deontic paradoxes far less problematic than Symptom have gotten all the attention. There isn't enough space here to compare Symptom with the Good Samaritan and Gentle Murder paradoxes, and the syntactic rule of Detachment with Entailment. I hope to do that elsewhere.

4 Symptomatic relief

Frank (1997: Section 4.2–3) offers a way of blocking Symptom—at the price of generating a different though related symptom I discuss in Zvolenszky (2002).

(11) If Annie Hall is making a U-turn, then she should not be making a U-turn.

This cannot be represented as true in Frank's framework, yet it seems exceedingly plausible to someone who thinks that every driving maneuver of Annie Hall's constitutes a traffic violation. More generally, on Frank's proposal, every conditional of the form *if p then it must be that p* and *if p then it must be that not-p* comes out false (See Jackson 1985: p. 191. for more counterexamples).

For reasons that are parallel, Jackson (1985)'s as well as Geurts (2004)'s accounts amount to giving up on Culprit in the end. This serves to reinforce my conclusion, rather than deflecting it. Recall the debate over adopting the Exclusive approach (which retains restrictions to conditional antecedents when evaluating the second half of modal conditionals) or the Inclusive approach (which removes the restriction). In effect, both Jackson and Geurts propose that we keep the Exclusive approach to handle garden-variety conditionals, and alongside it, retain the Inclusive approach to make Symptomatic conditionals false. Jackson and Geurts do this by distinguishing two possible readings of deontic conditionals, recommending the Exclusive approach for one reading, the Inclusive one for the other. Before addressing why neither account rescues Culprit, I will briefly outline each.

Jackson (1985: p. 187–188) thinks that requirements are to be interpreted relative to alternatives (see also Sloman 1970). For absolute requirements, this means the following. *It ought to be that I tell the truth* is construed as *It ought to be that I tell the truth out of* $\{$*I tell the truth*, *I do not tell the truth*$\}$, which is true if and only if the closest worlds in which I tell the truth are better than the closest worlds in which I don't. With respect to conditional requirements, Jackson has two choices: $O(q/p)$ is read as either *It ought to be that q out of* $\{q, \sim q\}$, or as *GIVEN p, it ought to be that q out of* $\{q, \sim q\}$. The difference between the two options is crucial: the first proposes to include non-p alternatives (in accordance with the Inclusive approach); the second excludes them (in accordance with the Exclusive approach). Jackson thinks the first option is plausible for Symptomatic conditionals like (1), (2) and (5), while the second is needed for ordinary conditionals like (4) and (11) (see Jackson 1985: p. 191).

Geurts (2004) points out that if we treat if-clauses as quantifier restrictions (following Kratzer 1991), then we get distinct readings depending on whether the if-clause restricts an overt or a covert quantifier. Consider the two truth-conditionally different readings of the following conditionals with the adverbial quantifier *often*:

(12) If Beryl is in Paris, she often visits the Louvre.

(a) *Overt reading*: Often, if Beryl is in Paris she visits the Louvre.
(the if-clause restricts the domain of the overt 'often', which quantifies over trips to Paris)
▹ true if, say, Beryl has made 4 trips to Paris, and on three of those trips, she visited the Louvre once, and on the fourth trip she did not go to the Louvre at all.

(b) *Covert reading*: If Beryl is in Paris, she visits the Louvre often.
(the if-clause restricts the domain of a covert quantifier over trips to Paris, whereas *often* quantifies over events more finely grained than trips, say days within a given trip.)

▹ (b)'s truth requires that Beryl make multiple, frequent visits to the Louvre every time she goes to Paris.

Geurts thinks that this sort of ambiguity is quite general and sometimes two structurally identical conditionals each have a single natural reading that is distinct from the other's: one is overt, the other, covert. Indeed, this is his diagnosis for Symptom (although his sole motivation for positing the ambiguity for modal conditionals is that he can thereby avoid Symptom without touching Culprit; that's putting the cart before the horse). He thinks that the natural reading of the ordinary conditional (4) is the overt one (as the Exclusive approach would have it), whereas for the Symptomatic conditionals (1), (2) and (5), the covert one (as the Inclusive approach would have it).

Whether we go Jackson's or Geurt's way, the issue is: what kind of account would capture the *right* reading for the Symptomatic conditionals, which call for the Inclusive approach, while retaining the plausible Exclusive approach to get the *right* reading of garden-variety conditionals? By positing an ambiguity, Jackson and Geurts have not improved the situation yet. All they have done is secure two readings for conditionals across the board: one that is plausible, and one that is (99 percent of the time) wide of the mark. Jackson and Geurts want more than room for ambiguity—for each conditional, they are aiming to deliver the intuitively plausible reading and that one only. Their goal is to capture the following contrast between (4) and (5): in Besenyőtelek-headed, motorbike-riding situations, driving directions do issue an instruction to take the Füzesabony exit (hence the expectation that (4) be true), but don't impose any requirement about riding a motorbike (hence the expectation that the Symptomatic conditional (5) be false). But to formulate this very pair of points, Jackson and Geurts need to make independent appeal to the status of the conditionals in question, *determining independently of Culprit whether the conditionals are supposed to hold or not.* This relegates Culprit to the status of an afterthought stripped of its intended explanatory value. Both Jackson's and Geurt's accounts end up appealing to considerations that Culprit should have helped avoid; and once those considerations are allowed in after all, they obviate the need for Culprit, making it functionally inert.

Imagine a man deeply attached to his pocket watch, a family heirloom that has always been on the erratic side. The man is relieved when he gets himself a cell phone with a reliable clock function. He continues wearing his pocket watch however, and out of habit, he even checks the time on it; but every time he does that, he would also glance on his cell phone to double check the time and in case of disagreement, would always go by the verdict of his cell phone. On Jackson's and Geurt's accounts, keeping Culprit within the semantics of modal conditionals would mean relegating it to the status of the pocket watch as a time-telling device.

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