Arbeitspapier Nr. 117

Proceedings of the Conference "sub8 – Sinn und Bedeutung"

Cécile Meier, Matthias Weisgerber (ed.)

Fachbereich Sprachwissenschaft der Universität Konstanz

Arbeitspapier Nr. 117

Proceedings of the Conference
“sub8 – Sinn und Beudetung”

8th Annual Meeting of the Gesellschaft für Semantik

Cécile Meier, Matthias Weisgerber (ed.)

Fachbereich Sprachwissenschaft
Universität Konstanz
Fach D 185
D-78457 Konstanz
Germany
matthias.weisgerber@uni-konstanz.de
c.meier@lingua.uni-frankfurt.de
http://www.uni-frankfurt.de/fb10/SuB8/

Konstanz
Oktober 2004
Schutzgebühr EUR 6

Fachbereich Sprachwissenschaft der Universität Konstanz
Sekretariat des Fachbereichs Sprachwissenschaft, Frau Gabriele Fahmy,
D 185, D-78457 Konstanz, Tel. 07531/88-2465

sub8
Sinn und Bedeutung

8th Annual Conference of the Gesellschaft für Semantik
September 29th – October 1st, 2003
Johann Wolfgang Goethe-Universität, Frankfurt am Main

sub8

sub8-Team
Elke Höhe-Kupfer, Cécile Meier, Christian Plunze,
Malte Zimmermann, Thomas Ede Zimmermann

sub8-proceedings-Team
Jürgen Konradi, Cécile Meier, Matthias Weisgerber

Referees
Sigrid Beck, Agnes Bende-Farkas, Paul Dekker, Hans Kamp, Cécile Meier, Winnie Lechner,
Christian Plunze, Robert van Rooy, Malte Zimmermann, Thomas Ede Zimmermann.

wwweb
`http://www.uni-frankfurt.de/fb10/SuB8/`

Contents

Preface

The present volume contains papers presented at the annual meeting "Sinn und Bedeutung VIII" of the "Gesellschaft für Semantik" held at the Johann Wolfgang Goethe-Universität, Frankfurt/Main, in September 2003.

The contributions are on various aspects of contemporary semantics. The issues addressed fall into one or more of the following categories: (i) semantics of topic and focus [Ebert / Endriss, Gyuris, Kaiser / Trueswell, Lee, Umbach, Wedgewood]; (ii) semantics and pragmatics of questions [Beck, Benz, Dekker]; (iii) semantics of tense and voice [Fernando, Lekaku, Sailer]; (iv) the syntax-semantics interface [Kobuchi-Philip, Stateva, Zeijlstra], (v) modality [van Rooy, Copley] and (vi) lexical semantics [Aksan, Nicolas, Schäfer, Schlücker, Seong, Zwarts].

We would like to thank the reviewers for their work and all speakers and guests of that conference for making it an inspiring event.

German Preface

Mit dem vorliegenden Band halten Sie eine Sammlung von Aufsätzen in Händen, die bei "Sinn und Bedeutung VIII", der Jahrestagung der "Gesellschaft für Semantik" in der Johann Wolfgang Goethe-Universität, Frankfurt/Main, im September 2003 vorgestellt worden sind.

Die Beiträge umfassen verschiedenste Aspekte aktueller Semantik-Forschung und lassen sich inhaltlich den folgenden Kategorien zuordnen: (i) Semantik von Topic und Focus [Ebert / Endriss, Gyuris, Kaiser / Trueswell, Lee, Umbach, Wedgewood]; (ii) Semantik und Pragmatik von Fragen [Beck, Benz, Dekker]; (iii) Semantik von Tense und Voice [Fernando, Lekaku, Sailer]; (iv) Das Syntax-Semantik Interface [Kobuchi-Philip, Stateva, Zeijlstra], (v) Modalität [van Rooy, Copley] und (vi) Semantik [Aksan, Nicolas, Schäfer, Schlücker, Seong, Zwarts].

Unseren großen Dank möchten wir den Reviewern für ihre Arbeit aussprechen – und, vor allen, den Vortragenden und Gästen, die die Konferenz ein gutes und inspirierendes Ereignis sein ließen.

Cécile Meier
Matthias Weisgerber

ASPECTUAL AND LEXICAL SEMANTIC PROPERTIES OF TURKISH AND ENGLISH DENOMINAL VERBS

Yeşim Aksan
Mersin University

yaksan@mersin.edu.tr

Abstract

This study attempts to describe lexical and aspectual properties of Turkish and English denominal verbs. Using Clark & Clark's (1979) semantic classes for denominal verbs, the study limits its data with *location*, *locatum* and *goal* denominal verbs whose nominal bases denote a thing. In considering the analogy between mass/count distinction in the spatial dimension displayed by nouns and telic/atelic distinction in the temporal dimension exhibited by events, present study discusses the effect of inherent semantic features of base nouns in determining the aspectual properties of *location*, *locatum* and *goal* verbs in Turkish and in English. This study also focuses on the variable aspectual nature of locatum verbs with mass noun bases and explains this variability by using the means of scalar semantics.

1 Introduction

Denominal verbs are simply nouns that have come to be used as verbs. Denominal verb formation via zero morphology ($\text{box}_N \rightarrow \text{box}_V$) is extremely productive in English compared with any other language like Turkish. Turkish uses the suffix {-lA} (*kutu* $_N$ 'box' → *kutu*+lA_V 'to box') most of the time, and frequently zero morphology (*boya* $_N$ 'paint'→ *boya*-Ø $_V$ 'to paint') to produce noun based verbs. The preponderance of denominal verbs in English has inspired not only morphologists but also syntacticians and semanticians to make inquiries into their peculiar properties. That's why we can observe various different approaches to the same today.

Studies in morphology question basically the suffixation process in denominal verb formation: how far is zero derivation different from any other type of derivations? (Marchand, 1969, Lieber, 1992). Syntacticans like Hale and Keyser (1993, 1998) discuss the noun-verb conversion, and they have develop a syntactic theory of denominal verb formation on the basis of Lexical Relational Structure. Semanticians like Pinker (1989), Jackendoff (1990, 1991), Kageyama (1997), and Labelle (2000) propose different templates or semantic primitives for conceptual structures of denominal verbs. Pragmatic elucidation on denominal verb formation is posed by Clark & Clark (1979), who furnished the most comprehensive data of both lexicalized and innovative denominal verbs in English. They claim that denominal verbs as lexical items — contrary to denotational or indexical ones— can change their referents and senses in countless number of ways. Since their senses depend on the context in which they occur, they argue that denominal verbs should be called *contextuals*.

Clark & Clark (1979) classify English denominal verbs into 8 semantic categories as follows: *location* (shelve the book), *locatum* (spice the food), *goal* (group the actors), *source* (word

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference "sub8 – Sinn und Bedeutung". Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany*

the sentence), *instrument* (mop the floor), *duration* (summer in the France), *agent* (nurse the patient), *miscellaneous* (bandage his ankle). This study will carry out its analyses on the basis of these major categories, specifically on *location, locatum* and *goal* . It is noteworthy that Turkish has all these semantic classes in its denominal verb classification with different degrees of productivity except for the semantic category of *agent,*.

The aims of the present study can be summarized as follows:

(1) to explicate lexical conceptual structure of location, locatum and goal denominal verbs in Turkish and in English; (2) to demonstrate that aspectual nature of location, locatum and goal verbs can be identified via inherent semantic features of the base noun. Particularly, we expect to find a correlation between the (non)boundedness of the base nominal and the (a)telicity of the derived verb; (3) to illustrate that Turkish and English locatum denominal verbs with nonbounded nominal base provide evidence which reinforces the argument of scalar semantics that incremental theme by itself is not enough to determine the telicity of the predicate.

The study first determines the lexical properties of so-called denominal verbs. Then it presents the aspectual (or Aktionsart) analysis of location, locatum, goal verbs, and questions the effect of inherent semantic features of base nouns (i.e., countable nouns) in determining telicity of location, locatum and goal denominal verbs. The study will also discuss the exceptional cases in locatum verbs derived from countable nouns. It finally focuses on the variable aspectual properties of locatum verbs with nonbounded nominal bases (i.e., mass nouns), and points out briefly the explanatory power of scalar semantics in ascribing (a)telicity interpretations to such verbs.

2 Lexical Conceptual Structure of *Location, Locatum, Goal* Verbs

The conceptual meaning of verbs are represented in lexical conceptual structure (LCS) which structurally organizes finite set of primitive semantic predicates and their arguments. This section will of show that location, goal and locatum verbs are not just different realizations of the identical thematic structures as has been hypothesized in previous studies (Jackendoff, 1990). We claim that these verbs have distinct semantic predicates. For location and goal verbs there exists locative predicate; for locatum verbs there is possessional predicate ‘WITH’ (Kageyama, 1997, p. 48).

Location verbs describe an act of ‘putting something in a location’, where the location is described by the base noun that is interpreted as thematic goal or place. Location verbs take as direct object the entity-theme which is located or moved with respect to the base noun. To sum up, the noun describes the final location of an entity in locative verbs. All the following representations capture the notion of movement and spatial location inherent in locative verbs.

(1) Ali bilgisayar-ı kutu-la-dı.

Ali computer-ACC box-LA-PAST-Ø

‘Ali boxed the computer.’

Clark & Clark (1979): Ali did something to cause it to come about that [the computer was in the box]

Jackendoff (1990): CAUSE ([Thing ∀], [Event GO ([([Thing ∃], [path TO ([place IN ([Thing BOX])])])])])

Kageyama (1997):[$]_x$ CAUSE [BECOME [[$]_y$ BE AT- $[N]_z$]]

Ali CAUSE [BECOME [computer BE AT -IN BOX]]

In goal verbs " the shape, entity, form, or role denoted by the parent noun come to exist by virtue of the action denoted by the verb" (Clark & Clark, 1979, p.774). The base nouns are in the goal case.

(2) Deniz öğrenci-ler- i grup-la-dı.

Deniz student-PL-ACC group-LA-PAST-Ø

'Deniz grouped the students.'

Clark &Clark (1979)**:** Deniz did something to cause to come about that [the students were grouped]

Kageyama (1997)**:** $[_X$ CAUSE [BECOME $[_y$ BE AT-IN-$[_{property}$ N]

[Deniz CAUSE [BECOME [students BE AT-IN-$[_{property}$ GROUP]]]]

Locatum verbs describe an act of 'putting a theme somewhere'. The theme argument is identified by the base noun. Such verbs take as direct object the entity interpreted as the final location of the base noun. According to these explanations, for instance, in the predicate 'polish the table', the locatum noun (i.e., theme argument) 'polish' goes onto the goal, 'the table'.

(3) Deniz masa-yı cila-la-dı.

Deniz table-ACC polish-LA-PAST-Ø

'Deniz polished the table.'

Clark & Clark (1979)**:** Deniz did something to cause it to come about that [the table had polish on it]

Jackendoff (1990)**:** CAUSE ([Thing ∀], [Event INCH [BE ([Thing BUTTER], [Place ([ON ([Thing])])])])])

Kageyama (1997)**:** [$]_X$ CAUSE [BECOME [[$]_y$ BE WITH $[NOUN]_Z$]]

[Deniz] CAUSE [BECOME [[table]] BE WITH [POLISH]]]

At this point, Kageyama's objection to the LCS representation of locatum verbs should be noted. Kageyama (1997, pp. 54-55) argues against the movement of locatum nouns and he does not find the LCS proposed in this line adequate.[1] Inherent lexical meaning of these verbs reveals that when we *spice the food,* or *saddle the horse* it is not just that 'spice is on the food' or 'saddle is on the horse' rather it indicates that 'spice is mixed with the food and adds spicy property to it'or 'the saddle is fixed on the relevant part of the horse's body so that the horse becomes ready to ride'. Thus, what is crucial in locatum verbs is "the coming together of theme and the place in such a way that they essentially form one unit" (Buck, 1993, p.143). This is named as "affectedness" by Buck. Yet, if LCS of locatum verbs is hypothesized as in Jackendoff's representation, it is not clear where the affectedness comes from. Hence, Kageyama (1997) proposes a new semantic predicate 'WITH' which signifies *possession* in a broad sense. For instance, in the predicate *spice the food* the semantic predicate WITH SPICE is interpreted as the 'state of being covered with spice' or in the predicate *saddle the horse* WITH SADDLE means 'ready to ride with the saddle on'. Our study sides with Kageyama's LCS representation of locatum verbs.

Briefly, LCS of denominal verbs are constructed on the prototypical schemes motivated for basic verb forms of English and Turkish. In this sense, these verbs belong to accomplishment verbs class[2] exhibiting either change of state or change of position.

3 Denominal Verbs and their Aspectual Properties

Second argument of this paper is on the determination of the aspectual, or Akitonsart properties of Turkish and English denominal verbs. First, we shall brifely comment on aspectual composition and related aspectual principle.

The relation between the verb and its arguments determine the aspectual classes of the predicates which are identified via aspectual feature of *telicity*. Telicity shows *terminativity* or *quantization* of the internal contour of an event described. As maintained by Krifka (1989), telicity includes a mapping between the structure of an argument of a verb and the structure of the event indicated by the verb. The semantic nature of the object argument has a direct effect on telicity. Telic interpretation originates when the object or incremental theme argument is quantized as in (4a). Since 'a plate of rice' denotes a quantized amount of substance, an endpoint for the described event in (4a) can be detected as the point at which all the substance in question is consumed. On the other hand, verbs with mass or uncountable objects (4b) do not allow a telic interpretation.

(4) a. Deniz *bir tabak pilavı* bir saatte yedi.

'Deniz ate a plate of rice in an hour.'

b. Deniz bir saat boyunca *pilav* yedi.

---

[1] The following points are the counter evidence propsed by Kageyama (1997) against the movement of locatum nouns in denominal locatum verbs. If we treat locatum verbs as the movement of the locatum entity, how can you explain the locatum nouns like *button hole* or *dog ear,* whose substance does not exist before the action carried out? Since *buttonholes* can not exist independently of clothes, it is meaningless to say *move buttonholes on the shirt*. Jackendoff's interpretation of locatum verbs as " cause N to come to be all over" does not apply to *diaper the baby, saddle the horse, tag the box, string the guitar*, through which the whole entity in question is not covered up.

2 LCS of accomplishment verb class,i.e., [[x ACT] CAUSE [y BECOME [y BE at-Z]]] properly fits the conceptual structure which underlies in location, locatum and goal denominal verbs.

‘Deniz ate rice for half an hour.’

This fact about the aspectual interpretation of predicates displays the obvious parallel between the nominal meaning and verbal meaning. The mass/count distinction in the spatial dimension shown by things is similar to the telic/atelic distinction in the temporal dimension exhibited by events (Krifka, 1989, Brinton, 1991, Jackendoff, 1991, Dowty, 1991, Verkuyl, 1993, Tenny, 1994 , Jackendoff, 1991,1996 Ramchand, 1997).

In this line, Jackendoff (1991) proposes the semantic function of boundedness [± BOUNDED] to distinguish between count and mass nouns. Count nouns are described as [+BOUNDED] and mass nouns as [-BOUNDED]. The basic idea is that count nouns are units: if we divide an apple by slicing we do not get further instances of the basic unit. Mass nouns are not units and they can be divided into further instances of themselves: if you divide a five litre of water into one liter bottles, each of one liter bottle can still be referred as ‘water’. Apart from the boundedness feature, Jackendoff also presents the semantic feature of [± INTERNAL STRUCTURE] to distinguish between plural count nouns and mass nouns. Plural count nouns can be divided into their composite units. It means that they are composed of individual units. Thus, mass nouns are [-i], plural count nouns are [+i]. In short, typology of semantic classes of nouns according to Jackendoff is as in (5).

(5)

count nouns (individuals):	[+b, -i] *araba ‘a car’*, *muz ‘a banana’*
collective nouns (groups):	[+b, +i] *hükümet ‘government’*
mass nouns (substances):	[-b, -i] *su ‘water’ , oksijen ‘oxygen’*
plural nouns (aggregates):	[-b, +i] *muzlar ‘bananas’* , *arabalar ‘cars’*

3.1 *Location, Locatum, Goal* Verbs and Telicity

Drawing on the analogy between the nominal and verbal meaning, we argue that aspectual (Aktionsart) properties of denominal verbs can be identified via inherent semantic features of the base noun. Following Harley (1999, 2003), we assume that location (*kitabı kutula- ‘box the books’, belgeyi dosyala-‘file the document’*), locatum (*atı eyerle- ‘saddle the horse’,yatağı çarşafla- ‘sheet the bed’*) and goal *(öğrencileri grupla- ‘group the students’ kitapları sınıfla- ‘cluster the books’)* denominal verbs derived from count nouns (like box, saddle, group) will be telic. Thus, they are classified as *accomplishment verbs*, which is compatible with their LCS analysis. On the other hand, the ones derived from mass nouns (like butter, polish, cream) will be atelic, hence they belong to *activity verb* class.

The present study verifies the above mentioned assumptions on data built upon Clark and Clark's subcategories of location, locatum and goal verbs. 200 canonical examples of location, locatum and goal verbs whose nominal base denote a thing constitute our database. All sorts of metaphorical extensions of determined denominal verbs are excluded from the database. To test the aspectual well-formedness of the predicates, standard telicity tests, namely temporal entailments [3] and distribution of temporal adverbs (x-boyunca ‘*for x-time’* / x-de *‘in x-time’*)

[3] The entailment test used in identifying aspectual properties of predicates is that:

(i) If Ø is an accomplishment verb, then *x is (now) Øing* entails that *x has not (yet)Øed.*

(ii) If Ø is an activity verb, then *x is (now) Øing* entails that *x has Øed.*

are used. One last point about the tendecies of languages in denominal verb formation is that Turkish does not lexicalize the same nouns as English does in denominal verb formation and English does not have some of the Turkish denominals either. These different lexicalizations are given under appropriate subclasses of relevant semantic categories as Tr. and Eng. Question mark displays non-occurring denominal verbs. The # notation by the temporal adverb testers indicates the unavailability of the produced readings.

• Location verbs

Storage places (on 'üstünde'): Tr: *sepeti sırtla- '?shoulder the basket', meyvaları tezgahla- '?stand the fruit'...* **Eng:** *shelve the books '?kitapları rafla-', land the boat '?tekneyi kıyıla-'...*

(6) a. Ali sepeti 2 dakikada / # 2 dakika boyunca sırtladı.
'Ali shouldered the basket in 2 minutes / # for two minutes.'
b. John shelved the book in 2 minutes / # for two minutes.

Storage places (in 'içinde'): *mısırı depola- 'silo the corn', yazıyı dosyala- 'file the document', telefonu ceple- 'pocket the cell-phone'...*

(7) a. Deniz yazıyı 2 dakikada / # 2 dakika boyunca dosyaladı.
'Deniz filed the report in 2 minutes / # for 2 minutes.'
b. Çiftçi mısırı bir saatte / # bir saat boyunca depoladı.
'Farmer siloed the corn in an hour / # for an hour .'

Containers (in 'içinde'): *şarabı fıçıla- 'barrel the wine', bilgisayarı kutula- 'box the computer' şarabı şişele- 'bottle the wine'...*

(8) a. Ali bilgisayarı 2 dakikada / # 2 dakika boyunca kutuladı.
'Ali boxed the computer in 2 minutes / # for 2 minutes.'
b.Ali şarabı 2 dakikada / # 2 dakika boyunca şişeledi.
'Ali bottled the wine in 2 minutes / # for 2 minutes.'

• Locatum verbs

Coverings (on 'üstünde')

Temporary: *yatağı çarşafla- 'sheet the bed', bebeği kundakla-,'swaddle the baby', zemini keçele- '? felt the floor'...*

(9) Deniz yatağı 2 dakikada / # 2 dakika boyunca çarşafladı.
'Deniz sheeted the bed in 2 minutes / # for 2 minutes.'

Individual objects: dress, animal paraphernalia: *bebeği bezle-'diaper the baby' yüzünü peçele- 'veil your face', atı nalla- 'shoe the horse', atı eyerle - 'saddle the horse'...*

(10) Ali atı 10 dakikada / # 10 dakika boyunca nalladı.
‘Ali shoed the horse in 10 minutes / # for 10 minutes.’

Location and locatum verbs derived from countable nouns, which are independent units by themselves yield telic interpretations [4] with respect to standard telicity tests, as seen in the example sentences. They are all compatible with a time span adverbial (in-x time) which occurs only with telic predicates.

• **Goal verbs**

Groups: *öğrencileri grupla- ‘group the students’, sınıfı sırala-’line up the class ’, kitapları sınıfla ‘cluster the books’...*

(11) Deniz öğrencileri grupluyor. DOES NOT ENTAIL Deniz öğrencileri grupladı.
‘Deniz is grouping the students DOES NOT ENTAIL Deniz has grouped the student.’

Masses: *kağıtları destele- ‘bundle the papers’, giyisileri kümele-‘pile the clothes’, çiçekleri demetle- ‘bouquet the flowers’...*

(12) Ali kağıtları desteliyor.≠> Ali kağıtları desteledi.
‘Ali is bundling the papers. ≠> Ali has bundled the papers.’

Shapes: *ipi düğümle- ‘knot the string’* **Eng:** *loop the rope ‘?ipi ilmekle-’, coil the rope ‘??ipi kangalla-’, braid her hair ‘?saçını örgüle-’...*

(13) Ali ipi düğümlüyor. ≠> Ali ipi düğümledi.
‘Ali is knotting the string. ≠> Ali has knotted the string.’

Goal verbs have either collective (*group*) or countable (*bundle*, *cluster*, *pile*, *mass*) base nominals. Under Jackendoff’s account, countable nouns are units, so they are bounded; collective nouns contain individual units like bare plurals, so they have [+i]. However, if we divide a group into smaller segments, we can not name each of the results as a ‘group’. Thus, such nouns are also [+bounded]. As is expected, goal denonimal verbs derived from collective nouns and countable nouns are bounded in time. With respect to entailment tests, they give

[4] One could argue that the telicity of these events described by denomial location and locatum verbs (in 6-10) derives from the boundedness of their object arguments. When compared with the indeterminate nature of the predicate *eat*, the events denoted by these verbs have inherent endpoints. To put it in other words, the telicity inherent in the events described by the location and locatum verbs themselves is “intuitively obvious” (Harley, 1999: p.77, see also Tenny, 1994, p. 212). This explanation becomes more meaningful when we analyse the telicity status of denomial locatum verbs whose nominal bases are mass nouns (like polish, butter) in section 3.4. The activites illustrated by these verbs have no inherent endpoints, thus both telic and atelic readings are equally possible.

rise to telic interpretations. As is seen in (11-13), telic predicates are not entailed by their progressive forms. Due to this principle, for instance in (11) ‘Deniz is grouping the students’ entails that ‘Deniz has not yet grouped the students’.

3. 2 Aspect Shift: Repeated Event

A change in the semantic properties of object noun in telic location and locatum verbs affects the aspectual interpretation of the verb. When a bare plural appears in the direct object position of telic verbs like *saddle* or *box*, the event receives the interpretation of repeated instances of saddling or boxing, i.e, each repeated event is completed.

(14) a. Ali # bir saatte / bir saat boyunca at eyerledi.
‘Ali saddled horses # in an hour / for an hour.’
b. Ali # bir saatte / bir saat boyunca bilgisayar kutuladı.
‘Ali boxed computers # in an hour / for an hour.’

Bare plurals bear a high potential for creating ambiguity. Many of them can be understood either as denoting a collection of individuals or quantifiying over the members of that collection, and thus they give rise to *collective / distributive* ambiguity. In our case, speakers resolve such ambiguity by relying on their world knowledge or generic knowledge. In (14 a, b), by virtue of generic knowledge *saddle the horses* would normally mean there was one saddle for each horse (distributive reading), not that there was one or more saddles for the horses taken as a set (collective reading). On the other hand, *box the computers* can be taken either way: it could be collective (15 a) when one or more boxes for the computers is understood as a set or it could be distributive (15b) when one box is assigned for each computer.

(15) a. Ali bilgisayarların tümünü bir kutuya koydu.
‘Ali put all the computers in a box.’
b. Ali bilgisayarları ayrı ayrı kutulara koydu.
‘Ali put each computer in a different box.’

3. 3 Exceptional Data in *Locatum* Verbs

Verbs categorized under the semantic classes of symbols *çeki imzala- ‘sign the check’, çeki tarihle- ‘date the check’ pasaportu damgala- ‘stamp the passport’* and labels *kavanozu etiketle- ‘label the jar’* , *mektubu mühürle- ‘seal the letter’* have exceptional cases in terms of telic interpretation. Although these locatum verbs have bounded nominal bases, like *sign*, *label*, *stamp* which give rise to telic predicates, our world knowledge tells us that the event of labeling, stamping, signing, sealing can be carried out more than once on a particular entity. Given the appropriate context, events described by such denominal verbs can have an atelic interpretation as well as the more usual telic interpretation.[5]

---

[5] Regarding the contextual explanation developed for subcategories of *symbol* and *label* locatum verbs, one can claim that under appropriate context, locatum verbs from semantic subclasses of *temporary dress* (like diaper

(16) a. Ali 5 dakika boyunca / 5 dakikada belgeyi imzaladı.

‘Ali signed the document for 5 minutes / in 5 minutes.’

Possible interpretations:

Ali signed different places of the same document for 5 minutes.

Ali signed one particular place of the document in 5 minutes.

b. Ali 5 dakika boyunca / 5 dakikada kavanozu etiketledi.

‘Ali labelled the jar for 5 minutes / in 5 minutes.’

Possible interpretations:

Ali labelled different sides of the same jar for 5 minutes.

Ali labelled one particular side of the jar in 5 minutes.

Locatum verbs categorized under the semantic class of decoration constitute another group of exception. Again, the locatum verbs in this category derived from count nouns like *resim ‘picture’*, *desen ‘pattern’, süs ‘ornament’* are supposed to be telic. Yet, it is very likely to interpret the event described by these verbs as atelic, simply because nominal bases of locatum verbs of decoration class are plural in their inherent lexical senses.[6] For instance, resimle- ‘picture’ means “draw, paint or print on a surface a lot of pictures”. This inherent plural sense of these derived verbs enforces us to make undelimited, or atelic readings. When we utter ‘Deniz pictured the book’, the process of picturing the book involves drawing more than one picture (or a series of pictures) in a book.

(17) Deniz kitabı bir saatte/ bir saat boyunca resimledi.

‘Deniz pictured the book in an hour/for an hour.’

the baby) and *animal paraphernalia* (like saddle the horse) may allow atelic interpretations. However, such a claim does not hold for the above mentioned subcategories. In the same vein, denominal location verbs with countable nomial bases do not have such a tendency since they are inherently telic . The only way to change their telicity is to manipulate the boundedness feature of their arguments. On the other hand, our world knowledge naturally triggers the relevant context which makes atelic reading possible with locatum verbs from the semantic subclasses of *symbol* and *label* .

[6] Followings are inherent lexical meaning of locatum verbs categorized under the semantic class of decoration :

desenle- ‘pattern’: a pattern is an arrangement of lines or shapes, especially a design in which the same shape is repeated at regular intervals over a surface.

süsle- ‘festoon ’ (n-count, usually plural): If sth. is festooned with -eg. lights, balloons or flowers-, a large number of things are hung from it or wrapped around it, especially in order to decorate it.

işle- ‘garland ’ (n -count, usually plural): circular decoration made from flowers and leaves.

pulla- ‘sequin ’ (n-count, usually plural): sequins are small shiny discs that are sewn on clothes to decorate them.

Again the well known collective / distributive interpretation occurs with the plural sense of the predicate resimle- 'to picture'. Telic reading of sentence (17) considers pictures in a book as a set, whereas atelic reading views each picture in the book separately .

3. 4 Aspectual Vagueness in *Locatum* Verbs

Final part of this study focuses on the aspectual vagueness of locatum verbs in Turkish and in English derived from mass nouns. Most of the locatum verbs have mass nouns as nominal roots which describe the movement of a spatially unbounded substance. According to our assumption, these locatum denominals should be atelic. However aspectual tests illustrate that locatum verbs derived from mass nouns allow both telic and atelic readings.

i. Coverings (on 'üstünde')

Permanent: *rafı kağıtla- 'paper the shelf', mobilyayı vernikle-'varnish the furniture', duvarı kireçle- 'lime the wall'* **Tr:** *tarlayı ilaçla-'?medicine the field', dolabı naftalinle- '?naphthalene the wardrobe'...*

(18) Deniz masayı 10 dakikada/ 10 dakika boyunca cilaladı.
'Deniz polished the table in 10 minutes / for 10 minutes.'

Permanent solid: Tr: *zemini ziftle- '?pitch the floor', yolu katranla- '?tar the road'...* **Eng:** *roof the house '?evi çatıla-', tile the floor '?zemini karola-', seed the lawn '?bahçeyi tohumla-'...*

(19) İşçiler yolu 2 günde / 2 gün boyunca asfaltladı.
'Workmen asphalted the road in 2 days / for 2days.'

Viscous: *ekmeği yağla- 'butter the bread', yüzünü kremle- 'cream your face', yarayı merhemle- 'balm the wound ',* **Tr:** *vazoyu tutkalla-'?glue the vase'...*

(20) Deniz yüzünü 10 dakikada / 10 dakika boyunca kremledi.
'Deniz creamed her face in 10 minutes / for 10 minutes.'

Powdery: *yüzünü pudrala- 'powder your face,' balığı unla-'flour the fish'...*

(21) Deniz balığı 5 dakikada / 5 dakika boyunca unladı.
'Deniz floured the fish in 5 minutes / for 5 minutes.'

ii. Coverings (in 'içinde')

Condiments *yemeği biberle-'pepper the food', salatayı limonla- 'lemon the salad'...*

(22) Deniz salatayı 2 dakikada / 2 dakika boyunca limonladı.

'Deniz lemoned the salad in 2 minutes / for 2 minutes.'

As we maintained before, what is crucial in locatum verbs is the semantic relation of WITH possession which signifies addition of a relevant property to the object. For instance, the locatum verb *polish* in the predicate *polish the table* implies 'polish is mixed with the surface of the table and adds polished property to it'. Thus, these verbs are change of state verbs which display variable telicity along the line of other change of state verbs as in degree achievements (e.g, *cool, lengthen, widen*).

Finally, our study paves the way to a discussion of telicity interpretation in the verb classes which display variable telicity. What is crucial in the sample sentences (18-22) is that they involve incremental theme arguments, but these arguments do not affect telicity of the predicates, which is quite contrary to the claims of Krifka (1989) and Dowty (1991).

We explicate this fact by using the means of *scalar semantics* which reanalyzes and extends the notion of incremental theme in terms of scalar representation. Scalar semantics elucidates the grading relations in lexical categories, basically adjectives and verbs, whose canonical examples involve grading. For instance, consider the verb *build*, which describes a kind of "process of creation", and therefore supports an ordering of objects according to how far along in a scale of completion they are (Kennedy, 2000).

Locatum verbs with mass noun bases displaying a variable telicity describe an event in which direct object arguments undergo a gradual change. This is characterized in a scalar representation as a change in the degree to which the direct object arguments possess some gradable property. For instance, with the predicate *polish the table* two scales are possible:

1. Intensity scale: brightness of the table. The desired result may be the brightest table, with the scale being one of brightness.

2. Quantity scale: extent / surface area of the table. The process of polishing is conceived to be complete when the act of polishing has covered the entire table.

As stated in Kennedy & Levin (2000), if any identifiable degree of change is assigned to one of the above scales, this immediately determines the telicity of the predicate. That is to say:

(i) When the degree of change has a quantized scalar structure, an endpoint to the event can be identified, and the predicate is telic.

Intensity scale: scale of brightness

(23) a. Deniz masayı 2 dakikada / # 2 dakika boyunca *pırıl pırıl* cilaladı.

Deniz table-ACC two minute-LOC / # 2 minute long brightly polish-PAST-Ø

'Deniz polished the table *smooth* in 2 minutes / # for 2 minutes.'

Quantitiy scale: *scale of extent*

b. Deniz masanın *tamamını* 2 dakikada / # 2 dakika boyunca cilaladı.

Deniz table-ACC completely two minute-LOC / # 2 minute long polish-PAST Ø

'Deniz *polished up* the table in 2 minutes / # for 2 minutes.'

(ii) When the degree of change does not have a quantized scalar structure as in 'Deniz polished the table', an endpoint to the event can not be identified, and the predicate is atelic.

In short, telicity corresponds to the degree of change which is a scalar property of verb meaning. It is determined in terms of mapping between the “structure of the degree of change and the structure of the event” (Kennedy & Levin, 2000). On the other hand, incremental theme argument itself does not directly determine telicity.[7] As is pointed out in Hay et. al. (1999) and in Kennedy & Levin (2000) “incremental theme indirectly determines telicity to the extent that its structure affects possible values of the degree of change. ” Briefly, on their view, incremental theme is seen as a measure of a property of an argument of a verb, not actual argument.

When we attempt to formalize the notion of “gradual change” observed in denominal locatum verbs, the formula developed by Kennedy & Levin (2000) in (24) displays the proposed underlying semantics for these verbs. VΔ illustrates the verbs of gradual change , where Pv is gradable property associated with the verb.

(24) a. $V\Delta = \lambda x\lambda\ d\lambda t\lambda e.$ CHANGE (Pv (x) (t)) (d) (e)

b. [CHANGE (P (x) (t)) (d) (e)] = 1 iff P (x) (BEG (e)) + d= P (x) (END (e))

In prose, CHANGE a gradable property P of an object *x* to degree *d* is ture of an event *e* just in the case to which the degree to which *x* possesses property P at the beginning of an event plus *d* equals the degree to which *x* possesses property P at the end of an event.

By applying this formula to the predicates in (23), one can represent the lexical semantics of verbs of gradual change as such. Note that the following representations ignore the external arguments.

(25) [polish (d-much of) x]= λe. CHANGE (POLISHED (x) (t)) (d) (e)

a. Deniz polished the table smooth.

λe. CHANGE (POLISHED (table) (t)) (smooth) (e)

b. Deniz polished up the table.
λe. CHANGE (POLISHED (table) (t)) (entire) (e)

A last word is on the telic reading of the sentences without a delimiter. Although the degree of change does not have quantized scalar structure in atelic interpretations of locatum verbs with mass nouns, we can still assign telic interpretations to such predicates. This is imposed by our world knowledge of the specific process (e.g., polishing) and the object involved (e.g., table). In other words, context supports the inference of a quantized degree of change. That is to say, real world knowledge tells us that there is conventional maximal degree of brightness / of being covered up with polish for tables. In the sentence ‘Deniz polished the table in 10 minutes’, the event is considered to have been completed when the table reaches to a point which would *conventionally* be considered “polished” (Hay et.al., 1999, Smollett, 2001 and Ramchand, 2001).

[7] Such an account clarifies the relationship between telicity and the incremental theme argument. It is implicitly assumed that only telic events have incremental themes (see Dowty, 1991). However, scalar representation of denominal locatum verbs demonstrates that telicity and incremental theme are independent, which is something parallel with the proposals in Krifka (1992), Jackendoff (1996), Ramchand (1997, 2001), Levin (2000), Smollett (2001).

Here, we see the role of conversational implicatures in generating telic interpretations in verbs of gradual change, which are compatiable with both durative and time span adverbials (recall the sentences in 18-22). On Hay et.al.'s account, such an adverb duality occurs when the degree of change is inferred, because only then the principles of conversational implicature are employed. According to the principle of informativity, the sentence 'Deniz polished the table' is most informative in a telic interpretation: Deniz polished the table until it reaches to a conventionally specified degree of brighthess. This "degree of brighthess" has some sort of a bound; it is not indefinitly unbounded. Since a telic reading is the most informative one, a time span adverbial is acceptable, as 'Deniz polished the table in 10 mintues'. On the other hand, we see that the same predicate, 'polish the table' can be felicitous with a durative adverbial, 'Deniz polished the table for 10 mintues'. This is also acceptable because " the durative adverbial has the effect of cancelling the telicity implicature" (Hay et.al, 1999). As a result, the sentence is interpreted as such, the table gradually becomes polished, but only to some unspecified degree. We should keep in mind that adverbial duality immediately disappears when the degree of change has a quantized scalar structure as illustrated in (23).

4 Conclusion

• It is possible to determine the aspectual properties of derived denominal verbs in Turkish and in English by regarding the semantic features of the base nominal to some extent. As is discussed, denominal location, locatum and goal verbs derived from countable base nouns are most of the time telic, quite contrary to Harley's (1999, 2003) remark that they are "necessarily" telic. We exemplified that each class of denominals involve exceptions to the telicity claim, e.g., plural senses of decoration denominals. Moreover, collective / distributive interpretations caused by plural arguments of the verbs easily affect the aspectual properties of location, locatum and goal verbs. Consequently, generalizations about the semantic effect of the base noun on the related verb's telicity is not as straightforward as Harley suggests.

• Our data from Turkish provide evidence for

(i) Levin's (2000) claim that verb classes sharing the same lexical conceptual structure do not display unification in terms of aspectual properties. For example, locatum denominals belong to either accomplishment or change of state verb classes. In other words, locatum verbs constitute a grammatically-relevant, semantically-coherent verb class that nevertheless contains some verbs that are necessarily telic, and others display variable telicity.

(ii) Scalar representation of predicates displaying variable telicity.

• The discussion in our study emphasizes that world knowledge and contextual conditions are very influential in carrying out effective interpretations on the aspectual nature of predicates. In other words, we have illustrated that telicity is not strictly determined by linguistic means, whereas contextual cues take their place in the speaker's interpretations of predicates.

References

Brinton, L.: 1991, The mass/count distinction and aktionsart, *Belgian Journal of Linguistics* **6**, 47- 49.

Buck, R.: 1993, Affectedness and other semantic properties of English denominal locative verbs, *American Speech* **68**, 139-160.

Clark, E.V. and Clark, H. H.: 1979, When nouns surface as verb, *Language* **55**, 767-810.

Dowty, D. 1991: Thematic proto-roles and argument selection, *Language* **67**, 547-619.

Hale, K. and Keyser, J. : 1993, On argument structure and the lexical expression of syntactic relations, *in* K. Hale and S.J. Keyser (eds.), *A view from the building 20*, Cambridge University Press, Cambridge, pp. 53-109.

Hale, K. and Keyser, J.: 1998, The basic elements of argument structure, *MIT Working papers in linguistics* **32**, 73-118.

Harley, H. 2003: How do verbs get their names?, *in* N. Shir and T. Rapoport (eds.), *Papers from 2001 Israel workshop on aspect* , Kluwer, Dordrecht (in press).

Harley, H. 1999: Denominal verbs and aktionsart, *MIT Working Papers in Linguistics* **35**,73-85.

Hay, J. et.al. 1999: Scalar structure underlies telicity in 'degree achievements', *in* T. Matthews and D. Strolovich (eds.), *Proceedings of SALT* 9, Cornell University, Ithaca, NY.

Jackendoff, R. 1990: *Semantic structures*, MIT Press, Cambridge, Mass.

Jackendoff, R. 1991: Parts and boundaries, *in* B. Levin and S. Pinker (eds.), *Lexical and conceptual semantics*, Blackwell , Cambridge, pp. 9-46.

Jackendoff, R. 1996: The proper treatment of measuring out, telicity, and perhaps even quantification in English, *NLLT* **14**, 305-351.

Kageyama, T. 1997: Denominal verbs and relative salience in lexical conceptual structure, *in* T. Kageyama (ed.), *Verb semantics and syntactic structures*, Kurosio, Tokyo, pp. 45-94.

Kennedy, C. 2000: Scalar representation in natural language semantics, NSF Career BCS.

Kennedy, C. and Levin, B. 2000: Telicity corresponds to degree of change, Michigan State University, Nov. 30, 2000. www. ling.nwu.edu/~kennedy/.

Krifka, M. 1989: Nominal reference, temporal constitution and quantification in event semantics, *in* R. Bartsch et al. (eds.), *Semantics and contextual expression*, Foris , Dordrecht, pp.75-115.

Krifka, M. 1992: Thematic relations as links between nominal reference and temporal constitution, *in* I.A. Sag and A. Szabolcsi (eds.), *Lexical matters*, Stanford, CSLI, 29-54.

Labelle, M. 2000: The semantic representation of denominal verbs, *in* P. Coopmans, M. Everaert and J. Grimshaw (eds.), *Lexical specification and insertion*, John Benjamins, Amsterdam, pp. 213-240.

Levin, B. 2000: Aspect, lexical semantic representation, and argument expression, *BLS* **26**, 413-430.

Lieber, R. 1992: *Deconstructing morphology: word formation in syntactic theory*, University of Chicago Press, Chicago.

Marchand, H. 1969: *The categories and types of present-day English word-formation*, C. H. Beck, Münih.

Pinker, S.1989: *Learnability and cognition: The acquisition of argument structure*, MIT, Cambridge.

Ramchand, G.: 1997: *Aspect and predication*, Oxford University Press, Oxford.

Ramchand, G. 2001: Aktionsart, l-syntax and selection, Utrecht conference on aspect, ms. http:// users.ox.ac.uk/~gcram/research/utproc.pdf.

Smollett, R. 2001: Quantized direct objects don't delimit after all, Utrecht conference on aspect, ms. http:// users.ox.ac.uk/~gcram/research/utproc. pdf.

Tenny, C. 1994: *Aspectual roles and the syntax-semantics interface,* Kluwer, Dordrecht.

Verkuyl, H. 1993: *A theory of aspectuality,* Cambridge University Press, Cambridge.

A SEMANTIC EXPLANATION FOR INTERVENTION EFFECTS

Sigrid Beck, University of Connecticut and Universität Tübingen
sbeck@sp.uconn.edu

Abstract

This paper proposes a semantic analysis of intervention effects in wh-constructions. Wh-phrases are assumed to use the same interpretive mechanism as focus. Similar to a focus sensitive operator evaluating the contribution of focus, a question operator evaluates the contribution of a wh-phrase. An intervening focus sensitive operator interferes with this evaluation and renders the structure uninterpretable. Crosslinguistic variation in the appearance of intervention effects arises due to variation in the Logical Form of questions and of focus evaluation.

1 Introduction

The sentences in (1) exemplify a set of data referred to as intervention effects: the combination of a wh-phrase with a quantificational or focusing element leads to ungrammaticality in certain configurations.

(1)	a.	*	Minsu-man	nuku-lûl	po-ass-ni?		(Korean)
			Minsu-only	who-Acc	see-Past-Q		
			'Who did only Minsu see?'				
	b.	??	koi	nahiiN	kyaa	paRhaa	(Hindi)
			anyone	not	what	read-Perf.M	
			'What did no one read?'				

Until now, there have been syntactic (Beck (1996), Beck & Kim (1997), Hagstrom (1998), Kim (2002), among others) as well as semantic (Honcoop (1998)) explanations of this phenomenon.[1] This paper proposes yet another approach to intervention effects, which is semantic in the sense that intervention effects are made to follow from the component of the grammar that compositionally interprets interrogative sentences. The proposal identifies a core case of intervention, in which a focusing operator interferes with the interpretation of a wh-phrase in situ. Compositional interpretation proceeds in such a way that both focus and wh-phrase make use of the same interpretational mechanism. The way the framework is designed, a wh-phrase interpreted within the scope of a focussing operator leads to uninterpretabilty of the structure as a whole.

Motivation for this strategy comes from the fact that research over the past several years has shown intervention effects to exist in a wide variety of typologically unrelated languages. Moreover, the most stable intervention effect crosslinguistically appears to be that of focussing elements like *only*, *even* and *also*. This suggests that the cause of intervention effects is relatively fundamental, anchored in rather basic properties of the grammar. These properties plausibly concern focus interpretation. Further support for the idea comes from the observation that other focus-related constructions also show intervention effects.

[1]There is also a proposal by Lee and Tomioka (presented at the 2001 Japanese/Korean Linguistics conference) which suggests to derive intervention effects from information structure. Unfortunately, the paper is not yet available in a form that would enable me to comment in an informed way.

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference "sub8 – Sinn und Bedeutung"*.
Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany

The structure of the paper is as follows. Section 2 builds the empirical picture, leading to a characterisation of the universal as well as (some of) the variable properties of intervention effects in wh-constructions. In section 3 I develop the framework of focus interpretation and question interpretation that derives the core intervention effect. I address in section 4 some of the aspects of intervention effects that are variable crosslinguistically, specifically under what syntactic circumstances an intervention effect arises. Section 5 is devoted to the question of what a problematic intervener is. Conclusions are drawn in section 6.

2 Data

Subsection 2.1. introduces and defines intervention effects as they will be understood in this paper. In 2.2. we construct a crosslinguistic picture of intervention effects, identifying a core intervention effect that is crosslinguistically stable, as well as some parameters of variation. I lay out the strategy pursued in the paper for dealing with these facts.

2.1 Intervention Effects

A wh-in-situ language like Korean allows us to construct the simplest examples for intervention effects. Observe that (2a) is ungrammatical, even though the sentence is what we would expect in Korean for the question 'who did only Minsu see?'. Responsible for the ungrammaticality is the element 'only', as shown by the acceptable (2b). Moreover, the structural relationship between the wh-phrase and 'only' is relevant: in the well-formed (2c), the wh-phrase has moved past 'only' and is no longer c-commanded by this element. A preliminary characterisation of the effect is given in (3).[2]

(2)	a.	*	Minsu-man	nuku-lûl	po-ass-ni?	(Korean)
			Minsu-only	who-Acc	see-Past-Q	
			Who did only Minsu see?			
	b.		Minsu-nun	nuku-lûl	po-ass-ni?	
			Minsu-Top	who-Acc	see-Past-Q	
			Who did Minsu see?			
	c.		nuku-lûl	Minsu-man	po-ass-ni?	
			who-Acc	Minsu-only	see-Past-Q	
			Who did only Minsu see?			

(3) A wh-phrase in situ may not be c-commanded by a focussing or quantificational element.

Data ruled out by the generalisation in (3) will be referred to as intervention effects. The set of focussing and quantificational elements contains (counterparts of) the following items:

(4) only, even, also, not, (almost) every, no, most, few (and other nominal quantifiers), always, often, never (and other adverbial quantifiers).

These items will be referred to as interveners. There will be more discussion of the nature of interveners below.

[2] The judgments described are the ones from Beck & Kim (1997). It has since come to my attention that, while most people agree with the data reported there, some speakers of Korean do not perceive as strong an intervention effect with these data. I have convinced myself that the variation is genuine, but won't offer an analysis of the more liberal dialect. I am espescially grateful to Sei-Rang Oh for helping me to clarify this point.

In a language with overt wh-movement, like German, relevant examples are necessarily more complex, because it is harder to successfully place a wh-phrase in situ. Still, German provides further illustration of (3), for example in the multiple question in (5a).

(5)	a.	*	Wen	hat	niemand	wo	gesehen?
			whom	has	nobody	where	seen
			'Where did nobody see whom?'				
	b.		Wen	hat	Luise	wo	gesehen?
			whom	has	Luise	where	seen
			'Where did Luise see whom?'				
	c.		Wen	hat	wo	niemand	gesehen?
			whom	has	where	nobody	seen
			'Where did nobody see whom?'				

In (5a), the wh-phrase 'where' is in situ and c-commanded by 'nobody'. The sentence is ungrammatical. Clearly, the element 'nobody' is responsible, cf. the well-formed (5b). Finally, it is once more the structural relation between the quantifier and the wh-phrase that determines acceptability: in the well-formed (5c), the wh-phrase has moved past the intervener.
I refer the reader to Beck (1996) and Beck and Kim (1997) for more Korean and German data illustrating (3), and move on to data that require a refinement of (3) - the example in (6).

(6)	a.	*	Was	glaubt	niemand	wen	Karl	gesehen	hat?
			what	believes	nobody	whom	Karl	seen	has
			'Who does nobody believe that Karl saw?'						
	b.		Was	glaubt	Luise	wen	Karl	gesehen	hat?
			what	believes	Luise	whom	Karl	seen	has
			'Who does Luise believe that Karl saw?'						
	c.	%	Wen	glaubt	niemand	daß	Karl	gesehen	hat?
			whom	believes	niemand	that	Karl	seen	has
			'Who does nobody believe that Karl saw?'						

(6a) is a scope marking construction (compare Lutz et al. (2000) and references therein). Informally speaking, the element 'was' marks the scope of the wh-phrase 'wen', and the entire sentence is a non-multiple question. In (6a), the intervener 'nobody' makes the sentence ungrammatical, as witnessed by the acceptable (6b). In (6c), the wh-phrase has moved past the intervener. In those dialects of German that accept movement of this kind, there is a contrast between (6a) and (6c) in that (6c) is acceptable in an appropriate context while (6a) is bad. The point of (6a) is that 'wen' is not in situ. It has moved to the SpecCP of the embedded clause. Still, the intervention effect in (6) is quite parallel to (5). I will therefore adopt (7) (closely following Kim (2002)) as a more appropriate generalisation:

(7) A quantificational or focusing element may not intervene between a wh-phrase and its licensing complementizer.

By 'A intervenes between B and C' I mean that A c-commands B, and C c-commands both A and B, as illustrated in (8). I will refer to the licensing complementizer of a wh-phrase, for the moment informally, as the complementizer of the clause in which intuitively the wh-phrase takes scope. The instantiation of the schema in (8) that we are interested in is thus (9) - the intervention effect.

(8) [C [... [A [... B ...]]]]
(9) * [Q_i [... [intervener [... wh-phrase$_i$ ...]]]]

2.2 Crosslinguistic data

It has become clear over the past few years that intervention effects are a fairly widespread phenomenon among the world's languages. According to my knowledge, they have been claimed to exist in Dutch, English, German, French, Hindi/Urdu, Japanese, Korean, Malayalam, Mandarin, Passamaquaddy, Persian, Thai and Turkish. Below is a sample of relevant data from other wh-in-situ languages besides Korean.

(10) Hindi (Beck (1996)):

a.	??	koi	nahiiN	kyaa	paRhaa
		anyone	not	what	read-Perf.M
b.		kyaa	koi	nahiiN	paRhaa
		what	anyone	not	read-Perf.M

‘What did no one read?’

(11) Japanese (from Pesetsky (2000) who cites Miyagawa (1998)):

a.	*	Hotondo	dono hito-mo	nani-o	yonda	no?
		almost	every person	what-Acc	read	Q
b.		Nani-o	hotondo	dono hito-mo	yonda	no?
		what-Acc	almost	every person	read	Q

'what did almost every person read?'

(12) Mandarin (Kim (2002):

a.	?*	zhiyou Lili	kan-le	na-ben		shu?
		only Lili	read-ASP	which-CL	book	
b.		na-ben		shu	zhiyou Lili kan-le?	
		which-CL	book	only	Lili read-ASP	

Which book did only Lili read?

(13) Malayalam (Kim (2002)):

a.	*	Lili-maatram	eete	pustakam-aane	waayikk-ate
		Lili-only	which	book-be	read-Nom
b.		eete pustakam-aane		Lili-maatram	waayikk-ate
		which book-be		Lili-only	read-Nom

Which book did only Lili read?

(14) Turkish (Beck (1996)):

a.	*	Kimse	kimi	görmedi?
		anyone	who-Acc	see-Neg-Past?
b.		Kimi	kimse	görmedi?
		Who-Acc	anyone	see-Neg-Past

Whom did nobody see?

See Hagstrom (1998), Pesetsky (2000) and Lee & Tomioka (2001) for more Japanese data, Kim (2002) for Malayalam and Mandarin, and Beck (1996) for Hindi/Urdu and Turkish. French allows wh-in-situ normally ((15a)), but not after an intervener ((15b)):

(15) French (from Pesetsky (2000) who cites Chang (1997) & Boskovic (to appear)):
a. Ils ont rencontré qui?
they have met who
'Whom did they meet?'
b. # Il n'a pas rencontré qui?
he Neg has Neg met who
Whom did he not meet? [only as echo question]

(16)-(177) illustrate effects parallel to German intervention effects for the wh-movement languages Dutch and English.

(16) Dutch (van den Born, p.c.):
* Wie heeft niemand aan wie voorgesteld?
Who has nobody to who introduced
'Who did nobody introduce to whom?'

(17) English (Pesetsky (2000)):
a. ?? Which diplomat should I not discuss which issue with _?
b. ?? Which book did almost everyone write to which newspaper about _ ?

Finally, the following examples from Passamaquaddy and Thai, respectively, have been brought forth by Bruening and Lin (2001) and by Ruangjaroon (2002) as examples of intervention effects in those languages. The Passamaquaddy example is a scope marking construction similar to German (6) above.

(18) Passamaquaddy (Bruening and Lin (2001)):
* Keq(sey) skat itom-uhk Tihitiyas [$_{CP}$ wen wenatomine-t]
What Neg say-3ConjNeg Tihitiyas who IC.be.crazy-3Conj
Who didn't Tihitiyas say was crazy?

(19) Thai (Ruangjaroon (2002)):
* mâymiikhray chôop ?àan nangsii lêmnay
nobody like read book which
Which books does nobody like to read?

This short list of data should suffice to show that intervention effects plausibly exist in these languages. Persian has been claimed to have intervention effects in Megerdoomian and Ganjavi (2000), who unfortunately do not provide actual examples.

Beyond the mere fact that all these languages seem to have intervention effects, it has become clear that the way the effect manifests itself is subject to some crosslinguistic variation. This variation concerns (i) the syntactic circumstances under which intervention effects arise, and (ii) the set of problematic interveners. I discuss them in turn.
Pesetsky (2000) observes that intervention effects exist in English, contrary to fist appearances, but they occur only under rather special circumstances - namely, in otherwise permissible violations of superiority. So, in contrast to German, many potential intervention constellations are grammatical, cf. (20).

(20) a. Who did only John introduce to whom?
b. Which children didn't buy which book?

An intervention effect in English is constructed as follows. Take a multiple question with which-phrases like (21a). Now, instead of the strucurally higher wh-phrase, overtly front the structurally lower wh-phrase, as in (21b). Normally, this by itself would make the example ungrammatical; compare the contrast in (22a) vs. (22b): a superiority violation. In the case of which-phrases, though, a superiority violation does not induce ungrammaticality (compare Pesetsky (1982)). However, if you now add an intervener, as in (21c), the example becomes unacceptable. Thus, wh-phrases in situ that successfully defy superiority are sensitive to intervention effects.

(21) a. Which girl did (only) Mary introduce _ to which boy?
b. Which boy did Mary introduce which girl to _ ?
c. ?? Which boy did only Mary introduce which girl to _? [Pesetsky]

(22) a. Who did Mary introduce _ to who?
b. * Who did Mary introduce who to _ ?

Pesetsky accounts for the contrast between English and German, and the English facts in particular, by claiming that the inventory of covert movement operations differs between the two languages. We will come back to these data and to Pesetsky's analysis in section 4.

Moving on to (ii): variation regarding the set of problematic interveners, compare (23) and (24):

(23) Korean (Beck & Kim (1997)):
Minsu-nûn chachu nuku-lûl p'ati-e teliko ka-ss-ni?
Minsu-Top often who-Acc party-Dir take-Past-Q
'Who did Minsu often take to the party?'

(24) German:[3]
a. * Luise zaehlt auf, welche Uni oft welche Linguisten eingeladen hat.
Luise enumerates which university often which linguists invited has
b. Luise zaehlt auf, welche Uni welche Linguisten oft eingeladen hat.
Luise enumerates which university which linguists often invited has
'Luise enumerates which university often invited which linguists.'

While the adverb 'often' is a problematic intervener in German, it is not in Korean (cf. Beck & Kim (1997)). Even more striking is the contrast (25) vs. (26): 'not' is an intervener in many languages, but apparently not in Thai (Ruangjaroon (2002)).

(25) Thai (Ruangjaroon (2002)):
Nít mây síi ?aray
Nit not buy what
What didn't Nit buy?

(26) a. Which diplomat should I discuss which issue with _ ?
a. ?? Which diplomat should I not discuss which issue with _ ? [Pesetsky]

3I have chosen to embed the question under the verb 'enumerate' in order to avoid a single-pair interpretation, which may sometimes be possible with such questions. I do not know why that is.

Kim (2002) proposes that the core set of interveners, which is crosslinguistically stable, consists of the focussing operators 'only', 'even' and 'also'. Other elements may or may not be problematic interveners. Section 5 discusses this variation.

In sum, we have seen that intervention effects exist in a wide variety of languages. I conjecture that the effect itself may well be universal, while its exact appearance is subject to crosslinguistic variation. The question is how to account for the hypothesised universality of intervention effects, as well as the variation in their appearance. My strategy in this paper is to identify a core case of intervention, and to develop a semantic analysis for that. I follow Kim (2002) who identifies the core intervention effect as in (27),(28):

(27) *[Q_i [... [FocP [... wh-phrase$_i$ ...]]]] (Kim (2002))

(28) A focused phrase (e.g. only+NP) may not intervene between a wh-phrase and its licensing complementizer.

Note that the structure in (27) is the syntactic level that is the input to compositional interpretation, Logical Form. Section 3 presents an analysis of the core case in terms of focus interpretation. The topic of sections 4 and 5 are the other data introduced above: the frequent lack of intervention effects in English, and the additional quantifier interveners in English, German etc.

3 Focus Interpretation

Subsection 3.1. motivates the suggestion that wh-questions are interpreted by the same mechanism as focus. The framework for focus and question interpretation is introduced in section 3.2. Section 3.3. shows how the framework derives the core intervention effect.

3.1 Motivation and Idea

The sentence in (29), in which the subject NP 'John' is focused, is standardly (Rooth (1885, 1992)) associated with two semantic objects: On the one hand, there is the proposition expressed by the sentence - the set of possible worlds in (30a). Alternatively, I will talk about this proposition informally as in (30b).

(29) [John]$_F$ left.

(30) a. λw.John left in w
b. that John left

Besides this proposition, the ordinary semantic value of (29), the sentence makes salient a set of alternative propositions - for example the set in (31a), which contains alternative propositions to the proposition that John left. This is the focus semantic value of the sentence, rendered more generally in (31b), and in the form of a (semi-) logical expression in (31c).

(31) a. {that John left, that Bill left, that Amelie left,...}
b. {that x left | x is an individual}
c. $\lambda p \exists x[p= \lambda w.x \text{ left in } w]$

Turning now to the interrogative in (32), according to the standard semantic theory of questions (Hamblin (1973), Karttunen (1977)) the denotation of a question is the set of answers to the question - for example (33a). More generally, this is the set of propositions in (33b) (rendered in more formal terms in (33c)).

(32) Who left?

(33) a. {that John left, that Bill left, that Amelie left,...}
b. {that x left | x is an individual}
c. $\lambda p \exists x[p= \lambda w.x \text{ left in } w]$

It is obvious that the focus semantic value of example (29) is the same as the ordinary meaning of the question in (32). Questions, like focus, introduce a set of alternatives. Unlike a focused phrase, introducing alternatives seems to be the only semantic role of a wh-phrase. It is not surprising that this parallel has inspired semanticists to derive the interpretations of questions and focus in the same way; relevant references include for example Hamblin (1973), Ramchand (1997) Rullmann & Beck (1998), and Kratzer and Shimoyama (2002). I will develop a particular way of doing that in the next subsection.
Before I move on to the technicalities, I give the reader an informal idea of the plot. I follow Rooth in attributing a twofold semantic contribution to focused phrases: their ordinary semantic value on the one hand, and a set of alternatives of the same type on the other. A wh-phrase shares with focus the second role. Unlike focus, the wh-phrase makes no ordinary semantic contribution. I propose that the ordinary semantics of the wh-phrase is in fact undefined. Since wh-phrases occur in expressions that have a perfectly well-defined ordinary semantic value, something must rescue the structure as a whole from undefinedness. This is the role of the question operator. Thus I propose that the LF of (33) is (34), and that the semantics of Q lets it ignore the ordinary semantic value of its sister, and elevate its focus semantic value to the ordinary semantics.

(34) [Q [who left]]

Things go wrong when there is in addition a focus in the question whose contribution is evaluated within the question, i.e. within the scope of the Q operator. This situation is schematized in (35).

(35) [Q ... [Op [$_{\phi}$ ... XP_F ... wh ...]]]

For the focus on XP to be evaluated within the scope of the Q operator means that there is a focus sensitive operator, here: Op, which uses the semantic contribution of the focus. Op could be 'only' or 'even' or the like, or, in Rooth's (1992) more indirect framework for association with focus, it could be the ~ operator. We know that when focus is evaluated at the level of a phrase ϕ, focus semantic values enter into ordinary semantics. For example, in order to derive the semantics of "only John left", we need to consider both the proposition that John left, and alternative propositions 'that x left for alternatives x to John.
This means that with all focus sensitive operators (other than the question ooperator), we use the ordinary as well as the focus semantic value of ϕ. Moreover, the effect of focus is neutralized, i.e. for external purposes the expression ϕ behaves as if all foci had been reset to their ordinary semantics. The problem that arises in (35) is that the wh-phrase has no ordinary semantics. Thus the ordinary semantics of ϕ is undefined. This undefinedness is inherited by the larger structure. But since the focus semantic value has been reset to the ordinary semantic value, the sister of the Q operator has neither a well-defined ordinary nor a well defined focus semantic value. Not even the Q operator can save the structure from undefinedness. This, I claim, is why structures like (35) are unacceptable. We now move on to the explicit proposal.

3.2 Framework

It should be noted that to my knowledge, none of the available frameworks for the compositional interpretation of wh-questions predicts uninterpretability of the intervention effect data. Therefore a new framework is developed below that achieves that. This framework is based on Wold's (1996) implementation of Kratzer's (1991) version of Rooth's (1992) theory of focus. Each Logical Form α is associated with an ordinary semantic interpretation $[[\alpha]]^{g}$ and a focus semantic interpretation $[[\alpha]]^{g,h}$. The focus feature is indexed and functions as a variable from a set of distinguished variables. A second variable assignment function h interprets distinguished variables. The ordinary semantic value of a focused constituent is the same as the interpretation of that consituent without a focus feature. The focus semantic interpretation is the value assigned to the distinguished variable by the variable assignment h. The focus semantic value of an unfocused item is the same as its ordinary semantic value. Both g ang h can be partial.

(36) a. $[[\text{John}_{F1}]]^{g}$ = john b. $[[\text{John}_{F1}]]^{g,h}$ = h(1) [4]

(37) a. $[[\text{John}]]^{g}$ = john b. $[[\text{John}]]^{g,h}$ = john

(38) a. $[[\text{left}]]^{g} = [\lambda x.\lambda w.x \text{ left in } w]$b. $[[\text{left}]]^{g,h} = [\lambda x.\lambda w.x \text{ left in } w]$

Translations of complex expressions are constructed from the translations of their parts in the usual way. (39) below gives the relevant version of Function Application.

(39) Function Application:
If X=[Y Z] then for any g,h: $[[X]]^{g} = [[Y]]^{g} ([[Z]]^{g})$ and $[[X]]^{g,h} =[[Y]]^{g,h} ([[Z]]^{g,h})$

(40) a. $[[\text{John}_{F1} \text{ left}]]^{g} = \lambda w.\text{john left in } w$
b. $[[\text{John}_{F1} \text{ left}]]^{g,h} = \lambda w.h(1) \text{ left in } w$

Focus sensitive operators evaluate the contribution of focus. In this framework, they bind the distinguished variables. The two focus sensitive operators I will use are the ~ and the question operator. We begin with the ~ operator and a translation of Rooth's theory of focus evaluation into our framework. According to this theory, the LF of (41a) is (41b). (42) specifies the semantics of the ~ and (43) the semantics of 'only'.

(41) a. Only John left.
b. [only C [~C [John_{F1} left]]]

(42) If X=[~C Y] then $[[X]]^{g} = [[Y]]^{g}$ if $g(C) \leq \{[[Y]]^{g,h'} : h' \in H\}$, undefined otherwise,
and $[[X]]^{g,h} = [[X]]^{g}$.

(43) $[[\text{only}]] (\alpha)(\beta)(w) = 1$ iff for all p such that p(w)=1 and $p \in \alpha$, $p=\beta$.

Putting things together, we compositionally intepret (41b) as in (44). This results in the desired truth conditions (45).

4More precisely: [[JohnF1]]g,h = h(1) if 1□dom(h), =john otherwise. The more precise version is relevant for data like "I only wondered who JOHN invited", which I will not discuss in this paper.

(44) $[[\ [\text{ only C } [\ {\sim}\text{C } [\text{ John}_{F1} \text{ left }]]]\ ]]^{g}(w) = 1$ iff
$[[\text{only}]]\ (g(C))\ (\lambda w.\ \text{john left in } w)\ (w) = 1$ iff
for all p such that $p(w)=1$ and $p \in g(C)$, $p=\lambda w.$ john left in w
if $g(C) \subseteq \{[[\ [\text{John}_{F1} \text{ left}]\ ]]^{g,h'} : h' \in H\}$
i.e. $g(C) \subseteq \{\ \lambda w.\ x \text{ left in } w: x \in D\}$

(45) for all p such that $p(w)=1$ and $p \in \{\lambda w.\ x \text{ left in } w: x \in D\}$, $p=\lambda w.$ john left in w

To this system we add wh-questions. Wh-phrases use the same mechanism of distinguished variables. This reflects the fact that they introduce alternatives. In contrast to focus, they make no ordinary semantic contribution - introducing alternatives is their only semantic function.

(46) a. $[[\text{who}_1]]^{g}$ is undefined
b. $[[\text{who}_1]]^{g,h} = h(1)$ [5]

(47) a. $[[\text{who}_1 \text{ left}]]^{g}$ is undefined
b. $[[\text{who}_1 \text{ left}]]^{g,h} = \lambda w.h(1)$ left in w

The second focus sensitive operator that is relevant for our purposes, recall, is the question operator. Similar to Berman's (1991) and Shimoyama's (2002) interpretations, the question operator is a variable binder. In contrast to their proposals, the variables bound by this operator are distinguished variables. I assume that a wh-question like (48a) has the Logical Form in (48b). The semantic effect of the question operator is specified in (49) (for the case of one wh-phrase) and in (51) (the general case). The translation of our example in (48) is given in (50).

(48) a. Who left?
b. $[Q_1\ [\text{who}_1 \text{ left}]]$

(49) If $X=[Q_i\ Y]$ then $[[X]]^{g} = \lambda p \exists x[p=[[Y]]^{g,\{\}[x/i]}\ ]$
and $[[X]]^{g,h} = \lambda p \exists x[p=[[Y]]^{g,h[x/i]}\ ]$

(50) $[[\ [Q_1\ [\text{who}_1 \text{ left}]]\ ]]^{g} = \lambda p \exists x[p=[[\ [\text{who}_1 \text{ left}]\ ]]^{g,\{\}[x/1]}\ ]$
$= \lambda p \exists x[p=\lambda w.x \text{ left in } w]$

(51) If $X=[Q_{i1,\ldots in}\ Y]$ then $[[X]]^{g} = \lambda p \exists x1\ldots xn[p=[[Y]]^{g,\{\}[xk/ik]}\ ]$
and $[[X]]^{g,h} = \lambda p \exists x1\ldots xn[p=[[Y]]^{g,h[xk/ik]}\ ]$

We will say that a structure is uninterpretable if it does not have a well-defined ordinary semantic value.

5More precisely: [[who1]]g,h = h(1) if 1 dom(h), undefined otherwise. The more precise version is relevant for the multiple question reading of Baker sentences like "Who knows where we bought which book?", which I will not discuss in this paper.

3.3 Deriving Intervention Effects

We are now in a position to explain intervention effects. I will consider (52a), a prototype of an intervention effect. The relevant LF is (52b), in which the Q operator is associated with the wh-phrase, John_F wants to associate with *only* via the ~ operator, and the Q operator takes scope over *only*.

(52) a. * Only JOHN saw who?
b. $[_{CP}\ Q_2\ [_{IP3}\ \text{only}_C\ [_{IP2}\ \sim C\ [_{IP1} \text{John}_{F1}\ \text{saw}\ \text{who}_2]]]]]$

Crucially, $[[IP1]]^g$ is undefined for any g, since the wh-phrase's ordinary translation is undefined. Accordingly, $[[IP2]]^g$ is undefined; but then $[[IP2]]^{g,h}$ is also undefined, for any g,h. So are both $[[IP3]]^g$ and $[[IP3]]^{g,h}$. But since $[[IP3]]^{g,h}$ is not defined, neither is $[[CP]]^g$. The structure in (53b) is therefore uninterpretable, and hence ungrammatical.

In more general terms, the system I have introduced requires a wh-phrase to be immediately c-commanded by a coindexed Q operator. A wh-phrase not c-commanded by a Q operator will be uninterpretable, since the expression it is contained in can never have a well-defined ordinary interpretation. A wh-phrase c-commanded by an intervening focus sensitive operator (here: the ~ operator) will lead to uninterpretability despite a c-commanding Q operator, because the ~ operator makes use of both the ordinary interpretation and the focus semantic interpretation. The Q operator is the only binder for distinguished variables that uses just the focus semantic interpretation. We thus exclude structures like (53b). This is very close to the generalization advanced by Kim that we are trying to capture.

(53) a. *[Q_i [...[FocP [... wh-phrase_i ...]]]] (Kim (2002))
b. *[Q_i [... [~C [... wh-phrase_i ...]]]]

(54) Generalization: A wh-phrase may not have a ~ operator as its closest c-commanding potential binder.

The crucial ingredients for this analysis are that both focus and wh-phrases are interpreted via the mechanism of distinguished variables; in contrast to focus, wh-phrases make no ordinary contribution, and can therefore only be evaluated by the question operator.
Prima facie, we now expect that a focus sensitive operator can never intervene between a wh-phrase and its associated question operator. To the extent that I am aware of the relevant data, Hindi, Korean, Turkish and Malayalam transparently meet our prediction. In a lot of other languages, the set of available data is unfortunately too small to permit firm conclusions. Further predictions are examined in the next sections.

4 Movement Issues

We know from section 2 that the way intervention effects manifest themselves varies from one language to another. We will first addresse the role of overt movement. Then we look at crosslinguistic variation that can be reduced to the inventory of movement operations that a language has.
German presents a small complication over Korean etc. in terms of the availability of overt wh-movement. The trace this leaves must be an ordinary variable. Other than that, German transparently meets the prediction. I go over two relevant examples below. In the simple question (55), the crucial category is the one labeled **X**. **X** is where we are done with evaluating the contribution of focus. This category has a perfectly well-defined ordinary and

focus semantic interpretation containing an ordinary variable bound from the outside. The calculation proceeds in the usual way, and the question is associated with the semantics in (55c).

(55) a. Wen hat nur der Dirk gesehen?
whom has only the Dirk seen
'Whom did only Dirk see?'

b. $[_Z\ Q_3\ [_Y$ wen$_3$ [1 $[_{\mathbf{X}}$ nur$_C$ [~C [[der Dirk]$_{F2}$ t1 gesehen hat]]]]]
who only the Dirk seen has

c. $[[Z]]^g = \lambda p\exists x[p=[[Y]]^{g,\{\}[x/3]}\ ]$
$= \lambda p\exists x[p=[[\ [1[X]]]]^{g,\{\}[x/3]}\ ([[wen_3]]^{g,\{\}[x/3]}\ )]$
$= \lambda p\exists x[p=[\lambda z.[[X]]^{g[z/1],\{\}[x/3]}\ ](x)]$
$[[X]]^{g[z/1],\{\}[x/3]} = [[only]]\ (g(C))([\lambda w.\text{Dirk saw z in w}])$
if $g(C) \subseteq \{[[\ [Dirk_{F1}\text{ hat t1 gesehen}]\ ]]^{g[z/1],h'} : h'\in H\}$
i.e. $g(C) \subseteq \{[\lambda w.y\text{ saw z in w}]:y\in D\}$
$[[Z]]^g = \{\text{that only Dirk saw x} \mid \text{x an individual}\}$

The calculation will proceed in a parallel way for other examples with overt movement of a wh-phrase (e.g. scrambling). By contrast, addition of an in situ wh-phrase as in (56) leads to uninterpretability. The crucial category is once more **X**, which indeed does not have a well-defined interpretation. Undefinedness is inherited by the rest of the tree.

(56) a. * Wen hat nur der Dirk wo gesehen?
whom has only the Dirk where seen
Who did only Dirk see where?

b. $[_Z\ Q_{3,4}\ [_Y$ wen$_3$ [1 $[_{\mathbf{X}}$ nur$_C$ [~C [[der Dirk]$_{F2}$ wo$_4$ t1 gesehen hat]]]]]
who only the Dirk where seen has

c. $[[X]]^g$ and $[[X]]^{g,h}$ are undefined ==> $[[Z]]^g$ is undefined.

These facts indicate that a wh-phrase is interpreted in its moved position - here: where it shows up overtly.

A different and more serious complication arises once we look at the contrast between English and German. Recall that a lot of prospective intervention effects are actually fine in English, and that intervention effects only show up in otherwise permissible superiority violations like (57) (as observed by Pesetsky (2000)).

(57) a. Which girl did (only) Mary introduce _ to which boy?
b. Which boy did Mary introduce which girl to _ ?
c. ?? Which boy did only Mary introduce which girl to _? [Pesetsky]

This looks like a genuine problem for my analysis of intervention effects. Interestingly, however, one option open to me is to simply persue Pesetsky's analysis of these data.

According to Pesetsky (2000), wh-phrases in situ in English generally undergo LF wh-movement ("covert phrasal movement"). Superiority effects are an indicator of such movement, and those wh-phrases that are sensitive to superiority constraints therefore must undergo phrasal movement. Conversely, wh-phrases that are not sensitive to superiority thereby show that they do not move. This is true of which-phrases. A which-phrase that has successfully violated superiority thus doesn't undergo phrasal movement. According to Pesetsky, such a wh-phrase is 'interpreted' via the alternative strategy of feature movement.

The above English data show us that feature movement is sensitive to intervention effects, and that covert phrasal movement is not.
I propose to view my focus related interpretation mechanism as the interpretational strategy that underlies the term 'feature movement' - i.e. what I do in the previous section is to provide an interpretation of the notion of feature movement as used by Pesetsky. I further propose to adopt the part of his analysis that has wh-phrases insensitive to interveners move covertly, i.e. at LF, past the intervener. My suggestions are illustrated for the relevant English examples below.
Sentence (58a) is an ordinary multiple question with the kind of wh-phrase sensitive to superiority. Pesetsky shows us that the LF for the sentence (i.e. the structure that is the input to compositional interpretation) must look as in (58b). The in-situ wh-phrase has moved covertly. Consequently, adding an intervener as in (59a) is harmless: the structure we interpret does not include an intervention configuration. The crucial category **X** has a well-defined interpretation.

(58) a. Who did John introduce to whom?
b. [$Q_{1,2}$ [who_1 [4 [$whom_2$ [5 [did [John introduce t4 to t5]]]]]]

(59) a. Who did only John introduce to whom?
b. [$_Z$ $Q_{1,2}$ [who_1 [4[$whom_2$ [5[did [**X** $only_C$ [~C[$John_{F3}$ introduce t4 to t5]]]]]
c. $[[X]]^g=[[X]]^{g,h}= [[only]](g(C))(\lambda w.$ John intro. g(4) to g(5))
$[[Z]]^{g,h}$ = { that only John intoduced x to y | x, y individuals}

Matters are different in (60), a multiple question containing a which-phrase that defies superiority. This wh-phrase does not move, and the input to the interpretation component looks as in (60b). While things work out fine in this example, addition of an intervener as in (61a) now leads to ungrammaticality, since we find the familiar intervention configuration in (61b).

(60) a. Which boy did Mary introduce which girl to _?
b. [$Q_{1,2}$[[which boy]$_1$ [4[did [Mary introduce [which girl]$_2$ to t4]]]]]]

(61) a. ?? Which boy did only Mary introduce which girl to _?
b. [$_Z$ $Q_{1,2}$[[which boy]$_1$ [4[did [**X** $only_C$ [~C[$Mary_{F3}$ int. [which girl]$_2$ to t1]]]]
c. $[[X]]^g$ and $[[X]]^{g,h}$ are undefined ==> $[[Z]]^g$ is undefined

Essentially, there is no intervention effect in many English data because at the relevant level, Logical Form, there is no intervention configuration. Pesetsky's account thus works well with the present analysis. It should be pointed out that it leads to a few non-trivial further expectations. For one thing, covert phrasal movement of the kind assumed for regular English wh-phrases must be unavailable in all those languages that reliably show intervention effects in multiple questions (e.g. Japanese, Korean, German etc.). One wonders what kind of movement this is: what triggers it, and how it is parametrized. See Pesetsky for discussion. A general prediction is that in languages that have superiority effects, we expect the limited English-type intervention effects. In languages without superiority effects (or any other indication that wh-phrases must move phrasally) we expect general intervention effects of the German, Korean etc type. I.e., the analysis predicts a correlation of limited vs. general intervention effects and superiority vs. no superiority effects. Further research will have to show if this is borne out.

5 Focus Issues

5.1 Variable Interveners

We observed in section 2 that the set of problematic interveners varies between languages. In particular, in English and German quantified expressions in general cause an intervention effect - not just focusing operators like 'only', 'even' and 'also' (compare Beck (1996) and Pesetsky (2000) for more data illustrating this). Let us first consider what could, in principle, be said about the intervention effect caused by items such as 'always', 'often', 'every' etc. under the present analysis.

Intervention effects arise through focus sensitive operators. The relevant one so far is ultimately the ~ operator. In Rooth's (1992) theory, which I have followed, the ~ operator evaluates the contribution of focus. In the data relevant for us, it derives association with focus via the focus anaphor C, shared by the ~ operator and whatever operator is supposed to associate with focus. If we can argue that there is a ~ operator present in structures with quantifiers, then we expect an intervention effect to arise. A ~ operator is plausibly present if we can find association with focus.

It is well-known that quantifiers do associate with focus. Some relevant examples are given below.

(62) a. Mary always takes John to the MOVIES. [Rooth]
≈ If Mary takes John anywhere, she takes him to the movies.
b. Mary always takes JOHN to the movies.
≈ If Mary takes anyone to the movies, she takes John to the movies.

(63) Most ships passed through the lock at NIGHT. [Krifka]
≈ Most ships that passed through the lock passed through the lock at night.

The structures for (62) are given in (64).

(64) a. [always$_{\cup C}$ [~C [Mary takes John to [the movies]$_{F1}$]]]
b. [always$_{\cup C}$ [~C [Mary takes [John]$_{F1}$ to the movies]]]

Assuming the simplified interpretation of *always* given in (65), it is easy to see that (66) will lead to the appropriate interpretations of (64a,b) depending on the value of the focus anaphor C.

(65) [[always]] (p)(q)(w)=1 iff for all s such that s≤w & p(s)=1, q(s)=1
(66) [[always]] (g(∪C))(λw.john takes mary to the movies in w)

Thus it seems clear that a ~ operator can be part of structures with quantifiers (see for example Rooth (1996)). This, however, is not quite good enough for my purposes: the intervention effect in English, German etc. does not depend on association with focus. That is, intervention effects arise without any indication that the intervening quantifier in that structure associates with focus. Therefore I have to claim that there is always a ~ operator present in quantified structures in languages in which those quantifiers cause an intervention effect.

At first, this seems problematic. It has been observed (Buering (1996), Beaver and Clark (2002)) that quantifiers do not necessarily associate with focus. A relevant example is given in below. Lack of association in (67a) excludes the structure in (67b).

(67) a. Mary always managed to complete [her exams]$_F$ [Beaver & Clark]
b. [always$_{\cup C}$ [~C [Mary managed to complete [her exames]$_{F1}$]]]

Note, however, that nothing precludes the structure in (68), in which there is a ~ operator, but the focus anaphor is not coindexed with the resource domain variable of the quantifier. All that is required for my purposes is that focus is obligatorily evaluated in the scope of the quantifier - not that the quantifier obligatorily associates with focus. (This could be viewed as an argument for the indirect approach to association with focus represented by Rooth's ~.)

(68) [always$_{C1}$ [~C2 [Mary managed to complete [her exames]$_{F1}$]]]

Let us ask ourselves, then, what predictions obligatory evaluation of focus in the domain of a quantifier makes. This question, it turns out, is not easy to answer.
Note that the ~ operator unselectively evaluates all foci in its syntactic scope. The Roothian definition in (42) binds all distinguished variables in the scope of the ~. It also makes those variables inaccessible from the outside by setting the new focus semantic value to the ordinary semantic value. An obvious hypothesis would be that since any foci in the scope of a quantifier have to be evaluated within the scope of that quantifier, they cannot be evaluated higher up, outside its scope. Thus we would expect (69a) to be impossible on the interpretation in (69b), where I may have lent other things besides Harry Potter to students, but the only thing I lent EVERYONE is Harry Potter.

(69) a. I only lent every student HARRY POTTER.
b. Harry Potter is the only thing that I lent every student.

(70) [only$_{C1}$ [~C1 [[every$_{C2}$ student] [~C3 [5[I lent t5 [Harry Potter]$_{F1}$]]]]]]

Under our current assumptions, (69) is associated with the Logical Form in (70). The definition of the ~ operator makes '~C3' in the above structure evaluate the focus on 'Harry Potter' and neutralize that focus. Hence association of 'Harry Potter' with 'only' (via the higher '~C1') is precluded. It turns out that in fact, reading (69b) is impossible - so far, so good.

However, it it is claimed in the literature (e.g. Krifka (1991), Rooth (1996)) that a focus can skip one focus sensitive operator and associate with a higher one. An example of this kind is given in (71b).

(71) a. I only introduced MARILYN to John Kennedy. [Rooth]
b. I also only introduced Marilyn to BOB Kennedy.
= Bob Kennedy is another person that I introduced only Marilyn to.

We know that the focus on 'Bob Kennedy' skips a focus sensitive operator because 'only' obligatorily associates with focus (here: Marilyn), but 'Bob Kennedy' associates with the structurally higher 'also'. Given our current assumptions, (71b) would be associated with the Logical Form in (72).

(72) [also$_C$ [~C [only$_D$ [~D [I introduced Marilyn$_{F2}$ to [Bob Kennedy]$_{F1}$]]]]]

(72) runs into the same problem as (70) above: association should be impossible. This means that what we have just said about (69) can't be the whole story. I will come back to the issue of multiple focus, and to possible analyses of (71), in section 5.2. As far as our empirical predictions are concerned, a more realistic expectation is (73).

(73) If an element Y is an intervener in language X, then any focus contained in the scope of Y should have the same options of focus evaluation as a focus contained in the scope of an obligatorily focus sensitive item (like 'only') in X. If Y is not an intervener in X, then Y does not have to come with a ~ operator, and a focus contained in the scope of Y should be completely free in its evaluation.

We have yet to determine concretely what the options of focus evaluations are for a focus contained in the scope of an focus sensitive item, as opposed to some other focus. Only then can we examine the predictions made by my proposal.

5.2 Multiple Focus

We are already in the process of examining a second 'intervention' constellation structurally parallel to the wh-intervention effect (74a) - multiple focus in (74b). If multiple focus were empirically parallel, the association depicted in (74b) should be impossible.

(74) a. * $[Q_i$ ... [~C [... wh_i ...]] ...] Intervention effects
d. $[\sim_i$ D...[$\sim_j$C [... F_j ... F_i ...]] ...] Multiple Focus

We have already seen that the LF in (72) does not allow us to capture that reading of (69), since the ~ under 'only' already evaluates the focus on 'Bob', and leaves nothing for 'also' to associate with.

Such examples have received much attention in the literature. Let us briefly review the discussion. Rooth (1996) considers the alternative LF in (75) for the example. Here, 'Bob Kennedy' has moved out of the c-command domain of 'only' at LF and is now free to associate with 'also'. Since we know independently that phrases can move at LF, nothing precludes (75) as a possible LF of (69), and we do after all derive the relevant reading (so Rooth argues). Note that the suggestion mirrors what happens in English multiple questions without intervention effects.

(75) [$also_C$ [~C [[Bob Kennedy]$_{F1}$ [3[$only_D$ [~D [I introduced Marilyn$_{F2}$ to t3]]]]]

This makes the prediction that skipping an intervening focus sensitive operator should be possible only when movement can come to the rescue. Rooth tests this prediction with (76), where the focus is embedded inside a relative clause (an island for movement).

(76) a. We only recovered the diary entries that MARILYN made about John.
b. We also only recovered [the diary entries [that Marilyn made about BOBBY]]

Rooth reports that association with 'also' is still possible, and leaves the example as a problem for a restrictive theory of movement.

Wold (1996), on the other hand, is led to the suggestion that the ~ operator is not, after all, truly unselective in that it evaluates all foci in its scope. He develops a version of the theory in which the ~ operator itself bears an index, and evaluates only the contribution of coindexed foci. A representation of (69) would then look as in (77).

(77) [$also_C$ [$\sim_1$C [$only_D$ [$\sim_2$D [I introduced Marilyn$_{F2}$ to [Bob Kennedy]$_{F1}$]]]]

I will not provide a detailed semantics for (77). See Wold (1996). Suffice it to say that the indexed ~ is a binder for only those variables that bear the same index. This predicts that association of focus across intervening focus sensitive operators is completely free.
On the other hand, von Fintel (1994, p.49, Fn 44) observes that when the order of 'only' and 'also' is reversed, the relevant reading is completely impossible. His example is (78;B2). This is not what we expect under either Rooth's movement theory or Wold's theory.

(78) A: I know that John drank water at the party. What else did he drink?
B1: Besides water he only drank [CARrot juice]$_F$.
B2: #He only also drank [CARrot juice]$_F$.

In the same vein, Heck and Sauerland (2003) note that in (79) focus on 'bike' does not seem to be able to skip the intervening universal quantifier. This example is parallel to the Harry Potter example from section 5.1., where association across a universal quantifier was similarly impossible.

(79) # Tina hat nur jedem Kind ein FAHRRAD gegeben. [Heck & Sauerland]
Tina has only every child a bike given
* The only thing Tina gave to every child was a bike.

The empirical situation thus seems to be less clear than one would like.
Let us consider the relevance of this problem for the purposes of this paper. The immediate issue is the semantics of the ~ operator. The derivation of the intervention effect in section 3 relies on the fact that the ~ operator evaluates the contribution of all foci in its syntactic scope, and neutralizes their contribution. A selective version of the ~ operator like Wold's is incompatible with that explanation. On a more conceptual level, intervention effects are supposed to follow from the mechanism responsible for evaluating the contribution of focus. This leads us to expect that they might show up in other constructions that use an alternative semantics. Specifically, under the present assumptions, the ~ operator should lead to an intervention effect for the binding of distinguished variables, through being unselective and through the closure effect. The effect need not show up as one of grammaticality (as in the case of wh-phrases), but it should be detectable (as an interpretational effect concerning possibility of association with focus, or circumstances under which such association is possible).
It follows that both the empirical issue of multiple focus and its theoretical implications are extremely important for the present purposes.

In order to contribute to the empirical picture, I have conducted a small survey that tests association with focus across an intervening focus sensitive operator. My results are summarized in the table below. The first column reports the judgments collected for association of 'only' with focus across intervening 'nobody', the second column for association across intervening 'nobody' in an island condition. The third column reports the judgments of association of 'also' (English) or 'sogar' ('even'; German) across intervening 'only', the fourth column adds an island condition to that. The last two columns are test sentences without intervener. I obtained judgments for seven native speakers of English and ten native speakers of German. The actual data used in the survey are reported in the appendix. The last three rows in the table are the theoretical predictions made by Wold's theory, and by Rooth's theory including/not including the movement option. In the 'nobody' condition, there is also the question of whether Rooth would go along with my claim that 'nobody' requires a ~ operator (the unbracketed judgment) or not (the judgment in brackets).

(80)	negation	negation, Is	only	only Is	T	T Is
EnglLiberal	*	*	ok	ok	ok	ok
EnglRestr.	*	*	*	*	ok	ok
GerLiberal	ok	ok	*	*	ok	ok
GerRestr.	*	*	*	*	ok	ok
PredWold	ok	ok	ok	ok	ok	ok
PredRooth+M	ok	* (ok)	ok	*	ok	ok
PredRooth-M	* (ok)	* (ok)	*	*	ok	ok

I found considerable variation in the judgments collected, both within and across the two languages. In English, there is a dialect in which 'nobody' is a problematic intervener for association with focus, but 'only' is not. There is a second dialect in which both 'nobody' and 'only' are problematic interveners. The German judgments reveal a dialect in which 'nobody' is not a harmful intervener, but 'only' is, and a second dialect in which both 'nobody' and 'only' are problematic interveners. It seems fair to say the following:

(i) Association across intervening operators is not freely possible. There are intervention effects for association with focus. A theory like Wold's in which anything ought to be possible does not seem to be on the right track.
(ii) Movement constraints do not play a role. Movement does not seem to be able to rescue bad cases of intervention, and movement constraints don't seem to block unproblematic cases of association. It looks as if focus never moves.
(iii) Rooth's theory without the option of movement, and agreeing with me on the role of 'nobody', makes good predictions for the two restrictive dialects. But the two liberal dialects are fairly mysterious.
(iv) The class of problematic interveners for association with focus seems to vary from one language/dialect to another.

Beyond these points, I hesitate to base definitive conclusions on the nature of association with focus and focus evaluation on the data I have collected. For one thing, a larger set of data ought to be tested than the ones I have looked at, where more interveners are considered as well as other focus sensitive items. For another, one ought to test similar data in a different experimental/contextual set-up to make sure there are no side effects from that.
At this point, I conclude that we have no theory of focus evaluation that completely covers the available data. It is possible that we have to revise the theory of the ~ operator that I have used, but it is unclear exactly how. One should also explore, alternatively, the possibility of leaving the theory of focus evaluation intact and finding a different explanation for the liberal dialects. In the case of association with 'also', one could consider association with Topic alternatives (suggested e.g. in Krifka (1998)). If that were plausible, the 'also' data would turn out to be a garden path for testing association with focus. I must leave the issue unresolved.
Importantly, for the present purposes, we do not want a theory of focus evaluation without the 'closure' effect of Rooth's ~ operator. And it is this 'closure' that my explanation of intervention effect relies upon.

6 Conclusions

6.1 Summary and Literature

I have developed an analysis of intervention effects that ties them to the evaluation of focus. Wh-phrases are interpreted via the same mechanism that also interprets focus. In the case of intervention effects, the semantic properties of wh-phrases interfere with focus evaluation. Focus evaluation unselectively applies to all foci and neutralizes their contribution, i.e. reduces their contribution to their unfocused semantics. Since wh-phrases do not have an 'unfocused' semantics, this leads to uninterpretability of the structure as a whole. Thus a wh-phrase may never have a focus sensitive operator other than the Q operator as its closest c-commmanding potential binder.

I propose this view of intervention effects as an alternative to previous accounts, which analyse them either as a violation of a movement constraint (Beck (1996), Hagstrom (1998), Kim (2002), among others), or as a consequence of restrictions on variable binding in general (Honcoop (1998)). I will discuss these two types of analysis in turn.

The basic idea of a movement analysis is that something prohibits the structure indicated in (M); that is, movement of a wh-phrase may not (under certain circumstances) cross an intervener.[6]

(M) $[_{CP}$ __ [... [Interv [... wh-phrase ...]]]]

x

It is irrelevant for our purposes what exactly the constraint on movement is. I think there are several reasons to be sceptical of this kind of explanation. First, we know that movement constraints (or, more generally, constraints on when a syntactic connection like the one above can be made) vary considerably from language to language. There is no reason to expect that the one that rules out (M) is universal. On the whole, the constraint is something that is stipulated rather superficially on top of a grammar that would actually permit a grammatical derivation of the intervention data. Now, as laid out in section 2, it seems likely that intervention effects per se are in fact universal. It would be desirable to derive their existence more profoundly from the structure of the grammar. The present proposal tries to do so on the basis of the specific semantic contribution of wh-phrases, in interaction with what we know about focus evaluation.

Secondly, recent years have brought to light a number of arguments against moving wh-phrases in situ, as well as ways of interpreting them in their surface position (see in particular Reinhart (1992)). This should make us cautious of designing an analysis of intervention effects that crucially relies on such movement.

Then, there are, for English wh-questions in particular, the arguments by Pesetsky (2000) that the wh-phrases that are sensitive to intervention are just the ones of which we would like to

---

6The analyses I subsume under movement accounts differ from each other and deviate from the concrete picture in (M) in ways I will not address. In Kim's (2002) proposal the syntactic connection between the wh-phrase and the "landing site" could be, but doesn't have to be, made by movement. For Hagstrom (1998) it is not the wh-phrase that moves but an abstract Q morpheme/operator (which, however, originates from the vicinity of the wh-phrase). My comments as they are phrased below apply to movement accounts such as the one proposed in Beck (1996), although the more general considerations are relevant for other syntactic accounts as well.

I do not include Pesetsky (2000) under the movement accounts I comment on here, because I propose to give a reconstruction of his notion of feature movement - not to argue against it. Pesetsky does not actually say why interveners block feature movement. He refers to Honcoop (1998) for a semantic explanation. I comment on Honcoops analysis below. I think for Pesetsky's purposes, the reference to Honcoop could be replaced by a reference to the present proposal without problem.

say that they do NOT move. The connection between superiority and intervention discovered by Pesetsky argues against a movement analysis of intervention.
These would be good reasons to look for a theory of intervention effects that does not rely on movement. Conversely, let's think about what an explanation in terms of alternative semantics buys us, compared to a movement analysis. The focus-related analysis leads to different expectations regarding where intervention effects should surface. Now, we expect them to (potentially) show up when semantics makes use of alternatives. The data on multiple focus make this look like a good prediction. Additioinal motivation comes from intervention effects in NPI licensing and from alternative questions, both of which very likely involve the construction of alternative sets. An example for a plausible intervention effect in alternative questions is given in (81).

(81)	a.		Hat	Peter	Maria$_F$ oder Susanne$_F$		eingeladen?
			has	Peter	Maria or Susanne		invited
			'Did Peter invite Maria or Susanne?'				
	b.	*	Hat	nur	Peter	Maria$_F$ oder Susanne$_F$	eingeladen?
			has	only	Peter	Maria or Susanne	invited
			'Did only Peter invite Maria or Susanne?'				

NPI intervention is exemplified in (82) (data discovered by Linebarger (1987)).

(82) a. Mary didn't wear any earrings to every party.
* NOT >> every >> any
b. I didn't give Joe/*most people a red cent.

The effect is obviously strongly reminiscent of the wh-intervention effect, and it has been suggested in Beck (1996), Honcoop (1998), Kim (2002) and Guerzoni (in preparation) that it should be viewed as kin to intervention in questions. It goes beyond the scope of this paper to give an explanation of intervention effects in negative polarity licensing; see in particular Honcoop and Guerzoni (as well as Krifka (1995) and Chierchia (2001), discussed in Guerzoni) for such accounts.
Note that a movement analysis is not plausible for intervention in NPI licensing. If we said that (82b) is bad because the NPI obligatorily moves (i.e. undergoes covert phrasal movement) to its licenser, we would wrongly predict that (83a) doesn't have the reading in (83b).

(83) a. Peter didn't need to eat any cherries.
b. NOT >> need >> any

Similarly, a movement analysis is not attractive for intervention with multiple focus, because it would make us posit a movement analysis of focus in cases that violate island constraints.
There is also the reverse type of case in which a movement analysis leads us to expect an intervention effect, but alternatives don't seem to play a role. Scope rigidity is such a case. Heck and Sauerland (2003) observe that a movement analysis can capture the lack of an inversely linked reading in (84), while a focus analysis has no way of doing so.

(84)	Kein	Produkt	aus	jedem	EU-Land	verkauft	sich	gut.
	No	product	from	every	EC country	sells	Refl.	well
	No product from every EC-country sells well.							[from Beck (1996)]

I concur with Heck and Sauerland that we lose the connection between intervention and scope rigidity by giving up a movement analysis. However, I believe that this is the right move, in view of the fact that English, for example, does not have scope rigidity, but it does show intervention effects. In sum, I have come to the conclusion that the bigger picture fits an alternative semantic analysis of intervention better than a movement analysis.

A competitor of the movement analysis of intervention effects has been Honcoop (1998), who argues that intervention effects are the consequence of general constraints on the binding of variables, as they are reflected in particular by the possibility of anaphora. Under this view, the intervention effect caused by negation, for example, would be linked to the fact that negation also blocks an anaphoric connection in (85).

(85) #There wasn't a man in the garden. He was smoking.

Honcoop suggests that weak islands, as well as intervention effects, are caused by intervening operators that create inaccessible domains for anaphora - more technically: interveners in his sense are operators across which variable binding is prohibited.
First it should be noted that there is some similarity between Honcoop's suggestion and my present proposal, in that binding of a certain variable is blocked by an intervener. The main difference I see is that my proposal applies in an empirically overlapping, but ultimately rather different domain. On my account, binding is affected of those variables that are used in the construction of alternative sets: wh-phrases, focused phrases, probably NPIs. This happens at the level of focus semantic values. On Honcoop's account, it is the binding of ordinary variables that is affected, in the calculation of ordinary semantic values. The two proposals 'overlap' where a given variable could be taken to be either an ordinary or a distinguished variable, as e.g. in the case of wh-phrases. But let's look at the empirical consequences of this difference.
There is a large set of data that fall under Honcoop's analysis but not mine. This specifically includes weak islands and anaphora. Honcoop claims that problematic interveners are just those elements that block anaphora. I think that the crosslinguistic picture makes such a general claim unsustainable. Recall that there is variation between languages with respect to what is a problematic intervener. In Thai, negation is not an intervener in (86), but of course, the Thai version (87) no more permits anaphora than English (85). Korean (88) vs. (89) makes a similar point.

(86) Thai (Ruangjaroon (2002)):
Nít mây síi ?aray
Nit not buy what
What didn't Nit buy?

(87) # mây mee phuuchay yuu nay su:an. khao su:p buri:
Neg have man be in garden he smoke cigarette
\# There isn't a man in the garden. He is smoking.

(88) Korean (Beck & Kim (1997)):
Minsu-nûn chachu nuku-lûl p'ati-e teliko ka-ss-ni?
Minsu-Top often who-Acc party-Dir take-Past-Q
'Who did Minsu often take to the party?'

(89)	#	wuli-nun	chachu	oypwu yensa-lul	chotayha-n-ta.
		we-Top	often	outside speaker-Acc	invite-Pres-Decl
		ku-nun	tokilin-i-ta.		
		he-Top	German-be-Decl		
	#	We often invite an outside speaker. He is German.			

Quite generally, I would be exceedingly surprised if anaphoric possibilities across languages mirrored wh-intervention effects. While I have not collected extensive crosslinguistic data, I would conjecture that anaphoric accessibility is fairly stable. On the other hand, we know that there is considerable variation with both weak islands and intervention effects. I do not think that Honcoop's analogy can be maintained.

Moreover, I believe that it is necessary to make a distinction between weak islands and intervention effects. Recall for example the contrast between (6a) and (6c) from section 2. Overt wh-movement is possible in cases where an intervention effect arises. Hence we cannot use one and the same mechanism (constraints on variable binding) to exclude both. See also Beck (1996, chapter 4) for discussion.

Conversely, there are two kinds of data that fall more naturally under my proposal than Honcoop's: intervention effects with multiple focus and NPI licensing. Honcoop does provide an analysis of NPI licensing within his framework, but it is somewhat roundabout, as he acknowledges. And while an analysis of focus is possible in which there is binding of ordinary variables, this is not the standard assumption.

I conclude that there are empirical reasons to favour an analysis in terms of focus semantics.

6.2 Consequences

The theory of intervention effects I have proposed identifies a set of constructions in natural language as 'focus related' in that they all employ a particular interpretational mechanism: the one that constructs alternatives. The proposal is that not only do all these constructions involve the same semantic object - alternative sets -, but that that semantic object is derived by the grammar in the same way as well. I have chosen distinguished variables for that mechanism. Thus wh-phrases, focused phrases and NPIs all correspond to distinguished variables. Alternative formation is binding of those variables. The choice of variable binding for this purpose is guided by the fact that we need an evaluation of these expressions that is to some extent selective (for example, a focus inside a question is not affected by the Q operator); thus the mechanism of alternative formation in Rooth (1985) would not work.

In addition to the obvious semantic support for a uniform analysis, there is some morphological support for making this connection between wh-phrases, NPIs and focus. In Japanese, NPIs like 'anyone' are literally 'who also':

(90)	Japanese:	dare-mo	=anyone
		who-also/even	

We expect this tie since the semantic function of 'who' is the same in a wh-phrase and an NPI. Such morphology should be recurring crosslinguistically, which seems correct (compare also Kim (2002)). A further expectation is that other contexts in which this morphology shows up should also involve an alternative semantics. The work of Shimoyama (2001) and Kratzer and Shimoyama (2002) explores this connection. They examine in particular Japanese wh-pronouns in *mo*- and *ka*- constructions (as well as a German free choice indefinite) and provide an analysis in terms of alternative semantics. *Mo* and *ka* are operators evaluating the contribution of the alternatives. Among other things, this semantics explains intervention effects such as the following:

(91) * [... [... wh_i ... mo/ka_j] ...]-mo/ka_i

A wh-pronoun must associate with the closest potential binder. This effect is thus another example of an intervention effect in a focus related construction. Kratzer and Shimoyama's work converges with my suggestions.[7]

My proposal raises further questions. The most important empirical question concerns multiple foci. It needs to be clarified to what extent focus association is possible across intervening operators, and why there is variation w.r.t. to which intervener is harmful. Only then can we decide whether the semantics of the focus evaluation needs to be revised, and if so how. This is a theoretical question concerning the evaluation of focus, here done by the ~ operator. There is also the claim implied by my analysis that the grammar may require the presence of a ~ in certain domains (the scope of quantifiers) without any apparent semantic necessity for this (i.e. there is no association with focus). Finally I find it puzzling that focus may not move. I see no reason for this. I can only hope that it will turn out to be a virtue of the present proposal that it raises these questions, and that it may lead to a better understanding of how the grammar of natural language constructs and uses alternative sets.

Acknowledgements

I am grateful to Hani Babu, Reinier van den Born, Liang Chen, Lisa Cheng, Elena Guerzoni, Fabian Heck, Ji-yung Kim, Shin-Sook Kim, Angelika Kratzer, Luisa Marti, Cecile Meier, Toshiko Oda, Sei-Rang Oh, Ning Pan, David Pesetsky, Sugunya Ruangjaroon, Uli Sauerland, Yael Sharvit, Arnim von Stechow, as well as audiences at UMass, UConn, Universität Frankfurt, Universität Tübingen, and 'Sinn und Bedeutung' 8. I would also like to thank my informants for the survey: Jonathan Bobaljik, Christine Brisson, Sarah Felber, Kyle Johnson, Lisa Mattewson, Karen OBrian, William Snyder for English, and Klaus Abels, Annett Eichstaett, Cornelia Endriss, Stephan Kepser, Winnie Lechner, Reimar Müller, Albert Ortmann, Irene Rapp, Frank Richter, Ede Zimmermann, for German.

Appendix: the Survey

The sentences I report judgements for in the table in (80) are the B-sentences of the first six dialogues for English and the next six dialogues for German. The bracketed material is the overall context for the examples, which I also gave to the native speakers I consulted.

[Sally, Maria, Bill, A and B are all training to become spies. It is very important in a spy network that personal contact between spies is controlled. If you meet another spy in person, for example, you are establishing a connection that may give away the whole network. That's what the fuss below is about.]

(Neg) A: You told nobody that Maria met Sally.
B: No - I only told nobody that Maria met BILL.

7Although it should be pointed out that their technical implementation, strictly Roothian, is not compatible with mine. This stems from the fact that they have a different empirical focus. In the mo- and ka- constructions, focus sensitive operators invariably cause an intervention effect. This is not generally the case. Accordingly, Kratzer and Shimoyama do not extend their analysis to standard wh-intervention effects. They propose to adopt Pesetsky's analysis in terms of feature movement for those data, where feature movement is blocked by an intervener, for reasons unknown. My proposal is to find a semantic source for the blocking of feature movement, and to trace the Japanese data and the standard wh-intervention effects both to that source. I think this is in the spirit of their work, even though we make different specific claims here.

(NegIs)	A.	You told nobody that Sally met Bill.
	B:	No - I only told nobody that MARIA met Bill.
(only)	A:	You only told THE BOSS thst Maria met Sally
	B:	Right. I also only told the boss that Maria met BILL.
(onlyIs)	A:	You only told THE BOSS that Sally met Bill.
	B:	Right. I also only told the boss that MARIA met Bill.
(T)	A:	You told the boss that Maria met Sally.
	B:	No - I only told the boss that Maria met BILL.
(TIs)	A:	You told the boss that Sally met Bill.
	B:	No - I only told the boss that MARIA met Bill.

[A and B are talking about the annual company excursion ('Betriebsausflug') of their company, which took place a few days ago. By now photos are circulating that have created a certain amount of discussion.]

(Neg)	A:	Du hast also keine Photos auf Karls Schreibtisch gelegt. So you didn't put any photos on Karl's desk.
	B:	Das stimmt nicht. Ich hab nur keine Photos auf die REZEPTION gelegt. That's not true. I only didn't put any photos on the reception desk.
(NegIs)	A:	Du hast also niemandem ein Bild gezeigt, in dem der Karl nackt ist. So you didn't show anybody a picture on which Karl is naked.
	B:	Nee - ich hab nur niemandem ein Bild gezeigt, in dem der CHEF nackt ist. No - I only didn't show anybody a picture on which the boss is naked.
(only)	A:	Du hast also gestern nur 2 Abzuege auf Karls Schreibtisch gelegt. So you only put 2 prints on Karl's desk yesterday.
	B:	Stimmt. Ich hab sogar gestern nur 2 Abzuege auf die REZEPTION gelegt. Right. I even only put 2 prints on the reception desk yesterday.
(onlyIs)	A:	Du hast also nur dem Otto ein Bild gezeigt, in dem der Chef nackt ist. So you only showed Otto a picture on which the boss is naked.
	B:	Stimmt. Ich hab sogar nur dem Otto ein Bild gezeigt, in dem der KARL nackt ist. Right. I even only showed Otto a picture on which Karl is naked.
(T)	A:	Hast Du Photos auf Karls Schreibtisch gelegt? Did you put photos on Karl's desk?
	B:	Nein. Ich hab nur Photos auf die REZEPTION gelegt. No. I only put photos on the reception desk.
(TIs)	A:	Du hast also dem Otto ein Bild gezeigt, in dem der Chef nackt ist. So you showed Otto a picture on which the boss is naked.
	B:	Nee- ich hab dem Otto nur ein Bild gezeigt, in dem der KARL nackt ist. No - I only showed Otto a picture on which Karl is naked.

A few comments on the choice of the examples: I tested intervening negation because that is a fairly solid and reliable intervener for English and German wh-constructions. I used association with 'only' for this case, which seems the most canonical example of association with focus. I tested intervening 'only' for association with 'also' in English because those are the data reported in the literature on multiple focus. I changed to German 'sogar' ('even') in this condition because German 'auch' ('also') is known to be able to so strange things.
The syntax of the English examples is taken directly from Guerzoni (in preparation), who uses those same data in NPI-intervention. Her tests show that the subject position of an

embedded clause is an island for covert phrasal movement (of the relevant kind - we used to call it QR), while the object position is not an island. These particular island- vs. non-island-configurations differ minimally and have exactly the same complexity, so I judged them to be an interesting test case - especially in view of Guerzoni's data.
The German constructions were chosen to make sure that we really have a non-island-configuration for covert phrasal movement vs. an island configuration. The example in (92) naturally permits inverse scope, and relative clauses are pretty solid scope islands.

(92)	Ich	habe	eine	Karte	auf	jeden	Tisch	gelegt.
	I	have	a	menu	on	every	table	put
	I have put a menu on every table.							

The English and the German test items thus differ in several important ways. A lot of empirical work remains to be done.

References

Beaver & Clark (2002). *Always* and *Only*: Why not all focus-sensitive operators are alike. Ms., Stanford University.
Beck, Sigrid (1996). Wh-constructions and Transparent Logical Form. PhD dissertation, Universität Tübingen. Available at http://www.sfs.uni-tuebingen.de
Beck, Sigrid & Shin-Sook Kim (1997). On Wh- and Operator Scope in Korean. Journal of East Asian Linguistics 339-384.
Berman, Stephen (1991). On the Semantics and Logical Form of Wh-Clauses. PhD diss, University of Massachusetts at Amherst.
Bruening, Benjamin & Vivian Lin (2001). Discontinuous QPs and LF Interference Effects in Passamaquoddy. Proceedings of SULA, UMass, April 2001.
Büring, Daniel (1996). The 59th Street Bridge Accent. PhD diss, Universität Tübingen.
Chierchia, Genaro (2001). Scalar Implicatures, Polarity Phenomena and the Syntax/Pragmatics Interface. Forthcoming in A. Belleti (ed.): Structures and Beyond. Oxford University Press.
Guerzoni, Elena (in prep.). Intervention Effects on NPIs and Feature Movement: Towards a unified account of intervention. Ms, MIT.
Hagstrom, Paul (1998). Decomposing Questions. PhD dissertaion, MIT.
Hamblin, C.L. (1973). Questions in Montague English. Foundations of Language 10, 41-53.
Heck, Fabian & Uli Sauerland (2003). LF Intervention Effects in Pied-Piping. Proceedings of NELS 2002, MIT.
Honcoop, Martin (1998). Dynamic Excursions on Weak Islands. PhD diss, University of Leiden.
Karttunen, Lauri (1977). Syntax and Semantics of Questions. Linguistics and Philosophy 1, 3-44.
Kim, Shin-Sook (2002). Focus Matters: Two Types of Intervention Effect. Paper presented at WCCFL XXI.
Kratzer, Angelika (1991). Representation of Focus. In: Stechow, Arnim von & Dieter Wunderlich (eds.): Handbook of Semantics.
Krifka, Manfred (1990). Four Thouand Ships Passed through the Lock: Object-induced measure functions on events. Linguistics and Philosophy 13, 487-520.
Krifka, Manfred (1991). A compositional semantics for multiple focus constructions. Proceedings of SALT 1, Cornell, Ithaca, NY, 127-158.
Krifka, Manfred (1998). Additive Particles under Stress. Proceedings of SALT 8.
Linebarger, Marcia (1987). Negative Polarity and Grammatical Representation. Linguistics

and Philosophy 10, 325-387.
Lutz, Ulrich, Gereon Mueller & Arnim von Stechow (eds.): Wh-Scope Marking. Amsterdam/Philadelphia: Benjamins.
Megerdoomian, Karine, and Shadi Ganjavi. 2001. Against Optional Wh-Movement. To appear in Proceedings of WECOL 2000, Volume 12.
Pesetsky, David (2000). Phrasal Movement and its kin. MIT Press.
Ramchand, Gillian (1997). Questions, Polarity and Alternative Semantics. Proceedings of NELS 27, 383-396.
Reinhart, Tanya (1992). Wh-in-situ: An Apparent Paradox. Proceedings of the Amsterdam Colloquium.
Rooth, Mats (1985). Association with Focus. PhD diss, University of Massachusetts at Amherst.
Rooth , Mats (1992). A Theory of Focus Interpretation. Natural Language Semantics 1, 75-116.
Rooth, Mats (1996). Focus. In S. Lappin (ed.): The Handbook of Contemporary Semantic Theory. Oxford, UK; Cambridge, Mass.: Blackwell, 272-297.
Ruangjaroon, Sugunya (2002). Thai Wh in-situ. Talk presented at NWCL, Simon Fraser University, April 6-7 2002.
Shimoyama, Junko (2001). Wh-Constructions in Japanese. PhD diss, UMass Amherst.
Wold, Dag (1996). Long Distance Selective Binding: The Case of Focus. Proceedings of SALT 6, Cornell, Ithaca, NY, 311-328.

QUESTIONS, PLANS, AND THE UTILITY OF ANSWERS

Anton Benz*
Syddansk Universitet, Kolding

Abstract

The goal of this paper is to derive a measure of utility for questions and answers from a game theoretic model of communication. We apply this measure to account for a number of judgements about the appropriateness of partial and mention–some answers, e.g. that a partial answers to a question can be as appropriate as a strongly exhaustive answer. Under the assumption that interlocutors are Bayesian utility optimisers we see questioning and answering as a two-person sequential decision problem with complete coordination of preferences. Our approach builds up on the work of A. Merin and R. v. Rooy on measures of *relevance*. We will compare it in detail with their ideas.

1 Introduction

Given a question $?x.\phi(x)$, what is the most useful answer? This question becomes especially interesting in connection with the problem of *partial* and *mention–some answers*. There are a number of judgments about the appropriateness of partial answers that seem to be due to their utility in a specific pragmatic context. In our examples, we write 'I' for the *inquirer*, and 'E' for the answering *expert*:

(1) I: Where can I buy an Italian newspaper?

In addition to requesting for information, this reveals a future plan of the inquirer, namely to buy an Italian newspaper. Lets assume that it doesn't matter for him where to buy it. The following answers are equally useful with respect to informativity:

(2) E: There are Italian newspapers at the station and at the Palace but nowhere else. (GS)

There are Italian newspapers at the station. (A)

There are Italian newspapers at the Palace. (B)

A and B are example for *mention–some* answers. All three seem to be equally useful. Answer A is not inferior to answer $A \wedge \neg B$:

E: There are Italian newspapers at the station but none at the Palace.

If E knows only that $\neg A$, then $\neg A$ is an optimal partial[1] answer:

E: There are no Italian newspapers at the station.

*This paper presents ongoing work that was done in part during my time at the ZAS Berlin; most of it at Syddansk Universitet in Kolding.

[1]Henceforth, I use *partial* answer as a cover term for both, mention-some and partially resolving answers.

The fact that the answers *GS*, *A* and *B* are equally *useful* for pursuing the inquirer's plan of buying an Italian newspaper seems to account for their being equally *appropriate* as answers. Our problem is to find a game theoretic model for the communication situation that provides for a measure of utility of answers and can account for our intuitive judgments about their quality.

If a question or answer is to be called *useful*, then there must be an end to which it can contribute as a means. Hence, we see the activity of asking and answering as embedded in a pragmatic situation where the inquirer follows a plan that specifies his ends. Under the assumption that interlocutors are Bayesian utility optimisers we see questioning and answering as a two-person sequential decision problem with complete coordination of preferences. The goal of our investigation is to derive an appropriate measure of usefulness from this game theoretic model of communication. There may be additional pragmatic principles that rule out some of the answers; e.g. the Gricean principle of manner would lead to a preference for *A* and *B* over *GS*. We concentrate on the aspect of utility only. This aspect is linguistically important as it captures at least a substantial part of what is called *relevance*. We don't discuss whether the Bayesian principle of optimising expected utility explicates the Gricean principle of relevance or not. Nor do we claim that it provides an explanation for the different uses of the adjective 'relevant'. But, of course, our investigation is closely related to some game and decision theoretic explications of *relevance*, and indeed deeply indebted to them. We build up on the work of A. Merin (1999) and especially R. v. Rooy (2001; 2003; 2003a; 2003b). Merin measures the relevance of a proposition *E* by its ability to make us believe that a certain hypothesis *H* holds. The appropriate pragmatic situation is one where a speaker wants to convince his addressee of the truth of *H* and seeks for evidence that is most effective for this purpose. According to van Rooy, the basic pragmatic situation is one where an inquirer faces a *decision problem* and seeks for information to resolve it. This type of problem has been well studied in decision theory and van Rooy derives a measure for the relevance of *answers* in terms of their ability to influence the inquirer's decision. We build up on van Rooy but in contrast we consider questioning and answering as a sequential *two*–person game and use backward induction for deriving a solution for the expert's and inquirer's decision problems.

2 Partial Answers — Pragmatic Background Assumptions

What counts as an answer to a question? Does the set of answers depend only on the question itself or does it also depend on the inquirer's underlying reasons for asking the question? There has been a controversial debate about these questions and we don't intent to decide them here[2]. This section should make clear our background assumptions and our main motives for adopting them. Little depends on these assumptions in our formal model, and whatever does so can easily be reformulated such that it fits to other assumptions.

Following Gronendijk & Stokhof (1984) we identify the set of answers to a question $?x.\phi(x)$ with the set of all *strongly exhaustive answers*. E.g. if the question is 'Who came to the party yesterday?', and only *John*, *Jane* and *Jeff* came, then the strongly exhaustive answer states that exactly they and nobody else came. If Ω is a set of possible worlds with the same domain D, and $[\![\phi]\!]^v$ denotes the extension of predicate ϕ in v, then a strongly exhaustive answer to question $?x.\phi(x)$ is a proposition of the form $[v]_\phi := \{w \in \Omega \mid [\![\phi]\!]^w = [\![\phi]\!]^v\}$; i.e. it collects all worlds where predicate ϕ has the same extension. In our example, it collects all worlds where exactly John, Jane and Jeff came to the party. The set of all possible answers is then given by

[2] See (Groenendijk & Stokhof, 1997)[Sec. 6.2.3] for a short survey of positions regarding *mention–some* interpretations.

$[\![?x.\phi(x)]\!]^{GS} := \{[v]_\phi \mid v \in \Omega\}$. This approach poses a problem for partial answers: They are not elements of $[\![?x.\phi(x)]\!]^{GS}$, hence no answers at all.

We don't try to show that this is the best approach; we just state our main motivations for following Groenengijk & Stokhof. It has been noted that partial answers are possible only if the question is embedded in a situation where they are subordinated to an inquirer's goal. If a question is asked only for gathering information, i.e. in a pragmatically neutral context, then a strongly exhaustive answer is expected:

(3) **a)** Which animals have a good sense of hearing?

b) Where do coral reefs grow?

c) When do bacteria form endospores?

Without an explanation for the possibility of partial answers, this observation alone would not suffice to justify an identification of the set of answers with the set of strongly exhaustive answers. So, we need in addition a pragmatic explanation for partial answers. Let us consider a situation where asking a question is subordinated to further ends:

(4) *Somewhere in the streets of Berlin...*

I: I want to take the next train to Potsdam. Where can I buy a ticket?

a) *E: Lists all places where to buy a ticket*/At the main station/At this shop over there.

b) *E:* Come with me! (*Takes him to the next ticket-shop*)

c) *E:* (*Hands him a ticket*)

d) *E:* There are no controllers on the trains today.

The responses in a) are partial answers. The response in b) contributes to a goal (*Get to a ticket–shop* (G_2)) immediately super–ordinated to the goal of *getting to know a shop that sells tickets* (G_1). The third option in c) contributes to a goal (*Getting a ticket* (G_3)) which is again super–ordinated to the plan of buying a ticket. The response in c) contributes to a project (G_4) that is again super-ordinated to getting a ticket. We wouldn't call the responses in b) and c) *answers*. A more appropriate name is probably *reaction*. In b) it is a mixture of a verbal command and an action, in c) a pure action. But we may replace both by pure assertions, e.g.:

(4) b') *E:* I go to a ticket–shop right now.

c') *E:* I've already bought a ticket for you.

We assume that a question $?x.\phi(x)$ itself introduces the immediate goal of providing the strongly exhaustive answer (G_0). Writing the sub-ordination relation as $<$ we find in Example **(4)** that this immediate goal is embedded in a hierarchy of goals $G_0 < G_1 < G_2 < G_3 < G_4$. We might call such a hierarchy a *plan*. The basic assumption that explains the possibility of responses as in **(4)** is: Super-ordinated goals can override the immediate goal of providing a strongly exhaustive answer. Partial answers differ from other verbal responses by the relative distance of their goal from the basic goal G_0. They contribute to a goal that is directly super–ordinated to it. Hence there is only a gradual difference in how good the responses in **(4)** b'), c') and d) are if we evaluate them as answers. This is our main motivation for identifying the set of proper answers with the set of strongly exhaustive answers.

As we address only the case of partial answers, we concentrate on situations where there is only one goal super–ordinated to the goal of providing the strongly exhaustive answer. The goals are represented by an utility function. A natural way to do this is by setting $U(v,a) := 1$ if we reach the goal in situation v after execution of action a, and $U(v,a) = 0$ if we don't reach it. If in Example **(1)** a is the act of *going to the station* and v a world where there are Italian newspapers at the station, then act a leads to success, and hence $U(v,a) = 1$. Of course, utility measures can represent more fine–grained preferences over the outcomes of actions; e.g. if the inquirer wants to buy an Italian newspaper but prefers to buy it at the Palace because it's closer to his place, then this can be represented by different values for buying Italian newspapers at the station and at the Palace.

3 Merin's Measure of Relevance

Before I go to present my model of questioning and answering that puts the principle of optimising utility in its centre, I first discuss two approaches that introduce game and decision theoretic explications of the Gricean principle of relevance. In addition to utility, relevance measures the (psychological) impact of an assertion on the addressees believes. The Gricean principle of relevance is, of course, a natural candidate for explaining our judgments about the appropriateness of various partial answers. Hence, game and decision theoretic explications of this principle are of immediate relevance to our investigation.

Merin derives his measure of relevance of assertions from measures of the relevance of experimental data in empirical science. The fact that the barometer is rising (E) provides evidence that the weather is becoming sunny. We can see the situation as a competition between two hypotheses: (H) The weather will be sunny, and $(\overline{H})$ The weather will be rainy. For simplicity we may assume that H and $\overline{H}$ are mutually exclusive and cover all possibilities. E, the rising of the barometer, does not necessarily imply that H, but our expectations that the weather will be sunny are much higher after learning E than before. This change of degree of belief can be captured by conditional probabilities. Let P^i represent the given expectations before learning E, i.e. P^i is a probability distribution over possible states of the world (in context i). Let $P^{i'}$ represent the expectations obtained from epistemic context i when E, and nothing else but E, is learned. Modelling learning by conditional probabilities we find that $P^{i'}(H) = P^i(H|E)$, where $P(H|E) := P(H \cap E)/P(E)$ for $P(E) \neq 0$, the probability of H given E. With Bayes' rule we get:

$$P^{i'}(H) = P^i(H|E) = P^i(H) \cdot (P^i(E|H)/P^i(E)). \tag{e.1}$$

$\overline{H}$ denotes the complement of H. Then learning E influences our beliefs about $\overline{H}$ in the same way as it influences our beliefs about H: $P^{i'}(\overline{H}) = P^i(\overline{H}|E)$. We find:

$$P^{i'}(H)/P^{i'}(\overline{H}) = P^i(H|E)/P^i(\overline{H}|E) = (P^i(H)/P^i(\overline{H})) \cdot (P^i(E|H)/P^i(E|\overline{H})). \tag{e.2}$$

Hence, $\log(P^{i'}(H)/P^{i'}(\overline{H})) = \log(P^i(H)/P^i(\overline{H})) + \log(P^i(E|H)/P^i(E|\overline{H}))$. We can see the term $\log(P^i(E|H)/P^i(E|\overline{H}))$ as a measure for the ability of E to make us believe H.

Merin (1999) transfers this measure from empirical sciences to the communication situation. In its new domain we can see $\log(P^i(E|H)/P^i(E|\overline{H}))$ as the (possibly negative) *argumentative force* of E to make the addressee believe that H. Consider a situation where the speaker wants to convince the hearer that H is the case. If P^i represents the epistemic state of the hearer, then an assertion E is the more effective, or relevant, the bigger $\log(P^i(E|H)/P^i(E|\overline{H}))$.

Merin defines *relevance* as a relation between a probability function P representing expectations in some given epistemic context i and two propositions: a proposition H, the *hypothesis*, and a proposition E, the *evidence*. This leads to the following definition[3]:

Definition 1 (Relevance, Merin) *The* relevance $r^i_H(E)$ *of proposition E to proposition H in an epistemic context i represented by a conditional probability function $P^i(.|.)$ is given by* $r^i_H(E) := \log(P^i(E|H)/P^i(E|\overline{H}))$.

Relevance can be positive or negative according to whether E influences the addressee to believe or disbelieve H. In the same way it favours H it disfavours $\overline{H}$, i.e. $r^i_H(E) = -r^i_{\overline{H}}(E)$. Hence, we can model the situation as a zero–sum game between hypotheses H and $\overline{H}$. This fits into Merin's outlook that sees competition and the aim to convince the communication partner of some fact H as the dominant features of conversation.

We don't follow Merin in this respect. For the situations described in Example **(1)** it seems to be more appropriate to model it by a game of complete coordination, i.e. a game where the inquirer's and expert's payoffs completely coincide. But this does not decide about Merin's general attitude, and a discussion of whether we should see conflict or coordination at the bottom of conversation needs more care and space than is available here. What is of more immediate importance is the fact that Merin measures relevance from the perspective of the *receiver* of the information. We will argue below that we need to switch to the *provider's* perspective in order to get the appropriate measure of the utility of answers.

Who's probability is P? It is the purpose of an assertion to influence the expectations of the addressee, hence P must represent the subjective probabilities of the receiver of information, or if the measure is used by the speaker, it must be the subjective probability that the speaker ascribes to the hearer. Approximately, we can identify the addressee's perspective with the *common ground*. In experimentation, the *speaker* is nature and the scientist performing the experiment is the *hearer*. Hence, in both cases, in scientific experimentation and in communication, relevance is defined from the receiver's perspective, i.e. information E is the more relevant the more it influences the receiver's expectations about some hypothesis H. We will argue that in answering a question the dominant goal is not to change the inquirer's, i.e. the receiver's, expectations but to provide information that maximises the expert's, i.e. provider's, expectations about how much E increases the chances of I's success. We will see that van Rooy, who directly addresses questioning and answering using a decision theoretic model, too measures the relevance of an answer from the receiver's perspective. We think that this is the main reason for its inadequateness.

4 Van Rooy's Measure of Relevance

Why do we ask questions? Because we want to resolve a decision problem! That is van Rooy's answer[4]. We will follow him in our analysis of situations like **(1)** which allow for partial answers in Section 6.

Let us first consider whether we can apply Merin's measure for the relevance of assertions to questioning and answering situations. If the inquirer I asks whether ϕ, then we can set $H := \{v \in \Omega \,|\, v \models \phi\}$, and $\overline{H} := \{v \in \Omega \,|\, v \not\models \phi\}$. Assuming that the answering expert applies Grice' principles and selects a proposition with maximal relevance, he has to select a proposition A as answer that maximally affects the inquirer's expectations[5]. Of course, such an answer may

[3](Merin, 1999), Definition 4.

[4](v. Rooy, 2003a, p. 727)

[5]Where we measure an answer's *pure relevance* by the absolute of $r^i_H(A)$; compare Merin (1999), Definition 5.

be highly misleading, even if it has to be truthful. In case of a question like '*Who came to the party yesterday*', we have to consider many competing hypotheses, in fact, all the strongly exhaustive answers in the sense of Groenendijk & Stokhof. It should be possible to generalise Merins approach as long as the set of answers is countable. It becomes more of a problem if the questioning is embedded in a decision problem where the inquirer has to choose between several alternative actions with results that bear different value for him. In this case we can't just measure the amount of information provided by an assertion; we also need to consider the expected gain of profit. Van Rooy's idea was to look at the communicative situation as a problem of decision theory and thereby to derive a criterion for the relevance of questions and answers.

Lets consider an example. An oil company has to decide where to build a new oil production platform. Given the current information it would invest the money and build the platform at a place off the shores of Alaska. An alternative would be to build it off the coast of Brazil. So the ultimate decision problem is to decide whether to take action a and build a platform off the shores of Alaska, or take action b and build it off the shores of Brazil. Now, should the company invest time and explore the off shore fields of Alaska and Brazil more thoroughly before deciding about its actions? If yes, then the company has to find the most efficient way to do it. This type of situation has been thoroughly studied in statistical decision theory[6]. Lets simplify the situation and assume that investigating the oil fields goes without costs. We can capture the essentials of the situation by the following model:

Let Ω be a set of states, $\mathcal{A}$ a set of actions, $U : \Omega \times \mathcal{A} \longrightarrow \mathbf{R}$ an utility measure, and P a probability measure for Ω. Then, the *expected utility* of an action a given P is defined by:

$$EU(a) = \sum_{v \in \Omega} P(v) \times U(v,a). \tag{e.3}$$

The effect of learning a proposition A is again modelled by conditional probabilities. The *expected utility after learning A* is given by:

$$EU(a,A) = \sum_{v \in \Omega} P(v|A) \times U(v,a). \tag{e.4}$$

What a manager wants to have is a criterion that tells him whether or not it is reasonable to investigate the off shore fields before finally deciding the question where to build the platform. As he is a Bayesian utility maximiser, additional explorations are only rational if he can expect that they lead him to choose an action with higher payoff than the action that he would choose now. It can only be higher if newly learned information can induce him to change his decision to build the oil platform off the shores of Alaska, i.e. if it changes his decision for action a. This leads to the following definitions of *relevance*: A proposition A is relevant if learning A induces the inquirer to change his decision about which action a to take. Let a^* denote the action where the expected payoff relative to information represented by P is maximal. Then the *utility value*[7] of proposition A is defined as:

$$UV(A) = \max_{a \in \mathcal{A}} EU(a,A) - EU(a^*,A). \tag{e.5}$$

A is relevant for the decision problem if $UV(A) > 0$. Exactly then the inquirer has a decisive reason to choose another action than a^*. The *expected utility value* of an investigation is then defined by:

$$EUV(Q) = \sum_{q \in Q} P(q) \times UV(q); \tag{e.6}$$

[6] See e.g. (Raiffa & Schlaifer, 1961, Ch. 4), (Pratt et. al., 1995, Ch. 14).

[7] Compare e.g. (Raiffa & Schlaifer, 1961, Sec. 4.5) and (Pratt et. al., 1995).

where Q is the set of all possible results of the investigation. It is reasonable to do additional investigations before finally deciding if $EUV(Q)$ is positive. So we can say that investigating is *relevant* if $EUV(Q) > 0$. Utility value UV and expected utility value EUV are defined from the investigator's perspective. Metaphorically speaking, we can call an experiment a *question*, and a result an *answer* to it. The answering *person*, nature, is not providing information with respect to the investigator's decision problem. There is only one real person involved in this decision model, namely the inquirer. Nature shows oil, or doesn't show oil, according to whether there is oil where the exploration drilling takes place. It does not show it *in order to contribute* to a decision problem, or because it thinks that this is *relevant*. The model does not predict that nature will only give relevant answers, and it does not even say that this were desirable. E.g. assume that there is indeed a very large oil field in the area near Alaska where the company wanted to build the platform given its old information, and a very small oil field in the Brazilian area. If the exploration drilling confirms that the original decision was right, then this is, according to our criterion, irrelevant. Only if by some bad luck the drilling in the Brazilian area gives rise to the hope that there is more oil than in Alaska, we got relevant information.

In (2001; 2001a) van Rooy introduced (e.5) as a measure for the relevance of answers[8]. I hope it became clear, that I don't follow him here. The whole model is a model for a one–person decision problem. The relevance of information is evaluated only from the inquirer's perspective. Hence it is not a trivial claim that this approach provides a measure that can be used by the answering expert E to select the best answer. But, of course, we may try to turn the model into a model for a two-person game. This makes it necessary to reinterpret the formulas above. So we ask: *Who's* probability could P be? There are three possibilities:

1. It is the inquirer's subjective probability.
2. It is the expert's subjective probability.
3. It is the subjective probability that E assigns to I.

Alternatives 1. and 2. are unsatisfactory. If 1., then (e.7) cannot be applied by E. If we assume that (a) the expert can only give answers that he believes to be true, and if we define (b) '*Expert believes q*' by $P_E(q) = 1$, then 2. implies that *any* answer will do as long as E believes it to be true. In order to turn the model into a model for a two-person game we have to choose interpretation 3.[9]. In this case (e.5) advises the answering expert only to choose answers that can make I change his decision.

(5) Assume that it is common knowledge between I and E that there are Italian newspapers at the station with probability $2/3$, and at the Palace with probability $1/3$. What should E answer if he is asked **(1)**: *Where can I buy an Italian newspaper*? According to the initial epistemic state, I decided to go to the station. Lets consider three possible answers: (A) There are Italian newspapers at the station; (B) There are Italian newspapers at the Palace, and $(A \wedge B)$. All three should turn out to be equally relevant but some calculation shows that B is the *only* relevant answer according to (e.5).

[8] "And indeed, it seems natural to say that a cooperative participant of the dialogue only makes a *relevant* assertion in case it makes John *change* his mind with respect to which action he should take. It also seems not unreasonable to claim that in a cooperative dialogue one assertion, A, is 'better' than another, B, just in case the utility value of the former is higher than the utility value of the latter, $UV(A) > UV(B)$." (v. Rooy, 2001a, p. 78), emphasises are van Rooy's. 'John' refers to an inquirer in a previous example.

[9] Of course, that's van Rooy's intended interpretation.

This is clearly not intuitive. The point here is the same as in the oil-drilling example. Van Rooy therefore[10] replaces (e.5) by (e.7) in his later papers:

$$UV(A) = \max_{a \in \mathcal{A}} EU(a,A) - \max_{a \in \mathcal{A}} EU(a). \tag{e.7}$$

(e.7) gives the advice: '*Increase the hopes of the inquirer as much as you can*!' This fixes the problem with Example **(5)** but it's easy to see that we run into a similar problem with *negative* information: Assume that in the scenario of Example **(5)** E knows that there are no Italian newspapers at the station $(\neg A)$; in this case (e.7) implies that $\neg A$ is not relevant because it does not increase the inquirer's expectations. This seems to be quite unintuitive. But the problem can be easily fixed again by taking the absolute | | of the right side of (e.7). And again, this runs into problems. An answer that increases, or changes, the hopes of the inquirer as much as possible is not necessarily a good answer:

(6) Assume a scenario like that in **(5)**. There is a strike in Amsterdam and therefore the supply with foreign newspapers is a problem. It is common knowledge between I and E that the probability that there are Italian newspapers at the station is slightly higher than the probability that there are Italian newspapers at the Palace. Now E learns that the Palace has been supplied with British newspapers but not with Italian ones. In general, it is known that the probability that Italian newspapers are available at a shop increases significantly if the shop has been supplied with foreign newspapers. What should E answer when asked: *Where can I buy an Italian newspaper*?

Some calculation shows that, according to (e.7), E should answer that the Palace has been supplied with foreign newspapers. The same holds for the improved version of (e.7) with the absolute difference. As the probability that there are Italian newspaper at the Palace, *given* that the Palace has been supplied with foreign newspaper, is much higher than the assumed probability for there being Italian newspapers at the station, this answer should lead the inquirer to go to the Palace. But this is the wrong choice as there are no Italian newspapers at the Palace. A good answer should maximise the inquirer's chances for real success, and not maximally increase or change his expectations about success.

In its form of (e.7) the criterion is very close to Merin's criterion of relevance. It may be the proper generalisation of Merin's approach for cases where the speaker does not only want to influence the hearer subjective probabilities but also his expectations about payoffs. So it should be better understood as a measure of the *argumentative force* of an assertion.

As indicated above, I see the main methodological flaw of this approach in its attempt to apply a model for a one-person decision problem to a real communication situation involving two persons. The expectations of the answering expert about the real state of affairs are treated as irrelevant. Of course, this is understandable as the model is derived from a theory that accounts for the value of experimental data where *questions* are directed to nature and where *answers* can only be evaluated from the experimentator's perspective.

[10] See (v. Rooy, 2001a, Sec. 4.3) for a comparable example; but this phenomenon has nothing to do with whether or not we see the situation as a game of complete coordination or of conflict. In (2001) van Rooy considers only scenarios with trivial probability distribution, i.e. where all possible states of affairs have equal probability. See also (v. Rooy, 2003, Sec. 3.1) and (v. Rooy, 2003a, Sec. 3.3).

5 Van Rooy's Order of Relevance

In (v. Rooy, 2003a, Sec. 3.1) van Rooy introduces an *order of relevance* as a simplified version of the measure of relevance introduced before. It is used to define the *set of answers* to a question. This is necessary in order to provide the semantics for embedded interrogatives as in *John knew who came to the party*, or *John knew where to buy an Italian newspaper*. In (v. Rooy, 2003b) this approach is generalised such that arbitrary orders of relevance are covered; i.e. it provides for the definitions of *optimal propositions* and *set of answers* for arbitrary orders of relevance. We restrict our discussion here to (v. Rooy, 2003a, Sec. 5.2)[11], and we discuss it only in as far as to whether it provides a justification of our judgments on appropriateness of partial and strongly exhaustive answers. Although the new order of relevance is introduced as a special case of the order of relevance defined by (e.7), I think that it is interesting on its own. It has an independent intuitive basis and prefers answers that eliminate more possible choices of actions in the inquirer's decision problem.

As mentioned before, Groenendijk & Stokhof define the set of answers to be the set of strongly exhaustive answers:

$$[\![?x.\phi(x)]\!]^{GS} = \{\{v \in \Omega \mid [\![\phi]\!]^v = [\![\phi]\!]^w\} \mid w \in \Omega\}.$$

Van Rooy identifies the set of answers with the set of *relevant* answers. One answer is more relevant than another if it helps more to resolve the inquirer's decision problem (v. Rooy, 2003a, p. 753). The decision problem consists in choosing an action from a set of actions $\mathcal{A}$. For each $a \in \mathcal{A}$ we can define the set of worlds where a is optimal:

- $a^* = \{v \in \Omega \mid \neg\exists b \in \mathcal{A}\, U(v,a) < U(v,b)\}$;
- $\mathcal{A}^* = \{a^* \mid a \in \mathcal{A}\}$.

As v. Rooy writes, the ordering relation on propositions induced by their utility value under certain conditions comes down to the claim that a proposition A is better to learn than a proposition B if A eliminates more cells from $\mathcal{A}^*$ than B. For some special cases this leads to the following order of relevance:

$$\phi(g') >_{\mathcal{A}^*} \phi(g) \textit{ iff } \{a^* \in \mathcal{A}^* \mid a^* \cap [\![\phi(g')]\!] \neq \emptyset\} \subset \{a^* \in \mathcal{A}^* \mid a^* \cap [\![\phi(g)]\!] \neq \emptyset\}. \quad \text{(e.8)}$$

Here, ϕ has two arguments: $\phi(v)(g)$ means that group g is such that '$\phi(g)$' holds in v. Lets consider our question: *Where can I buy an Italian newspaper*? We can consider an answer as specifying a *group* of places where it is possible to buy them; e.g. the answer '*At the palace and at the station*' says that the group $\{Palace, Station\}$ is in the actual world in the extension of the predicate *Place-where-Inquirer-can-buy-Italian-newspapers* (ϕ). With help of the order of relevance defined in (e.8) the most relevant group in each world is determined by:

$$[\![\mathrm{Op}(\phi)]\!] = \{\langle v,g\rangle \mid \phi(v)(g)\,\&\,\neg\exists g'(\phi(v)(g')\,\&\,\phi(g') >_{\mathcal{A}^*} \phi(g))\}. \quad \text{(e.9)}$$

This leads van Rooy to define the set of answers as:

$$[\![?x.\phi(x)]\!]^R = \{\{v \in \Omega \mid g \in \mathrm{Op}(\phi)[v]\} \mid \exists w \in \Omega\, g \in \mathrm{Op}(\phi)[w]\}. \quad \text{(e.10)}$$

I.e. a proposition is a possible answer if it is a set of worlds v such that there exists a world w and an optimal group g for w such that g is also optimal in v.

[11] This is mainly because (v. Rooy, 2003b) is only available as preprint. The reader is encouraged to check Section 3 there.

(7) My decision problem might be, for example, to find out which way is best for me to go to get an Italian newspaper. It could be, for instance, that the *best* way to buy an Italian newspaper is at the station in u, at the palace in v, and that buying one at the station and at the palace is equally good in w. (v. Rooy, 2003a, p.753)

In this case we get $Op(\phi)(w) = \{Palace, Station\}$[12]. The answer set for '*Where can I buy an Italian newspaper?*' is then: $[\![?x.\phi(x)]\!]^R = \{\{u,w\},\{v,w\}\}$[13]. We are here only concerned with whether or not this provides a justification for the judgment that the partial answers '*At the station*' (A) and '*At the Palace*' (B) are equally relevant with respect to information as the exhaustive answer '*At the station and at the Palace*' $(A \wedge B)$. Intuitively, all three answers should be equally good. $A \wedge B$ is more complex, so A or B should be preferred, but this needs an additional pragmatic principle, Grice' Principle of Manner. If $[\![?x.\phi(x)]\!]^R$ is the set of answers the addressee of the question can choose from, then $A \wedge B$ is not even an answer. But this point may turn out to be not important. What is more relevant for our concerns is whether or not there is a way to extend the order of relevance in order to cover answers that include negations as in '*At the station but not at the Palace*'. As soon as an answer entails the negation of A or B it eliminates more possibilities than either A or B. Hence, it should turn out that $A \wedge \neg B$ is more relevant than A, B or $A \wedge B$. But this contradicts our initial judgment that all these answers are equally good with respect to utility. Given the intuitions that underlie (e.8) this generalisation would be natural. This shows that it is not so much important to eliminate unsuccessful options in order to solve a decision problem but to show actions that are successful.

6 Measuring the Utility of Answers and Questions

As the discussion of Merin's and van Rooy's approaches did show, it is essential to take into account the perspectives of the interlocutors. As there are two interlocutors involved in questioning and answering, the inquirer and the addressee of the question, we conclude that we need to model it as a two person game. Under the assumption that interlocutors are Bayesian utility optimisers we see questioning and answering as a two-person sequential decision problem with complete coordination of preferences. This fits well within a dialogue theory that sees collaboration towards joint goals at the heart of communication. The best known such theory is that of Herbert H. Clark (1996). He predominantly analyses dialogue in terms of joint projects. This implies that knowledge about each other, and especially the notion of *common ground*, gets some prominence. Fortunately, we don't need mutual knowledge in our communication model, but we represent some knowledge about the knowledge of others. We follow van Rooy and see questioning and answering situations that allow for partial answers as subordinated to a final decision problem of the inquirer. Hence, we find three successive decision problems:

Inquirer I Asks		Expert E answers		I decides for action		Evaluation
$\downarrow$		$\downarrow$		$\downarrow$		$\downarrow$
$\bullet$	$\xrightarrow{Q?}$	$\bullet$	$\xrightarrow{A}$	$\bullet$	$\xrightarrow{a}$	$\bullet$
$\uparrow$		$\uparrow$		$\uparrow$		$\uparrow$
subject. expectations of I $\langle \Omega_I, P_I \rangle$		subject. expectations of E $\langle \Omega_E, P_E \rangle$		subject. expectations of I $\langle \Omega, P \rangle$		utility measure $U(v,a)$

[12]This is van Rooy (2003a, p. 753).
[13]This is again van Rooy's calculation.

We denote the inquirer again by I, and the answering person by E. As before, let Ω be a fixed set of states of the environment, $\mathcal{A}$ a set of actions, $U : \Omega \times \mathcal{A} \longrightarrow \mathbf{R}$ an utility measure. The model will represent (a) I's final beliefs about the world, (b) expectations of E about I's beliefs about the state of the environment, and (c) expectations of I about E's answering situation.

Why do we want to represent E's expectations about I's beliefs? Consider again a scenario like that in **(6)**.

(8) There is a strike in Amsterdam and therefore the supply with foreign newspapers is a problem. It is common knowledge between I and E that I has a clear preference to buy his newspapers at the station. Now E learns that the Palace has been supplied with Italian newspapers and he knows that both, the station and the Palace, get their newspapers from the same supplier. As the supplier favours none of his customers, the probability that the station too got Italian newspapers is quite high. Now, E knows that I thinks that the Palace and the station probably get their Italian newspapers from different sources, hence the fact that the Palace got them does not indicate to I that the station got them too. We assume that E should only say what he believes to be true, i.e. we assume that only propositions A with $P_E(A) = 1$ are admissible as answers. If he does not take into account I's beliefs, then it seems the best answer he can give to the question '*Where can I buy an Italian newspaper*?' is '*The Palace got Italian newspapers today*'. But this would induce I to go to the Palace, although E knows that I's expected utility is higher if he goes to the station.

(a) The inquirer I has to decide in the final situation about which action a to take according to his expectations about the actual states of affairs. We assume that his decision does not depend on what he believes that the expert E believes. Hence we can represent his epistemic state by a pair $\langle \Omega, P \rangle$, where P represents his knowledge about the actual world.

I's Decision Situation: It is given by a probability space $\langle \Omega, P \rangle$ and an utility measure U.

(b) We assume that the answering expert E wants to maximise I's final success. Hence, E's payoff is identical with I's. E has to choose his answer in such a way that it optimally contributes towards I's decision. In general, he has to calculate how I will decide if he provides him with some information A. Therefore, our model must take into account what E expects about what I knows. Hence, we represent the possible states of affairs in E's decision situation by pairs $\langle v, \langle \Omega, P \rangle \rangle$, where $v \in \Omega$ is a possible state of the environment and $\langle \Omega, P \rangle$ a possible information state of I. The states $\langle \Omega, P \rangle$ are intended to represent I's knowledge *before* he learned E's answer. I assume that all probability spaces that I will introduce are finite.

E's Answering Situation:

- $\Omega_E := \{\langle v, \langle \Omega, P \rangle \rangle \mid v \in \Omega,\, P$ a probability measure on $\Omega\}$.
- P_E is a probability measure on Ω_E.

Note that any probability measure P_E on Ω_E induces a probability measure on Ω by $P_E(v) := P_E(\{\langle u, \langle \Omega, P \rangle \rangle \in \Omega_E \mid v = u\})$.

(c) The inquirer I in his initial situation may take into account what he believes that E believes. Hence we represent the possible states in I's initial decision situation by pairs $\langle v, \langle \Omega_E, P_E \rangle \rangle$, where $\langle \Omega_E, P_E \rangle$ is a possible information state of E.

I's Questioning Situation:

- $\Omega_I := \{\langle v, \langle \Omega_E, P_E \rangle \rangle \mid v \in \Omega,\, P_E$ a probability measure on $\Omega_E\}$.

- P_I is a probability measure on Ω_I.

Again, we get a probability measure on Ω by $P_I(v) := P_I(\{\langle u, \langle \Omega_E, P_E\rangle\rangle \in \Omega_I \mid v = u\})$.

How to determine the utility of answers? The idea is to calculate backward from the final evaluation situation, i.e. by backward induction. This is indeed the most natural and straightforward solution to our decision problems.

Calculating Backward Expected Utilities

The final Decision Situation: The expected utility of an action $a \in \mathcal{A}$ is calculated according to (e.3):

$$EU_{\langle \Omega, P\rangle}(a) := \sum_{v \in \Omega} P(v) \times U(v,a). \tag{e.11}$$

Hence E calculates I's expected utilities in situation $v = \langle w, \langle \Omega, P_v\rangle\rangle$ after learning A by:

$$EU_{\langle \Omega, P_v\rangle}(a,A) = \sum_{u \in \Omega} P_v(u|A) \times U(u,a). \tag{e.12}$$

Let $a^v_A := \mathrm{indmax}_{a\in\mathcal{A}} EU_{\langle \Omega, P_v\rangle}(a,A)$. If it is not unique, we assume some mutually known tie breaking rule. According to our assumption, E's payoff function is identical with I's payoff function U, i.e. questioning and answering is a game with complete coordination. In order to maximise his own payoff, E has to choose an answer such that it induces I to take an action that maximises their common payoff.

The Answering situation: We use again (e.3) for calculating the expected utility of an answer $A \subseteq \Omega$:

$$EU_{\langle \Omega_E, P_E\rangle}(A) := \sum_{v \in \Omega_E} P_E(v) \times U(v, a^v_A). \tag{e.13}$$

We add here a pragmatic constraint: An answer is admissible only if $P_E(A) = 1$. This means that we only allow for answers that the expert E believes to be *true*. For $v = \langle w, \langle \Omega_E, P^v_E\rangle\rangle \in \Omega_I$ let $Adm(v) := \{A \subseteq \Omega \mid P^v_E(A) = 1\}$, the set of *admissible*, i.e. true, answers. This leads to the following definition of the set of optimal answers in situation v:

$$\mathrm{Op}(v) = \{A \in Adm(v) \mid \forall B \in Adm(v)\, EU_{\langle \Omega_E, P^v_E\rangle}(B) \le EU_{\langle \Omega_E, P^v_E\rangle}(A)\}. \tag{e.14}$$

If there are several optimal answers, then we assume again that E's choice from $\mathrm{Op}(v)$ is determined (in a mutually known way). We denote this unique answer by A^v.

Going back to I's initial querying situation, we have to switch perspectives again. In order to calculate his expected utilities for questions, I has to take into account which action he would choose if he gets some information A. We denote this action by a_A. I can calculate for all possibilities $v = \langle u, \langle \Omega_E, P_E\rangle\rangle \in \Omega_I$ the answer A^v that is optimal from E's perspective given by $\langle \Omega_E, P_E\rangle$. Hence, he can conclude that in situation v he will be led to take action $a_{A^v} = \mathrm{indmax}_{a\in\mathcal{A}} EU_{\langle \Omega, P_I\rangle}(a, A^v)$, where P_I is the probability measure induced on Ω and where we have to use the tie braking rule if a_{A^v} is not unique.

The Querying situation: The expected utility of a question Q can then be calculated by:

$$EU_{\langle \Omega_I, P_I\rangle}(Q) := \sum_{v \in \Omega_I} P_I(v) \times U(v, a_{A^v}). \tag{e.15}$$

$EU_{\langle\Omega_I,P_I\rangle}(Q)$ does not depend on Q. This is a consequence of calculating utilities with respect to a fixed decision problem. This is the point where our pragmatic backgrounds assumptions of Section 2 enter. There we claimed that a question introduces the immediate goal of providing a strongly exhaustive answer; this goal may be subordinated to further ends that provide for additional targets that can override the immediate goal of exhaustively resolving the question. These further ends may be given in the background, or they may be inferred from the question by help of some plan recognition mechanism. All these goals and further ends have to be represented in our model by the utility function U. Hence, in (e.15), U should have a subscript Q. Lets consider e.g.:

(9) **a)** Where can I buy an Italian newspaper? (Q)
b) Are there Italian newspapers at the station? (Q')

Let $\mathcal{A} = \{a,b\}$, the actions of going to the station and going to the Palace. We can represent the difference between Q and Q' by the assumption that $U_Q(w,a) = U_{Q'}(w,a)$ and $U_Q(w,a) = 1$ iff in w there are Italian newspapers at the station; $U_Q(w,b) = 1$ iff in w there are Italian newspapers at the Palace and $U_{Q'}(w,b) = 0$ for all w. How U_Q has to be defined in general given the common background and the inquirer's question lies outside of our investigation.

The Examples Reconsidered

Let us first consider the answers of Example **(2)**. Let $\mathcal{A} = \{a,b\}$, the actions of going to the station and going to the Palace. Let $A \subseteq \Omega$ be the set of worlds where there are Italian newspapers at the station, and $B \subseteq \Omega$ where they are at the Palace. Let $\overline{A}$ and $\overline{B}$ denote the respective complements. We represent the payoffs as follows: $U(w,a) = 1$ iff $w \in A$, $U(w,b) = 1$ iff $w \in B$.

If E knows that A, then A is an optimal answer:

$$EU_{\langle\Omega_E,P_E\rangle}(A) = \sum_{v\in\Omega_E} P_E(v) \times U(v,a^v_A) = \sum_{v\in A} P_E(v) \times U(v,a) = 1$$

No other answer can yield a higher payoff[14]. In the same way it follows that B is optimal if E knows that B. The same holds for $A \wedge B$ and the strongly exhaustive answer.

If E knows only $\neg A$, hence $P_E(\overline{A}) = 1$, then $\neg A$ is an optimal answer:

$$EU_{\langle\Omega_E,P_E\rangle}(\overline{A}) = \sum_{v\in\Omega_E} P_E(v) \times U(v,a^v_{\overline{A}}) = \sum_{v\in\overline{A}} P_E(v) \times U(v,b) = P_E(\overline{A} \cap B) = P_E(B).$$

If $P_E(C) = 1$, then for $v \in \Omega_E$ either $a^v_C = a$ or $a^v_C = b$. Let $B_C := \{v \in \Omega_E \mid a^v_C = b\}$. Then

$$EU_{\langle\Omega_E,P_E\rangle}(C) = \sum_{v\in B_C} P_E(v) \times U(v,b) = P_E(B_C \cap B) \leq P_E(B).$$

Here enters: $P_E(C) = 1 \Rightarrow P_E(C \cap A) = 0$. Hence, no other answer than $\neg A$ can be better[15].

Lets consider Example **(6)**. We use the same utility function as before. Let N denote the set of all $u \in \Omega$ where the Palace has been supplied with British newspapers. We model the epistemic states described in **(6)** by the following condition: For all $v = \langle u, \langle\Omega,P\rangle\rangle \in \Omega_E$ it holds that:

[14]There could be a problem if I believes that B and E has evidence that B is unlikely. Hence, the result stated above holds in full generality only if we assume in addition e.g. that E believes that I can't be convinced of B. In all calculations there are additional pragmatic assumptions that should be made explicit in a more rigorous presentation. E.g. we repeatedly have to assume that for conditional probabilities $P(u|A)$ it holds that $P(A) > 0$.

[15]It is important that I can only choose between actions a and b. The result holds even if $C = B$.

1. $P(A) > P(B)$ and $P(B \cap N) > P(A \cap N)$;
2. $P_E(A) > P_E(B)$, $P_E(A \cap N) = P_E(A)$ and $P_E(B \cap N) = P_E(B)$.

Is N a good answer? Let $v \in \Omega_E$:

$$EU_{\langle \Omega, P_v \rangle}(a,N) = \sum_{u \in N} P_v(u|N) \times U(u,a) = P(A \cap N).$$

and

$$EU_{\langle \Omega, P_v \rangle}(b,N) = \sum_{u \in N} P_v(u|N) \times U(u,b) = P(B \cap N).$$

Hence $a_N^v = b$. We get

$$EU_{\langle \Omega_E, P_E \rangle}(N) = \sum_{v \in N} P_E(v) \times U(v,b) = P_E(N \cap B) = P_E(B) < P_E(A)$$

It is easy to see that $EU_{\langle \Omega_E, P_E \rangle}(\Omega) = P_E(A)$. Hence, N cannot be the best answer. Let C be such that $P_E(C) = 1$. Let $A_C := \{v \in \Omega_E \mid a_C^v = a\}$ and $B_C := \{v \in \Omega_E \mid a_C^v = b\}$. Then:

$$EU_{\langle \Omega_E, P_E \rangle}(C) = \sum_{v \in A_C} P_E(v) \times U(v,a) + \sum_{v \in B_C} P_E(v) \times U(v,b) = P_E(A_C \cap A) + P_E(B_C \cap B) \quad \text{(e.16)}$$

Is it possible that E has a better answer than saying nothing although he does not know more about A and B than the inquirer? Well, it is.

(10) Imagine that there is a causal relation between who is delivering Italian newspapers this morning and whether or not there are newspapers at the station and Palace. E knows that a man named *van den Berg*[16] delivered them this morning. Assume that E knows that I can infer from who delivered the newspapers whether there are Italian newspapers at the station or at the Palace. In this case E has a better answer than saying nothing:

I: Where can I buy an Italian newspaper?

E: A man named ‘van den Berg’ delivered the newspapers this morning. (C)

In addition, this example shows that our theory does not say that the relevance measured from the receiver's perspective, i.e. the inquirer's, is irrelevant for determining the best answer. C carries no information for E, only for I. It only says that, in general, the inquirer's perspective is not enough. It takes two for communicating.

References

H.H. Clark (1996): *Using Language;* Cambridge.

J. Groenendijk, M. Stokhof (1984): *Studies in the Semantics of Questions and the Pragmatics of Answers;* Ph.D. thesis, University of Amsterdam.

J. Groenendijk, M. Stokhof (1997): *Questions;* in: J. v. Benthem, A. ter Meulen (eds.): *Handbook of Logic and Language*, Amsterdam, the Netherlands; pp. 1055-1124.

[16] I was told that — in spite of its complete flatness — this is the most common name in the Netherlands.

A. Merin (1999): *Information, Relevance, and Social Decisionmaking: Some Principles and Results of Decision-Theoretic Semantics;* In: L.S. Moss, J. Ginzburg, and M. de Rijke (eds.): *Logic, Language, and Information* Vol. 2; Stanford.

J.W. Pratt, H. Raiffa, R. Schlaifer (1995): *Introduction to Statistical Decision Theory;* The MIT Press, Cambridge, Massachusetts.

H. Raiffa, R. Schlaifer (1961): *Applied Statistical Decision Theory;* Harvard.

R. v. Rooy (2001): *Utility of Mention-Some Questions;* To appear in *Journal of Language and Computation*.

R. v. Rooy (2001a): *Questions and Answers in cooperative and non-cooperative settings;* in: P. Kühnlein, A. Newlands, H. Rieser (eds.): *Proceedings of the Workshop on Coordination & Action*, pp. 71–90.

R. v. Rooy (2003): *Quality and Quantity of Information Exchange; Journal of Logic, Language, and Computation* 12, pp. 523–451.

R. v. Rooy (2003a): *Questioning to Resolve Decision Problems; Linguistics and Philosophy* 26, pp. 727–763.

R. v. Rooy (2003b): *Questions and Relevance;* In: Questions and Answers: Theoretical and Applied Perspectives (Proceedings of 2nd CoLogNET-ElsNET Symposium, pp. 96–107.

Aspect, Scope, and Future Conditionals*

Bridget Copley,
University of Southern California

copley@usc.edu

Abstract

This paper argues that though *will* and *be going to* both involve a future modal, their meanings differ aspectually. *Be going to* includes a progressive-like aspectual operator that takes scope over the future modal. *Will,* on the other hand, is ambiguous between a reading that is the future modal alone, and a reading that has a generic-like aspectual operator over the modal. The evidence for these logical forms consists primarily of modal effects caused by aspectual operation on the temporal argument of the future modal's accessibility relation. Similar evidence motivates a proposal that future modals in conditionals can have scope either over or under the antecedent of the conditional. These findings argue against analyses that treat futures as a kind of tense, and suggest possible directions for theories of aspect, modals, and conditionals.

1 Introduction

The goal of this paper is to provide a better understanding of futures in general, through comparison of *will* with another future, namely *be going to*. *Will* and *be going to,* I will argue, contain the same future modal, differing only in aspect. *Be going to* has a progressive-like operator located just under tense and over the future modal, while *will* initially at least seems to have no aspectual component. *Will,* however, is later argued to be ambiguous between an aspect-free reading and a reading with a generic-like aspectual operator. In all these cases, the aspect, or lack thereof, has detectable effects on the temporal argument of the future modal's accessibility relation.[1]. However, since we know that higher *tense* has an effect on the temporal argument of accessibility relations, perhaps we should not be too surprised to see aspectual effects as well. A class of apparent counterexamples to the *be going to* proposal is shown to have a different scope for *be going to,* and a class of apparent counterexamples to the *will* proposal is accounted for via a reading of *will* with generic aspect. Subsequently the evidence for scope distinctions among *will* conditionals is examined. We are left with a fairly varied picture of future conditionals.

2 Aspect of *be going to*

In this section I offer a puzzle about offering, and solve the puzzle by proposing an aspectual difference between *be going to* and *will*. The puzzle is this: Why can *will* be used to make an offer, while *be going to* seemingly cannot be? The eventual solution is that *be going to* consists

*This research was supported in part by an NSF Graduate Research Fellowship and a Kosciuszko Foundation Tuition Scholarship. The author also wishes to thank Sabine Iatridou, Norvin Richards, Jennifer Cunningham, Kai von Fintel, Irene Heim, Elena Guerzoni, Noam Chomsky, and Joseph 'Jofish' Kaye.

[1]The effect of higher aspect on modals has not been much remarked upon; in fact, the very existence of aspect in that position has not been much remarked upon (Cinque (2002), Tenny (2000)

of a progressive-like aspectual operator on top of a future modal, and that this combination conflicts with a pragmatic requirement on acts of offering.

As a first step in the argument that *will* and *be going to* differ aspectually, it is necessary to demonstrate that *will* and *be going to* do in fact differ in meaning. It is not immediately obvious that they do; in some contexts, as in (1), they seem almost interchangeable.

(1) a. It will be sunny tomorrow
  b. It's going to be sunny tomorrow.

Certain contexts, however, bring out clear assertability differences. Consider the sentence in (2a), seen outside Madera, California, on a billboard advertising a mechanic's shop. The sentence in (2b) was not on the billboard, and in fact could not felicitously have been used there.

(2) a. We'll change your oil in Madera. $\surd$offer
  b. We're going to change your oil in Madera. #offer

Thus here is a difference between *will* and *be going to*. Intuitively, (2a) is used to make an offer that you can take or leave. But the sentence in (2b), in the context given, is not an offer. Rather, it is somewhat bullying. The threatening nature of (2b) seems to stem from the intuition that there is no chance for you to have a say in the matter.

Suppose we consider in more depth what it is to make an offer. First, the contribution of the speaker. It seems clear that only someone who believes they can say whether an eventuality happens or not can felicitously make an offer for that eventuality to happen. I cannot felicitously offer for it to rain tomorrow, for instance, because I have no power over the weather, and I know it. So in order for an individual s ("speaker") to be able to make a valid offer to carry out a q-eventuality (an eventuality of which a predicate q holds), s must have power over whether a q-eventuality holds occurs. Let's call this ability (without going into a precise modal characterization of ability) *direction* (Copley 2002b).

(3) An individual s *directs* q just in case s has the ability to determine whether q happens.

The one to whom the offer is made, whom I will refer to as h ("hearer"), also seems to have some control over whether the q-eventuality occurs. It should happen if h wants it to happen, and, equally importantly, it should not happen if h wants it not to happen. It would certainly be rude for someone to make an assertion that entails that in some cases where you do not want them to change your oil, they do it anyway. For an utterance to count as an act of offering, the speaker's carrying out of the offered eventuality has to be contingent on the interlocutor's preferences.

Let's treat a sentence of offering as a conditional with an elided antecedent *if you want q*, an overt consequent *will q*, and a presupposition that d has power over whether a q-eventuality occurs. The offerer s, in uttering that sentence in good faith, asserts the truth of that conditional. On a Lewis-Kratzer-style account of conditionals (Lewis (1986), Kratzer (1986)), s asserts that in all worlds where h wants q, a q-eventuality happens. And let us further agree that in making a valid offer, s is also committed to the truth of the proposition expressed by the conditional *If you don't want q, won't q* (where *don't want* = *want not*). This commitment reflects our intuition that the hearer's desires have an effect on whether a q-eventuality happens; it happens only if the hearer wants it to. Note that this commitment is not required by anything about the semantics of the conditional, but rather is just a pragmatic requirement on offers.

We also need a condition on offers. (I have abbreviated the intensional verbs *want* and *be-*

lieve; w-t-*believe*, for instance, is short for “believes in w at t,” with the usual possible world semantics.)

(4) *Condition on offers:* A person s offers in w at t to bring about a q-eventuality for h only if s w-t-believes that: $\forall w'$ that agree with w up to t: $[\exists t'$ such that s directs q in w' at t': $[h\ w'\text{-}t'\text{-wants}\ q \Leftrightarrow \forall w''$ that agree with w' up to t': $[\exists t'' > t' : [q(w'')(t'')]]]]$

Now let’s see how this characterization of offering intuitively conflicts with the semantics of *be going to*. According to our assumption, an offering utterance is interpreted with a certain kind of antecedent, whether or not it is pronounced. In that case, the billboard utterances actually have the meaning of the conditionals given in (5):

(5) Revision of the billboard utterances

a. (If you want us to change your oil in Madera,) we will change your oil in Madera.

b. #(If you want us to change your oil in Madera,) we are going to change your oil in Madera.

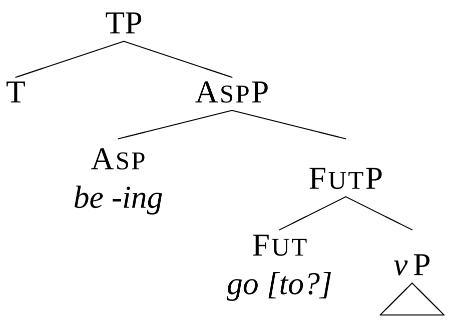
The problem with (5b) seems to be a conflict with part (b) of the offering condition in (4), instantiated in this case as follows:

(6) If you don’t want us to change your oil in Madera, we won’t change your oil in Madera.

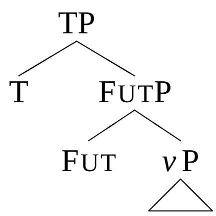
While (6) feels consistent with (5a), it feels inconsistent with (5b). This intuition is what is responsible for the feeling noted earlier: Felicitous offering requires the offerer to take the hearer’s desires into account, but using *be going to* feels like a decision has already been made, without prior consultation with the hearer.

The question we have arrived at is this: What is it about the meaning of *be going to* that causes (5b) to contradict (6)? The answer to this question, I propose, is that *be going to* consists of a progressive-like aspectual operator scoping over a future modal. The proposed structure is as in (7a) below. Tense is marked on the progressive auxiliary, yielding *was/were going to*.[2] Note that (7a) is minimally different from a proposal for the logical form of *will* and *would* (Abusch 1985), shown in (7b).

(7) a. *Be going to* (Copley 2001, 2002a, b)



b.



Two considerations motivate the proposed structure in (7a). The first is morphological. *Be -ing* often marks progressives; perhaps it does just that, or something quite like that, in *be going to*. English is notorious for reusing morphology, but the presence of *be -ing* should at least

[2] *To* is not separable from *going* (Copley 2001), giving the impression that *be going to* is something of an idiom. It is not unusual for constructions to lose transparency as they progress from main verb to tense/aspect marking (Dahl 1985).

prompt an investigation into the possibility of progressive semantics. And if we decide to take the morphology seriously, and if we believe in the Mirror Principle (Baker 1985), the future projection, presumably *go*, ought to be lower than the aspectual head, which is itself lower than the tense head.

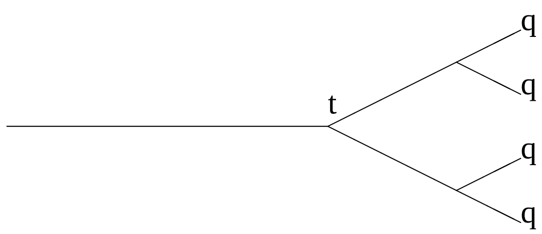
The second consideration is semantic in nature. The core meaning of progressives involves a kind of “ongoingness;” if John was singing, then at the time under discussion, the John-singing eventuality was already ongoing. Recall the intuition about why *be going to q* is not a felicitous offer: It’s already true that a q-eventuality will happen, so the hearer has no chance to say yea or nay. We may understand this fact as reflecting a kind of “ongoingness,” not of the eventuality itself, but of the *futurity* of the eventuality. If so, this intuition is another reason to give serious attention to the idea that there is something like a progressive scoping over the future element.

To evaluate the hypothesis, we need to flesh it out with specific future and progressive elements from among the existing literature: a version of Thomason’s (1970) future operator, and a very simple progressive operator first proposed by Bennett and Partee (1978). Thomason’s operator is defined as follows:

(8) (Thomason 1970): For any time t and world w, $\textsc{Fut}(w)(t)(q)$
$= 1$ if $\forall w'$ that agree with w up to t: $\exists t'$: $t < t'$ and $q(w')(t') = 1$;
$= 0$ if $\forall w'$ that agree with w up to t: $\neg\exists t'$: $t < t'$and $q(w')(t') = 1$;
and is undefined otherwise.

The definition in (8) says that for any instant t and world w, $\textsc{Fut}(w)(t)(q)$ is defined just in case all the worlds share a truth value for q at the time in question. Then, if $\textsc{Fut}(w)(t)(q)$ is defined, it is true if on all worlds that agree with w up to t, there is some time t' that is later than t, at which q is true; and it is false if on all worlds that agree with w up to t, there is no time t' that is later than t at which q is true. The figure in (9) represents graphically a case in which $\textsc{Fut}(w)(t)(q)$ is true: The horizontal line in the diagram below represents the actual world, and the lines branching off represent the set of accessible worlds at time t.

(9) A case in which $\textsc{Fut}(w)(t)(q)$ is true



The Bennett and Partee progressive operator, which I will call ”P”, is a very simple one; it is true at a world and a time just in case its propositional argument is true at a superinterval of that time, in that world.[3]

(10) $P(w)(t)(p) = 1$ iff $\exists t' \supset t$: $p(w)(t')$

Let us assume that present tense is null, and that *will* is just Thomason’s modal $\textsc{Fut}$, while

[3]This denotation of progressive aspect (Bennett and Partee 1978) runs afoul of the imperfective paradox, as noted by (Dowty 1979). Thus P cannot be the denotation of a “real” progressive. In Copley (2002b), I argue, following Dowty and practically everyone since (e.g., Landman (1992), Portner (1998), Cipria and Roberts (2000)) that “real” progressives have a modal component as well as this temporal component. I diverge from earlier accounts by pointing out a number of similarities between the modal component of “real” progressives and the future modal.

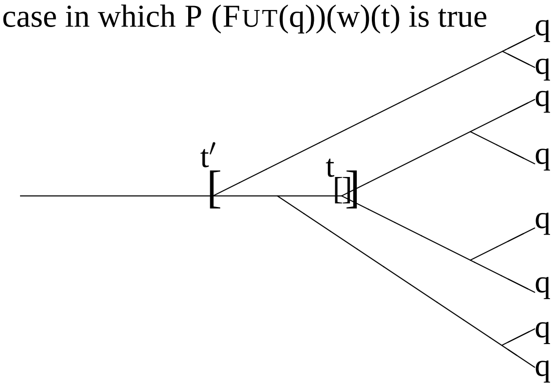
be going to has the proposed structure, with a Bennett and Partee progressive scoping over the Thomason modal, as expanded below.

(11) $P(w)(t)(\text{FUT}(q)) = 1$ iff $\exists t' \supset t$: $[\text{FUT}(w)(t')(q) = 1]$
$P(w)(t)(\text{FUT}(q)) = 1$ if $\exists t' \supset t$: $[\forall\, w'$ that agree with w up to t': $[\exists t''$: $t' < t''$ and $q(w')(t'') = 1]]$

How can we characterize the set of worlds quantified over by this denotation of *be going to*? P, evaluated at t, w, and p, yields a truth value of 1 just in case p holds over a superinterval t' of t in w, where t is an internal interval of t'. *Be going to* represents a case where p is $\text{FUT}(q)(w)(t')$ (for some q).[4]

The worlds *be going to* quantifies over are not just the set of worlds $\text{FUT}(q)(w)(t)$ quantifies over, i.e., those that branch off during t, but a larger set of worlds: the worlds that branch off during some interval t' that surrounds t. We would represent the worlds *be going to* quantifies over as below in (12). If $[\![$*be going to*$]\!](q)(w)(t)$ is true, that entails that all the worlds pictured branching off during some t' are q worlds, as shown in (12).

(12) A case in which P (FUT(q))(w)(t) is true



Be going to therefore quantifies over not only the worlds that FUT would quantify over given the same arguments, but also over additional worlds — those that branch off during t' but before the beginning of t — as long as t is not an initial interval of t'. While we could explicitly define the relation between t and t' to exclude such a possibility, there is no need to do so if we adopt a common[5] assumption that the actual world only exists up to the time of utterance; equivalently, that future world-time pairs are not available except via modal means.

We are now in a position to return to the puzzle about offering, and explain why the speaker of ((13)a) (i.e., the billboard *be going to* utterance with the elided antecedent made explicit) cannot also consistently assert ((13)b), part of the offering condition.

(13) a. #If you want us to change your oil in Madera, we're going to change your oil in Madera.
b. If you don't want us to change your oil in Madera, we won't change your oil in Madera.

Let p = the proposition expressed by *you want us to change your oil in Madera* (in the context in question); q = the proposition expressed by *we change your oil in Madera* (in the context in

[4]Thomason's original operator must be altered slightly so that it takes intervals rather than instants. The change is to substitute "agree with w up to the beginning of t" for "agree with w up to t" in the denotation of FUT. Intuitively, we can speak of branching worlds that branch off during an interval, rather than at an instant.

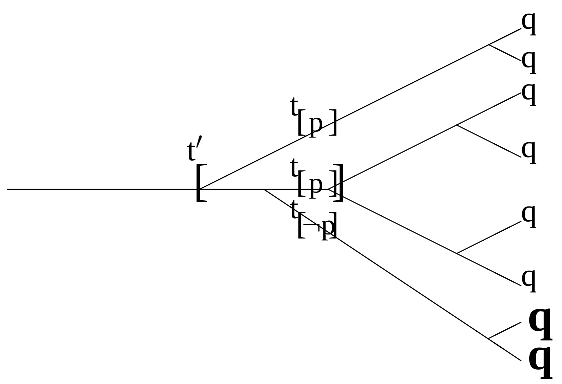
[5]See, among others, Prior (1967) and Abusch (1998) for independent justification of this assumption.

question); and t = a time at or after the reading of the billboard (i.e., the time when it matters whether the hearer wants q, and at which the offerer is prepared to bring about a q-eventuality). Then ((13)a) and ((13)b), the incompatible utterances from the puzzle, turn out as follows.

(14) a. all worlds w such that p(w)(t) = 1 are worlds in which P(w)(t)(FUT(q)) = 1
b. no worlds w such that p(w)(t) = 1 are worlds in which FUT(w)(t)(q) = 1

Now we will see how the current proposal derives the intuition that (14a) and (14b) are incompatible, solving the puzzle. Suppose now we consider one of the worlds in which p is true at t. We can imagine possible worlds in which p is not true at t (i.e., worlds in which not-p is true at t, assuming contradictory negation for the sake of simplicity). These worlds would have to branch off from the p world before t. Of course, not all of the worlds that branch off before t are worlds that have not-p true at t; some of the worlds that branch off before t make p true at t. In general, for any interval t′ which properly includes t, there will be some worlds that branch off from the actual world during t′ such that not-p is true at t (given, again, that t cannot be an initial interval of t′). Now, let us further suppose that (14a) is true. Therefore on any world that makes p true at t, there is an interval t′ such that all the worlds that branch off during t′ make q true at some later interval. This state of affairs is given below in (15).

(15)



But now notice that in a situation in which (14a) is true — that is, in which there is an interval t′ including t such that all worlds branching off during t′ have q true at some later time — there can still be not-p worlds among these q worlds. Two such worlds in the diagram above are those with boldface, larger q. The existence of such worlds is inconsistent with the condition in (14b) that all not-p worlds are worlds in which not-q will happen (assuming that q and not-q are inconsistent). That, then, is why the *be going to* sentence can't be used to make an offer. This incompatibility with a condition on offering explains the infelicity of *be going to* in this context, and is the correct characterization of the puzzle.

That this is the right approach to the puzzle becomes clear when we consider contexts in which not-p worlds are assumed to be non-existent. In these contexts, *be going to* sentences don't sound so rude. Consider, for example, another possible billboard (you are already in Madera):

(16) We're going to make you happy in Madera.

The sentence in (16) isn't exactly an offer, but neither is it entirely rude. The reason it is not so rude is that it is safe for the speaker to assume that there are no not-p worlds; that is, conceivably, if you are already in Madera, there are no possible worlds in which you don't want to be happy in Madera. The utterance of (16) thus doesn't entail that any not-p worlds are q worlds. Hence no conflict emerges.

The puzzle we began with, i.e., that *be going to* cannot be used to make an offer, provided empirical support to the proposal that this construction involves two ingredients: progressive-like aspect and a future modal. Indeed the semantic result of composing these two operators is apparently incompatible with what it means to make an offer.

Thus we have seen that an aspectual difference between *will* and *be going to* can account for modal differences between them. The modal semantics, we suppose, are indistinguishable, but because there is a temporal input to the accessibility relation, a difference in aspect means a difference in the set of worlds quantified over by the modal. In this case we saw that a progressive future conditional *If p, be going to q* will typically entail that some[6] not-p worlds are q worlds, while a *will* conditional will not have such an entailment.

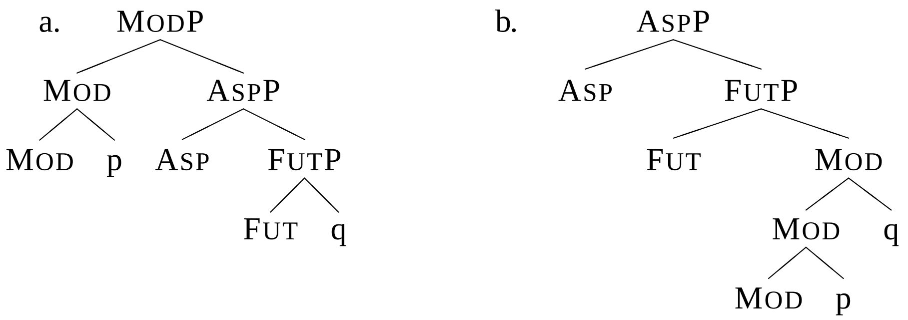
Let's call the entailment triggered by *be going to* the *anyway entailment,* since what is conveyed is that a q-eventuality will happen anyway whether a p-eventuality happens or not.

(17) *anyway entailment:* Some not-p worlds are q worlds

Conditionals that entail the anyway entailment I will term "anyway-entailing;" those that conflict with it I will call "anyway-conflicting".[7]

3 Scope of *be going to*

In this section we will see that the aspectual component of *be going to* provides a way to detect scope differences among *be going to* conditionals. To do this, we first need to get a bit more precise about the logical form of the future modal. The presence of the aspectual element P makes it clear that P, and also FUT, must be part of the consequent of the conditional. For what drives the argument of the preceding section is the idea that all p worlds are "be going to q" worlds *at the time at which p is evaluated*. That is, the antecedent p and the constituent *be going to q* (= ASP FUT q) must get the same temporal argument. This is possible in a structure such as (18a), where *be going to q* is a constituent. This is not possible in a structure such as (18b) where *be going to q* is not a constituent, as *be going to* has scope over both *p* and *q*.[8]

(18)


narrow scope reading wide scope reading

[6] Actually, no other not-p worlds are accessible, so *all* not-p worlds under consideration are q worlds.

[7] Again, it will be important to remember that the semantics of conditionals, by assumption, has nothing to say about the not-p worlds; i.e., there is nothing inherently wrong with *be going to* in conditionals per se. Whether a conditional conflicts with the anyway entailment has rather to do with the pragmatics of the particular conditional.

[8] As we begin to construct trees for future conditionals, we have an immediate choice to make: Does the future modal take two (overt) propositional arguments, as is frequently proposed for modals, or does it take only one, as we have been assuming along with Thomason? We have no need for FUT to take two overt propositional arguments in this case; if it needed two arguments we would have to put a null argument in. As this is unwieldy, I will continue to assume that FUT has only one propositional argument seen by the syntax. Of course I do not mean to rule out contextually-supplied, syntactically invisible restrictions on FUT.

The informal meanings associated with the structures in (18) are given in (19); again, it is clear that the reading in which *be going to* has narrow scope is the one we want.

(19) a. if p, q is going to happen — narrow scope
b. it's going to be like this: if p, q — wide scope

To give a formal denotation for narrow scope *be going to* conditionals, let us assume a very bland modal semantics for the null modal:[9]

(20) $\text{MOD}(w)(t)(p)(q) = 1$ iff $\forall\, w'$ such that w' is accessible from w,t and $p(w')(t)$:
$[\exists t' \geq_q t: [q(w')(t') = 1]]$

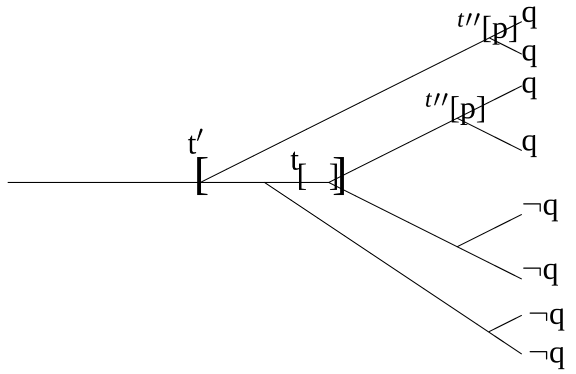
The denotation of a narrow *be going to* conditional is given in (21), and that of a wide scope *be going to* conditional in (22).

(21) Narrow *be going to:* For any time t and world w,
$= \text{MOD}(w)(t)(p)(P(\text{FUT}(q)))$
$= 1$ if $\forall w'$ s.t. w' is accessible from w,t and $p(w')(t)$:
$[\exists t' \supset t: [\forall\, w''$ s.t. w'' is accessible from w', t':
$[\exists t'' > t': [q(w'')(t'') = 1]]]]$

(22) Wide *be going to:* For any time t and world w,
$= (\ P(w)(t)(\text{FUT}(\text{MOD}(p)(q)))$
$= 1$ if $\forall w'$ is accessible from w,t: $[\exists t' \supset t$:
$[\forall\, w''$ s.t. w'' is accessible from w', t':
$[\exists t'' > t''$: $[\forall\, w''$ accessible from w', t''
& $p(w'')(t'')$: $[\exists\, t''' \geq_q t''$: $q(w'')(t''') = 1]]]]]$

Narrow scope *bgt*, as we have seen, does trigger the anyway entailment: worlds that branch off during t' may or may not be p worlds, and must be q worlds. However, wide scope *bgt*, if it exists, would not trigger the anyway entailment, as it says nothing about not-p worlds. A branching diagram for a case where a wide scope *be going to if p, be going to q* is given below in (23).

(23)



But is the wide scope *be going to* conditional reading attested anywhere? It appears that it is. Under certain circumstances, it is in fact possible to use a *be going to* conditional to make an offer, as in (24).

[9] $\geq_q$, briefly, would be a relation such that: if q is stative, $t' = t$; if q is not stative, $t' > t$. It is an old idea, in one version or another; c.f., e.g., Condoravdi (2002).

(24) We're going to take good care of you before your defense.
 a. If you want a manicure, we're going to give you a manicure.
 b. If you want an oil change, we're going to give you an oil change.

These conditionals do present the manicure and the oil change as contingent on the hearer's desires. There still is something that does not depend on the hearer's desires; what is not negotiable in ((24)) is the idea that the speaker is going to take care of the hearer.

In addition to speaker intuitions that (24a,b)involve *be going to* scoping over the entire conditional, there is other evidence that (24a,b) are wide scope *be going to* conditionals. Since an offering reading is possible, it follows immediately that the anyway entailment is not triggered, just as we would predict for a wide scope reading. Furthermore, the offering reading disappears under *already:*

(25) If you want a manicure, we're already going to give you a manicure. #offer

Supposing that *already* only takes a stative argument (Michaelis 1996), and further supposing that our simple progressive P counts as a stativizer, *already* forces P to be interpreted in situ, i.e., a narrow scope reading. Forcing the narrow scope reading causes the offering reading to disappear; therefore the offering reading must be associated with the wide scope reading.

4 Aspect of *will*

So far, I have argued that *will* and *be going to* differ in the presence or absence of an aspectual operator on the modal, and that *be going to* in conditionals exhibits two different scope-taking positions. The evidence for these claims rests on the idea that an aspectual operator, located higher than the future modal in *be going to*, triggers an entailment in a certain configuration.

Of course we do not want to stop here; ideally we would use the same means to determine whether *will*, like *be going to*, has two possible scope-taking positions in conditionals. We will begin such an investigation in section 5 below, but first it will be useful to re-examine the idea that *will* has no aspectual operator. Contrary to prediction, as we will see, some *will* conditionals are anyway-entailing. To explain these facts, I will posit a generic-like aspectual operator for these instances of *will*.

The anyway-entailing context that will prove surprising is furnished by relevance conditionals. Relevance conditionals are conditionals in which the antecedent seems to be a condition on the relevance to the hearer of the information in the consequent. Two examples of relevance conditionals are given in (26).

(26) a. If you want to know, there's some beer in the fridge.
 b. If I may be frank, Frank is not looking good.

Unlike offering contexts, relevance contexts are anyway-entailing. We can see immediately that relevance conditionals are at least consistent with the anyway entailment; for example, the speaker of (26a) is not committed to (27a), nor is the speaker of (26b) committed to (27b).

(27) a. If you don't want to know, there is no beer in the fridge.
 b. If I may not be frank, Frank is looking good.

Therefore, in the context in which a relevance conditional *If p, q* is truthfully uttered, not all not-p worlds are not-q worlds. That is, some not-p worlds are q worlds. So relevance conditionals are anyway-entailing.

(28) *Condition on relevance conditions.* If p is a relevance condition on q, some not-p worlds are q worlds.

We predict that *be going to* should be possible in the consequent of relevance conditionals, and *will* should be impossible. While it initially may seem that a *will* conditional *if p, will q* has nothing to say about the not-p worlds, this is not strictly true. Worlds that branch off before the present (or in the case of *be going to*, before the relevant superinterval of the present) are simply not accessible. So in a narrow scope *will* conditional, there will be no not-p worlds under consideration. We might, then, expect *will* conditionals to trigger a presupposition failure with respect to (28).[10]

The prediction seems at first to be borne out. While the conditional in (29a), using *will*, is not a good relevance conditional (but makes a fine offer), the conditional in (29b), using *be going to,* is a good relevance conditional (and as expected, is not a particularly good offer).

(29) a. If you want to know, we'll go get some beer. #relevance, √offer
b. If you want to know, we're going to go get some beer. √ relevance, #offer

Interestingly, however, some *will* clauses *are* good in the consequent of relevance conditionals.

(30) a. If you really want to know, John will win.
b. If you really want to know, this comet will next be visible in 22 years.

What is responsible for these facts?

It does seem that there is something special about the felicitous anyway-entailing *will* conditionals in (30) that wants addressing. In order for a *will* conditional to be anyway-entailing, the eventuality must be viewed by the speaker as a necessary outcome of forces that have already been set in motion and cannot be deflected. The same is true for *will* sentences that are *not* conditionals, as in (31).

(31) a. Oh, she'll show up, all right.
b. Don't worry, the Red Sox will win.
c. It'll work. Trust me. I know about these things.

There seems to be some flavor of strong speaker certainty in these examples, though at this point it is hard to say what exactly. That is, we would not want to say that the corresponding *be going to* examples in (32) reflect some lesser level of certainty. In these examples, too, the speaker is absolutely sure.

(32) a. Oh, she's going to show up, all right.
b. Don't worry, the Red Sox are going to win.
c. It's going to work. Trust me. I know about these things.

Yet, nonetheless, there is a clear intuition that *something* about the *will* sentences is stronger; somehow that they require more or better or more general evidence, or more strongly inevitable conclusions.

[10] For reasons of space I have had to abbreviate this point; what is important is the idea that, contrary to any homogeneous prediction, some *will* conditionals are anyway-entailing and some are anyway-conflicting.

I would like to propose the hypothesis that an aspectual difference between *will* and *be going to* is responsible for this intuition. Where *be going to* has an existential quantifier over times, the anyway-entailing version of *will* has universal quantification. In both cases the times thus picked out represent the times from which the worlds branch. If we suppose in this case that the branching is epistemic branching, then we can explain why the *will* sentences feel stronger. They require q to be true on epistemically accessible worlds branching off not merely from *some* time overlapping the present, but from *all* (realis) times that overlap the present.[11] This amounts to a requirement that the evidence for the statement be of relatively long standing.

Before addressing additional evidence for this idea, some formal details. We will proceed entirely in parallel to the *be going to* analysis, the only difference being the force of quantification. The proposed "dumb" aspectual component of anyway-entailing or G-*will* is given in (33), along with a timeline diagram illustrating the set of times that p(w) must hold of for G(w)(t)(p) to be true.[12]

(33) $G(w)(t)(p) = 1$ iff $\forall t' \supset t$: $p(w)(t')$

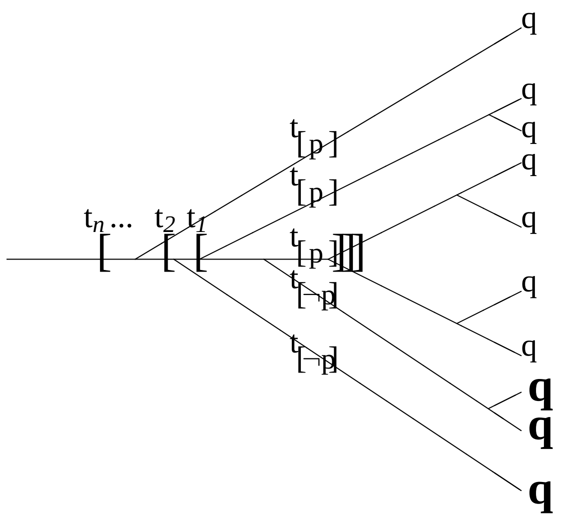
Combining G with FUT, our future modal, yields the following denotation.

(34) $P(w)(t)(\text{FUT}(q)) = 1$ iff $\forall t' \supset t$: $[\text{FUT}(w)(t')(q) = 1]$

$P(w)(t)(\text{FUT}(q)) = 1$ if $\forall t' \supset t$: $[\forall w'$ that agree with w up to t':
$[\exists t''$: $t' < t''$ and $q(w')(t'') = 1]]$

And (35) represents a state of affairs in which G (w)(t)(FUT q) is true.

(35)



As with *be going to* conditionals, we expect that all not-p worlds under consideration are q worlds (shown as worlds with boldface q), thus deriving the anyway entailment for narrow scope generic *will*. Why narrow scope? Again, the branching of the conditional modal MOD is not depicted. (35) represents a single p-world on which G (FUT q) is calculated at t.

This hypothesis seems to be supported by a conflict between the use of *will q*, and the speaker's having just found out that q. This would be expected if the *will* used is G-*will*, where what G-*will* does is universal quantification over the contextually salient time, saying that FUT q

[11] Naturally there will be contextual restriction on the universal quantification.

[12] As with the progressive-like operator P above, I use the single letter G in an attempt to evoke the traditional aspectual terminology for mnemonic purposes.

has been known all that time. The data is exemplified in (36). The use of *Look!* in in these examples forces a context in which the subsequent claim must follow from evidence that is new information. (36a) and (37a) show that *be going to* is fine in such a context; (36b) and (37b) demonstrate that *will* is not.

(36) a. Look! It's going to rain!
b. #Look! It'll rain!

(37) a. Look! He's going to jump!
b. #Look! He'll jump!

When the evidence is of long standing, *will* is fine.

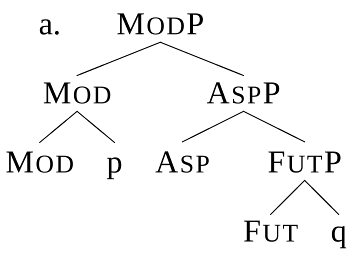
(38) a. Don't worry, it'll rain. It always does eventually.
b. Oh, he'll jump. He's just that kind of person.

This is exactly what we would expect if the *will* in these examples is the G-future version of *will*. But to summarize where we are so far: We have seen that *will* does not behave in a homogeneous way with respect to the anyway entailment. This fact suggests two alternative theories. The first, which I will call the "aspectual theory", is that *will* itself is aspectually ambiguous. One version, the G-future, triggers the anyway entailment by way of universal quantification over the temporal argument of the future modal's accessibility relation, and the other, an aspectless future ("A-future"), has no such aspectual element.[13] Both of these contrast with the P-future *be going to*, which involves existential quantification over the temporal argument of the future modal's accessibility relation. The second alternative, which I will call the "structural theory", is that there is only one aspectual value of *will*, namely the G-future reading. As with *be going to*, the narrow scope reading is anyway-conflicting, and the wide scope reading is anyway-entailing. We turn now to evaluate that alternative.

5 Scope of *will*

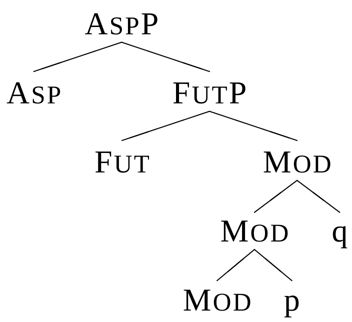
Recall that *be going to*, our P-future, has two different scope possibilities when in a conditional; it can occur either inside the consequent or scoping over the entire conditional.

(39) a.



narrow scope reading

b.



wide scope reading

[13]Would there be any aspect on "aspectless" *will*? Semantically there has to be at least a binding off of the temporal variable, which could be done by an unpronounced aspectual element:

(i) $\mathbf{A} = \lambda p \lambda w\ .\ \exists t{:}[p(w)(t)]$

Or it could be done by existential closure. Morphosyntactically, of course, there is no evidence for or against an aspectual head in either the A cases or the G cases.

Likewise, we might expect G-*will* to have these scope possibilities, with G swapped in for P as the Asp head. Then the narrow scope reading would be anyway-entailing, and the wide scope reading would be anyway-conflicting, as in the *be going to* conditionals. There would be no need to posit two different aspectual values for *will*; G-*will* could do it all.

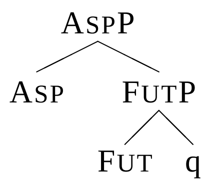
As initially satisfying as the structural account seems, there are a couple of reasons not to be satisfied with it. The first reason is that this theory has no principled way to explain the fact that wide scope *will* is much more natural as an offer than wide scope *be going to*. If we were to return to the aspectual theory, with an aspectually ambiguous *will*, we would at least be able to say that the aspectual futures *be going to* and G-*will* prefer to occur as narrow scope for some reason, and the aspectless future A-*will* prefers wide scope. There is still no principled reason, but at least the data are split into natural classes.

The second reason we should not be satisfied with the structural theory is that the wide scope G-future meaning simply does not seem to correspond to the meaning of *will* as it is used in offers. While the G-future semantics requires quantification over all the worlds that branch off within a contextually-specified interval, offering *will* seems intuitively to involve a "spur of the moment" decision. Indeed, *will* offers contrast with the wide scope *be going to* offers in that respect.

Thus it appears that the structural theory is not the one we want. We return to the aspectual theory, in which *will* is aspectually ambiguous, to see if that theory can be more satisfying. First we will develop a way to determine the scope of A-*will* in offers and G-*will* in inevitable *will* readings, based on whether the antecedent is obligatory or not.

The presence of Mod and its antecedent p is crucial to the wide scope readings. By compositionality, the only antecedentless structure possible should be (40):

(40)



Semantically this structure should always behave like a narrow scope reading rather than a wide scope reading in triggering the anyway entailment that all not-p worlds are q worlds, because for any p, whether or not p, q. Thus narrow scope readings should be able to occur either with or without an antecedent, while wide scope readings should only be possible with an antecedent. To detect an antecedent, we can rely on intuitions about whether the consequent is contingent on some other eventuality happening, or whether it will happen regardless. As per the discussion in section 1, it looks like offering *will* is wide scope, with the offer being contingent on the hearer's desires. What we might call "inevitable *will*" must conversely be narrow scope, because the eventuality's happening is not contingent on anything.

(41) a. We'll change your oil in Madera. offering *will*
b. Don't worry, it'll rain. inevitable *will*

This is the same result the structural theory suggested. But in the structural theory, we expected wide scope to correlate with anyway-conflict, and narrow scope to correlate with anyway-entailment. In the aspectual theory, we do not expect such a correlation. That is, we expect to find a wide scope G-*will* conditional, and a narrow scope A-*will* conditional (or, failing that, a good reason why one or the other or both do not exist).

In fact there exists a good candidate for a wide scope G-*will* conditional. Consider the sentence in (42). It has two readings, paraphrased in (42a) and (42b). One is the familiar inevitable *will*;

the other is commonly called "dispositional *will*". The readings also differ in truth value, as (42a) is false, while (42b) is true.

(42) Dogs will eat doughnuts.

a. That's the way dogs are; there's nothing you can do about it. inevitable *will*

b. If you give a dog a doughnut, it will eat it. dispositional *will*

The first reading is not contingent upon anything; the second is contingent on something. Thus the first reading (as before) should be narrow scope, and the second reading should be wide scope. The similarity between offering *will* and dispositional *will* conditionals is even more striking if we interpret (42b) as a kind of dispositional standing offer: Generally, if you want them to, dogs will happily oblige you and eat doughnuts.

The modal semantics also seems to be appropriate for G-*will*. (41b) says that generally, these days, any world where you give the dog a doughnut is one where it eats it. (42) That is, the quantification is over all normal worlds that branch off during a contextually specified interval that overlaps the present.

Therefore it appears that we have a good candidate for a wide scope G-*will* conditional, which supports the aspectual theory rather than the structural theory. We would also then wonder whether narrow scope readings of A-*will* conditionals exist. A reexamination of the data in (36)a and (37)b above suggests that they may not. For if they did exist, unlike G-*will* readings, we would not expect them to be ruled out in the relevant contexts. Hence we would not expect infelicity in these examples. Since there is infelicity, we conclude that only G-*will* is possible with narrow scope. If this is true, we should look for a principled reason why A-*will* is not possible in narrow scope conditionals.

6 Conclusions

I have presented evidence that futures such as *will* and *be going to* have aspectual components to their meaning. These aspectual components interact with future modality by modifying the temporal argument to the modal's accessibility relation. This has the effect of altering the set of worlds over which the modal quantifies. These modal differences support a theory in which there are three different aspectual variations, and two different scope positions for futures in conditionals. The presence of aspect on modals therefore provides us with a new tool with which to investigate the logical form of conditionals.

One question deserving of further investigation is whether there are any correlations or dependencies between aspect or scope and the modal base for the future modal. For instance, we saw in section 4 above that the wide scope G-future apparently has an epistemic modal base. While this topic is omitted from this paper for reasons of space, it is omitted for reasons of space only; it would be instructive to see how the choice of aspect or scope constrains the choice of modal base for the future modal, and why.

Finally, it is worth pointing out that the explanations explored here absolutely require a modal analysis of *will* and *be going to*. Central to the explanation of the data is the idea that a higher aspect affects the temporal argument of the modal's accessibility relation, If instead we were to begin from a tense analysis of these futures (see Hornstein (1990), Condoravdi (2001) for discussion of such an analysis in comparison with modal analyses), it is difficult to see how the facts presented here could be explained at all.

References

Abusch, D.: 1985, *On Verbs and Time*, PhD thesis, University of Massachusetts.

Abusch, D.: 1998, Generalizing tense semantics for future contexts, *in* S. Rothstein (ed.), *Events and grammar*, Vol. 70 of *SLAP*, Kluwer, Dordrecht.

Baker, M.: 1985, The mirror principle and morphosyntactic explanation, *Linguistic Inquiry* **16**(3), 373–415.

Bennett, M. and Partee, B.: 1978, *Toward the Logic of Tense and Aspect in English*, Indiana University Linguistics Club.

Cinque, G. (ed.): 2002, *Functional Structure in DP and IP: The Cartography of Syntactic Structures*, Oxford University Press, Oxford.

Cipria, A. and Roberts, C.: 2000, Spanish *imperfecto* and *pretérito*: Truth conditions and aktionsart effects in a Situation Semantics, *Natural Language Semantics* **8**(4).

Condoravdi, C.: 2001, Will.
URL: *citeseer.nj.nec.com/condoravdi01will.html*

Condoravdi, C.: 2002, Temporal interpretation of modals, *in* D. Beaver, S. Kaufmann, B. Clark and L. Casillas (eds), *Stanford Papers on Semantics*, CSLI Publications, Palo Alto.

Copley, B.: 2001, *Be going to* as a case of high aspect, *Proceedings of SALT XI*, Cornell Linguistics Circle, Ithaca, NY.

Copley, B.: 2002a, A linguistic argument for indeterministic futures, *Proceedings of NELS 32*.

Copley, B.: 2002b, *The Semantics of the Future*, PhD thesis, MIT. In press in Garland's *Outstanding Dissertations in Linguistics* series.

Dahl, Östen.: 1985, *Tense and Aspect Systems*, Blackwell, Oxford.

Dowty, D.: 1979, *Word meaning and Montague Grammar*, Reidel, Dordrecht.

Hornstein, N.: 1990, *As Time Goes By*, MIT Press.

Kratzer, A.: 1986, Conditionals, *Papers from the Regional Meetings, Chicago Linguistic Society*, pp. 1–15.

Landman, F.: 1992, The progressive, *Natural Language Semantics* **1**(1), 1–32.

Lewis, D.: 1986, *On the Plurality of Worlds*, Blackwell, Oxford.

Michaelis, L.: 1996, On the use and meaning of *already*, *Linguistics and Philosophy* **19**, 477–502.

Portner, P.: 1998, The progressive in modal semantics, *Language* **74**(4), 760–87.

Prior, A.: 1967, *Past, Present, and Future*, Oxford University Press, Oxford.

Tenny, C.: 2000, Core events and adverbial modification, *in* S. Rothstein (ed.), *Events and grammar*, Kluwer, Dordrecht, pp. 333–348.

Thomason, R.: 1970, Indeterminist time and truth-value gaps, *Theoria* **36**, 264–281.

SATISFYING QUESTIONS*

Paul Dekker
ILLC/Department of Philosophy
University of Amsterdam
(p.j.e.dekker@uva.nl)

Abstract

In this paper we first combine and refine the semantics of questions and answers (Groenendijk and Stokhof 1984) and the logic of interrogation (Groenendijk 1999) in order to deal with topical restriction, constituent answerhood and conditional questions in a compositional way. The proposal builds on insights from the structured meanings approaches to questions (von Stechow 1991; Krifka 1991). We next present a global, pragmatic perspective on the use of such questions and answers, which founds and furthers work of (Büring 1999; Ginzburg 1996; Roberts 1996) on information structure.

1 Introduction

Questions (interrogative utterances) have been studied from both a semantic and a pragmatic perspective, more than indicative sentences have been, and for good reasons. While the interpretation of questions depends on context as much as the interpretation of assertions does, their effects upon the context are more obvious, of course. A question normally wants to be answered. Even so, indicative utterances have also been studied from a combined semantic/pragmatic perspective in recent systems of dynamic semantics and discourse representation theory. Clearly, this suggests a treatment of both types of utterances in tandem.

(Groenendijk and Stokhof 1984) has already given a first, and very appealing, systematic treatment of the semantics and pragmatics of questions and answers. This approach elaborates on the idea that the linguistic content of assertions can be specified in terms of their truth conditions, and the content of questions in terms of their answerhood conditions. Truth conditions are defined by the situations or possibilities in which a sentence counts as true, rather than false, and answerhood conditions are defined by the set of full, and mutually exclusive, possible answers to a question (the partition theory). Building on (Jäger 1996), (Groenendijk 1999) has cast this approach in a dynamic framework, which elaborates that of (Veltman 1996).

These partition theories, however, fail to account for at least two crucial aspects of the interpretation of questions and subsequent assertions. First, elliptical answers to *yes*/*no*-questions and constituent answers to *wh*-questions are not really compositionally dealt with. Second, only direct answers to explicit questions are fully dealt with, not partial or conditional replies, neither conditional questions or questions which do not stand in need of full replies.

With this paper we want to overcome both limitations. We first present a more refined notion of what are satisfying questions and answers (section 2). Our notion of a satisfying question incorporates (empirical) insights from the structured meaning approaches to questions (von

*The research for this work is supported by a grant from the Netherlands Organization for Scientific Research (NWO), which is gratefully acknowledged.

Stechow 1991; Krifka 1991), while it preserves the logical and conceptual merits of the partition theories (section 3). This semantic system is next lifted to a pragmatic setting, which allows for a contextual definition of what counts as an optimal discourse and what is a reasonable contribution to a discourse (section 4). Basic notions from theories of information structure like that of (Büring 1999; Ginzburg 1996; Roberts 1996) will be given a rational pragmatic explanation. Section 5 winds up the results.

2 Satisfaction Semantics for Questions and Answers

We take our start from a truth-conditional first order semantics in the spirit of Frege and Tarski. Like the latter, we will not say that a formula ϕ denotes **1**, or *true*, relative to some sequence of parameters like that of a model M, a variable assignment g, a sequence of witnesses $\vec{e}$, or a world w, but we will say that such a sequence of parameters *satisfies* ϕ, e.g., $M,g,\vec{e},w \models \phi$. Since our initial investigations are extensional, we will omit reference to the world parameter w in the first half of the paper. Also, since the treatment of indefinites and pronouns is not directly relevant for the issues at stake here, we will generally omit the witness parameter $\vec{e}$.[1] In the first part models M thus consist of a domain of individuals D, and an interpretation function V for the interpretation of the (individual and relational) constants of our language, and we generally write $M(c)$ for $V(c)$ if $M = \langle D,V \rangle$.

The first order language is extended with a question operator ?, which allows us to form inquisitive expressions $?\vec{x}\phi$ which question the value of a possible empty sequence of variables $\vec{x} = x_1 \dots x_n$ in a sentential expression ϕ. A true novelty is that our language is fully recursive: questions may occur in the scope of a negation, conjunction or of other question operators. If an expression ϕ does not contain any question operator we will call it indicative and also write it as $!\phi$; otherwise ϕ is inquisitive. Furthermore, if ϕ is indicative, $?\phi$ is a polar (*yes/no*) question; if $\vec{x}$ is non-empty, then $?\vec{x}\phi$ is a constituent (*Wh-*) question. The Language of Questions and Answers *LQA* is defined in Backus-Naur Form:

- $\phi ::= \ Rt_1 \dots t_n \mid [\exists \vec{x}\phi] \mid {\sim}\phi \mid \phi \wedge \psi \mid ?\vec{x}\phi$

Expressions ϕ of *LQA* are evaluated relative to a model M, an assignment g and a possibly empty sequence of answers $\vec{\alpha}$ to the questions posed in ϕ. The semantics for inquisitive expressions is built on the classical insight (Hamblin 1958; Karttunen 1977; Groenendijk and Stokhof 1984) that the meaning of a question is its full and complete answer but we combine this with the insight from the structured meanings and the dynamic semantic frameworks that these assertions and answers can be structured objects themselves.

For instance, a question $?\vec{x}\phi$ gets satisfied by the answer to the question which sequences of individuals can be the values of $\vec{x}$ in ϕ. If $\vec{x}$ consists of one variable x only, as in $?xCx$ (*Who come?*), it asks for the extension of C; if $\vec{x} = xy$ consists of two variables, as in $?xy(Bx \wedge (Gy \wedge Sxy))$ (*Which boys saw which girls?*), it asks for the set of pairs consisting of a boy and a girl the boy saw[2]; if $\vec{x}$ is the empty sequence, as in $?p$ (*Does it rain?*) it asks for the truth value of p: it denotes the set $\{\lambda\}$ consisting of the empty sequence $\lambda = \langle\ \rangle$ only, which is the truth value *true* (**1**) by definition, or the empty set $\{\ \}$, the truth value *false* (**0**). (We use capital Λ for the empty sequence of answers, for instance when we specify the satisfaction of indicative expressions.)

As a matter of convention, when we consider the possible answers $\vec{\alpha} = \alpha_1,\dots,\alpha_n$ to a

[1] The basic ingredients of such extensions are discussed in detail in (Dekker 2002a; Dekker 2003).

[2] As we will argue later in this paper, this is not an entirely accurate rendering of the associated natural language question, for *which*-phrases should be taken to presuppose their domain, the denotation of the associated common noun phrase.

question ϕ, we always assume in this paper that ϕ asks n questions $q_1,\dots,q_n$ and such that each α_i has the same type as q_i. In the semantics we use a product $\prod$ and a complement operator C and the usual interpretation of (individual and relational) constants c and variables x:

- $\prod(\alpha_1\dots\alpha_n) = \alpha_1 \times \dots \times \alpha_n$ (n possibly 0)
  $C(\alpha_1\dots\alpha_n) = C(\alpha_1)\dots C(\alpha_n)$ ($n \geq 1$)
  $[c]_{M,g} = M(c)$ and $[x]_{M,g} = g(x)$

Definition 1 (Satisfaction Semantics for LQA)

- $M,g,\Lambda \models Rt_1\dots t_n$ iff $\langle [t_1]_{M,g},\dots,[t_n]_{M,g}\rangle \in [R]_{M,g}$
  $M,g,\vec{\alpha} \models \sim\phi$ iff $\forall\vec{\varepsilon}$: if $M,g,\vec{\varepsilon} \models \phi$ then $\vec{\alpha} = C(\vec{\varepsilon})$
  $[M,g,\vec{\alpha} \models \exists\vec{x}\phi$ iff $\exists\vec{e}$: $M,g[\vec{x}/\vec{e}],\vec{\alpha}(\vec{e}) \models \phi]$
  $M,g,\vec{\alpha}\varepsilon \models \phi\wedge\psi$ iff $M,g,\vec{\varepsilon} \models \phi$ and $M,g,\vec{\alpha} \models \psi$
  $M,g,\alpha \models ?\vec{x}\phi$ iff $\alpha = \{\vec{e}\cdot\vec{e}' \mid \exists\vec{\varepsilon}$: $M,g[\vec{x}/\vec{e}],\vec{\varepsilon} \models \phi$ & $\vec{e}' \in \prod\vec{\varepsilon}\}$

We cannot explain this definition in full detail here, but we leave it at a few comments. First, satisfaction of indicative expressions is completely standard, for atomic formulas have their ordinary satisfaction conditions and this property is preserved under the indicative operators:

Observation 1 (Satisfaction of Indicatives)

- $M,g,\Lambda \models \sim!\phi$ iff $M,g,\Lambda \not\models !\phi$[3]
  $[M,g,\Lambda \models \exists x!\phi$ iff $\exists d$: $M,g[x/d],\Lambda \models !\phi]$
  $M,g,\Lambda \models !\phi\wedge!\psi$ iff $M,g,\Lambda \models !\phi$ and $M,g,\Lambda \models !\psi$

The indicative part of our system thus is classical, as it should be. Simple questions are treated in a fairly standard way as well:

Observation 2 (Satisfaction of Simple Questions)

- $M,g,\mathbf{1} \models ?!\phi$ iff $M,g,\Lambda \models !\phi$ iff $M,g,\mathbf{0} \not\models ?!\phi$
  $M,g,\alpha \models ?x!\phi$ iff $\alpha = \{d \mid M,g[x/d],\Lambda \models !\phi\}$
  $M,g,\alpha \models ?xy!\phi$ iff $\alpha = \{\langle d,d'\rangle \mid M,g[x/d][y/d'],\Lambda \models !\phi\}$

Yes is the true and complete answer to a polar question *Does it rain?* if and only if it rains. The true and complete answers to the questions *Which boys come?* and *Which professors failed which students?* consist of a specification of the set of boys who come, and the set of professor-student pairs which stand in the fail relation, respectively.

Indicatives and simple inquisitives are, thus, treated in a standard fashion. What is really new is that questions can be embedded in questions or under other operators. We briefly discuss two very useful applications of this phenomenon. Let us define a conditional $\Rightarrow$ so that $\phi \Rightarrow \psi \equiv \sim(\phi\wedge\sim\psi)$, the difference with classical definitions of material implication residing in the fact that the expressions ϕ and ψ can be inquisitive. Now look at conditional questions of the form $!\phi \Rightarrow ?\vec{x}\psi$. Applying the above definition of our satisfaction conditions we get:

Observation 3 (Simple Conditional Questions)

- $M,g,\alpha \models (!\phi \Rightarrow ?\vec{x}\psi)$ iff if $M,g,\Lambda \models !\phi$ then $M,g,\alpha \models ?\vec{x}\psi$

[3] Since $\overline{\Lambda}$ does not exist $M,g,\Lambda \models \sim!\phi$ iff *nothing* satisfies $!\phi$.

Interestingly, this is the type of interpretation argued for in (Velissaratou 2000). Consider:

(1) If we throw a party tonight, will you come?

Clearly, neither of the answers *Yes* and *No* should entail that we throw a party tonight. Intuitively, the two replies state that, *Yes, if you throw a party tonight I will come* and *No, if you throw a party tonight I will not come*, respectively. This is precisely what we find in observation (3).[4] Something essentially similar goes for conditional constituent questions. Consider:

(2) If it rains, who will come?
(3) John and Mary, but not Dick and Trix.

The answer to the above question should be understood to claim that John and Mary come if it rains, and that Dick and Trix do not come if it rains. Clearly, the answer can be perfectly fine when Dick and Trix do show up, and John and Mary don't, that is, in case it does not rain. The results are again like those argued for by (Velissaratou 2000). The difference is that they are obtained in a direct and compositional fashion here.[5]

The possibility of embedding questions in questions is another useful application of our system. If a formula ϕ is already inquisitive, then $?\vec{x}\phi$ not only queries the possible values of $\vec{x}$, but also the answers to the embedded questions. Thus we find for instance that:

Observation 4 (Question Aborption)

- $?\vec{x}?\vec{y}\psi \Leftrightarrow ?\vec{x}\vec{y}\psi$
- $?\vec{x}(\phi \wedge ?\vec{y}\psi) \Leftrightarrow ?\vec{x}\vec{y}(\phi \wedge \psi)$

The first equation in observation (4) shows that the polyadic question-operator can be defined compositionally itself, for $?x_1 \ldots x_n\phi \Leftrightarrow ?x_1 \ldots ?x_n\phi$. The second equation shows an even more attractive feature of our system. Question operators absorb embedded questions which is to say that embedded question operators can be 'bound' by embedding ones. This is very attractive. In previous systems like that of, e.g., (Groenendijk and Stokhof 1984), the meaning of example (4) is relatively adequately specified as (5) but it is not compositional since (5) does not really reflect the intuitive syntactic structure of (4):

(4) Which boys saw which girls?
(5) $?xy(Bx \wedge (Gy \wedge Sxy))$

Our system improves on this, since the more compositional analysis of (4) as (6) turns out equivalent with (5):

(6) $?x(Bx \wedge ?y(Gy \wedge Sxy))$

The fact that we can appropriately analyze (4) as (6) clearly draws from two innovations. First, we allow questions to figure in conjunctions and in the scope of other question operators; sec-

[4] A persistent number of authors claims that conditional sentences ought to address a strict, rather than a weaker, material, notion of implication. This issue is orthogonal to the present discussion. Even if we favor a strict interpretation of conditional sentences, saying *Yes* to question (1) says that our throwing a party tonight strictly implicates that you will come, whereas saying *No* says that it strictly entails that you will not come. Replying with *No* certainly does not mean that our throwing a party tonight does not strictly implicate that you will come.

[5] As observed by Velissaratou $!\phi \Rightarrow ?!\psi$ can be answered by both *Yes* and *No* provided, of course, that $!\phi$ is false. As a matter of fact, $!\phi \Rightarrow ?\vec{x}!\psi$ can be answered by *any* answer α of the right type. This means that a conditional question becomes totally useless if its antecedent turns out to be false. The truth of the antecedent clause thus is a pragmatic, and cancelable, presupposition.

ond, our semantics of embedded questions is adequate in the sense that (6) is equivalent with the intended interpretation (5), as observation (4) shows.[6]

3 Logic and Pragmatics of Questions and Answers

The system discussed in the previous section is innovative because of its successful compositional treatment of conditional and constituent questions, but it still contains all the goodies of the standard theories of questions. As we will see, all important notions of the standard theory of questions can be derived. Apart from this, the additional underlying structure which we assume has the type of structure required to solve some basic problems for the classical theories: the treatment of elliptical and constituent answers.

We build on the relatively standard idea that contents of assertions and information states can be characterized by means of sets of possibilities, those possibilities compatible with these assertions or states, and that questions can be taken to (pseudo-)partition these states. The elements of such partitions indicate the relevant distinctions. Agents are interested in knowing which of the elements of a partition correspond to the real world, and they are supposed to be insensitive to differences between possibilities which reside in one block.

Talk about possibilities requires us to generalize the extensional models we used above to intensional models $\mathcal{M} = \langle W, D, V \rangle$ consisting of a set of worlds W, a domain of individuals D, and an interpretation function V for the constants of our language, and such that for any world $w \in W$: $\mathcal{M}_w = \langle D, V_w \rangle$ is an extensional model. Structured information states are rendered as satisfaction sets S which consist of sequences of answers $\vec{\alpha}$ plus worlds w such that w is conceived possible and $\vec{\alpha}$, in w, provides the complete answers to outstanding questions. Satisfaction sets allow us to define relatively standard notions of content, answerhood and indifference:

Definition 2 (Content, Answerhood, and Indifference)

- $[\![\phi]\!]_{\mathcal{M},g} = \{\vec{\alpha}w \mid \mathcal{M}_w, g, \vec{\alpha} \models \phi\}$ (content of ϕ)
  $D(S) \quad = \{w \mid \exists\vec{\alpha}\text{: } \vec{\alpha}w \in S\}$ (data of S)
  $A(S) \quad = \{\ \{w \mid \vec{\alpha}w \in S\}\ \mid \vec{\alpha}v \in S\}$ (possible answers)
  $I(S) \quad = \{\langle v, w \rangle \mid \exists\vec{\alpha}\text{: } \vec{\alpha}v \in S \ \&\ \vec{\alpha}w \in S\}$ (indifference)

The content, or data, $D(S)$ of a satisfaction set S is simply modeled as the set of not (yet) excluded possibilities. Like in (Groenendijk and Stokhof 1984), $A(S)$ groups together possibilities in which the same answer to pertaining questions can be given. Indeed, these groups themselves constitute the propositions (sets of possible worlds) which count as propositional answers to these questions. Like in (Groenendijk 1999), $I(S)$ relates any two possibilities in $D(S)$ the difference between which is considered immaterial.

The classical notions of answerhood and indifference have two major benefits. They combine a fully straightforward logic (Groenendijk and Stokhof 1984) with a strong intuitive

[6] In one respect (5) or (6) do not really capture the intuitive interpretation of (4), in particular the presuppositions associated with *which*-phrases. In (Dekker 2003) I have shown how to lift the present first order system to a system which hosts generalized quantifiers, and which deals with their domain presuppositions. Like all other quantifiers, *which*-phrases as in $WHICH(A)(B)$ can be said to presuppose a witness domain of A's, and to question which individuals in this domain are also B's. In this way we can easily account for the otherwise problematic difference between the following two questions (from Heim 1994):

(7) Which males are bachelor?

(8) Which bachelors are male?

decision-theoretic interpretation (van Rooy 1999). (Jäger 1996; Groenendijk 1999) define a notion of entailment for questions and answers in one gloss:

Definition 3 (Support)

- $\phi \models_{M,g} \psi$ iff $I([\![\phi_{M,g}]\!]) \subseteq I([\![\psi_{M,g}]\!])$

An expression ϕ entails or supports ψ iff it provides more data and poses more questions. For two indicative expressions this boils down to classical entailment, and for two inquisitive expressions ϕ and ψ we find that the former entails the latter iff every complete answer to the first also completely answers the second. But also mixtures as possible. For instance, an indicative expression $!\phi$ entails an inquisitive expression $?\vec{x}\psi$ iff it fully answers the question. The following observation summarizes the results:

Observation 5 (Answerhood and Entailment)

- $$\begin{array}{rl} p \wedge q \models p & \forall xCx \models Ca \\ ?p \wedge ?q \models ?p & ?xCx \models ?Ca \\ p \wedge q \models ?p & \forall xCx \models ?xCx \end{array}$$

(If ϕ is inquisitive, and ψ indicative, the first only entails the latter iff the latter is trivially true.) Other interesting mixtures involve conditional questions, which again appear to be fully well-behaved:

Observation 6 (Conditional Entailment)

- $$\begin{array}{rl} ?q \models p \Rightarrow ?q & ?p \not\models p \Rightarrow ?q \\ q \models p \Rightarrow ?q & p \not\models p \Rightarrow ?q \\ \neg q \models p \Rightarrow ?q & \neg p \models p \Rightarrow ?q \end{array}$$

It may be of interest to note that we also have a deduction theorem for conditional questions:

Observation 7 (Deduction Theorem)

- $!\phi \models ?\vec{x}\psi$ iff $\models !\phi \Rightarrow ?\vec{x}\psi$

Not only logically, but also decision-theoretically, answerhood and indifference are intuitively well-behaved. Suppose you want to cycle to the beach if the sun shines, and go to the cinema otherwise. Not knowing what the weather is like, you face a decision problem. What to do? Prepare the bikes or reserve tickets? Indeed, asking whether the sun shines may provide one way towards solving the decision problem. By means of such a question you indicate you are interested in the issue whether the world is like those in which the sun shines, or like those in which it doesn't. Indeed, as soon as you know which of these two ways the world is like, you know what to do. The same goes for constituent questions. Your decision to go to the party tonight may very well depend on who will be there. Some candidate visitors may make it into a great success, while the attendance of certain others may very well guarantee a safe disaster. Thus, the question *Who will visit the party?*—which queries the exact configuration of attending people—is relevant to your decision to go there yourself.[7]

[7] It should be noticed, though, that, strictly speaking, the question should be who would be there if I come, since I have not yet answered that question myself and since I am not interested in who come if I don't come. We will come back to this issue below.

We see that our system inherits the logical and decision-theoretical merits of previous approaches, but indeed we need, and have, more if we want to come up with a pragmatically adequate notion of answerhood. Suppose that all of my background knowledge can be summarized by a theory $!\Phi$, and if, given that background knowledge, I want to know whether q. In that case, of course, my question is not whether $!\Phi \wedge q$ or $!\Phi \wedge \neg q$. My question really is $!\Phi \Rightarrow ?q$, and observation (6) shows that the question $?q$, as well as the possible answers q and $\neg q$, support that question, like, of course, $!\Phi \Rightarrow q$ and $!\Phi \Rightarrow \neg q$ do. This naturally follows from our treatment of conditional questions.

A formal exercise also shows that our notion of content (definition 2) has more structure than the standard notions of answerhood and indifference and it can be argued that it has the additional type of structure which is minimally needed to deal with elliptical or constituent answers. Consider, for instance, the following questions (the second one from Zeevat, p.c.):

(9) Is Harry there?
Is Harry not there?
(10) Who wants an ice-cream?
Who does not want an ice-cream?

These questions are pairwise equivalent from both a logical and a decision-theoretical perspective. Any full answer to the first (second) question of each pair provides a full answer to the second (first) question of that pair. However, practically or pragmatically these questions are different. For instance, if the answer to the first question of (10) is *Rick* it will be taken to mean that Rick wants an ice-cream; as an answer to the second question of (10) it will be taken to mean that Rick does *not* want an ice-cream. Quite a difference indeed.[8] However, if we use our richer notion of content, these examples can be adequately dealt with in a straightforward way. Since our notion of satisfying contents employs the full answers to a pertaining question, it can be used to constrain the interpretation of subsequent constituent answers. In (Dekker 2002b) I have given a fully general definition of topical restriction and constituent answerhood which uniformly deals with answers to (9) and (10). The only, non-trivial, assumption is that topics, or questions, are modeled as abstracts in the way they are modeled here. In reply to a question like (13), the answer (14) can be interpreted fully compositionally as (15):

(13) Who will go to the party?
(14) John.
(15) John will go to the party.

This is certainly not a trivial result, even more, since the very same analysis renders the replies (17) and (19) to (16) directly equivalent with (18) and (20), respectively.

(16) Does Alice want more sandwiches?
(17) Yes.
(18) Alice wants more sandwiches.
(19) No.
(20) Alice does not want more sandwiches.

[8] This example indeed shows a striking resemblance with (a variant of) Partee's famous marble case. While the following two sentences are logically (truth-conditionally) equivalent, they have different pragmatic 'overtones':

(11) Exactly five of the nine soldiers were killed.
Exactly four of the nine soldiers survived.

The difference shows up when the assertion of any one of these examples is followed by the statement that:

(12) They will be buried.

4 Strategic Inquiry with Questions and Answers

Quite a few of the issues discussed above, and certainly the literature about them, directly or indirectly address the question what is a relevant question or assertion. Most of the formal semantic literature addresses this issue from a local perspective, by focusing in on the question what is a direct answer to an explicit question, or on what discourse relations may exist between two immediately successive utterances. In this section we advocate a global perspective which more accurately formalizes the pragmatic program initiated by (Grice 1975).

We think it is dubious theoretic practice to try and study any two subsequent utterances, and define, in terms of them, what discourse relation holds between the two. Of course, stating that *John comes to the party, and no other students do* can be relevant in response to a question *Who will come to the party?*, but almost any other utterance (indicative or inquisitive) can be relevant as well. This has already been noticed in (Groenendijk and Stokhof 1984), and (van Rooy 1999) gives a decision-theoretic explanation of the facts, in quantitative terms. We will argue here that an intuitive, qualitative explanation can be furthered.

One of Grice's aims was to show that certain general principles constrain and guide the intention and interpretation of utterances of (linguistic) agents which are deemed rational and cooperative. The assumption of rational cooperative behaviour advances the agents involved in a conservation to obey, or to pretend to obey, the maxims of quality, quantity, relation and manner. These maxims require a speaker not to say things for which she lacks adequate evidence, not to say more nor less than is required for the purposes of the conversation, to advance relevant propositions, and to be well-behaved.

These maxims can be understood and formalized in the following way. A game of information exchange consist in getting one's questions answered in a reliable and pleasant way. Interlocutors are therefore assumed to produce a multi-speaker dialogue Φ which is deemed optimal iff Φ answers their questions, while its contents are supported by the information the interlocutors have, and Φ is optimal. Grice's maxims can be (partly) formalized as follows:

Definition 4 (Optimal Inquiry) Given a set of interlocutors A with states $(\sigma)_{i \in A}$ a discourse $\Phi = \phi_1, \ldots, \phi_n$ is optimal iff:

- $\forall i \in A$: $D([\![\Phi]\!]) \cap D(\sigma_i) \models \sigma_i$ (relation)
  $\bigcap_{i \in A} D(\sigma_i) \models D([\![\Phi]\!])$ (quality)
  Φ is minimal (quantity)
  Φ is well-behaved (manner)

The maxim of relation requires an optimal discourse to answer all questions of all interlocutors. The information provided by Φ is hoped to answer the questions in any state σ_i. The maxim of quality requires these answers to be supported by the data which the interlocutors had to begin with.[9] The maxims of quantity and manner are deliberately left underspecified.[10]

[9]Some subtle notes should be added to this maxim. First, of course, in the course of a dialogue things happen and change, and these facts should be taken into account. For instance, after I told you that it rains, it is a fact that I have told you so, but it is not a fact I need to report on. Normally I don't need to tell you that I have told you that it rains. Second, in principle I could provide information which other people have themselves, but of course it would be better if they did themselves.

[10]A discourse can be minimal in the sense of digits produced, or in the sense of processing efforts required to generate and understand it, etc. In theory, and in practice, we cannot decide on the precise measures, but we have to negotiate it. For computational purposes, of course, we cannot leave this notion underspecified, but then we have to relate it to the maxim of being well-behaved, which crucially relies on the objectives of the implementation.

When agents engage in a cooperative conversation, it is reasonable that they make clear what questions they have, and that they provide information which they have support for. The above notion of an optimal inquiry accounts for this, but it also serves to guide agents to a dialogue in which the conditions are not guaranteed to be optimal. Let us first look at an optimal situation. Suppose *A* wishes to know whether Sue comes to the party (?*s*), and *B* wants to know whether Tim comes to the party (?*t*), and assume that each of them knows the answer to the other one's question. The two information states can be defined as follows:

- $\sigma = \{\overline{[\![t]\!]} \cap [\![s]\!], \overline{[\![t]\!]} \backslash [\![s]\!]\}$
- $\tau = \{[\![s]\!] \cap [\![t]\!], [\![s]\!] \backslash [\![t]\!]\}$

The following dialogue is optimal then:

(21) *A:* Will Sue come?
B: Yes.
Will Tim come?
A: No.

Both questions are answered, by information which was initially there distributed over the two initial information states.

Example (21) can be used to show that some standard felicity requirements (like informativity, non-redundancy, consistency, and congruence of answers with questions) can be derived from the maxims we have stated above. More interestingly, these maxims can also be used to explain why certain dialogues are perfectly reasonable also if certain expressions are not direct replies to questions posed just before. The examples which we discuss in the remainder of this section fit our notion of an optimal discourse, while they do not comply with notions of relevance or congruence proposed in localistic discourse grammars.

Consider the following sequence of utterances of *A* through *D*:

(22) *A:* Who were at the awards?
. . .
A: Who of the Bee Gees?
B: Robin and Barry but not Maurice.
A: Who of the Jackson Five?
C: Jackie, Jermain and Michael, but not Marlon and Tito.
A: Who of Kylie Minogue?
D: Kylie Minogue.
A: OK, I know enough!

The main question of our interrogator *A* cannot be fully answered directly by any of the participants. But we see it makes sense for her to cut up her question into subquestions in the sense of (Büring 1999; Ginzburg 1996; Roberts 1996), which, in this case, can be answered. By posing these subquestions the superquestion may get answered, so it is an orderly way of getting to the main goal. Interestingly, subquestions are senseless in a framework like that of (Groenendijk 1999), where they are rendered superfluous, and, thus, impertinent.

Counterquestions, or 'side questions' as Jefferson calls them, also fit neatly in our model. We do not need discourse or answerhood relations to explain why the sequence of the first two of the following four utterances is sensible:

(23) *Waitress:* What'll ya have girls?

Customer: What's the soup of the day?
Waitress: Clam chowder.
Customer: I'll have a bowl of clam chowder and a salad with Russian dressing.

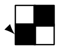
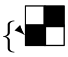
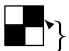
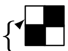
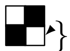
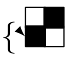
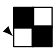
Clearly, the envisaged answer to the customer's question is needed to help the customer to answer the waitress's question. If we take into account what is the information and what are the interests of the interlocutors, this can be readily explained. But surely there is no linguistic relation between the first two utterances here.

We have already discussed conditional questions, and it should be clear what sense they make. Consider:

(24) *A:* Do you like to go to the party?
B: If I go to the party, will prof. Schmull be there?

Clearly, if *B* poses his question *B* wants to know about prof. Schmull's expected attendance in situations where *B* also goes. Apparently, *B* does not presuppose that he is going, assuming that he asks this question in order to motivate his decision whether to go to the party or not. In the model presented above this makes perfect sense, because *B* wants to know whether he is in a situation where prof. Schmull comes if he comes—in case he decides not to go to the party—, or in a situation where this is not so—in case he decides to go. This seems very rational, but indeed it seems very difficult to think of a linguistic or grammatical relation between the two utterances which could explain the relevance of *B*'s question as a reply to *A*'s original invitation.

The most interesting cases are those in which people pose questions which are more specific than the ones they personally face. Formally they ask for more information than they need. Out of the blue one would think that this doesn't make sense, but the general model sketched above suggests and covers cases in which this is perfectly reasonable. We sketch two such case, one more formal, and one more intuitive.

Let the actual world be a simple 2×2 chessboard with agent *A* at position $a1$, as in: . *A* knows she is on the chessboard, but she does not care at which position she is, although she does care whether she is at a black or a white square. Her intentional state can be characterized as follows: $\sigma = \{ \{$, $\}$, $\{$, $\} \}$. Her addressee *B* does know on which position *A* is, but she does not know what the chessboard looks like. Given that *B* does not have any questions himself, his intentional state can be characterized as: $\tau = \{ \{$, $\} \}$. Now the following discourse unfolds:

(25) *A:* Am I on a black square?
B: I don't know.
A: On which square am I?
B: You're on $a1$.
A: Then I am on a black square.

This discourse is perfectly reasonable because *A* first asks what she wants to know, and *B* indicates he doesn't know the answer and then *A* asks something more specific than she wants to know, but something which does entail her question. *B* has a motivated reply to that question, and indeed this turns out to answer *A*'s original question.

The previous example is a bit artificial, and it could be amended. For, as we already remarked above, *A*'s 'real' question is whether, given that she is right, she is on a black square, or more precisely whether she is on $a1$ or $b2$ if these are the black fields indeed. By the same token B could have directly solved A's question by replying that *Yes, if* $a1$ *is black* or with the counterquestion *What colour is* $a1$*, which is your current position?* But in practice it is not always obvious to see what is the optimal reply or question. The following example will show this in some more detail.

Consider the following situation. There is a party which may be visited by, apart from the speaker S, the professors Arms A, Baker B, Charms C, and Dipple D, which gives $2^4 = 16$ configurations. S's decision to go or not will be based on the question whether it is useful to do so, and it is going to be useful if S can speak to professor A or C. So A or C must be there, but there are some further complications. If, besides A, B is there as well she will absorb A if B doesn't absorb C, that is, if C is not absorbed by D; furthermore, if neither B and C are present, D will absorb A. The following table lists the configurations under which it is useful for S to go:

•

	$C\&D$	$C\&\neg D$	$\neg C\&D$	$\neg C\&\neg D$
$A\&\ B$	-	+	-	-
$A\&\neg B$	+	+	-	+
$\neg A\&\ B$	-	-	-	-
$\neg A\&\neg B$	-	+	-	-

Our speaker S only wants to know if she is in a $+$ or $-$ situation, and she could ask:

(26) Will it be useful to go to the party?

but probably her addressee T does not know about which configuration is useful. So S can formulate the contents of the above table in the form of a polar question, a positive answer to which would mean that she is in a $+$ type world, and a negative answer the opposite. Indeed something like the following yes/no question would do:

(27) $(A\ AND\ [(B\ AND\ C\ AND\ \neg D)\ OR\ (\neg B\ AND\ (D \rightarrow C))])\ OR$
$(C\ AND\ \neg B\ AND\ \neg D)$?

Apparently, this is somewhat cumbersome question. Alternatively it would do to simply ask:

(28) Who come?

Any full answer to this question would answer S's main question, but notice that this question (28) is more specific than the question she has. Nevertheless (28) is a much more efficient means than (27) for S to solve her decision problem.

Interestingly, if the addressee T understands a question like *Who come?* as a superquestion of the real question *Will S have reason to go?* he can attune his answer to the real one. That is, in stead of providing a full (exhaustive) answer to the explicit question, he might give one which he thinks suffices to solve S's basic question. This, we suggest, makes up the reason and rationale for providing non-exhaustive answers, and, therefore, for posing non-exhaustive questions.

5 Conclusion

In this paper we have proposed a minimal satisfaction semantics for a language with indicatives and interrogatives. It is new because it is fully recursive and allows us to deal with conditional questions and elliptical answers in a fully compositional way. We have next indicated how to employ this system to understand informative or inquisitive dialogues. The main conclusion is that such dialogues should be apprehended from a global perspective, which takes into account the information and intentions of the dialogue participants, rather than from a local perspective, which focuses on local discourse relations only.

Bibliography

Büring, D.: 1999, Topic, in P. Bosch and R. van der Sandt (eds.), *Focus — Linguistic, Cognitive, and Computational Perspectives*, pp 142–165, Cambridge UP

Dekker, P.: 2002a, Meaning and use of indefinite expressions, *Journal of Logic, Language and Information* 11, 141–194,

Dekker, P.: 2002b, Something else, in G. Alberti, K. Balogh, and P. Dekker (eds.), *Proceedings of the Seventh Symposium of Logic and Language*, pp 17–26, University of Pécs, Pécs

Dekker, P.: 2003, *A Proper Architecture for Presupposition and Quantification*, Manuscript, ILLC, University of Amsterdam

Ginzburg, J.: 1996, Interrogatives: questions, facts, and dialogue, in S. Lappin (ed.), *The Handbook of Contemporary Semantic Theory*, Blackwell, Oxford

Grice, H.: 1975, Logic and conversation, in P. Cole and J. L. Morgan (eds.), *Syntax and Semantics, Vol III: Speech Acts*, pp 41–58, Academic Press, New York

Groenendijk, J.: 1999, The logic of interrogation, in T. Matthews and D. Strolovitch (eds.), *Proceedings of SALT IX*, CLC Publications

Groenendijk, J. and Stokhof, M.: 1984, *Studies on the Semantics of Questions and the Pragmatics of Answers*, Ph.D. thesis, University of Amsterdam, Amsterdam

Hamblin, C.: 1958, Questions, *Australasian Journal of Philosophy* 36, 159–68

Heim, I.: 1994, Interrogative semantics and Karttunen's semantics for *know*, in R. Buchalla and A. Mittwoch (eds.), *Proceedings of the 9-th Annual Conference Ben Gurion University of the Negev 1993 and of the Workshop on Discourse Hebrew Unversity of Jerusalem 1993*, Israel Association for Theoretical Linguistics

Jäger, G.: 1996, Only updates. On the dynamics of the focus particle *only*, in M. Stokhof and P. Dekker (eds.), *Proceedings of the Tenth Amsterdam Colloquium*, pp 387–405, ILLC, University of Amsterdam, Amsterdam

Karttunen, L.: 1977, Syntax and semantics of questions, *Linguistics and Philosophy* 1, 3–44

Krifka, M.: 1991, A compositional semantics for multiple focus constructions, in S. Moore and A. Wyner (eds.), *Proceedings from SALT I*, pp 127–158, Cornell

Roberts, C.: 1996, Information structure in discourse, in J. Yoon and A. Kathol (eds.), *Working Papers in Linguistics 49*, Ohio State University

van Rooy, R.: 1999, Questioning to resolve decision problems, in P. Dekker (ed.), *Proceedings of the 12-th Amsterdam Colloquium*, pp 211–216, ILLC/Department of Philosophy, Amsterdam

Velissaratou, S.: 2000, *Conditional Questions and Which-Interrogatives*, Master of Logic Thesis MoL-2000-01, ILLC/University of Amsterdam

Veltman, F.: 1996, Defaults in update semantics, *Journal of Philosophical Logic* 25, 221–261

von Stechow, A.: 1991, Focusing and backgrounding operators, in W. Abraham (ed.), *Discourse Particles: descriptive and theoretical investigations on the logical, syntactic and pragmatic properties of discourse particles in German*, John Benjamins, Amsterdam

Zeevat, H.: 1994, Questions and exhaustivity in update semantics, in R. M. Harry Bunt and G. Rentier (eds.), *Proceedings of the International Workshop on Computational Semantics*, pp 211–221, ITK, University of Tilburg

TOPIC INTERPRETATION AND WIDE SCOPE INDEFINITES*

Christian Ebert & Cornelia Endriss,
King's College London & Universität Potsdam

(ebert@dcs.kcl.ac.uk & endriss@rz.uni-potsdam.de)

Abstract

In recent years it has turned out that only a subclass of indefinites can scope out of syntactic islands. As data from German suggests, this class corresponds to the class of quantifiers that can be interpreted as topics and therefore it seems to be desirable to correlate topicality and specificity (i.e. wide scope). In this paper, we will argue that the specific interpretation of indefinites is the result of the application of an illocutionary operator TopAssert (Topic Assert) to sentences in order to update a common ground. As a consequence of this operation, the topic-marked constituent receives wide scope and relates to the rest of the clause in a way that corresponds to the intuitive content of the notion of *aboutness* topic. Thus the ability to be a topic and to be interpreted specifically is reduced to the application of one and the same operation to the respective constituents. For this reason, we predict that only those quantifiers that can take wide scope out of syntactic islands can be topics. The observation that wide scope phenomena are restricted to only a subclass of quantifiers (and even indefinites) will be explained by a *Topic Condition*. This condition tests the lexical semantics of quantifiers and determines the applicability of TopAssert on the basis of a comparison of the aboutness and familiarity definitions we propose.

1 Data

In this section we want to show that the class of those quantifiers, which can take wide scope out of islands, and the class of quantifiers, which can inhabit topical positions (in German), coincide.

1.1 Wide Scope Phenomena

In sentences containing multiple quantificational determiner phrases (DPs) local scope inversion is generally possible. The following two sentences have two readings each – one which reflects the surface order and one which reflects the inverse order of the quantifiers:

(1) 1. *Some girl likes every horse.* $[\exists \succ \forall]$ $[\forall \succ \exists]$
2. *Every girl likes some horse.* $[\forall \succ \exists]$ $[\exists \succ \forall]$

However, strong and weak quantifiers[1] seem to behave differently when they occur embedded in syntactic islands (cf. Reinhart 1997, Winter 1997, Ruys 1999, and many others):

*We would like to thank Sigrid Beck, Ariel Cohen, Andreas Haida, Stefan Hinterwimmer, Gerhard Jäger, Manfred Krifka, Robert van Rooij, Roger Schwarzschild, Peter Staudacher, and Ede Zimmermann for ongoing discussions and valuable comments.

[1] In the following, we will also refer to weak quantifiers as *indefinites*. We take it that they are interpreted as quantifiers which differs from other approaches such as (Kamp and Reyle 1993) or (Heim 1982).

(2) 1. *Some girl will be sad if every horse falls ill.* $[\exists \succ \forall]$ $[{}^*\forall \succ \exists]$

2. *Every girl will be sad if some horse falls ill.* $[\forall \succ \exists]$ $[\exists \succ \forall]$

Here the reading corresponding to the inverse order of quantifiers involved is not available for the first sentence whereas it is available for the second. The indefinite *some horse* seems to able to take scope out of an island contrary to the strong quantifier *every horse*.

It has been noted however that in those cases where specific readings are possible the distributive properties seem to stay local. This is called *Ruys' observation* (cf. Ruys 1999).

(3) *If three relatives of mine die I will inherit a fortune.*

Apart from a narrow distributive and a wide collective reading for *three relatives*, there is no wide distributive reading, i.e. (3) does not have the following reading

(4) $$\exists x_1, x_2, x_3.\, x_1 \neq x_2 \wedge x_1 \neq x_3 \wedge x_2 \neq x_3 \wedge \bigwedge_{i=1}^{3} rel\_of\_mine(x_i) \wedge$$
$$IF\ \ \bigvee_{i=1}^{3} dies(x_i)\ THEN\ I\ will\ inherit\ a\ fortune$$

which may be paraphrased as *There are three relatives of mine and if one of them dies I will inherit a fortune.*[2]

It has been observed that by far not all indefinites show this island-free scope taking behaviour (cf. Kamp and Reyle 1993, Abusch 1994, Reinhart 1997, among others):

(5) 1. *Every girl will be sad if some horse falls ill.*
$[\forall > \exists]$ $[\exists > \forall]$

2. *Every girl will be sad if three horses fall ill.*
$[\forall > 3]$ $[3 > \forall]$

3. *Every girl will be sad if at least three horses fall ill.*
$[\forall >$ *at least* $3]$??$[$*at least* $3 > \forall]$

4. *Every girl will be sad if exactly three horses fall ill.*
$[\forall >$ *exactly* $3]$??$[$*exactly* $3 > \forall]$

5. *Every girl will be sad if at most three horses fall ill.*
$[\forall >$ *at most* $3]$ *$[$*at most* $3 > \forall]$

As the table shows, monotone decreasing and non-monotonic quantifiers are excluded from a wide scope interpretation. This leaves the monotone increasing quantifiers, but as the contrast between *three* in 2. and *at least three* in 3. shows, only a subclass of the monotone increasing quantifiers can actually take exceptional wide scope. This is particularly puzzling if one considers that *three* and *at least three* are standardly assumed to have the same semantics.

[2] Abusch (1994) discusses examples where there is a wide scope distributive reading for indefinites. Winter (1997) on the other hand points out that not only indefinites show distributive wide scope, but that also strong quantifiers can scope out of the syntactic islands in Abusch's examples. This means that these are no strong islands in the first place. Matthewson (1999) mentions that there are very few speakers who do get wide scope distributive readings also in cases such as (2). There are further examples in (Kempson and Meyer-Viol 2003) which hint towards the direction that Ruys' observation does not always hold. At this point, we have no explanation for these exceptions.

1.2 Topicality

In German, there are at least two positions that can host topical constituents only. First, there is a topic position for left dislocated elements (cf. Frey 2000, Jacobs 2001). The only DPs that can turn up in this position are referential DPs or specific indefinites (Jacobs 2001)[3].

(7) 1. **Jedes / *Kein / $^{??}$Irgendein / Ein Pferd, das frisst Bananen.*
*Every / *No / $^{??}$Some (or other) / Some horse it eats bananas
'Every horse / No horse / Some horse (or other) / Some horse eats bananas.'

2. **Höchstens drei / $^{??}$Mindestens drei / $^{?}$Alle / Drei Pferde, die fressen Bananen.*
*At most three / $^{??}$At least three / $^{?}$All / Three horse they eat bananas
'At most three / At least three / All / Three horses eat bananas.'

Second, there is a topic position in the German middle field above the sentence adverbial according to Frey (2000). This position can only be targeted by constituents that can be interpreted as *aboutness* topics, which are also referential or specific DPs:

(8) *Otto war traurig, weil…*
Otto was sad because…
'Otto was sad because...'

1. **kein / $^{??}$irgendein / $^{?}$jedes / ein Pferd unglücklicherweise Bananen…*
*no / $^{??}$some (or other) / $^{?}$every / some horse unfortunately bananas…
'no horse / some horse or other / every horse / some horse has eaten bananas.'
…gefressen hat.
…eaten has

2. **höchstens drei / $^{??}$mindestens drei / $^{?}$alle / drei Pferde unglücklicherweise…*
*at most three / $^{??}$at least three / $^{?}$all / three horses unfortunately…
'unfortunately at most three / at least three / all / three horses have eaten…
…Bananen gefressen haben.
…bananas eaten have
…bananas.'

Left dislocation (7) and middle field topics (8) allow those DPs in topical positions which can also take exceptional wide scope as indicated in (5). For instance, the DP *three horses* can occupy topical positions, whereas *at least three horses* and *at most three horses* cannot. This suggests that there is a strong correlation between the wide scope interpretation and the topical interpretation of DPs.

2 Existing Approaches

2.1 Wide Scope

Unselective Binding of an Individual Variable A strategy that has been investigated by Heim (1982) is to explain wide scope phenomena by unselectively binding an individual vari-

[3]Generically interpreted indefinites are also possible in a left-dislocated position:

(6) *Ein Hund, der ist meistens grünäugig.*
A dog he is usually green-eyed
'A dog usually has green eyes.'

In this paper, we will not comment on this issue.

able which is introduced in situ by the DP under consideration. As Heim (1982) pointed out, this mechanism leads to wrong truth conditions:

(9) 1. *Every girl will be sad if some horse falls ill.*
2. $\exists y.IF\ horse(y) \wedge ill(y)\ THEN\ \forall x.girl(x) \rightarrow is\_sad(x)$

The problem with this representation is that the selection of any non-horse as witness for the existential quantification makes the formula true, i.e. the formula is true in every model containing non-horses. This is often referred to as the *Donald Duck problem* as assigning y to Donald Duck makes the sentence true.

Choice Functions In the choice function (CF) approach (Reinhart 1997, Winter 1997) the wide scope readings are derived by unselectively binding a choice function variable which is introduced in situ by the DP. This circumvents the problem of the previous unselective binding approach. The problematic reading (9) is represented as follows:

(10) *Every girl will be sad if some horse falls ill.*

$$\exists f.CF(f) \wedge IF\ ill(f(horse))\ THEN\ \forall x.girl(x) \rightarrow is\_sad(x)$$

As the function f is applied to the set of horses, it necessarily picks a member of this set and the *Donald Duck problem* cannot arise. Furthermore the CF approach can account for the locality of distributive properties (cf. (3)) as follows:

(11) $\exists f.CF(f) \wedge\ IF\ \ f(three\ relatives\ of\ mine)\ die$

$THEN\ I\ will\ inherit\ a\ fortune$

As can be seen, the indefinite gets a wide scope interpretation, but at the same time the distributive properties stay local – intuitively speaking, because the indefinite is interpreted in situ and all its properties remain local as well. Still there are several problems with this approach (cf. Winter 1997, Ruys 1999, Geurts 2000, von Stechow 2000, Endriss 2002), arising from the decisive feature of the CF approach, namely the in situ-interpretation of certain indefinites.

2.2 Topicality and Wide Scope

Cresti (1995) correlates the topic interpretation of indefinites to their wide scope interpretation. The same correlation is the basis of (Portner and Yabushita 2001), where specificity of an indefinite arises when the restrictor set forms the topic of the sentence. Building on (Portner and Yabushita 1998), it is proposed that all information of a sentence is stored under an associated discourse referent which is the sentence's topic. This relates to the ideas of Reinhart (1982) and Vallduví (1992). Both approaches restrict their attention to singular indefinites (i.e. *a* and *some*).

2.3 Classification

The before-mentioned approaches either limit their applicability to a certain subclass of wide scope indefinites (singular ones) or have to stipulate two different interpretation mechanisms – one, which applies to the class of wide scope quantifiers and another, which applies to the remaining ones. The following two proposals aim at distinguishing the correct class of wide scope takers from other quantifiers by taking the semantic properties of the respective quantifiers into consideration:

Szabolcsi (1997) The main aim of Szabolcsi (1997) is to explain the scope taking behaviour of different quantifiers. While focusing on local scope phenomena, she also makes several predictions concerning exceptional wide scope. Szabolcsi (1997) assumes that there is a specific position (*HRefP*) which can be regarded as a wide scope position. Due to the interpretative mechanism at *HRefP*, only monotone increasing quantifiers can inhabit this particular position (referred to as the *increasingness constraint* by the author). Therefore non-increasing quantifiers are excluded from being interpreted in *HRefP*, but there is still no explanation for the fact that it is only a proper subclass of the increasing quantifiers that can be interpreted with exceptional wide scope.

de Swart (1999) The aim of de Swart (1999) is to subdivide weak quantifiers into different groups according to certain properties they share. She distinguishes three different classes of indefinites, of which one class is the class of wide scope indefinites we are concerned with in this paper (class II in de Swart 1999). Building on observations of Partee (1987) and by taking discourse anaphora into account, de Swart (1999) singles out monotone increasing quantifiers. By recurrence to a formal notion of referentiality (i.e. type shifting to type *e*) she explains the difference between wide scope and other increasing quantifiers: for the former there has to be a simple *identity criterion* (cf. de Swart 1999, p. 290ff) on the basis of which a plural individual can be picked. This explanation crucially hinges on what is regarded as a *simple* criterion.

In the following we aim at dealing with all of the above-mentioned issues with one uniform approach: wide scope interpretation, topicality and the correct classification based on inherent semantic properties of the quantifiers involved.

3 Technical Preliminaries

We will briefly review the technical preliminaries we build our system upon. At first, we will make use of the concepts of *Dynamic Semantics* (cf. Staudacher 1987, Groenendijk and Stokhof 1991, Kamp and Reyle 1993). Thus we will speak of *discourse referents* (*DR* in short) and *accessibility* concerning anaphoric reference. Although we phrase our approach in terms of *Dynamic Predicate Logic* (Groenendijk and Stokhof 1991) nothing hinges on this choice. Furthermore we adopt the view that a speaker's utterance leads to an update of a *common ground* (as e. g. Krifka 1992).

3.1 Quantifier Semantics

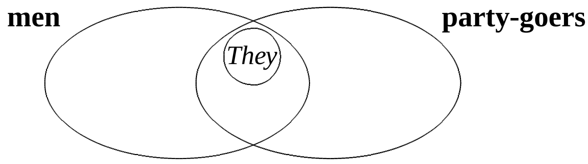
In this section we review empirical findings concerning the semantics of generalized quantifiers, which are related to anaphoric possibilities and exhaustivity. We propose a modification of the standardly assumed semantics towards a definition using plural dynamic effects to accommodate the facts in the spirit of Kadmon (1985). The following pair of examples illustrates the difference regarding anaphoric possibilities between *three* and *at least three* – the latter allows only for exhaustive anaphoric reference (cf. Kadmon 1985, Kamp and Reyle 1993)[4]:

(12) 1. *Yesterday, three men were at the party. They all wore a hat.* (not exhaustive).

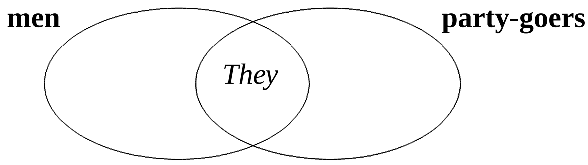
2. *Yesterday, at least three men were at the party. They all wore a hat.* (exhaustive)

[4]Reinhart (1997, p. 385) discusses this phenomenon (and assigns its observation to Kamp and Reyle (1993)), but she does not come to the conclusion that these findings should be reflected in the semantics of the respective quantifiers.

The first sentence of the statement in (12.1), containing the GQ for *three men*, agrees with a situation in which there were more than three men at yesterday's party. With the second sentence, the speaker does not assert that more than three men wore a hat: *They* in the second sentence refers to a set of three men, irrespective of how many men were at yesterday's party.



The facts are different for the statement in (12.2). The first sentence of (12.2) agrees with exactly the same situation as the first sentence of (12.1). However, in contrast to (12.1), the speaker asserts with the second sentence that more than three men wore a hat, given that more than three men were at yesterday's party. To be more precise: if six men were at yesterday's party, the anaphor *They* can only refer to the set of all six men that were at the party and not to a set of five or four.



Our aim is to account for these findings directly by changing the semantics of the respective quantifiers[5]. This has been proposed by (Kadmon 1985). The idea is to define the quantifiers in a dynamic setting such that they employ existentially quantified discourse referents which allow directly for the respective (non-)exhaustive reference. This then yields the following semantics for a numeral determiner *n*:

(13) $n \quad \rightsquigarrow \quad \lambda P.\lambda Q.\exists X.|X| = n \wedge X \subseteq P \cap Q$

This definition contains one existentially bound plural variable (of type $\langle e,t\rangle$) which will therefore be dynamically accessible in further discourse. It refers to a *subset* of the intersection of restrictor and nucleus (i.e. to a subset of the set of *P* which *Q*) and thus we shall call it a *non-exhaustive quantifier*.

For *at least n* the semantics has to be changed only slightly to account for the exhaustivity effects seen above:

(14) *at least n* $\quad \rightsquigarrow \quad \lambda P.\lambda Q.\exists X.|X| \geq n \wedge X = P \cap Q$

Again one existentially bound plural variable is introduced but this time it refers to the *entire* intersection of restrictor and nucleus (i.e. to the entire set of *P* which *Q*) and thus we shall call it an *exhaustive quantifier*.

This gives us the following quantifier semantics:

[5]This approach differs from the one proposed in (Kamp and Reyle 1993), where exhaustivity is accounted for by means of an additional *abstraction* operation.

(15)
$$\begin{array}{rcl} n & \rightsquigarrow & \lambda P.\lambda Q.\exists X.|X| = n \wedge X \subseteq P \cap Q \\ \textit{at least } n & \rightsquigarrow & \lambda P.\lambda Q.\exists X.|X| \geq n \wedge X = P \cap Q \\ \textit{exactly } n & \rightsquigarrow & \lambda P.\lambda Q.\exists X.|X| = n \wedge X = P \cap Q \\ \textit{at most } n & \rightsquigarrow & \lambda P.\lambda Q.\exists X.|X| \leq n \wedge X = P \cap Q \end{array}$$

Note that concerning static truth conditions the semantics for *n* and *at least n* are equivalent, as it is commonly assumed. With respect to dynamic semantics however, these definitions account for the facts concerning exhaustivity. Together with the following approach to topic/wide scope interpretation, they allow for the correct classification of topic/wide scope quantifiers to be derived.

3.2 Structured Meanings

Following (Krifka 1992) and (von Stechow 1989), we make use of *structured meanings*. Resembling the treatment of focus in (Krifka 1992) the representation of an expression containing a topic-marked constituent is structured into a topic component α_T (representing the semantics of the topic-marked constituent) and a comment component α_C such that the entire representation is of the form $\langle \alpha_T, \alpha_C \rangle$. The conventional meaning of the expression can be derived by applying the comment α_C to the topic α_T.

The following definition of functional application with structured meanings is taken from (Krifka 1992):

(16)
1. $\langle \alpha_T, \alpha_C \rangle(\beta) = \langle \alpha_T, \lambda X.[\alpha_C(X)(\beta)] \rangle$ where X is of the same type as α_T
2. $\beta(\langle \alpha_T, \alpha_C \rangle) = \langle \alpha_T, \lambda X.[\beta(\alpha_C(X))] \rangle$ where X is of the same type as α_T

This definition ensures that the information about topic-marked sub-constituents is inherited to larger constituents while functional application is carried out.

The following small grammar (together with semantic composition rules) serves as the basis to derive the syntactic analysis of our example sentences:

Grammar:

$$\begin{array}{rcl} S & \rightarrow & NP\ VP \\ & & [\![S]\!] = [\![NP]\!]([\![VP]\!]) \\ S & \rightarrow & \text{IF } S_1 \text{ THEN } S_2 \\ & & [\![S]\!] = \lambda p.\lambda q.(p \rightarrow q)([\![S_1]\!])([\![S_2]\!]) \\ NP & \rightarrow & Det\ N \\ & & [\![NP]\!] = [\![Det]\!]([\![N]\!]) \\ [C]_T & \rightarrow & C \\ & & [\![[C]_T]\!] = \langle [\![C]\!], \lambda X.X \rangle \text{ where } X \text{ is of the same type as } [\![C]\!] \end{array}$$

The last rule states that topic-marked phrases are translated as topic-comment-structures. The following lexicon uses the new definition of generalized quantifiers as given in the preceding section.

Lexicon:

$$
\begin{array}{lcl}
\text{horse} & \rightsquigarrow & \mathsf{horse}_{(et)} \\
\text{horses} & \rightsquigarrow & \mathsf{horse}_{(et)} \\
\text{sleep} & \rightsquigarrow & \mathsf{sleep}_{(et)} \\
\text{three} & \rightsquigarrow & \lambda P.\lambda Q.\exists X.|X| = 3 \wedge X \subseteq P \cap Q \\
\text{at most three} & \rightsquigarrow & \lambda P.\lambda Q.\exists X.|X| \leq 3 \wedge X = P \cap Q \\
\text{every} & \rightsquigarrow & \lambda P.\lambda Q.\forall x.P(x) \rightarrow Q(x)
\end{array}
$$

We illustrate the interplay of structured meanings, the grammar and the lexicon with two simple examples:

(17) [Three horses]$_T$ sleep.

$$\langle \lambda Q.\exists X.|X| = 3 \wedge X \subseteq \mathsf{horse} \cap Q, \lambda \mathcal{R}.\mathcal{R} \rangle \qquad \mathsf{sleep}$$

$$\langle \lambda Q.\exists X.|X| = 3 \wedge X \subseteq \mathsf{horse} \cap Q, \lambda \mathcal{R}.\mathcal{R}(\mathsf{sleep}) \rangle$$

As mentioned above the conventional meaning of this sentence can be derived by applying the comment component to the topic component:

$$\lambda \mathcal{R}.\mathcal{R}(\mathsf{sleep})(\lambda Q.\exists X.|X| = 3 \wedge X \subseteq \mathsf{horse} \cap Q) \quad \equiv \quad \exists X.|X| = 3 \wedge X \subseteq \mathsf{horse} \cap \mathsf{sleep}$$

(18) If [three horses]$_T$ sleep then ϕ.

$$\text{If} \quad \langle \lambda Q.\exists X.|X| = 3 \wedge X \subseteq \mathsf{horse} \cap Q, \lambda \mathcal{R}.\mathcal{R} \rangle \qquad \mathsf{sleep} \quad \text{then} \quad \phi$$

$$\langle \lambda Q.\exists X.|X| = 3 \wedge X \subseteq \mathsf{horse} \cap Q, \lambda \mathcal{R}.\mathcal{R}(\mathsf{sleep}) \rangle$$

$$\langle \lambda Q.\exists X.|X| = 3 \wedge X \subseteq \mathsf{horse} \cap Q, \lambda \mathcal{R}.(\mathcal{R}(\mathsf{sleep}) \rightarrow \phi) \rangle$$

Again the application of the comment component to the topic component yields the conventional meaning, which is the narrow scope reading for *three horses*:

$$\lambda \mathcal{R}.(\mathcal{R}(\mathsf{sleep}) \rightarrow \phi)(\lambda Q.\exists X.|X| = 3 \wedge X \subseteq \mathsf{horse} \cap Q) \equiv ((\exists X.|X| = 3 \wedge X \subseteq \mathsf{horse} \cap \mathsf{sleep}) \rightarrow \phi)$$

4 A Topic Theory of Wide Scope Phenomena

In our approach, the topical status of the quantifier under consideration is responsible for its wide scope interpretation. According to (Reinhart 1982), the topic of a sentence can be taken to be the entity the sentence is *about*. This is called the *aboutness* function of a topic. A topic can then be understood as the *address* (Jacobs 2001) or the *link* (Vallduví 1992) which (sloppily speaking) points to a place where the information conveyed by the sentence will be stored. This explains why only certain entities can function as aboutness topics as they have to be able to provide *sensible* addresses.

Another concept relating to topics is *familiarity*. If a topic is *familiar* it has been introduced previously. In more formal terms this means that a discourse referent for this topic already exists in the common ground, which in turn means that the information conveyed by the sentence can straightforwardly be added to the common ground. Therefore the common ground can be simply updated with the conventional meaning $\alpha_C(\alpha_T)$. By this definition only individuals (and sets) can be familiar as only they can be referred to by discourse referents. In particular, quantifiers (and other expressions of non-individual and non-set type) cannot be familiar as such.

However, it is known (see (7) and (8)) that certain quantifiers can still function as aboutness topics of a sentence. In this case, we assume that a sensible address/link has to be created. More formally this comes down to the creation of a sensible discourse referent that stands proxy for the quantifier in question. Exactly this is the decisive criterion for separating the topical quantifiers from others: while the former allow for the creation of a sensible discourse referent, the latter fail to do so.

In the following sections we will formally spell out these ideas and intuitions. First we will define what it means (for a quantifier) to provide a sensible address/discourse referent, which will lead to a condition on the semantics on quantifiers. This *Topic Condition* will serve to separate the class of topical/wide scope quantifiers from its complement class. Finally an illocutionary operator $\mathsf{TopAssert}$ (*Topic Assert*) implements the update of the common ground.

4.1 Creating a Topic Discourse Referent

First we will define what it means for a quantifier to provide a sensible discourse referent, which can be used as the address in the aboutness topic sense. So let us assume that we have to deal with a topic marked quantifier such as in example (18), i.e. with a quantifier that ends up as the topic component α_T of the sentence under consideration. Creating a new discourse referent for the quantifier α_T means:

1. to take a sensible *witness* for the quantifier, then
2. to create a DR P for this witness, and finally
3. to let this DR function as topic in place of the quantifier α_T itself.

This creation of a new topic corresponds to the procedure Szabolcsi (1997) proposes for a DP in *HRefP*.[6] Formalizing these steps we arrive at the following schema:

(19) $\exists P.\ P\ \textit{ is a witness for } \alpha_T \wedge \alpha_C(P)$

Here the phrase P *is a witness for* α_T is used to describe the operation in 1., which is needed to find a sensible witness P for the topical quantifier α_T. The existential binding of P corresponds to 2., the creation of a DR for P. Finally 3. is implemented by applying α_C to P instead of α_T, which would yield the conventional meaning. A good witness candidate to represent the entire quantifier α_T would be an element of the quantifier which does not contain any 'disturbing' elements. This is a *minimal witness set* in the sense of (Barwise and Cooper 1981). For every set P and generalized quantifier q a predicate $\mathsf{min}(P,q)$ can be defined which is true, iff P is a minimal set[7] with respect to the elements of q:

(20) $\mathsf{min}(P,q) \ = \ \forall Q(q(Q) \rightarrow P \subseteq Q)$

[6] Szabolcsi (1997) speculates that those DPs that can introduce discourse referents over witness sets might be "topics in some generalized sense" (p. 150). Beghelli and Stowell (1997) take it that "it is possible that our Spec of *RefP* position can be identified with the topic position" (p. 76). We take these intuitions seriously and build our proposal on the intuition that topicality and wide scope are closely tied together.

[7] We actually define only minimal sets, but it can be shown that for every quantifier minimal and minimal witness sets coincide.

Now we can formalize point 2. and replace the phrase P *is a witness for* α_T in (19) by the formal statement $\alpha_T(P) \wedge \mathsf{min}(P, \alpha_T)$ saying that P is a minimal (witness) set of α_T:

(21) $\exists P.\alpha_T(P) \wedge \mathsf{min}(P, \alpha_T) \ \wedge \ \alpha_C(P)$

As α_C is necessarily of a type that can be applied to α_T, there will be a type conflict whenever α_C is applied to the set $P \in \alpha_T$. These type conflicts are resolved by type shifting P as follows:

(22) $P \quad \rightsquigarrow \quad \lambda Q.\forall x.P(x) \rightarrow Q(x)$

Note that this type shift corresponds to inherent distribution of P over Q, which will basically distribute P over the predicate in α_C (such as *sleep*), to which the quantifier α_T applies[8].

4.2 The Topic Condition

Now that the creation of a discourse referent from a quantifier has been defined by (21) we can derive a formal condition on the semantics of quantifiers which tells us wether this operation yields a sensible result. This condition is called the *Topic Condition* (TC), because by checking for a sensible result it determines wether the quantifier in question (i.e. the quantifier which is topic-marked and ends up in the topic component α_T) can actually function as an *aboutness* topic. To achieve this, the *aboutness* case

$$\exists P.\alpha_T(P) \wedge \mathsf{min}(P, \alpha_T) \wedge \alpha_C(P)$$

(i.e. the case where a DR has to be created) is compared to the simpler *familiarity* case $\alpha_C(\alpha_T)$ for certain *simple comments*. The intuition behind the test is that the aboutness function of a topic should differ only minimally from the familiarity function, i.e. only in the creation of an additional address/link/discourse referent which serves to store the information of the sentence. Spelled out more technically, for simple comments the two cases should not at all differ concerning truth conditions and they should only differ in a *non-destructive* way concerning anaphoric potential.

Definition (Topic Condition)

A quantifier q fulfills the *Topic Condition* if for all sets Y

(23) 1. $\exists P.q(P) \wedge \mathsf{min}(P, q) \wedge \big(\lambda \mathcal{R}.\mathcal{R}(Y)\big)(P) \quad \equiv \quad \big(\lambda \mathcal{R}.\mathcal{R}(Y)\big)(q)$ and

2. all anaphoric possibilities which are available in $c + \big(\lambda \mathcal{R}.\mathcal{R}(Y)\big)(q)$ remain available in $c \ + \ \exists P.q(P) \wedge \mathsf{min}(P, q) \wedge \big(\lambda \mathcal{R}.\mathcal{R}(Y)\big)(P)$.

Here $\lambda \mathcal{R}.\mathcal{R}(Y)$ takes the place of α_C and is what we regard as a simple comment.

According to this definition a quantifier q fulfills the TC if for certain general simple cases 1., the creation of the DR has no truth conditional effect w.r.t. a standard context update. 2., dynamically speaking, the introduction of a new DR does not destroy already existing anaphoric possibilites, but only adds a new possible topic that can be referred to in subsequent discourse.

[8]If this was a collective predicate (such as *meet*) one would not have to shift the type of P and could apply α_C to P in a straightforward manner. In this case however one would have to extend the entire proposal to deal with plural semantics and the collective/distributive distinctions.

4.3 Quantifier Classification

Note that by this definition the Topic Condition is a condition on the semantics of a quantifier and thus is independent of the actual configuration the quantifier appears in. In the following we will show that the TC is capable of deriving the correct classification of quantifiers into topical/wide scope quantifiers and their complement class.

Non-increasing Quantifiers Monotone decreasing and non-monotonic quantifiers do not pass point 1. of the Topic Condition. After application of the type shift (22) we arrive at the equivalence

(24) $\exists P.q(P) \wedge \mathsf{min}(P,q) \wedge P \subseteq Y \quad \equiv \quad q(Y)$

which does not hold for all sets Y. For instance, taking *at most three horses* as an example for a monotone decreasing quantifier q this reduces to

(25) $\exists P.P = \emptyset \wedge P \subseteq Y \quad \not\equiv \quad \exists X.|X| \leq 3 \wedge X = \mathsf{horse} \cap Y$

Here it is obvious that the equivalence does not hold: the left hand side is tautological whereas the right hand side is the (non-tautological) semantics of *at most three horses*.

This fact about non-increasing quantifiers follows directly from findings in (Barwise and Cooper 1981) where it is shown that the assumed procedure of existential quantification over a minimal witness set has no truth conditional effect only for monotone increasing quantifiers. The above mentioned *increasingness constraint* of (Szabolcsi 1997) aims at an explanation along the same lines.

Increasing Quantifiers As mentioned before monotone increasing quantifiers pass point 1. of the Topic Condition. However, point 2. is only passed by *non-exhaustive* quantifiers (cf. section 3.1). Therefore *exhaustive* quantifiers such as *at least three horses* fail point 2. because

(26) $c + \exists P.|P| = 3 \wedge P \subseteq \mathsf{horse} \wedge P \subseteq Y$

does not have all of the anaphoric possibilies of

(27) $c + \exists X.|X| \geq 3 \wedge X = \mathsf{horse} \cap Y$

The standard quantifiers semantics shown in (27) allows X to refer to sets of cardinality greater than three (cf. 12). Introduction of a topic DR in (26) destroys these anaphoric possibilities for P. P can only refer to a minimal witness which contains exactly three horses. In this respect, the introduction of a new topic would be destructive and thus *at least three horses* fails the Topic Condition. On the other hand, *three horses* as a non-exhaustive quantifier passes the TC because the lexical semantics only allows for reference to sets of three horses, which are the minimal witness sets of the quantifier.

Thus the Topic Condition rules out monotone decreasing, non-monotonic, and monotone increasing exhaustive quantifiers. These quantifiers cannot be interpreted as topical quantifiers and therefore the Topic Condition yields the desired classification:

TC failed/non-topical	TC passed/topical
at most n	*n*
exactly n	*some*
at least n	*a*
...	*every*
	all

It might be surprising that the strong quantifiers *every* and *all* are classified as topical quantifiers by the TC, but it will be shown that this assumption does no harm.

4.4 Topic Assert

Eventually we propose an illocutionary operator TopAssert (*Topic Assert*) which applies to a common ground c and a structured meaning representation $\langle \alpha_T, \alpha_C \rangle$ of a sentence. It performs the update of the common ground by taking the status of the topic marked constituent α_T under consideration as follows[9]:

(28) $\mathsf{TopAssert}(\langle \alpha_T, \alpha_C \rangle)(c)$

$$= \begin{cases} c \,+\, \alpha_C(\alpha_T) & \text{if } \alpha_T \text{ is accessible in } c \\ c \,+\, \exists P.\alpha_T(P) \wedge \mathsf{min}(P, \alpha_T) \wedge \alpha_C(P) & \text{if } \alpha_T \text{ fulfills the Topic Condition} \\ \text{undefined} & \text{else} \end{cases}$$

The first case of the TopAssert definition deals with familiar topics: if the DR for α_T is already accessible in the common ground then an update with the conventional meaning $\alpha_C(\alpha_T)$ is carried out. The second case formalizes what it means to be an aboutness topic: if the topic-marked expression α_T passes the TC a new DR is created (as explained above) and the appropriate update is performed. Thus the application of TopAssert is only defined if the topic-marked constituent is either familiar or fulfills the Topic Condition. By this definition only constituents that pass the Topic Condition can be unfamiliar aboutness topics in this sense. As can be seen the update in the aboutness case leads to a wide scope reading of the respective quantifier which will be illustrated in the following section.

5 Deriving Wide Scope via Topicality

To illustrate our proposal let us start with the simple example (17), repeated here as (29).

(29) [Three horses $]_T$ sleep.

The application of the illocutionary operator TopAssert to the structured meaning representation, which has been derived in (17), and to some common ground c yields the following update.

$$\begin{aligned} &\mathsf{TopAssert}(\langle \lambda Q.\exists X \ldots, \lambda \mathcal{R}.\mathcal{R}(\mathsf{sleep}) \rangle)(c) \\ &\quad = c + \exists P.(\exists X.|X| = 3 \wedge X \subseteq \mathsf{horse} \cap P) \wedge \mathsf{min}(P, \lambda Q.\exists X \ldots) \wedge \lambda \mathcal{R}.\mathcal{R}(\mathsf{sleep})(P) \\ &\quad = c + \exists P.(\exists X.|X| = 3 \wedge X \subseteq \mathsf{horse} \cap P) \wedge \mathsf{min}(P, \lambda Q.\exists X \ldots) \wedge P \subseteq \mathsf{sleep} \end{aligned}$$

[9] Here, P is a new discourse referent.

In this example *three horses* is the sentence topic. Being a quantifier, *three horses* cannot already have been established, i.e. cannot be accessible in the common ground. For this reason, the first case of the TopAssert definition (28) is not applicable. Therefore the second case comes into play, because *three horses* is a non-exhaustive, increasing quantifier which passes the TC. Thus a new discourse referent P which refers to a set of three horses is established and the respective update is performed.

To see how exceptional wide scope readings of the type discussed in the first chapter can be derived we consider example (18) again, repeated as (30).

(30) If [three horses $]_T$ sleep then ϕ.

The structured meaning representation of this example has been derived in (18) and the application of TopAssert yields the following result:

$$\begin{aligned}&\mathsf{TopAssert}(\langle \lambda Q.\exists X\ldots, \lambda\mathcal{R}.(\mathcal{R}(\mathsf{sleep}) \rightarrow \phi)\rangle)(c)\\ &\quad = c + \exists P.(\exists X.|X| = 3 \wedge X \subseteq \mathsf{horse} \cap P) \wedge \mathsf{min}(P, \lambda Q.\exists X\ldots) \wedge \lambda\mathcal{R}.(\mathcal{R}(\mathsf{sleep}) \rightarrow \phi)(P)\\ &\quad = c + \exists P.(\exists X.|X| = 3 \wedge X \subseteq \mathsf{horse} \cap P) \wedge \mathsf{min}(P, \lambda Q.\exists X\ldots) \wedge (P \subseteq \mathsf{sleep} \rightarrow \phi)\end{aligned}$$

Here the reasoning is analogous to the above example (29). However, due to the structure of the sentence, an interpretation is generated, in which *three horses* takes wide scope over the *if*-clause. The formula the context is updated with can be paraphrased as: there is a minimal witness set P of *three horses* (i.e. a set containing exactly three horses) and if each of the elements in P sleeps, then ϕ. This is the desired wide scope reading, where the distributivity stays local.

As mentioned above the universal quantifiers *every* and *all* pass the Topic Condition by definition. Therefore, in a case like

(31) If [every horse $]_T$ sleeps then ϕ.

the second (aboutness) case of the TopAssert definition is applicable[10] just as in the case of (30). The result of the application of TopAssert is as follows:

(32)

$$\begin{aligned}&\mathsf{TopAssert}(\langle \lambda Q.\forall x\ldots, \lambda\mathcal{R}.(\mathcal{R}(\mathsf{sleep}) \rightarrow \phi)\rangle)(c)\\ &\quad = c + \exists P.(\forall x.\mathsf{horse}(x) \rightarrow P(x)) \wedge \mathsf{min}(P, \lambda Q.\forall x\ldots) \wedge \lambda\mathcal{R}.(\mathcal{R}(\mathsf{sleep}) \rightarrow \phi)(P)\\ &\quad = c + \exists P.(\forall x.\mathsf{horse}(x) \rightarrow P(x)) \wedge \mathsf{min}(P, \lambda Q.\forall x\ldots) \wedge (P \subseteq \mathsf{sleep} \rightarrow \phi)\end{aligned}$$

The unique minimal witness set of the quantifier *every horse* is the set of horses. Therefore P can be replaced by this set in the last conjunct and the existential quantification together with the first two conjuncts can be omitted. This yields the following result:

(33) $c + (\mathsf{horse} \subseteq \mathsf{sleeps}) \rightarrow \phi$

Obviously this represents the narrow scope interpretation of the sentence. Thus we predict that *every horse* can be topic marked, but because of the equivalence of the wide scope and the narrow scope reading, it only *seems* as if there was no wide scope reading.

In an ill-formed case of topic-marking such as

[10](Beghelli and Stowell 1997) as well as (Szabolcsi 1997) also assume that universal quantifiers can be interpreted in *DistP* where they pick a witness set from the quantifier.

(34) If *[at most three horses $]_T$ sleep then ϕ.

the reasoning is as follows. Again *at most three horses* as a quantifier cannot be familiar as such and thus the first case of TopAssert is not applicable. But in this case the second (aboutness) case is not applicable either, because *at most three horses* does not pass the TC (as explained above). Therefore only the third case remains and the result of any potential update is undefined. This explains why *at most three horses* cannot function as topic, i.e. cannot be topic marked and in turn cannot be interpreted in a wide scope reading.

6 Conclusion

In our system the ability to be a topic and to be interpreted specifically is reduced to the application of one and the same operation to the respective constituents. We are able to 1. simultaneously account for the exceptional wide scope behaviour and topicality of certain indefinites (without assuming in-situ-interpretation as e. g. in the Choice Function approaches), 2. give a purely semantic criterion (the Topic Condition) to single out this class of indefinites, and 3. provide a formal definition of the notion of aboutness topic.

References

Abusch, D.: 1994, The Scope of Indefinites, *Natural Language Semantics* **2**, 83–135.

Barwise, J. and Cooper, R.: 1981, Generalized Quantifiers and Natural Language, *Linguistics & Philosophy* **4**, 159–219.

Beghelli, F. and Stowell, T.: 1997, Distributivity and Negation, *in* A. Szabolcsi (ed.), *Ways of Scope Taking*, Kluwer Academic Publishers, Dordrecht, pp. 71–108.

Cresti, D.: 1995, *Indefinite Topics*, PhD thesis, MIT.

de Swart, H.: 1999, Indefinites between Predication and Reference, *Proceedings of SALT 9*, Universityof Cornell, Cornell University Press, Ithaca (NY), pp. 273–297.

Endriss, C.: 2002, *The Double Scope of Quantifier Phrases*, Linguistics in Potsdam, Universität Potsdam, Potsdam.

Frey, W.: 2000, Über die syntaktische Position des Satztopiks im Deutschen, *ZAS Papers in Linguistics* **20**, 137–172.

Geurts, B.: 2000, Indefinites and Choice Functions, *Linguistic Inquiry* **31**, 731–738.

Groenendijk, J. and Stokhof, M.: 1991, Dynamic Predicate Logic, *Linguistics & Philosophy* **14**, 39–100.

Heim, I.: 1982, *The Semantics of Definite and Indefinite Noun Phrases*, PhD thesis, University of Massachusetts, Amherst.

Jacobs, J.: 2001, The dimensions of topic-comment, *Linguistics* **39**, 641–681.

Kadmon, N.: 1985, The Discourse Representation of Noun Phrases with Numeral Determiners, *in* S. B. J. Choe and J. McDonough (eds), *Proceedings of NELS 15*, Linguistics Deptartment, University of Massachusetts, GLSA, Amherst, pp. 183–216.

Kamp, H. and Reyle, U.: 1993, *From Discourse to Logic*, Kluwer Academic Publishers, Dordrecht.

Kempson, R. and Meyer-Viol, W.: 2003, Indefinites and Scope Choice, Ms.

Krifka, M.: 1992, A Compositional Semantics for Multiple Focus Constructions, *in* J. Jacobs (ed.), *Informationsstruktur und Grammatik*, Linguistische Berichte, Kluwer Academic Publishers.

Matthewson, L.: 1999, On the Interpretation of Wide-scope Indefinites, *Natural Language Semantics* **7**, 79–134.

Partee, B.: 1987, Noun Phrase Interpretation and Type-Shifting Principles, *in* J. Groenendijk, D. de Jongh and M. Stokhof (eds), *Studies in Discourse Representation Theory and the Theory of Generalized Quantifiers*, Reidel, pp. 115–144.

Portner, P. and Yabushita, K.: 1998, The Semantics and Pragmatics of Topic Phrases, *Linguistics & Philosophy* **21**, 117–157.

Portner, P. and Yabushita, K.: 2001, Specific Indefinites and the Information Structure Theory of Topics, *Journal of Semantics* **18**, 221–297.

Reinhart, T.: 1982, Pragmatics and Linguistics. An Analysis of Sentence Topics, *Philosophica* **27**, 53–94.

Reinhart, T.: 1997, Quantifier Scope: How Labour is devided between QR and Choice Functions, *Linguistics & Philosophy* **20**, 335–397.

Ruys, E.: 1999, Unexpected Wide Scope Phenomena, Ms.

Staudacher, P.: 1987, Zur Semantik indefiniter Nominalphrasen, *in* B. Asbach-Schnitker and J. Roggenhofer (eds), *Neuere Forschungen zur Wortbildung und Historiographie der Linguistik*, Gunter Narr Verlag, Tübingen, pp. 239–258.

Szabolcsi, A.: 1997, Strategies for Scope Taking, *in* A. Szabolcsi (ed.), *Ways of Scope Taking*, Kluwer Academic Publishers, Dordrecht, pp. 109–154.

Vallduví, E.: 1992, *The Informational Component*, Garland, New York.

von Stechow, A.: 1989, *Focusing and Backgrounding Operators*, Arbeitspapier Nr. 6, Universität Konstanz, Fachgruppe Sprachwissenschaft, Konstanz.

von Stechow, A.: 2000, Some Remarks on Choice Functions and LF-Movement, *in* K. von Heusinger and U. Egli (eds), *Reference and Anaphoric Relations*, Kluwer Academic Pubishers, Dordrecht, pp. 193–228.

Winter, Y.: 1997, Choice Functions and the Scopal Semantics of Indefinites, *Linguistics & Philosophy* **20**, 399–467.

REICHENBACH'S E, R AND S IN A FINITE-STATE SETTING

Tim Fernando
Trinity College Dublin

Tim.Fernando@tcd.ie

Abstract

Reichenbach's event, reference and speech times are interpreted semantically by stringing and superposing sets of temporal formulae, structured within regular languages. Notions of continuation branches and of inertia, bound (in a precise sense) by reference time, are developed and applied to the progressive and the perfect.

1 Introduction

The analysis of tense and aspect in terms of an event time E, a reference time R and a speech time S in Reichenbach (1947) counts (arguably) as one of the classic works in formal natural language semantics. In view of the prominence there of the notion of time, it is surprising that Steedman (2000) should claim that

> temporal semantics of natural language is not primarily to do with time at all. Instead, the formal devices we need are those related to the representation of causality and goal-directed action.

The present work is an attempt to flesh out the claim above in a finite-state setting that accounts for Reichenbach's basic insights. The main idea is

$(*)$ to base the account not so much on times but on event-types, construed as regular languages over an alphabet $\mathsf{Pow}(\Phi)$ consisting of subsets of some finite set Φ of formulae.

The formulae in Φ are temporal in that they describe times, including the reference time and speech time. A string $\alpha_1\alpha_2\cdots\alpha_n$ in $\mathsf{Pow}(\Phi)^*$ is to be read as a chronologically ordered sequence of observations, with every formula in α_i understood to hold at the ith point of the sequence. That is, $\alpha_1\alpha_2\cdots\alpha_n$ amounts to a comic strip or movie that begins with the still picture α_1, followed by α_2 ... ending with α_n. Strings that are instances of the same event-type are collected in a language $L \subseteq \mathsf{Pow}(\Phi)^*$, taken below to be regular. The finite-state machines accepting the languages provide a vivid image of a causal realm, from which worlds and models arise by executing the machines in (real) time. The divide between extensional and intensional notions comes out as follows: regular languages (machines) are intensions, while screenings of movies (machine runs) in time are extensions. In this sense, the thrust of $(*)$ above is to treat intensions as basic, and extensions as derived.

To ground the discussion in English examples, consider (1).

(1) a. Pat crossed the road.
    b. Pat was crossing the road.
    c. Pat has crossed the road.

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference "sub8 – Sinn und Bedeutung".*
Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany

It is commonly held that the simple sentence (1a) is extensional while its progressive correlate (1b) is intensional — at least if, as in Dowty (1979) and Landman (1992), possibly unrealized continuations of the progressive are considered. To keep the semantics of the progressive extensional, Parsons confines himself to realized parts (Parsons 1990). The pressure to devise an extensional account vanishes if (as in the perspective we adopt) extensions are conceived as being *no* more basic than intensions. The issue of realized versus unrealized parts does *not* arise in the case of the perfect; (1c) puts the entire event of Pat crossing the road safely in the past. The challenge of the perfect, however, is how to derive its various readings. For instance, three distinct construction algorithms are provided in Kamp and Reyle (1993) for the perfect: one for (1c) and two for the stative (2), differing on whether or not Pat-live-in-Vienna is asserted to continue into the present.

(2) Pat has lived in Vienna for two years.

Portner (2003) has (among others) argued that a uniform analysis of the perfect should be given. My claim is that the notion of inertia connected to the notorious *frame problem* of McCarthy and Hayes (1969) is the key to a uniform analysis of the perfect.[1] Inertia, as embodied in worlds, is applied in Dowty (1979) to the *imperfective paradox* afflicting the progressive. This affliction is treated below by a finite-state approach to the stages and continuations in Landman (1992), under which worlds are *not* presumed basic, but instead derived by grounding strings in time.

Relating these back now to Reichenbach (1947), the event timed by E is given by the sentence radical to which the aspectual operator applies. For (1) and (2), the radicals are the un-inflected phrases Pat-cross-the-road and Pat-live-in-Vienna-for-two-years, respectively. Our account below proceeds in three steps, detailed in the next three sections. Section 2 turns the event time E into a string or better still: a set of strings — that is, a language. Section 3 brings in the reference time R, and introduces the possibility of branching beyond R. Section 4 imposes inertial laws before factoring in tense via speech time S. With E, R and S in place, section 5 grounds the strings in time, constructing worlds and models. Section 6 concludes.

2 *E* strung out

Consider the un-inflected phrase (3) on which aspect and tense operate in (2).

(3) Pat-live-in-Vienna for two-years

Let us assume that we have in Φ the formula $\mathsf{live}(p,v)$ for Pat-live-in-Vienna, and let us associate with the phrase two-years a movie of a clock τ marking an interval of two years. At the beginning, the clock τ is at 0; at the end, two years have elapsed. In the middle, the clock ticks; but we will not care how often. That is, we allow for an indeterminate (possibly variable) frequency, reflected in the regular expression (4) by non-zero Kleene iteration $\cdot^+$ on the empty picture $\square$. (We are drawing boxes instead of the usual curly braces $\{\cdot\}$ to distinguish sets-as-symbols from say, sets-as-languages, adopting the practice in regular expressions of writing strings for languages.)

(4) $\boxed{0(\tau)}\,\square^+\,\boxed{\mathsf{2years}(\tau)}$

[1] Such links with logical AI are advocated broadly in Steedman (2000), and were noted at the inter/multi-sentential level in Dowty (1986).

Next, we form a language (5) for the sentence radical (3) from (4) by superposition &, as defined in (6).

(5) $\boxed{0(\tau), \mathsf{live}(p,v)}\boxed{\mathsf{live}(p,v)}^{+}\ \boxed{2\mathsf{years}(\tau), \mathsf{live}(p,v)}$

$= \boxed{\mathsf{live}(p,v)}^{+} \ \ \& \ \ \boxed{0(\tau)}\Box^{+}\boxed{2\mathsf{years}(\tau)}$

(6) $L\&L' \ = \ \bigcup_{n\geq 1}\{(\alpha_1 \cup \alpha'_1)\cdots(\alpha_n \cup \alpha'_n) \mid \alpha_1\cdots\alpha_n \in L \text{ and } \alpha'_1\cdots\alpha'_n \in L'\}$

According to (6), the superposition $L\&L'$ of languages $L, L' \subseteq \mathsf{Pow}(\Phi)^*$ combines strings from L and L' of equal length, forming the componentwise union $\alpha_i \cup \alpha'_i$ of symbols. Each of α_i and α'_i is understood to be a partial snapshot at some ith time, so that the effect of & is to overlay motion pictures with the same duration. A natural form of conjunction, & maps regular languages to regular languages (Fernando 2003a). (5) associates with two-years the language (4), and, under pressure from "for", coerces the formula $\mathsf{live}(p,v)$ for Pat-live-in-Vienna to the language $\boxed{\mathsf{live}(p,v)}^{+}$. A systematic treatment of temporal "for"/"in" modification is provided in Fernando (2003b), based roughly on a re-analysis of the Vendler classes in Dowty (1979) and Naumann (2001) according to Figure 1 (with $\sim$ as negation).

Vendler	**Dowty**	**Naumann**/F
stat[iv]e	$P(\vec{x})$	$\boxed{\varphi}^{+}$
activity	Do$[x, P(\vec{x})]$	Con-BEC$(\varphi) = \boxed{\sim\varphi}\boxed{\varphi}^{+}$
achievement	Bec$[P(\vec{x})]$	Min-BEC$(\varphi) = \boxed{\sim\varphi}^{+}\boxed{\varphi}$
accomplishment	Cause(Do$[x, P(\vec{x})]$,Bec$[Q(\vec{y})]$)	$\boxed{\sim\varphi, \sim\psi}\boxed{\varphi, \sim\psi}^{*}\boxed{\varphi, \psi}$

Figure 1

Dowty's decomposition of an accomplishment into an activity and an achievement is re-captured in the third column of Figure 1 as

$$\text{Con-BEC}(\varphi)\ \&\ \text{Min-BEC}(\psi) \quad = \quad \boxed{\sim\varphi, \sim\psi}\boxed{\varphi, \sim\psi}^{*}\boxed{\varphi, \psi}$$

where $\cdot^*$ is Kleene star, $L^+ = L^*L$. A concrete example is provided by the accomplishment Pat-swim-two-miles with ψ as $\mathsf{swim}(\mathsf{pat}, a)$ and φ as $(\exists u \preceq a)\ \mathsf{swim}(\mathsf{pat}, u)$, where $u \preceq a$ says "u is a non-null part of a" and a is a distance of two miles. To record the last fact, we can superpose Con-BEC(φ) & Min-BEC(ψ) with the state $\boxed{2\mathsf{miles}(a)}^{+}$ to get (7).

(7) $\boxed{\sim\varphi, \sim\psi, 2\mathsf{miles}(a)}\boxed{\varphi, \sim\psi, 2\mathsf{miles}(a)}^{*}\boxed{\varphi, \psi, 2\mathsf{miles}(a)}$

The reader concerned about Pat repeatedly swimming two miles might sharpen the formula $\mathsf{swim}(x,y)$ to $\mathsf{swimSince}(x,y,t)$, with a temporal argument t marking the beginning of the swim. Adjusting φ and ψ accordingly, we would then replace (7) by (8), where $\mathsf{time}(t)$ is a formula marking the pictured time as t (Fernando 2003a).

(8) $\boxed{\mathsf{time}(t), \sim\varphi, \sim\psi, 2\mathsf{miles}(a)}\boxed{\varphi, \sim\psi, 2\mathsf{miles}(a)}^{*}\boxed{\varphi, \psi, 2\mathsf{miles}(a)}$

Clearly, our languages may become more complicated than those tabulated in Figure 1.

3 R and continuation branches

A typical Reichenbachian approach to aspect, relating E to R, is summarized in (9).

(9) a. **Simple** $E = R$
b. **Progressive** $R \sqsubset E$
c. **Perfect** $E < R$

Having stepped from event time E to a regular language $L \subseteq \mathsf{Pow}(\Phi)^*$ in the previous section, we can formulate temporal precedence $<$ and containment $\sqsubset$ as in (10), construing the reference time R as a formula in Φ that marks a position in a string in L.

(10) a. $\textsc{Simp}(L,R) = L \,\&\, \Box^* \boxed{R}$
b. $\textsc{Prog}(L,R) = L \,\&\, \Box^+ \boxed{R} \Box^+$
c. $\textsc{Perf}(L,R) = L\Box^* \boxed{R}$

For the simple aspect, R picks out the end of L (identified with E); for the progressive, it marks an intermediate point; and for the perfect, it marks a point after L. To illustrate, if

$$L \;=\; \boxed{0(\tau),\mathsf{live}(p,v)}\boxed{\mathsf{live}(p,v)}^+\boxed{\mathsf{live}(p,v),\, \mathsf{2years}(\tau)}$$

then

$$\textsc{Simp}(L,R) \;=\; \boxed{0(\tau),\mathsf{live}(p,v)}\boxed{\mathsf{live}(p,v)}^+\boxed{\mathsf{live}(p,v),\, \mathsf{2years}(\tau),R}$$

$$\textsc{Prog}(L,R) \;=\; \boxed{0(\tau),\mathsf{live}(p,v)}\boxed{\mathsf{live}(p,v)}^*\boxed{\mathsf{live}(p,v),R}\boxed{\mathsf{live}(p,v)}^*\boxed{\mathsf{live}(p,v),\mathsf{2years}(\tau)}\;.$$

Moving from regular languages to finite automata, the functions in (10) track the computation of an automaton for L: $\textsc{Simp}(L,R)$ says that the automaton has reached completion; $\textsc{Prog}(L,R)$ that it has *not* quite gotten there but is on its way; and $\textsc{Perf}(L,R)$ that it is history.[2]

To develop the account further, some notation is useful. Let us call a string $\alpha_1 \cdots \alpha_n \in \mathsf{Pow}(\Phi)^*$ *R-truncated* if for all $i \in \{1, \ldots n\}$,

$$R \in \alpha_i \quad \text{implies} \quad i = n\;.$$

The *R-truncation of* a string s, denoted s_R, is the largest prefix of s that is R-truncated. An *R-continuation of* s is a string s' with the same R-truncation, $\mathsf{s}'_R = \mathsf{s}_R$. Now, the idea is to relativize the membership relation $\mathsf{s} \in L$ by existentially quantifying over a (contextually given) set $c(\mathsf{s})$ of R-continuations of s

$$\mathsf{s} :_c L \quad \text{iff} \quad (\exists \mathsf{s}' \in c(\mathsf{s}))\; \mathsf{s}' \in L$$

so as to allow for an R-continuation s' of s different from s. To investigate this notion, let us move the subscript c on : over to L, forming the language

$$L/c \;=\; \{\mathsf{s} \mid c(\mathsf{s}) \cap L \neq \emptyset\}$$

(with $\mathsf{s} :_c L$ iff $\mathsf{s} : L_c$). Let us write $c_R(\mathsf{s})$ for the set of R-continuations of s

$$c_R(\mathsf{s}) \;=\; \{\mathsf{s}' \in \mathsf{Pow}(\Phi)^* \mid \mathsf{s}'_R = \mathsf{s}_R\}$$

and L_R for the set of R-truncations of strings in L

$$L_R \;=\; \{\mathsf{s}_R \mid \mathsf{s} \in L\}\;.$$

For the record, we have

Proposition 1. *Let* $L \subseteq \mathsf{Pow}(\Phi)^*$ *and (for parts (iv) to (vi) below)* $c : \mathsf{Pow}(\Phi)^* \to \mathsf{Pow}(\mathsf{Pow}(\Phi)^*)$.

[2] The present account has, in the informal terms just stated, much in common with Narayanan (1997) but differs from it in emphasizing strings/languages, using superposition & to stay regular.

(i) $L/\{\cdot\} \;=\; L$ *where* $\{\cdot\}$ *maps every* $\mathsf{s} \in \mathsf{Pow}(\Phi)^*$ *to* $\{\mathsf{s}\}$.

(ii) $L/c_R \;=\; L_R\, \mathsf{Pow}(\Phi - \{R\})^*$.

(iii) *If* L *is regular, then so is* L_R *and hence* L/c_R.

(iv) *Given* $c' : \mathsf{Pow}(\Phi)^* \to \mathsf{Pow}(\mathsf{Pow}(\Phi))^*$ *such that* $c(\mathsf{s}) \subseteq c'(\mathsf{s})$ *for all* $\mathsf{s} \in \mathsf{Pow}(\Phi)^*$,

$$L/c \;\subseteq\; L/c' \;.$$

(v) $L \;\subseteq\; L/c$ *provided*

(**c1**) $\mathsf{s} \in c(\mathsf{s})$ *for every* $\mathsf{s} \in \mathsf{Pow}(\Phi)^*$.

(vi) $(L/c)_R \;=\; L_R$ *assuming* c *satisfies* (**c1**) *above and*

(**c2**) $c(\mathsf{s}) \subseteq c_R(\mathsf{s})$ *for every* $\mathsf{s} \in \mathsf{Pow}(\Phi)^*$.

Proof. All of the assertions are straightforward, except perhaps for (iii). A finite automaton for L is turned into one for L_R as follows. For every transition $\xrightarrow{\alpha} q$ with $R \in \alpha$, replace its target state q by a new state that is added to the set of final/accepting states. Since such states are new, *no* transition may come out of them. $\dashv$

Conditions (**c1**) and (**c2**) from Proposition 1 allow for any number of choices of $c(\mathsf{s})$ between $\{\mathsf{s}\}$ and $c_R(\mathsf{s})$ that can be applied to the imperfective paradox. That is,

$$\mathsf{s} \in \textsc{Prog}(L,R)/c \quad \text{need not imply} \quad \mathsf{s} \in \textsc{Prog}(L,R) \;.$$

The converse, however, *does* hold, according to part (v) of Proposition 1, supporting the insight in Landman (1992) that

> if an accomplishment manages to get completed, it is unproblematic to assume (in retrospect) that the progressive is true during the development stage ... even if the event gets completed against all odds.

The progressive aside, the exact choice of c satisfying (**c1**) and (**c2**) need *not* matter for the aspectual functions in (10). To be more precise, let us call a language L *R-truncated* if $L_R = L$. Examples include $\textsc{Simp}(L',R)$ and $\textsc{Perf}(L',R)$ for languages L' that are R-free in that

$$\text{for every string } \alpha_1 \cdots \alpha_n \in L', \qquad R \notin \bigcup_{i=1}^{n} \alpha_i \;.$$

For R-truncated L, it follows from Proposition 1 (vi) that $(L/c)_R = L$. As far as R-truncations are concerned, the construction $\cdot/c$ is innocuous.

4 S after inertia

A Reichenbachian approach to tense relates R to S as in (11)

(11) a. **Past** $R < S$
b. **Present** $R = S$
c. **Future** $R > S$

To translate (11) in finite-state terms, it is useful to define the language $1(R)$ of strings in which R occurs at most once

$$1(R) \quad = \quad \mathsf{Pow}(\Phi - \{R\})^* \; \mathsf{Pow}(\Phi) \; \mathsf{Pow}(\Phi - \{R\})^* \quad .$$

Intersection with $1(R)$ is one of the regular operations, with which we can formalize the tenses.

(12) a. $\textsc{Past}(L,S) = (L\Box^* \;\&\; \Box^*\boxed{R}\Box^*\boxed{S}\Box^*) \;\cap\; 1(R)$
b. $\textsc{Pres}(L,S) = (L \;\;\&\; \Box^*\boxed{R,S}\Box^*) \;\cap\; 1(R)$
c. $\textsc{Futu}(L,S) = (\Box^* L \;\&\; \Box^*\boxed{S}\Box^*\boxed{R}\Box^*) \;\cap\; 1(R)$

An instructive example is provided by the sentence "Pat has left Vienna," worked out in (13).[3]

(13) a. Pat-leave-Vienna
$\boxed{\mathsf{in}(p,v)}\boxed{\mathsf{leave}(p,v)}\boxed{\sim\mathsf{in}(p,v)}$
b. Perfect(Pat-leave-Vienna)
$\boxed{\mathsf{in}(p,v)}\boxed{\mathsf{leave}(p,v)}\boxed{\sim\mathsf{in}(p,v)}\Box^*\boxed{R}$
c. Present(Perfect(Pat-leave-Vienna))
$\boxed{\mathsf{in}(p,v)}\boxed{\mathsf{leave}(p,v)}\boxed{\sim\mathsf{in}(p,v)}\Box^*\boxed{R,S}$
d. Resultative reading of "Pat has left Vienna"
$\boxed{\mathsf{in}(p,v)}\boxed{\mathsf{leave}(p,v)}\boxed{\sim\mathsf{in}(p,v)}\boxed{\sim\mathsf{in}(p,v)}^*\boxed{\sim\mathsf{in}(p,v),R,S}$

The obvious problem is how to bridge the gap between (13c) and (13d). Evidently, the formula $\sim\mathsf{in}(p,v)$ in (13c) must spill over onto R. With this in mind. let us introduce a set $\mathsf{Inr} \subseteq \Phi$ of inertial formulae, forming $\textsc{Perf}_{\mathsf{Inr}}(L,R)$ with inertial formulae at the end of L persisting

$$\textsc{Perf}_{\mathsf{Inr}}(L,R) \quad = \quad \{\alpha_1 \cdots \alpha_k \theta^n (\theta \cup \boxed{R}) \mid \alpha_1 \cdots \alpha_k \in L,\; \theta = \alpha_k \cap \mathsf{Inr} \text{ and } n \geq 0\} \; .$$

Assuming $\sim\mathsf{in}(p,v) \in \mathsf{Inr}$ but $\mathsf{leave}(p,v) \notin \mathsf{Inr}$,

$$\textsc{Perf}_{\mathsf{Inr}}((13\mathrm{a}),R) \quad = \quad \boxed{\mathsf{in}(p,v)}\boxed{\mathsf{leave}(p,v)}\boxed{\sim\mathsf{in}(p,v)}\boxed{\sim\mathsf{in}(p,v)}^*\boxed{\sim\mathsf{in}(p,v),R}$$

from which (13d) results after applying $\textsc{Pres}$.

Proposition 2. *If L is regular, so is* $\textsc{Perf}_{\mathsf{Inr}}(L,R)$.

Proof. Map a finite automaton $\langle Q,F,\to,q_0\rangle$ for L to the automaton $\langle Q,\{f\},\to',q_0\rangle$ for $\textsc{Perf}_{\mathsf{Inr}}(L,R)$ where the set Q' of states is

$$Q' \quad = \quad Q \cup \{f\} \cup \mathsf{Pow}(\mathsf{Inr})$$

with the sets Q,$\{f\}$ and $\mathsf{Pow}(\mathsf{Inr})$ assumed to be mutually disjoint, and transitions $\to'$ equal to

$$\begin{aligned} \to \quad \cup \quad & \{(q,\alpha,\alpha \cap \mathsf{Inr}) \mid q \in Q \text{ and } (\exists q' \in F)\; q \xrightarrow{\alpha} q'\} \;\cup \\ & \{(\theta,\theta,\theta) \mid \theta \subseteq \mathsf{Inr}\} \;\cup\; \{(\theta,\theta \cup \boxed{R}, f) \mid \theta \subseteq \mathsf{Inr}\} \end{aligned}$$

That is, whenever $q \xrightarrow{\alpha} q' \in F$, we add arcs $q \xrightarrow{\alpha} \theta$, $\theta \xrightarrow{\theta} \theta$, $\theta \xrightarrow{\theta[R]} f$, where $\theta = \alpha \cap \mathsf{Inr}$ and $\theta[R] = \theta \cup \boxed{R}$. $\dashv$

[3]The point to be made presently applies to other choices for (13a) such as $\boxed{\mathsf{in}(p,v)}^+\boxed{\mathsf{leave}(p,v),\sim\mathsf{in}(p,v)}$.

We can recover $\text{PERF}(L,R)$ in (10) by setting Inr to $\emptyset$

$$\text{PERF}(L,R) \quad = \quad \text{PERF}_{\emptyset}(L,R) \ .$$

Playing with different choices of Inr, we can account for various readings of the perfect. For example, consider again the un-inflected phrase Pat-live-in-Vienna-for-two-years. Building on our analysis in (5), we get

$$\text{PERF}((5),R) \quad = \quad \boxed{0(\tau),\,\mathsf{live}(p,v)}\boxed{\mathsf{live}(p,v)}^{+}\boxed{\mathsf{live}(p,v),\mathsf{2years}(\tau)}\Box^{*}\boxed{R} \ .$$

If $\mathsf{live}(p,v) \in \mathsf{Inr}$ but $\mathsf{2years}(\tau) \notin \mathsf{Inr}$, then

$$\text{PERF}_{\mathsf{Inr}}((5),R) \quad = \quad \boxed{0(\tau),\,\mathsf{live}(p,v)}\boxed{\mathsf{live}(p,v)}^{+}\boxed{\mathsf{live}(p,v),\,\mathsf{2years}(\tau)}\boxed{\mathsf{live}(p,v)}^{*}\boxed{\mathsf{live}(p,v),R}$$

and $\text{PRES}(\text{PERF}_{\mathsf{Inr}}((5),R),S)$ is

$$\boxed{0(\tau),\,\mathsf{live}(p,v)}\boxed{\mathsf{live}(p,v)}^{+}\boxed{\mathsf{live}(p,v),\,\mathsf{2years}(\tau)}\boxed{\mathsf{live}(p,v)}^{*}\boxed{\mathsf{live}(p,v),R,S} \ .$$

The last language expresses a continuative reading of (2), Pat has lived in Vienna for two years. What about an existential one that is silent on Pat's current domicile? The simplest way to block inertial flow is to restrict Inr, declaring that $\mathsf{live}(p,v) \notin \mathsf{Inr}$. But how do we justify this move?

One approach is to link existential readings with (possibly implicit) questions or topics that override default settings for Inr. An existential reading of (2) is, for instance, licensed by

Has Pat *ever* lived in Vienna for two years?

A further test is (14).

(14) I have lost my key but have found it.

Out of the blue, (14) is odd; but it is a fine reply to

Have you *ever* lost your key?

Similarly for an existential reading of "Pat has left Vienna."

An alternative account of existential readings can be based on the observation that $\text{PAST}(L,S)$ does not provide for inertial flow beyond R. That is, S is a barrier to inertial flow when R temporally precedes S. Inferences from the past to the present fail, such as

$$\text{Pat was happy} \quad \not\models \quad \text{Pat is happy}$$

under (15).

(15) a. Pat-be-happy
$\boxed{\mathsf{happy}(p)}^{+}$
b. Simple(Pat-be-happy)
$\boxed{\mathsf{happy}(p)}^{*}\boxed{\mathsf{happy}(p),R}$
c. Pat was happy.
$\boxed{\mathsf{happy}(p)}^{*}\boxed{\mathsf{happy}(p),R}\Box^{*}\boxed{S}\Box^{*}$

d. Pat is happy.
$\boxed{\mathsf{happy}(p)}^* \boxed{\mathsf{happy}(p), R, S}$

The blockage here of inertial flow suggests an alternative mechanism for deriving present existential readings: rather than manipulating Inr, an *ever* question might shift temporal perspective, introducing a displaced speech time $S' < S$ that yields in the case (for example) of "Pat has lived in Vienna for two years" the language

$$\boxed{0(\tau), \mathsf{live}(p,v)} \boxed{\mathsf{live}(p,v)}^+ \boxed{\mathsf{live}(p,v),\ \mathsf{2years}(\tau)} \boxed{\mathsf{live}(p,v)}^* \boxed{\mathsf{live}(p,v), R, S'} \square^* \boxed{S} \ .$$

This analysis would seem to be compatible with an "extended now," discussed for example in Portner (2003). It is not clear to me if it is superior to the previous (Inr-revising) approach.

The remainder of this section aims to isolate a general principle underlying $\text{PERF}_{\mathsf{Inr}}$. Let us introduce a further parameter $\Sigma \subseteq \mathsf{Pow}(\Phi)$ specifying a notion of "legal" stills/snaps that is $\subseteq$-closed

$$(\forall \alpha \in \Sigma)(\forall \alpha' \subseteq \alpha) \qquad \alpha' \in \Sigma$$

and free of $\sim$-pairs

$$(\forall \varphi \in \Phi) \qquad \boxed{\varphi, \sim \varphi} \not\in \Sigma \ .$$

Leaving the exact choice of Σ open, Σ regulates inertial flow according to the rules

$$\frac{\mathsf{s}\alpha\alpha'\mathsf{s}'}{\mathsf{s}\alpha(\alpha' \cup \boxed{\varphi})\mathsf{s}'} \ \varphi \in \alpha \cap \mathsf{Inr} \text{ and } \alpha' \cup \boxed{\varphi} \in \Sigma$$

and (reversing the flow of time)

$$\frac{\mathsf{s}\alpha\alpha'\mathsf{s}'}{\mathsf{s}(\alpha \cup \boxed{\varphi})\alpha'\mathsf{s}'} \ \varphi \in \alpha' \cap \mathsf{Inr} \text{ and } \alpha \cup \boxed{\varphi} \in \Sigma \ .$$

These rules induce the operator Γ that maps a language L to the language

$$\begin{aligned} \Gamma(L) \quad = \quad & \{\mathsf{s}\alpha(\alpha' \cup \boxed{\varphi})\mathsf{s}' \mid \mathsf{s}\alpha\alpha'\mathsf{s}' \in L,\ \varphi \in \alpha \cap \mathsf{Inr} \text{ and } \alpha' \cup \boxed{\varphi} \in \Sigma\} \cup \\ & \{\mathsf{s}(\alpha \cup \boxed{\varphi})\alpha'\mathsf{s}' \mid \mathsf{s}\alpha\alpha'\mathsf{s}' \in L,\ \varphi \in \alpha' \cap \mathsf{Inr} \text{ and } \alpha \cup \boxed{\varphi} \in \Sigma\} \end{aligned}$$

(suppressing the subscripts Inr and Σ to simplify notation). Let us define L to be (Inr, Σ)-*full* if $L \subseteq \Sigma^*$ and for all $s \in L$, $\Gamma(\{s\}) \subseteq \{s\}$. Iterating Γ over the natural numbers, let

$$\begin{aligned} \Gamma^0(L) \quad &= \quad L \\ \Gamma^{n+1}(L) \quad &= \quad \Gamma(\Gamma^n(L)) \\ \Gamma_\infty(L) \quad &= \quad \bigcup_{n \geq 0} \Gamma^n(L) \ . \end{aligned}$$

Proposition 3. $\text{PERF}_{\mathsf{Inr}}(L,R)$ *is the* (Inr,Σ)*-full fragment of* $\Gamma_\infty(\text{PERF}(L,R))$

$$\text{PERF}_{\mathsf{Inr}}(L,R) \quad = \quad \{s \in \Gamma_\infty(\text{PERF}(L,R)) \mid \Gamma(\{s\}) \subseteq \{s\}\}$$

assuming L *is* (Inr,Σ)*-full,* $R \not\in \mathsf{Inr}$ *and for all* $\alpha \subseteq \Phi - \{R\}$,

$$\alpha \in \Sigma \quad \textit{iff} \quad \alpha \cup \boxed{R} \in \Sigma \ .$$

Inertia has, under the same assumptions as in Proposition 3, no effect on the progressive or the simple of a language L

$$\begin{aligned} \text{SIMP}(L,R) \quad &= \quad \{s \in \Gamma_\infty(\text{SIMP}(L,R)) \mid \Gamma(\{s\}) \subseteq \{s\}\} \\ \text{PROG}(L,R) \quad &= \quad \{s \in \Gamma_\infty(\text{PROG}(L,R)) \mid \Gamma(\{s\}) \subseteq \{s\}\} \ . \end{aligned}$$

5 Background extensions: worlds and models

To interpret the strings in $\mathsf{Pow}(\Phi)^*$ model-theoretically, the basic idea is to apply the formulae to times for a notion of truth (Fernando 2003a, Fernando 2003b). In this section, we shall take a piecewise approach in terms of relations $p \subseteq \mathsf{Ti} \times \Phi$ between a set Ti of times and Φ, reading

$$p(t, \varphi) \quad \text{as} \quad \varphi \text{ holds at } t \text{, according to } p\ .$$

Given a sequence $t_1 \cdots t_n \in \mathsf{Ti}$, p induces the string

$$\mathsf{str}(p, t_1 \cdots t_n) \;=\; \boxed{\varphi \mid p(t_1, \varphi)} \cdots \boxed{\varphi \mid p(t_n, \varphi)}\ .$$

Conversely, a time-stamping $t_1 \cdots t_n$ on a string $\alpha_1 \cdots \alpha_n \in \mathsf{Pow}(\Phi)^*$ determines a relation p such that for all $t \in \mathsf{Ti}$ and $\varphi \in \Phi$,

$$p(t, \varphi) \quad \text{iff} \quad (\exists i \in \{1, \ldots, n\})\ t = t_i \text{ and } \varphi \in \alpha_i\ .$$

Along with Ti, let us fix a binary relation $\mathsf{succ} \subseteq \mathsf{Ti} \times \mathsf{Ti}$ such that its transitive closure succ^+ is irreflexive, writing ch(succ) for the set of finite succ-chains

$$\mathrm{ch}(\mathsf{succ}) \;=\; \{t_1 \cdots t_n \in \mathsf{Ti}^+ \mid \mathsf{succ}(t_i, t_{i+1}) \text{ for } 1 \leq i < n\}\ .$$

(As will become clear shortly, the intuition is that succ represents a level of granularity for taking snapshots.) To step from explicit to implicit information, let us assume a background $\mathsf{P} \subseteq \mathsf{Pow}(\mathsf{Ti} \times \Phi)$ of "possible" pieces, defining the *forcing relation* $\Vdash_{\mathsf{P}}$ with domain P so that for $p \in \mathsf{P}$,

$$p \Vdash_{\mathsf{P}} L, t \quad \text{iff} \quad p(t, R) \text{ and } (\exists \mathbf{t} \in \mathrm{ch}(\mathsf{succ}))\ \mathsf{str}(p, \mathbf{t}) :_c L$$

for some function $c : \mathsf{Pow}(\Phi)^* \to \mathsf{Pow}(\mathsf{Pow}(\Phi)^*)$. The force of P (as background) comes out in interpreting negation $\neg$ universally relative to the restriction $\supseteq_{\mathsf{P}}$ of $\supseteq$ to P

$$p \Vdash_{\mathsf{P}} \neg A \quad \text{iff} \quad \text{not } (\exists p' \supseteq_{\mathsf{P}} p)\ p' \Vdash_{\mathsf{P}} A\ .$$

Applying negation $\neg$ twice, we get our satisfaction relation $\models_{\mathsf{P}}$

$$\begin{aligned} p \models_{\mathsf{P}} A \quad & \text{iff} \quad p \Vdash_{\mathsf{P}} \neg\neg A \\ & \text{iff} \quad (\forall p' \supseteq_{\mathsf{P}} p)(\exists p'' \supseteq_{\mathsf{P}} p')\ p'' \Vdash_{\mathsf{P}} A\ . \end{aligned}$$

Worlds for $\models_{\mathsf{P}}$ are derived from selections in P that cover all of time and are, at each time, maximal. More precisely, relative to a set Ψ of formulas that may occur to the right of $\Vdash_{\mathsf{P}}$ (picking out a subset of Ti, named in Ψ), we define a subset G of P to be P-*generic* if

(i) for all $p \in G$ and $p' \in \mathsf{P}$ such that $p' \subseteq p$, $p' \in G$

(ii) for all $p, p' \in G$, there exists $p'' \in \mathsf{P}$ such that $p'' \supseteq p \cup p'$

(iii) for all $A \in \Psi$, there is a $p \in G$ such that either $p \Vdash_{\mathsf{P}} A$ or $p \Vdash_{\mathsf{P}} \neg A$.

Leaving open exactly what other connectives are available within Ψ, we may expect to extract a model $M[G]$ from a P-generic G such that

$$M[G] \models A \quad \text{iff} \quad (\exists p \in G)\ p \Vdash_{\mathsf{P}} A$$

and for $\mathcal{G}(\mathsf{P}, p) = \{G \subseteq \mathsf{P} \mid G \text{ is } \mathsf{P}\text{-generic and } p \in G\}$,

$$p \models_{\mathsf{P}} A \quad \text{iff} \quad (\forall G \in \mathcal{G}(\mathsf{P}, p)) \;\; M[G] \models A$$

provided we have suitable $||\!-_{\mathsf{P}}$-clauses for all $A \in \Psi$ guaranteeing persistence

$$p' \supseteq_{\mathsf{P}} p \text{ and } p \,||\!-_{\mathsf{P}} A \quad \text{imply} \quad p' \,||\!-_{\mathsf{P}} A$$

(e.g. (Keisler 1973)). It is natural to identify a generic set with a world, and, assuming without loss of generality that $\emptyset \in \mathsf{P}$, to associate the common ground $\mathcal{G}(\mathsf{P}, \emptyset)$ with P, which a formula A in Ψ updates to $\mathcal{G}(\mathsf{P}_A, \emptyset)$, where

$$\mathsf{P}_A \;\; = \;\; \{p \in \mathsf{P} \mid p' \,||\!-_{\mathsf{P}} A \text{ for some } p' \in \mathsf{P} \text{ such that } p \subseteq p'\} \; .$$

What about the function $c : \mathsf{Pow}(\Phi)^* \rightarrow \mathsf{Pow}(\mathsf{Pow}(\Phi)^*)$ invoked to determine whether or not $p \,||\!-_{\mathsf{P}} L, t$? For R-truncated L, the exact choice of c satisfying (**c1**) and (**c2**) is immaterial to $||\!-_{\mathsf{P}}$, and can be assumed to be the singleton map $\{\cdot\}$ (so that $L/c = L$). But for languages that are not R-truncated, it is natural to investigate c through other approaches to $||\!-_{\mathsf{P}}$ such as

$$\begin{aligned} p \,||\!-_{\mathsf{P}} L, t \quad & \text{iff} \quad (\exists p' \subseteq p) \; p'(t, R) \text{ and } p' :_{\mathsf{cb}} L, t \\ p :_{\mathsf{cb}} L, t \quad & \text{iff} \quad (\exists p' \in \mathsf{cb}(p, t))(\exists t_1 \cdots t_n \in \mathrm{ch}(\mathsf{succ})) \\ & \qquad\qquad \{t_1, \ldots, t_n\} \supseteq \mathsf{domain}(p') \text{ and } \mathsf{str}(p', t_1 \cdots t_n) \in L \end{aligned}$$

for some function $\mathsf{cb} : (\mathsf{Pow}(\mathsf{Ti} \times \Phi) \times \mathsf{Ti}) \rightarrow \mathsf{Pow}(\mathsf{Pow}(\mathsf{Ti} \times \Phi))$ satisfying

(a) $p \in \mathsf{cb}(p, t)$

(b) for all $p' \in \mathsf{cb}(p, t)$, $\varphi \in \Phi$ and $t' \preceq t$, $p(t', \varphi)$ iff $p'(t', \varphi)$

where $\preceq$ is the reflexive transitive closure of succ. The "continuation branch" function cb is similar to the modal base function Condoravdi (2002) applies for a temporal interpretation of might, with pieces $p \subseteq \mathsf{Ti} \times \Phi$ in place of worlds (Fernando 2003c). Conditions (a) and (b) correspond to (**c1**) and (**c2**) respectively, condition (b) building in *historical necessity* (Thomason 1984).[4] That said, there is a gap between $c(\mathsf{s}) \subseteq \mathsf{Pow}(\Phi)^*$ and $\mathsf{cb}(p, t) \subseteq \mathsf{Pow}(\mathsf{Ti} \times \Phi)$ to be bridged. The idea is that for all $t_1 \cdots t_n \in \mathrm{ch}(\mathsf{succ})$ and $p \subseteq \mathsf{Ti} \times \Phi$ such that

$$\{t_1, \ldots, t_n\} \supseteq \mathsf{domain}(p) \quad \text{and} \quad \text{for some } i \in \{1, \ldots, n\}, \; p(t_i, R) \; ,$$

we can identify $c(\mathsf{str}(p, t_1 \cdots t_n))$ with the language

$$\begin{aligned} \{\mathsf{str}(p', t'_1 \cdots t'_k) \quad | \quad & p' \in \mathsf{cb}(p, t_i), \; t'_1 \cdots t'_k \in \mathrm{ch}(\mathsf{succ}), \\ & \{t'_1, \ldots, t'_k\} \supseteq \mathsf{domain}(p') \text{ and } t_1 \cdots t_i \text{ is a prefix of } t'_1 \cdots t'_k\} \; . \end{aligned}$$

As different choices of p and $t_1 \cdots t_n$ may converge on the same string $\mathsf{s} = \mathsf{str}(p, t_1 \cdots t_n)$, we must be prepared to consider different functions $c : \mathsf{Pow}(\Phi)^* \rightarrow \mathsf{Pow}(\mathsf{Pow}(\Phi)^*)$ within $||\!-_{\mathsf{P}}$. Reference to any *one* function c is less than optimal in exposing the factors the come into the choice of continuation branches — but is irresistible when abstracting away these factors (or so section 3 above suggests).

[4]The candidate $\mathsf{cb}(p, t) = \{p\}$ is Ockhamist, as opposed to Peircean (in the sense of Prior; page 143 of Thomason (1984)).

6 Conclusion

The account above refines traditional Reichenbachian E, R, S analyses of tense and aspect in at least three ways.

1. Rather than taking event structures (Kamp and Reyle 1993) for granted, certain temporal formulae are strung together and superposed to form event-types, instantiations of which may have time E.[5]

2. The stative/non-stative contrast is traced to a distinction between inertial and non-inertial formulae, with ramifications for the perfect.

3. R is construed as a non-inertial formula, marking out a point in an intensional model, up to which inertia flows and beyond which there is branching.

The intensionality described 3 is effected above *not* by relativizing extensional notions to worlds, but by working with notions (such as event-type) that are meaningful prior to their extensional grounding. Worlds are not presumed to be primitive, but rather constructed (via standard techniques recalled in section 5) from runs of machines that may or may not get interrupted. What emerges is a finite-state alternative to (Priorian) tense logic, with conjunctive operations $\&, \cap$ in place of modal operators $\mathsf{P}, \mathsf{F}, \mathsf{G}, \mathsf{H}$ (Fernando 2003a). Relations between E, R and S are kept simple, with much of the complexities swept over to the context dependence of inertia and continuation branches. Different choices of inertial formulae induce different readings of the perfect; the choice of continuations c satisfying (**c1**) and (**c2**) shapes the progressive.

Acknowledgments

My thanks to Cleo Condoravdi, Hans Kamp, Stefan Kaufmann, Paul Portner, Frank Veltman and Ede Zimmermann for helpful discussions, and to audiences at the ESSLLI 2003 Workshop on Modality (Vienna) and at Sinn und Bedeutung 2003 (Frankfurt).

References

Condoravdi, C.: 2002, Temporal interpretation of modals: Modals for the present and for the past, *in* D. Beaver, S. Kaufmann, B. Clark and L. Casillas (eds), *The Construction of Meaning*, CSLI, Stanford, pp. 59–88.

Dowty, D. R.: 1979, *Word Meaning and Montague Grammar*, Reidel, Dordrecht.

Dowty, D. R.: 1986, The effects of aspectual class on the temporal structure of discourse: semantics or pragmatics?, *Linguistics and Philosophy* **9**, 37–61.

Fernando, T.: 2003a, A finite-state approach to events in natural language semantics, To appear *J. Logic and Computation*; an extension of section 2 of a paper by the same author in the proceedings of TIME-02, Manchester (IEEE CS Press, 2002, pages 124–131); available at www.cs.tcd.ie/Tim.Fernando/jlc.pdf.

[5] Instantiations of the event-types above may well have more complicated location times than the single intervals assigned by event structures in Kamp and Reyle (1993).

Fernando, T.: 2003b, Finite-state descriptions for temporal semantics, Supersedes the paper with the same title appearing in the proceedings of the 5th International Workshop on Computational Semantics (IWCS-5) Tilburg (pages 122–136); available at www.cs.tcd.ie/Tim.Fernando/tf.pdf.

Fernando, T.: 2003c, Schedules in a temporal interpretation of modals, Draft; available at www.cs.tcd.ie/Tim.Fernando/js.pdf.

Kamp, H. and Reyle, U.: 1993, *From Discourse to Logic*, Kluwer Academic Publishers, Dordrecht.

Keisler, H. J.: 1973, Forcing and the omitting types theorem, *in* M. Morley (ed.), *Studies in Model Theory*, The Mathematical Association of America, pp. 96–133.

Landman, F.: 1992, The progressive, *Natural Language Semantics* **1**, 1–32.

McCarthy, J. and Hayes, P.: 1969, Some philosophical problems from the standpoint of artificial intelligence, *in* M. Meltzer and D. Michie (eds), *Machine Intelligence 4*, Edinburgh University Press, pp. 463–502.

Narayanan, S. S.: 1997, Knowledge-based Action Representations for Metaphor and Aspect (KARMA), PhD Dissertation, Computer Science, University of California at Berkeley.

Naumann, R.: 2001, Aspects of changes: a dynamic event semantics, *J. Semantics* **18**, 27–81.

Parsons, T.: 1990, *Events in the Semantics of English: A Study in Subatomic Semantics*, MIT Press, Cambridge, MA.

Portner, P.: 2003, The (temporal) semantics and (modal) pragmatics of the perfect, *Linguistics and Philosophy* **26**(4), 459–510.

Reichenbach, H.: 1947, *Elements of Symbolic Logic*, London, Macmillan.

Steedman, M.: 2000, *The Productions of Time*, Draft, ftp://ftp.cogsci.ed.ac.uk/pub/steedman /temporality/temporality.ps.gz. Subsumes 'Temporality,' in J. van Benthem and A. ter Meulen, editors, *Handbook of Logic and Language*, pages 895–935, Elsevier North Holland, 1997.

Thomason, R.: 1984, Combinations of tense and modality, *in* D. Gabbay and F. Guenthner (eds), *Handbook of Philosophical Logic*, Reidel, pp. 135–165.

INGREDIENTS OF A SEMANTIC THEORY OF CONTRASTIVE TOPICS[1]

Beáta Gyuris

gyuris@nytud.hu

Abstract

The paper investigates four phenomena having to do with the interpretation of Hungarian sentences with contrastive topics (CTs), including the apparent wide scope as well as narrow scope readings of CTs, the lack of interpretations for particular, otherwise well-formed sentences with a CT, and the predictability of collective versus distributive readings for plural NPs in CT position. Some previous theories are reviewed, and claimed to be unable to handle all of the above phenomena simultaneously. The paper argues that the first puzzle should be handled along the lines of Jacobs (1997), the third and the fourth along the lines of Büring (1997), and it proposes a new approach to explain the second one.

1 Aim

The aim of the paper is to look at the issue of what factors need to be taken into account in order to be able to determine whether a sentence with a contrastive topic can have an interpretation at all, and if so, which of some theoretically possible interpretations will be available for it. Four phenomena from Hungarian will be identified which will be claimed to cause problems for existing theories concerned with the interpretation of sentences with contrastive topics, and therefore require a novel prespective.

The four phenomena to be discussed include the availability of a narrow scope reading for quantificational expressions playing the role of the contrastive topic in the sentence; the lack of wide scope readings for particular quantificational expressions in the same position, and the availability of the wide-scope reading for others; the uninterpretability of certain sentences with monotone decreasing and non-monotonic determiners in the above position; and the lack of collective readings for particular plural NPs there.

In section 2, the types of data listed above will be illustrated with examples, whereas section 3 will review some relevant claims made by previous theories on related phenomena. section 4 takes a new look at the wide scope phenomena, section 5 makes a proposal about the treatment of narrow scope readings, sentences with no available interpretation are looked at in section 6, while section 7 examines the availability of collective/distributive readings. The paper closes with the conclusions in section 8.

2 The phenomena

Consider the available readings for (1) and (2) below:

(1)	[$_{CT}$	/Két	könyvet] [$_{QP}$	\minden	gyerek	elolvasott.]
		two	book-acc	every	child	VM-read

a. ‘As for two books, they were read by all children.’
b. ‘As for (at least) two books, so many were read by all children.’[2]

[1] I wish to thank László Kálmán for discussions on the issues discussed in the paper. Research for the paper was supported by NOW-OTKA project No. N 37276. The paper was written during my stay at ZAS, Berlin, supported by a research fellowship from the Humboldt Foundation.

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference “sub8 – Sinn und Bedeutung”. Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany*

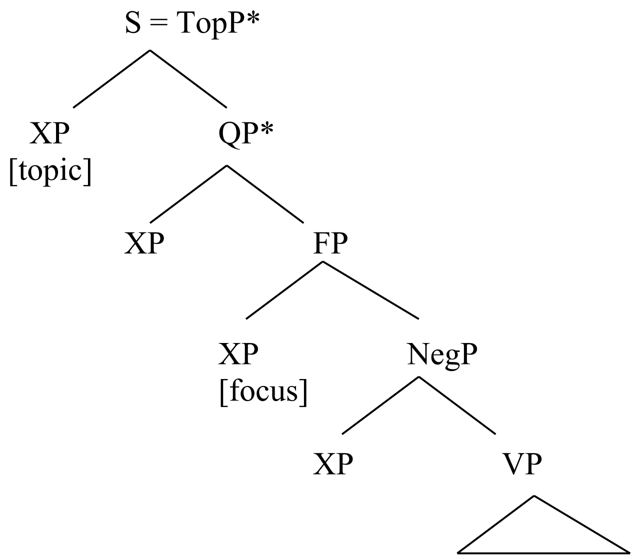
(2) [$_{CT}$ /Legalább három gyerek] [$_{QP}$ \minden könyvet elolvasott.]
at least three child every book-acc VM-read

a. # ‘As for at least three kids, they read every book. ’

b. ‘As for at least three kids, every book was read by that many. ’

The labeled brackets above refer to the positions of the constituents in the tree in (3), representing the surface structure of the Hungarian sentence, as proposed in É. Kiss (2002), irrelevant details aside:

(3) The surface structure of the Hungarian sentence:



Since there are strong arguments supporting the view (discussed more thoroughly in É. Kiss and Gyuris (2003)) that contrastive topics and topics occupy the same structural positions, the contrastive topic constituents, marked here with the label CT will also be assumed to be situated in spec, TopP.

Note that the term ‘contrastive topic’ is used here to refer here to maximal projections and not to smaller units. This choice follows the tradition of using the terms ‘topic’ and ‘focus’ in the Hungarian generative literature, cf. É. Kiss (2002). Some part(s) of the contrastive topic constituent as well as of the constituent following the contrastive topic in the sentence bear a heavy accent, marked with ‘/’ and ‘\’, respectively, which help to identify the alternative propositions the sentence is assumed to be contrasted with, to be discussed later.

The fact that the narrow scope interpretation is allowed for the CT in both of the above examples contradicts the so-called *scope-principle* for Hungarian (proposed, among others, by É. Kiss (2002)), according to which quantifiers scope over the domain they c-command, which needs to be accounted for. A comparison of the available readings of (1) and (2) reveals another property of contrastive topics, namely, that they sometimes also appear to take widest scope, although this option is not always available for them.

If we look at the first example, we find that it has no interpretations whatsoever, although it does not seem to be grammatically defective, particularly in view of the examples in (5) and (6), which have two and one reading available, respectively.

[2] When possible, the English translations try to convey not only the truth conditions of the Hungarian examples but also their implicatures. Only the truth-conditions of the readings of (1) would be conveyed by the paraphrases ‘Two books are such that they were read by all kids.’ versus ‘All kids have read at least two books.’

(4) #[$_{\text{CT}}$ /Ötnél kevesebb vendéggel] [$_{\text{VP}}$ \találkoztam tegnap délben.]
five-than fewer guest-with met-1sg yesterday noon-at
a. # ‘As for fewer than five guests, I did meet them at noon yesterday.’
b. # ‘As for fewer than five guests, I did meet that many at noon yesterday.’

(5) [$_{\text{CT}}$ /Három vendéggel] [$_{\text{VP}}$ \találkoztam tegnap délben.]
three guest-with met-1sg yesterday noon-in
a. ‘As for three guests, I did met them at noon yesterday.’
b. ‘As for three guests, I did meet that many at noon yesterday.’

(6) [$_{\text{CT}}$ /Ötnél kevesebb vendéggel] [$_{\text{QP}}$\sokszor [$_{\text{VP}}$ (össze)találkoztam.]]
five-than fewer guest-with many times VM-met-1sg
a. # ‘As for fewer than five guests, I did meet them many times.’
b. ‘As for fewer than five guests, I did meet that many many times.’

(6) also illustrates that the uninterpretability of (4) should not automatically be attributed to the fact that ist contrastive topic contains a monotone decreasing determiner.

The fourth phenomenon, which I believe has not been discussed in the literature so far, concerns the availability of collective readings for plural noun phrases situated in CT position. Compare the possible readings of the following examples:

(7) [$_{\text{CT}}$ /Öt gyerek] [$_{\text{VP}}$ \felemelte az asztalt tegnap ötkor.]
five kid VM-lifted the table yesterday five-at
a. ‘As for five kids, they did lift the table collectively/individually at five yesterday.’
b.‘As for (at least) five children, that many did lift the table #collectively/individually at five yesterday.'

(8) [$_{\text{CT}}$ /Öt gyerek] [$_{\text{QP}}$ \sok asztalt felemelt tegnap ötkor.]
five kid many table-acc VM-lifted yesterday five-at
a. ‘As for five kids, they did lift many tables collectively/individually at five yesterday.’
b. ‘As for five kids, many tables were lifted collectively/ individually by that many at five yesterday.’

As illustrated above, both sentences have interpretations according to which the table was lifted by a group of specific kids collectively or individually (reading a). However, when the sentences are used for stating that a type of event with non-specific participants did occur (e.g., as opposed to a previous assumption according to which such an event did not occur), only (8) allows for the collective reading of the contrastive topic in all circumstances. (7) allows for the collective reading only in cases where the occurrence of other collective table-lifting events is presupposed, e.g., in the context of a competition between groups. (Note that, as pointed out by Szabolcsi (1997), (7) can also have a reading according to which it ascribes the ability to lift the table to groups, but this will be ignored in the rest of this paper.)

3 Previous approaches

3.1 Büring (1997) on scope

Büring (1997) claims that sentences containing an expression capable of scope-taking in CT (Büring’s *Topic*) and another operator following it are potentially ambiguous as to the relative scope of the operators. The availability of a particular reading is dependent on the availability of ‘reasonable implicatures’, introduced by the CT. The notion of *topic value* introduced by him helps to define more precisely the above implicatures. The topic value of a sentence *A*, abbreviated as $[[A]]^t$, is a set of sets of propositions which differ from the one expressed by *A* in that the denotations of the stressed parts of the contrastive topic and of the focus constituents are replaced by type-identical alternatives in them. The sets of propositions constituting the topic value correspond to a set of questions, in the spirit of Hamblin (1973). Informally, the questions constituting the topic value of *A* could be regarded as the questions which could have been asked in the discourse instead of the one which *A* answers.

The implicature carried by a sentence *A* containing a contrastive topic is then defined by him as follows: there is an element *Q* (a question) in $[[A]]^t$ such that *Q* is still under consideration (or: disputable) after uttering *A*. Disputability of a question means the following: given a common ground, there should be at least one element in the set of propositions corresponding to the question which is informative and non-absurd with respect to the common ground, i.e., not included in it and are not in contradiction with it.

For example, the reason why reading b) is not available for (9) below is that the answers to the questions in its topic value, shown in (10), are all entailed by the truth of the proposition intended to be expressed with this reading. (In other words, the propositions corresponding to the possible answers to the relevant questions are all entailed or contradicted by the truth of the intended reading of the sentence.) (10a) illustrates the structure of the propositions in the topic value of *A*, where the function ALT associates with the denotation of particular expressions the set of their type-identical alternatives, (10b) lists some actual members of the above set in the form of sets of sets of propositions, whereas (10c) lists the questions corresponding to the sets of propositions in (10b):

(9) /ALLE Politiker sind NICHT\ korrupt.
all politicians are not corrupt
a. 'It is not the case that all politicians are corrupt.'
b. # 'No politician is corrupt.'

(10) a. $\lambda P.\exists Q_{\langle\langle e,t\rangle,\langle\langle e,t\rangle,t\rangle\rangle}[Q \in \text{ALT}(\textbf{all}) \,\&\, P = \lambda p.\exists \Re_{\langle t,t\rangle}[\Re \in \text{ALT}(\textbf{not}) \,\&\, p =$
$= Q(\text{politicians})(\lambda x.\Re(\text{corrupt}(x)))]]$

b. $\{\{\text{all}(\text{politicians})(\lambda x.\neg\text{corrupt}(x)), \text{all}(\text{politicians})(\lambda x.\text{corrupt}(x))\},$
$\{\text{most}(\text{politicians})(\lambda x.\neg\text{corrupt}(x)), \text{most}(\text{politicians})(\lambda x.\text{corrupt}(x))\},$
$\{\text{some}(\text{politicians})(\lambda x.\neg\text{corrupt}(x)), \text{some}(\text{politicians})(\lambda x.\text{corrupt}(x))\},$
$\{\text{one}(\text{politician})(\lambda x.\neg\text{corrupt}(x)), \text{one}(\text{politician})(\lambda x.\text{corrupt}(x))\},$
$\{\text{no}(\text{politicians})(\lambda x.\neg\text{corrupt}(x)), \text{no}(\text{politicians})(\lambda x.\text{corrupt}(x))\}\ldots\}$

c. {*Are all politicians corrupt?, Are most politicians corrupt?, Are some politicians corrupt?, Is one politician corrupt?, Are no politicians corrupt?…*}

Consider now what would happen if we tried to apply the above method to give an account of why the a) reading is not available for (2). The structure of the propositions in the topic value associated with the intended reading in the fashion of Büring (1997) is shown in (11a), (11b) lists some actual sets of propositions in it, and (11c) illustrates the questions corresponding to them:

(11) a. $\lambda P.\exists Q_{\langle\langle e,t\rangle,\langle\langle e,t\rangle,t\rangle\rangle}[Q \in \text{ALT}(\textbf{at least three}) \,\&$
$\& \, P = \lambda p.\exists R_{\langle\langle e,t\rangle,\langle\langle e,t\rangle,t\rangle\rangle}[R \in \text{ALT}(\textbf{every}) \,\&$
$\& \, p = Q(\text{children})(\lambda x.R(\text{book})(\lambda y.\text{read}(x,y)))]]$

b. $\{\{\text{at least three}(\text{children})(\lambda x.\text{every}(\text{book})(\lambda y.\text{read}(x, y))),$
$\text{at least three}(\text{children})(\lambda x.\text{many}(\text{book})(\lambda y.\text{read}(x, y))),$
$\text{at least three}(\text{children})(\lambda x.\text{one}(\text{book})(\lambda y.\text{read}(x, y))), \ldots\},$
$\{\text{at least four}(\text{children})(\lambda x.\text{every}(\text{book})(\lambda y.\text{read}(x, y))),$
$\text{at least four}(\text{children})(\lambda x.\text{many}(\text{book})(\lambda y.\text{read}(x, y))),$
$\text{at least four}(\text{children})(\lambda x.\text{one}(\text{book})(\lambda y.\text{read}(x, y))), \ldots\},$

{at least five(children)(λx.every(book)(λy.read(x,y))),
at least five(children)(λx.many(book)(λy.read(x, y))),
at least five(children)(λx.one(book)(λy.read(x, y))), … }, … }

c. {*How many books were read by at least three children?, How many books were read by at least four children?, How many books were read by at least five children?* … }

In order to be able to account for the impossibility to assign the a) reading to (2) in Büring's framework, we would have to prove that the answers to all questions in the topic value follow from the truth of the proposition associated with this reading, or, in other words, that all propositions associated with the questions in the topic value are either entailed or contradicted by the above proposition.

Note, however, that if the reading (2a) expresses the proposition represented by the first formula in the set in (11b) then there is no way to prove the unavailability of this reading on the basis of Büring (1997), since the truth of this proposition does not entail the truth or falsity of all other propositions corresponding to the formulae in (11b). For example, the fact that there are at least three kids each of whom read many books does not entail or contradict the truth of the proposition that there are at least five kids who read every book, corresponding to the seventh proposition in (11b).

3.2 Jacobs (1997) on the scope of contrastive topics

Jacobs (1997) introduces the distinction between *i-specification* versus *i-topicalization* constructions, illustrated by him with the help of (12) and (13), respectively:

(12)	EIn	Werk	von	Grass	hat	Reich-Ranicki	\NICHT	verrissen.
	one	work	of	Grass	have	Reich-Ranicki	not	pulled to pieces

‘One work by Grass Reich-Ranicki did not criticize severely.’

(13)	ALle	Grass-Romane	kann	man	\NICHT	empfehlen.
	all	Grass-novels	can	one	not	recommend

‘Not all novels by Grass can be recommended.’

As the notation above shows, both constructions can be uttered with the same intonation pattern consisting of two accented positions, the first of which bears a so-called root contour, and the second a falling tone. A characteristic feature of i-specification constructions is that the constituent with the root contour must refer to a specific individual, this is the reason why they can be followed by an expression which further specifies the referent, as illustrated in (12a). (12b) shows that (12) cannot easily be imagined to be contrasted to ist affirmative variants containing a different determiner:[3]

(12)	a.	...	nämlich	die	“BLECHtrommel”.
			namely	the	tin drum

... ‘namely, The Tin Drum.’

b.	?	...	aber	MANche	Werke	HAT	er	verrissen.
			but	several	works	have	he	pulled to pieces

... ‘but several works he did severely criticize.’

One of the defining characteristics of i-topicalization constructions, however, is that the constituent with the root contour should be associated with narrow scope with respect to the constituent bearing the falling tone.

[3] I believe, however, that there exists an alternative explanation for why (12) cannot easily be continued with (12b) along the lines of the proposal made in section 6.

The narrow scope requirement for i-topics is explained by Jacobs in the following way: the construction introduces an illocutionary operator ASSERT taking widest scope into the logical representation of the sentence, which then takes the form $\text{ASSERT}^{\text{IT}}$(TOP)(PRED). Jacobs defines the rule generating the semantic interpretation associated with the above structure in the following way:

(14) $[[\text{ASSERT}^{\text{IT}}(\text{TOP})(\text{PRED})]]_{\textbf{prop}} = [[\text{PRED}]]([[\text{TOP}]])$

As (14) shows, the narrow scope of the contrastive topic is due to the fact that it is interpreted as an argument of the denotation of the predicate part in the particular construction. The presence of the illocutionary operator ASSERT in the structure is justified by the fact that i-topicalization is only possible in assertive and directive sentences in German.

One of the problems with trying to adopt this theory to account for the Hungarian data under consideration would be that in Hungarian, wide-scope contrastive topics are not only possible in assertive/directive sentences, but also in questions:

(15)	[$_{\text{CT}}$	/Ötnél	több	gyerek] [$_{\text{FP}}$	\mikor [$_{\text{VP}}$	érkezett?]]
		five-than	more	kid	when	arrived

‘When did more than five kids arrive?’

We have seen in this section that the proposals made in Büring (1997) and Jacobs (1997) cannot directly be transferred to account for the possibility of contrastive topics to receive narrow scope. However, as will be shown in the rest of this paper, some of Büring’s and Jacobs’ insights are essential for providing the correct interpretation of the sentences under discussion.

In the next section, we take a closer look at the first phenomenon listed above, namely, the issue of why the reading in which the contrastive topic appears to take wide scope is available in certain sentences but not allowed in others.

4 Wide scope or referential interpretation?

Consider again the two potential readings of (1) and (2). I propose that they do not differ from each other in the scope of the quantificational expressions, but in the fact that in one of them, the contrastive topic DP is assumed to denote a specific referent, and in the other it is interpreted non-specifically. In other words, I wish to claim that the difference between the two readings of (1) is analogous to the difference between the interpretation of Jacobs’ i-specification and i-topicalization constructions.

The above proposal is supported by the fact that (1) can be complemented on its a) reading without a change of interpretation by an expression further specifying the intended referent of the contrastive topic DP, as illustrated below:

(16)	[$_{\text{CT}}$	/Két	könyvet	a	listán,	mégpedig	azokat,	amelyeket
		two	book-acc	the	list-on	namely	those-acc	that-acc

Tolsztoj	írt,] [$_{\text{QP}}$	\minden	gyerek	elolvasott.]
Tolstoy	wrote	every	child	VM-read

‘As for two books on the list, namely the ones written by Tolstoy, they were read by all kids.’

Although Jacobs (1997) does not discuss whether sentences with i-specification introduce a contrast between alternative statements, this does happen in the case of (1a): on this reading of the sentence, the two specific books read by all kids are set into tacit contrast with other books, which were read by some other subset of the set of students.

On this view about the interpretation of contrastive topic DPs, it becomes clear why (2), (4), or (6) do not have readings a), as opposed to (1) or (5). In the former examples, the contrastive topic DPs cannot pick out a specific referent (they also cannot stand in the 'ordinary' topic position of the Hungarian sentence, which only hosts expressions with a referential or generic reading), whereas in the latter they can.

With the problem of wide scope readings out of the way, let us turn to the investigation of the narrow scope readings.

5 Narrow scope readings

5.1 Observations

The possibility for quantificational expressions in the contrastive topic position in Hungarian to be associated with narrow scope is illustrated by the b) readings of (1), (2), (5), and (6), among others.

I would propose that the above problem can be tackled on the basis of an observation made in Kálmán (1985), according to which contrastive topics in Hungarian can only appear in non-neutral or corrective sentences, where they are obligatorily followed by a constituent bearing an *eradicating stress*. (Eradicating stress is defined by Kálmán as a type of stress that removes the stress from the words following it, unless this stress is also of the eradicating type.) In previous works, including, for example, Lambrecht (1994), Vallduví and Engdahl (1996), Lee (1999), von Fintel (1994), Büring (1997), it is claimed that contrastive topics have to be followed by a focus. In Hungarian, however, as (1), (2), (5), (6), (7) or (8) above illustrate, the constituent with the eradicating stress following the contrastive topic does not have to be identical to the constituent for which the term *focus* has been used in the generative literature i.e., the constituent sitting in the spec, FP position, as in (17), but can be situated in spec, QP, as in (1) and (2), in the VP, as in (5) or (7), or in NegP, as in (18):

(17)	$[_{\text{CT}}$ /Öt	gyerek] $[_{\text{FP}}$	az	\asztalt	emelte	fel	tegnap	ötkor.]
	five	kid	the	table-acc	lifted	VM	yesterday	five-at

a. 'As for five kids, it was the table they lifted collectively/individually at five yesterday.'
b. 'As for five kids, it was the table lifted by that many collectively/individually at five yesterday.'

(18)	$[_{\text{CT}}$ /Öt	vendég] $[_{\text{NegP}}$	\nem	érkezett	meg.]
	five	guest	not	arrived	VM

a. 'As for five guests, they didn't arrive. '
b. 'As for five guests, that many did't arrive. '

Therefore, in order to avoid terminological confusion, I will refer to the constituent with the eradicating stress following the contrastive topic as the *associate* of the contrastive topic.

Let us consider the contribution of the associate expressions to the truth conditions of the sentence again. I propose that in each case the associate can be seen as an expression introducing a restricted quantifier into the logical representation of the sentence which takes widest scope with respect to the other operators. Using a different terminology, we could say that the associate introduces a *tripartite structure* into the logical representation of the sentence (cf. Heim 1982, Partee 1991, Bach et al. 1995).

For example, in the b) readings of (1) and (2), repeated here as (19), and (20), respectively, the associate expression introduces a (restricted) universal quantifier over individuals, which takes widest scope:

(19) [$_{CT}$ /Két könyvet] [$_{QP}$ \minden gyerek elolvasott.]
two book-acc every child VM-read
a. 'As for two books, they were read by all children.'
b. 'As for (at least) two books, so many were read by all children.'

(20) [$_{CT}$ /Legalább három gyerek] [$_{QP}$ \minden könyvet elolvasott.]
at least three child every book-acc VM-read
a. # 'As for at least three kids, they read every book. '
b. 'As for at least three kids, every book was read by that many. '

In the case of (5), repeated as in (21) below, the accented verb (signalling VP focus) appears to introduce existential quantification over events which happened at a specific time and place:

(21) [$_{CT}$ /Három vendéggel] [$_{VP}$ \találkoztam tegnap délben.]
three guest-with met-1sg yesterday noon-in
a. 'As for three guests, I did met them at noon yesterday.'
b. 'As for three guests, I did meet that many at noon yesterday.'

In (6), repeated here as (22), the adverbial quantifier sitting in the quantifier position of the sentence introduces quantification over events of the same type happening at different times:

(22) [$_{CT}$ /Ötnél kevesebb vendéggel] [$_{QP}$\sokszor [$_{VP}$ (össze)találkoztam.]]
five-than fewer guest-with many times VM-met-1sg
a. # 'As for fewer than five guests, I did meet them many times.'
b. 'As for fewer than five guests, I did meet that many many times.'

In the next subsection we consider the issue of how the above intuitions could be represented in a more formal manner.

5.2 Steps towards formalization

Although I am not in a position to offer here a full-fledged formalism for handling the data under consideration, I wish to formulate some proposals which would bring us closer to a formal account of the relevant examples. I offer (23) as a general representation of the order of constituents in Hungarian sentences with a contrastive topic. The compulsory elements of the structure are marked with foldface, the others with italics:

(23) [$_{Topic}$]* [$_{\mathbf{CT}}$]* [$_{PrV}$]* [$_{\mathbf{AS}}$] [$_{PrV}$]* [$_{PoV/VP}$]

(23) says the following. There can be one or possibly more constituents referred to as contrastive topics in a sentence, situated in one of the spec, TopP positions (although sentences with more contrastive topics will be ignored here). Contrastive topics can be preceded by ordinary topics. The presence of a constituent referred to as the associate (marked as AS in (23)) is obligatory in a structure with a contrastive topic. The associate can be identical to a maximal projection in one of the preverbal operator positions shown in (3), except the topic position, as well as to the whole VP or only to the finite verb. (The latter two instances can only be differentiated on semantic or pragmatic grounds, since in both cases it is the first constituent of the flat VP assumed here which bears the eradicating stress. The finite verb alone would play the role of the associate in sentence (5) above, for example, if the sentence was uttered to contrast the event of meeting the guests with, for example, the event of speaking to them.) The contrastive topic does not need to be immediately followed by the associate, although the latest position for the latter is the VP or the verb itself, i.e., the associate cannot be identical to a postverbal phrase. If the associate does not follow the verb immediately, it is possible for them to be separated by constituents in the preverbal operator positions. Also, if the associate is not the last among the preverbal operator positions, it can

possibly be followed by one or more operators. When the associate is other than the VP, then it is, naturally, followed by a VP, and when it is identical to the finite verb, then it can be followed by further post-verbal material. In order to keep the discussion to a manageable size, in the rest of the paper we will ignore the cases when the associate is identical to spec, FP or is in NegP.

I wish to propose that in cases under consideration, the meaning of the construction consisting of a contrastive topic and its associate is calculated as follows. The associate expression introduces a restricted quantifier over a type of entities determined by its semantic type (e.g., DPs -- individuals, adverbs of quantification -- events, VP/V -- existential quantification over events). The restriction of the quantifier is specified by the rest of the constituent playing the role of the associate. This restricted quantifier necessarily takes highest scope among the scope-bearing elements in the logical representation of the meaning of the sentence. The scope of the restricted quantifier would then be composed of the meaning of the rest of the sentence, including the contrastive topic itself. Schematically, the meaning of a sentence with a contrastive topic would be represented in the format for restricted quantification proposed in Klima (1982) as follows, where **Q** denotes the quantifier introduced by the associate, α is the variable quantified over by **Q**, **R** stands for the restriction of **Q**, determined on the basis of the associate expression, and **S** stands for the scope of the quantifier, generated from information in the rest of the sentence:

(24) $(\mathbf{Q}\alpha.\ \mathbf{R}(\alpha))\ \mathbf{S}(\alpha)$

As an illustration, consider the semantic representation of reading (19b) in an event semantic framework (cf. Krifka 1992, for example) in (25). In this sentence, the role of the associate is played by a DP, the restriction of the universal quantifier introduced by it consists of individuals which satisfy the property specified by the rest of the DP, i.e. the noun *child*, whereas its scope is determined on the basis of the rest of the sentence. The property marked by **two-book** is the property of individuals in the denotation of *book* with at least two atomic parts. Quantifiers with empty restrictions will be substituted by their unrestricted counterparts:

(25) $(\forall x.\ \mathbf{child}(x))\ \exists e\ \mathbf{read}(e) \wedge \mathrm{AG}(x, e) \wedge \exists y\ (\mathrm{PAT}(y, e) \wedge \mathbf{two\text{-}book}(y))$

(25) thus expresses that for all individuals with the property of being a child the property of having read two books holds.

The following formula represents the a) reading of (19). Note that the reason why the contrastive topic meaning does not fall into the scope of the quantifier is that the former is a constant. This formula thus shows that the proposal for associating structures with a contrastive topic with the construction meaning proposed above does not contradict intuitions about the interpretation of the apparent wide-scope readings of sentences:

(26) $(\forall x.\ \mathbf{child}(x))\ \exists e\ \mathbf{read}(e) \wedge \mathrm{AG}(x, e) \wedge \mathrm{PAT}(\mathbf{a} \oplus \mathbf{b}, e)$

Sentences like (21), with focused VPs, introduce existential quantification over the domain of events. The meaning of the above sentence could thus be represented as follows:

(27) $(\exists e.\ \mathbf{meet}(e) \wedge \mathrm{AG}(\mathbf{I}, e) \wedge \mathrm{DAY}(\mathbf{yesterday}, e) \wedge \mathrm{AT}(\mathbf{noon}, e))\ \exists x\ (\mathrm{PAT}(x, e) \wedge$
$\wedge\ \mathbf{three\text{-}guest}\ (x))$

The above formula expresses that (21) is true if and only if there is an event of me meeting some plural individuals at noon yesterday and these individuals satisfy the property abbreviated as **three-guest** above, i.e., consist of at least three atoms and fall into the extension of the noun *guest.*

In this section we proposed an approach to account for the narrow scope readings of contrastive topics. We have claimed on the basis of empirical evidence that the logical structure of the construction consisting of a contrastive topic and an associate should always be represented as one in which the associate introduces a restricted quantifier, together with its restriction, and the rest of the sentence contributes to defining its scope. This proposal is based on the assumption that the property of playing the role of the associate in construction with a contrastive topic provides an expression with certain semantic features which it would not otherwise have in another sentence. This assumption seems to be further justified by examples like (28), which contains a contrastive topic followed by a quantificational expression and a focus. Since it is the latter which bears the eradicating stress und thus plays the role of the associate, the sentence cannot have a reading where the universal quantifier takes wide scope over the focus, although this would have to follow from the scope principle.

(28) $[_{CT}$ /Pontosan két lány] $[_{QP}$ mindig $[_{FP}$ \Jánost üdvözölte.]]
exactly two girl always John greeted
a. 'As for exactly two girls, it is John who was always greeted by that many.'
b. # 'As for exactly two girls, it happened always that John was the one greeted by that many.'

The method suggested above can accounts for the Hungarian data under discussion without the need to introduce illocutionary operators into the logical structure of sentences, as done in Jacobs (1997), which would not be justified in the language.

6 Sentences without interpretation

Sentences like (4) above, repeated here as (29), will be regarded, following Büring (1997), not as grammatically ill-formed, but will be assumed to be lacking an interpretation. The reason for this choice of terminology is due to the fact they do not seem to contradict any rule of syntax (cf. (22), with the same expression in contrastive topic position which is perfectly well-formed in the language). In section 4 above, we have already managed to account for the lack of reading (4a). We now take a look at the problem of why the sentence and its counterpart with a non-monotonic determiner in (30) cannot have the b) readings, either.

(29) #$[_{CT}$ /Ötnél kevesebb vendéggel] $[_{VP}$ \találkoztam tegnap délben.]
five-than fewer guest-with met-1sg yesterday noon-at
a. # 'As for fewer than five guests, I did meet them at noon yesterday.'
b. # 'As for fewer than five guests, I did meet that many at noon yesterday.'

(30) #$[_{CT}$ /Pontosan öt vendéggel] $[_{VP}$ \találkoztam tegnap délben.]
exactly five guest-with met-1sg yesterday noon-at
a. # 'As for exactly five guests, I did meet them at noon yesterday.'
b. # 'As for exactly five guests, I did meet that many at noon yesterday.'

I claim that the truth-conditional interpretation associated with (29b) and (30b) is that I met fewer than five and exactly five guests at noon yesterday.[4] The same truth conditions are expressed by the following sentences:

(31) $[_{FP}$ Ötnél kevesebb vendéggel] $[_{VP}$ találkoztam tegnap délben.]
five-than fewer guest-with met-1sg yesterday noon-at
'I met fewer than five guests at noon yesterday.'

(32) $[_{FP}$ Pontosan öt vendéggel] $[_{VP}$ találkoztam tegnap délben.]
exactly five guest-with met-1sg yesterday noon-at
'I met exactly five guests at noon yesterday.'

[4] Since the formalization of these truth conditions in the framework shown in the previous chaper would involve some complications regarding the meaning of monotone decreasing and non-montonic determiners, discussed in É. Kiss and Gyuris (2003), it will not be illustrated here.

The problem with (29)-(30), I believe, is not that they were unable to convey the truth-conditions associated with readings (29b) and (30b) but that they do not give rise to the implicatures associated with contrastive topics.[5] Consider the list of some of the questions which would be contained in the topic value of (29) in Büring's (1997) framework:

(33) {*Did you meet fewer than five guests at noon yesterday?, Did you meet more than five guests at noon yesterday?, Did you meet exactly five guests at noon yesterday?, …*}

We could prove that the reading in (29b) is not available if we could show that the answer to all alternative questions in the topic value associated with it in fact would follow from the truth of the proposition expressed, and thus the required implicature would not be fulfilled. This can be shown in the following manner.

I believe that the verb *meet* denotes a type of event which distributes down to the subparts of its patient. In other words, if I met *n* people on one occassion, then it follows that I also met *n-k* people on the same occassion, where $n\text{-}k \geq 1$. DPs with monotone decreasing and non-monotonic determiners in Hungarian are associated with a kind of maximality property, in other words, when I say that I met fewer than five guests, as in (31), it entails that I did not meet five or more guests on the same occassion. In other words, the expression of the above proposition equals to a claim about the truth or falsity of propositions of the structure 'I met *k* guests' for any number *k* where *k* refers to a quantity not fewer than five (i.e., where *k* is an alternative of *fewer than five*), or, using Büring's terminology, the utterance of the above proposition would answer any alternative questions of the form *Did you meet k guests?* In the topic value, thus would leave none debatable. In such a case, however, the implicatures associated with the contrastive topic would not be fulfilled. This is the reason for the lack of the reading under discussion.

As opposed to the above case, the sentence in (22), repeated here as (34), does have an interpretation, since the alternative questions in its topic value would not be yes-no questions like in the above case but questions of the type *Did you meet k guests n times?*, where *n times* would be an alternative to *many times*. The events asked about in these questions are independent of each other, the occurrence of an event of meeting fewer than five guests on one particular day cannot influence the occurrence of events of meeting a different number of guests on different days.

(34) [$_{CT}$ /Ötnél kevesebb vendéggel] [$_{QP}$\sokszor [$_{VP}$ (össze)találkoztam.]]
five-than fewer guest-with many times VM-met-1sg
a. # 'As for fewer than five guests, I did meet them many times.'
b. 'As for fewer than five guests, I did meet that many many times.'

Thus, as the preceding discussion has shown, an explanation for the lack of b) readings for (29)-(30) can be formulated in Büring's (1997) framework, provided that the alternative propositions or questions in their topic values refer to events happening at the same time and place and that the contributions of montone decreasing and non-montonic determiners to the menaing of propositions are identified correctly.

The availability of the b) reading for (21), repeated here as (35), also follows from the same principles:

[5] The representation of the truth conditions of readings (29b) and (30b) would involve some complications about the meaning of monotone decreasing and non-monotone determiners, discussed in É. Kiss and Gyuris (2003), which cannot be elaborated on here.

(35) [$_{CT}$ /Három vendéggel] [$_{VP}$ \találkoztam tegnap délben.]
three guest-with met-1sg yesterday noon-in
a. 'As for three guests, I did met them at noon yesterday.'
b. 'As for three guests, I did meet that many at noon yesterday.'

The difference between (29)-(30) versus (35) is that the latter allows there to be events of me meeting a different group of guests than at least three at the same time and place, provided they stand in a subevent relation to the former. Thus, from the utterance of (35) with the b) interpretation, the answer to all questions of the form *Did you meet k guests at noon yesterday?* (those contained in the topic value) does not follow, and the implicatures associated with contrastive topics are fulfilled. In the next section we extend our proposals to the analysis of collective/distributive readings.

7 Collective versus distributive readings

Consider again the data in (7) and (8) above, repeated here as (36) and (37):

(36) [$_{CT}$ /Öt gyerek] [$_{VP}$ \felemelte az asztalt tegnap ötkor.]
five kid VM-lifted the table yesterday five-at
a. 'As for five kids, they did lift the table collectively/individually at five yesterday.'
b. 'As for (at least) five children, that many did lift the table #collectively/individually at five yesterday.'

(37) [$_{CT}$ /Öt gyerek] [$_{QP}$ \sok asztalt felemelt tegnap ötkor.]
five kid many table-acc VM-lifted yesterday five-at
a. 'As for five kids, they did lift many tables collectively/individually at five yesterday.'
b. 'As for five kids, many tables were lifted collectively/ individually by that many at five yesterday.'

I propose that the lack of a collective reading in (36b) can be handled on the basis of the same assumptions as used in section 6, with one addition. Whenever a sentence predicates the occurrence of a collective event, the alternative questions in its topic value also have to refer to collective events of the same type. In other words, the following questions would be found in the topic value of the collective reading of (36b):

(38) {*Did five kids lift the table collectively at five yesterday?, Did four kids lift the table collectively at five yesterday?, Did six kids lift the table collectively at five yesterday?...*}

Since two collective but otherwise atomic events cannot stand in a subevent relation to each other (the collective event of lifting the table by five kids has no collective events of, say, three kids lifting the table as subevents), the utterance of (36b) on its collective reading automatically answers all other questions in (38) in the negative, if they are assumed to ask about events taking place at the same time and place, unless the criterion that the events should occupy the same temporal and physical place is lifted, i.e., when it is allowed that more events of the same type take place simultaneously.

In this and the preceding section we have thus seen that the application of Büring's (1997) theory to the Hungarian case can help to account for the lack of narrow scope readings of particular contrastive topics, as well as to explain the lack of collective readings of plural contrastive topic NPs, when special attention is paid on the structure of events whose occurrence is predicated about in these sentences. The next section summarizes the conclusions of the paper.

8 Conclusion

The paper looked at four phenomena involving the interpretation of Hungarian sentences with contrastive topics: the availability of what appear to be wide scope readings for quantificational expressions in this position, the availability of narrow scope readings for the same expressions, the issue of why otherwise grammatically well-formed structures with contrastive topics including monotone decreasing and non-monotonic determiners do not seem to have an interpretation, and the question of the availability of collective versus distributive readings for plural contrastive topic NPs.

It was argued that what appear to be wide scope readings are in fact cases where the contrastive topic receives a referential interpretation, and that the narrow scope readings can be accounted for by proposing that stuctures with contrastive topics are associated with a specific construction meaning, in which the expression playing the role of the associate introduces a restricted quantifier taking widest scope into the logical representation of the sentence. As regards the lack of interpretations for sentences with CTs involving monotone decreasing and non-monotonic determiners, and the availability of collective versus distributive readings, they can be accounted for by means of method proposed by Büring (1997) to filter out readings of sentences with contrastive topics which do not give rise to the required implicatures, provided that in sentences expressing existential quantification over events the alternative questions are also assumed to refer to events happening at the same time and place.

References

Bach, E., E. Jelinek, A. Kratzer and B. H. Partee (eds.): 1995, *Quantification in Natural Languages* (Kluwer, Dordrecht).

Büring, D.: 1997, *The Meaning of Topic and Focus. The 59th Street Bridge Accent* (Routledge, London, New York).

É. Kiss, K.: 2002 *The Syntax of Hungarian* (Cambridge University Press, Cambridge).

É. Kiss, K. and B. Gyuris: 2003, 'Apparent Scope Inversion under the Rise Fall Contour', *Acta Linguistica Hungarica* **50**, 371-404.

von Fintel, K.:1994, *Restrictions on Quantifier Domains* (Doctoral Dissertation, University of Massachusetts, Amherst).

Hamblin, C.: 1973, 'Questions in Montague English', *Foundations of Language* **10**, 41-53.

Heim, I.: 1982, *The Semantics of Definite and Indefinite Noun Phrases*. (Doctoral Dissertation, University of Massachusetts, Amherst).

Jacobs, J. : 1997, 'I-Topikalisierung', *Linguistische Berichte* **168**, 91-133.

Kálmán, L. :1985, 'Word order in non-neutral sentences', in I. Kenesei (ed.), *Approaches to Hungarian. Volume One: Data and Descriptions* (JATE, Szeged), pp. 25-37.

Klima, G.: 1982, *Aspects of a Theory of Singular Reference. Outstanding Dissertations in Linguistics* (Garland, New York).

Krifka, M.: 1992, 'Thematic Relations as Links between Nominal Reference and Temporal Constitution', in I. Sag and A. Szabolcsi (eds.), *Lexical Matters* (CSLI Publications, Stanford), pp. 29-53.

Lambrecht, K.: 1994, *Information Structure and Sentence Form* (Cambridge University Press, Cambridge, New York and Melbourne).

Lee, Ch.: 1999, 'Contrastive Topic: A Locus of Interface Evidence from Korean and English', in K. Turner (ed.), *The Semantics/Pragmatics Interface from Different Points of View,* (Elsevier, Oxford).

Partee, B. H.: 1991, 'Topic, Focus and Quantification', in A. Wyner and S. Moore (eds.), *Proceedings of the First Annual Conference on Semantics and Linguistic Theory, Linguistics Working Papers* (Cornell University, Ithaca), pp. 159-187.

Szabolcsi, A.: 1997, 'Strategies for Scope Taking', in A. Szabolcsi (ed.), *Ways of Scope Taking* (Kluwer, Dordrect), pp. 109-154.

Vallduví, E. and E. Engdahl: 1996, 'The Linguistic Realization of Information Packaging', *Linguistics* **34(3)**, 459-519.

The Referential Properties of Dutch Pronouns and Demonstratives: Is Salience Enough?*

Elsi Kaiser
University of Rochester
ekaiser@ling.rochester.edu

John Trueswell
University of Pennsylvania
trueswel@psych.upenn.edu

Abstract

According to many researchers, the form of referring expressions is connected to the accessibility/topicality of their referents: The most reduced referring expressions refer to highly accessible referents, whereas fuller expressions refer to less accessible referents. Thus, in languages with full and reduced pronouns, full forms are said to refer to less accessible referents. In this paper, we investigate these claims by looking at Dutch, which has full and reduced pronouns and demonstratives. We report here the results of a sentence-completion study as well as an eye-tracking experiment that we conducted, and argue that the results are only partly compatible with a straightforward accessibility-based approach to referential form. More specifically, our results suggest that the full vs. reduced pronoun choice is not triggered by referent salience, but the choice of a demonstrative over a pronoun is. Corpus examples indicate that use of full form of pronouns may in fact be prompted by contrast. Overall, these results – as well as work on Finnish and Estonian (Kaiser 2003) – show that different anaphoric forms within one language can be sensitive to different factors, and their referential properties cannot be captured by a unified notion of salience.

1. Introduction

Many researchers assume that the referential forms of a language follow a so-called accessibility hierarchy, and that the form of a referring expression is connected to the accessibility/salience of its referent. The claim is that the most reduced referring expressions refer to the most accessible referents, and less reduced expressions refer to less accessible referents, as shown in (1) (e.g. Ariel 1990, Givón 1983, Gundel, Hedberg & Zacharski 1993). Thus, in languages with full and reduced pronominal forms, full forms refer to less accessible referents (see Bresnan 2001, Cardinaletti & Starke 1999). The correlation between referential form and antecedent salience is claimed to hold even when there is no 'informational difference' between referential forms, i.e. even when the forms do not differ in the amount of semantic information they provide about the referent. For example, Ariel (2001) notes that the English pronoun *it* and the demonstratives *this/that* "are indistinguishable with respect to the description they provide for the intended referent (an inanimate object)" and emphasizes that according to her approach, these forms differ only "in terms of the processing instructions they mark: personal pronouns mark a higher degree of accessibility than demonstrative pronouns" (Ariel 2001:29).

* Special thanks to Anne Cutler, Delphine Dahan, Dan Swingley, Margret van Beuningen and Elske Schoenmakers for making it possible to conduct this work at the Max Planck Institute for Psycholinguistics, Nijmegen. Thanks also to the audience at SuB8 for useful comments and feedback. This research was partially funded by an NIH grant (1-R01-HD37507) to John Trueswell.

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference "sub8 – Sinn und Bedeutung". Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany*

(1)
null > reduced pronoun > full pronoun > demonstrative > full NP …etc

most salient referent	less salient referent

The questions we would like to address in this paper are whether we can really rank all referential expressions of a language along a unified salience hierarchy. Might it not be the case that different referential expressions are sensitive to different kinds of factors that go beyond salience? The outline of this paper is as follows: In the remainder of section 1, we discuss the nature of the Dutch anaphoric paradigm and review existing work on the referential properties of Dutch anaphors. In section 2, we discuss the sentence completion experiment and its results, and in section 3 we turn to the eyetracking experiment. Section 4 reports on the results of a preliminary corpus study which we conducted to investigate whether the notion of contrast guides use of certain anaphoric forms. Section 5 concludes the paper and also points out some directions for future study and connections to work in other languages.

1.1 Dutch referential forms

In this section we discuss Dutch third person pronouns and demonstratives, and review existing work about their referential properties. First, let us consider pronouns. The singular third person pronouns *zij/ze* 'full form/reduced form of she' and *hij/ie* 'full form/reduced form of he' show a striking asymmetry. Both the full (*zij*) and the reduced (*ze*) form of the feminine pronoun are used in colloquial and Standard Dutch. However, even though the full form of the masculine pronoun, *hij*, is also used in both registers, the reduced form *ie* is a clitic that is restricted to the spoken language. Even in spoken Dutch, it only occurs in particular phonological contexts, especially after [-t] and some other consonants (e.g, *Heeft-ie dat gedaan?* 'Has-he that done?', see Donaldson 1997:56). Due to its clitic status, *ie* cannot occur sentence-initially in subject position, whereas the feminine short form *ze* can occur sentence-initially, as illustrated in (2a,b) below.

	full form	reduced form[1]
(i) Masculine pronoun:	*hij* (he)	*ie* (he)
(ii) Feminine pronoun:	*zij* (she)	*ze* (she)

(2a)
Hij/*ie gelooft er niets van. (Haeseryn *et al.* 1997:253).
He-NOM believes there none of
'He doesn't believe any of it.'

(2b)
Zij/ze gelooft er niets van. (Haeseryn *et al.* 1997:253).
She-NOM believes there none of
'She doesn't believe any of it.'

[1] The reduced forms are always unstressed, whereas the full forms are often, but not always, stressed (Haeseryn *et al*. 1997:252).

In sum, in Standard Dutch, there are two pronominal forms that can be used for feminine referents, *ze* and *zij*, but only one form for masculine referents, *hij*. This brings us to the question: how do *ze* and *zij* differ in their referential properties, if they do? To the best of our knowledge, relatively little has been said about this distinction in the literature. The best-known reference grammar of Dutch (Haeseryn *et al.* 1997:252) notes that the full forms are used in cases of contrast, and provide ex. (3), with the second person pronoun *jou* 'you'. However, they do not say more about what kind of contrast they mean. Already, however, it seems that these observations do not fit the assumptions made in some of the accessibility-hierarchy theories that the full forms of pronouns are used to refer to less salient forms than the reduced forms.

(3)
Hij bedoelt *jou* niet, maar Mark. (italics in original)
He means *you* not, but Mark.
'He isn't referring to *you*, he means Mark.'

In addition to personal pronouns, the demonstrative *die* ('that') is used to refer to human antecedents in Dutch.[2] According to Haeseryn *et al.* (1997:306), demonstratives are used for referents that have just been introduced into the conversation while pronouns are used for 'old information'. Findings from a corpus study of demonstratives by Rullmann (2001) fit with these claims. Rullmann analyzes his data using Centering Theory (Grosz, Joshi and Weinstein 1995), and notes that while pronouns prefer topical or discourse-old antecedents, demonstratives refer back to antecedents which are not topics or which are new information (both are low-ranked on the Cf-list, Rullmann claims). Similarly, in another corpus-based investigation, Comrie (1997) finds that demonstratives have nontopical antecedents.

(3a)
Toen Jan_i de straat opging, kwam hij een oude vriend_j tegen. Hij_i/Die_j zeg hallo.
When Jan_i went into the street, he ran into an old friend_j. He_i/That_j said hello.
(Rullmann 2001)

(3b)
Mark_i kwam Arthur_j tegen. Die_j droeg een regenjas. Hij_j huiverde.
Mark_i ran into Arthur_j. He_j was wearing a raincoat. He_j was shivering. (Rullmann 2001)

In sum, a review of the existing work on the Dutch anaphoric paradigm indicates that the demonstrative *die* is used for entities that are new information and/or non-topics, the pronoun *hij* is used for salient, topical referents, and according to Haeseryn *et al.*'s grammar, the choice of *zij* over *ze* has to do with contrast of some kind. However, as mentioned earlier, accessibility-hierarchy theories make different predictions about the choice of *zij* vs. *ze*. According to these kinds of theories, the most reduced forms are used for the most salient referents, and less reduced forms for less salient referents. Thus, extending these claims to Standard Dutch, we would predict that (i) in the masculine paradigm, *hij* is used for more salient referents than *die* (*hij* >> *die*), and (ii) in the feminine paradigm, *ze* is used for more salient referents than *zij*, which in turn is used for more salient referents than *die* (*ze* >> *zij* >> *die*).

[2] The proximal demonstrative *deze* 'this' can also be used in this anaphoric way, but it is felt to be significantly more formal (Haeseryn 1997:307) and seems to occur more rarely than *die*, even in written standard Dutch. As in English, the demonstratives *die* and *deze* can also be used as prenominal modifiers (e.g. this man, that man) but we will not address that use here. (see Kirsner & van Heuven (1988), Kirsner, van Heuven & Vermeulen (1987) for the pragmatic properties of *die* and *deze* when used in this way).

Thus, it seems that there exists a fairly clear consensus concerning the referential properties of *hij* and *die*, at least on a basic level, but that there are two competing claims concerning the choice between *ze* and *zij*. Some claim that what matters is salience, whereas others view contrast as being what triggers use of *zij*. In the subsequent sections, we investigate these questions in more detail by means of a sentence completion experiment, an eyetracking experiment and a corpus study.

2. Sentence completion experiment

In the sentence completion experiment, we investigate the referential properties of *hij*, *die*, *ze* and *zij* to see if they are sensitive to the salience of the antecedent. In light of the finding that subjects are more salient than objects (e.g. Brennan, Friedman & Pollard 1987, and many others), we predict that *hij* is more likely to refer to a preceding subject than *die (hij >> die)*, and *ze* is more likely to refer to a preceding subject than *zij*, which is more likely to refer to a preceding subject than *die*. *(ze >> zij >> die).*

Forty native Dutch speakers participated in the experiment, and their task was to provide continuations for written sentence fragments. The critical stimuli were SVO sentences with either two clearly masculine or two clearly feminine arguments. Each sentence was followed by the first word of the next sentence, which was either *hij*, *die*, *ze* or *zij* (see (4)). Thus, there were four conditions: (i) masculine with *hij*, (ii) masculine with *die*, (iii) feminine with *ze* and (iv) feminine with *zij*. (We did not test feminine with *die*, due to reasons of experiment length.)

(4a)
De brandweerman kneep de bokser speels. Hij/Die…..
The fireman pinched the boxer jokingly. He…

(4b)
De serveerster kneep de onderwijzeres speels. Ze/Zij….
The waitress pinched the teacher[3] (‘teacheress’) jokingly. She….

All verbs used were action/agent-patient verbs (as defined by Stevenson *et al.* 1994). Continuations were coded according to which of the referents in the preceding sentence the participants chose as the referent of the anaphor, i.e. subject or object.

2.1 Sentence completion results
Figure 1 shows the ‘subject-object difference score’ for each of the four referential forms. We computed, on the basis of the raw numbers of continuations (160 in total for each of the four forms), how many more subject continuations than object continuations there were.[4] Thus, positive numbers indicate a subject preference and negative numbers indicate an object preference.

[3] The word *onderwijzeres* has a feminine suffix and thus clearly morphologically marked as being female. The nouns were designed to be as clear in their gender properties as possible: either they were morphologically marked for gender or their gender was otherwise clear (e.g. king vs. queen).
[4] However, not all continuations could be clearly coded as referring to the subject or object of the preceding sentence (they were coded as ‘unclear’ or ‘other’, depending on the type of continuation). As a result, it is never the case that all 160 data points (per condition) were either subject or object interpretations.

The continuations reveal that the pronoun *hij* and the demonstrative *die* have clear referential biases. As predicted, *hij* has a very strong subject bias, and *die* has an even stronger object bias. However, the patterns for the feminine pronouns, *ze* and *zij*, are somewhat less clear. Both forms have a preference for the preceding subject rather than the preceding subject. However, the feminine full form *zij* clearly does not pattern like the demonstrative *die* in the masculine paradigm (which is not surprising, since *die* also exists in the feminine paradigm). Moreover, despite sharing a preference for the subject over the object, *ze* and *zij* actually differ significantly in terms of their likelihood of referring to a preceding subject or object: The short form *ze* is more likely to refer to a preceding subject than the long form *zij* (see Kaiser 2003 for further analyses and discussion).

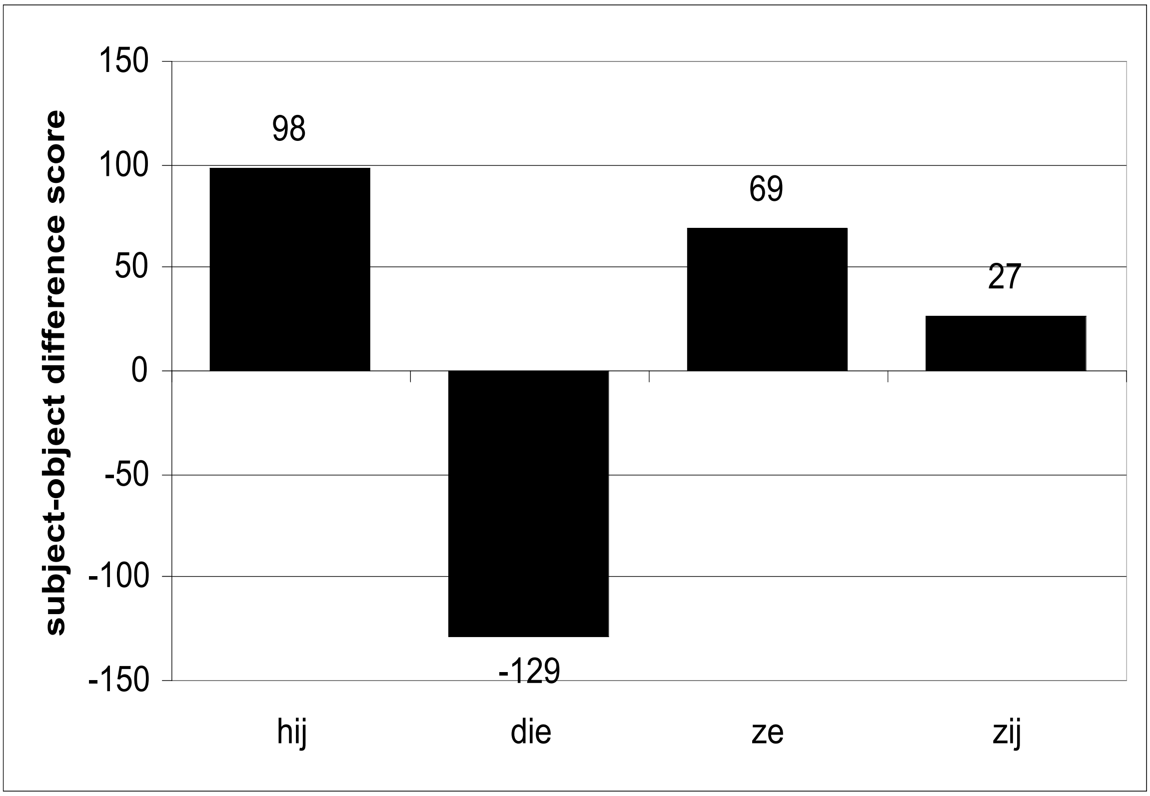


Figure 1. Preference for preceding subject vs. preceding object for each anaphoric form. (Positive numbers reflect a preference for the subject. Negative numbers reflect a preference for the object.)

2.2 Discussion

The prediction that pronouns refer to highly salient referents and demonstratives to less salient ones is supported by the continuation patterns for the masculine pronoun *hij* and the demonstrative *die*. However, the prediction that the choice between full vs. reduced forms is also salience-driven is not clearly supported. The two feminine forms tested here both show a preference for subjects over objects, but this preference is stronger for the short form *ze* than the long form *zij*. *Zij* does not pattern like the demonstrative *die*, but neither does it act quite like the short pronoun *ze*. Clearly, the overall pattern we see for *zij* is much closer to the referential properties of *ze* than those of *die*.

How do these results fit with the two claims that have been made regarding the referential properties of the long pronominal form, namely that (i) it is used for less salient referents than the short form, or that (ii) it is used in cases of contrast?

Let us first consider the claim that the full form is used for less salient referents than the reduced form. The sentence completion results do not support a claim that *zij* refers to referents that are *markedly* less salient than the ones that *ze* refers to, since if this were the case, we would presumably see a clear object preference with *zij*, as we see with the demonstrative *die* in the masculine conditions. So, perhaps we can uphold a weaker claim that *zij* is ranked only slightly below *ze* on the salience scale? However, as we will see in the next section, we should not make too much of this purported salience difference between *ze* and *zij*, since it is not replicated in the results of the eye-tracking experiment.

Now, let us turn to the claim that the full form *zij* is used in cases of contrast. The experiment here has nothing to say directly about the effects of contrast, since that was not tested here, and in fact we will return to the topic of contrast at the end of this paper. However, it is worth pointing out that if contrast is the only relevant factor for *zij*, then we do not necessarily expect the antecedents of *zij* to show any strong bias towards one grammatical role over another, since entities in any grammatical position can be interpreted as being contrastive. Thus, the weak subject preference for *zij* that we see in the sentence completion results is not incompatible with the contrast hypothesis; we could interpret it as a sign that *zij* can refer to either subjects or objects. Moreover, one also should keep in mind that even if contrast is a relevant factor for the use of *zij*, there is no reason why, say, grammatical role could not matter as well.

3. Eyetracking experiment

In this section, we turn to the results of an on-line eyetracking study that investigates the incremental interpretation of the anaphoric forms in Dutch. The sentence completion study gives us off-line data about people's interpretation of the pronouns. Here, with the eyetracking experiment, we can investigate the same hypotheses as were sketched above for the sentence completion experiment, but in a highly incremental manner that offers us a direct measure of the temporal properties of on-line anaphor resolution. The advantage of on-line methods is that they can provide information that off-line tasks cannot. For example, if multiple factors contribute to referent choice, we might be able to disentangle them by looking at reference resolution incrementally.

Sixteen native Dutch-speaking participants, mainly students at the University of Nijmegen, took part in the experiment. Participants were shown, on a computer screen, color pictures of simple scenes involving human or animal characters, and heard a brief pre-recorded story about the scene. Their task was to look for any mismatches between the story and the picture. Participants' eye movements (i.e. where they look in the scene as they listen to the story) were recorded with a digital video camera. The video tapes were later analyzed to see which characters in the picture were fixated over time.

A total of 16 target items (i.e., scene-story pairs) were constructed, each with two human characters. The verbal story for each target item contained a sentence with two masculine or two feminine human referents, followed by the critical sentence beginning with the anaphor *ze*, *zij*, *hij* or *die*. There were four conditions: (1) masculine with *hij*, (2) masculine with *die*, (3) feminine with *ze*, and (4) feminine with *zij*. All verbs were, again, agent-patient verbs. Neutral intonation was used throughout. A sample item is in (5).

(5a) *Feminine version*
Het begon uit de hand te lopen in het klaslokaal.
'Things were getting out of hand in the classroom.'
De leerlinge stak de lerares speels met een scherp potlood.
'The student poked the teacher jokingly with a sharp pencil.'
Ze/Zij was gekleed in een groene trui, omdat het buiten koud was.
'**Ze/Zij** was wearing a green sweater, because it was cold outside.'
Het lijkt erop dat ze naar de rector moeten.
'It looks like they will have to go see the principal.'

(5b) *Masculine version*
Het begon uit de hand te lopen in het klaslokaal.
'Things were beginning to get out of hand in the classroom.'
De leerling stak de leraar speels met een scherp potlood.
'The student poked the teacher jokingly with a sharp pencil.'
Hij/Die was gekleed in een groene trui, omdat het buiten koud was.
'**Hij/Die** was wearing a green sweater, because it was cold outside.'
Het lijkt erop dat ze naar de rector moeten.
'It looks like they will have to go see the principal.'

Before moving onto the results, let us consider how we predict people's eye-movements to pattern in the different conditions. In accordance with common assumptions in the literature, we might predict that the most reduced forms (in the masculine paradigm *hij*, and in the feminine paradigm *ze*) are used for the most salient referents, and less reduced forms for less salient referents (in the masculine paradigm *die*, and in the feminine paradigm *zij*)[5]. This, combined with the well-known finding that subjects are more salient than objects (e.g. Brennan, Friedman & Pollard 1987, and many others), leads to the prediction that *hij* and *ze* are more likely to refer to the subject of a preceding sentence than *die* and *zij*. However, if on the other hand, the referential properties of the full form *zij* involve contrast and not salience, then we do not necessarily expect it to show a clear preference for one antecedent over the other.

3.1 Eye-tracking results

Figure 2 shows 'subject advantage score', which refers to the difference between the proportion of time was spent looking at the subject and the proportion of time that was spent looking at the object, during three time windows, for the four conditions. Thus, positive numbers indicate a subject preference, and negative numbers indicate an object preference. The first time window is 0-19 frames (0-333 milliseconds, where 0 is the onset of the anaphoric expression), the second time window is 20-39 frames (333-666 ms), and the third time window is 40-59 frames (666-1000 ms).

We see that, for the masculine pronoun *hij*, we initially have a slight object preference right after the onset of the pronoun, but that this develops into a very strong subject preference over time. The demonstrative *die* has a clear object preference that becomes stronger over time. These two forms thus pattern as predicted. For the feminine conditions, however, the pattern does not fit with the predictions. The reduced form *ze* initially has a weak object

[5] As noted earlier, feminine referents can also be referred to with *die* and thus if we were to test feminine *die* and feminine *zij*, we would not expect them to pattern the same.

preference right after the onset of the anaphor, but this develops into a subject preference. Similarly, the full form *zij* shows a clear subject preference, and does not shows any sign of being used to refer to less salient referents than *ze*. On the whole, the graph shows that the pronouns *hij*, *ze* and *zij* behave in the same way—i.e. they prefer subjects over objects— and thus differ from the demonstrative *die*. The finding that *hij*, *ze* and *zij* show increased looks to the subject, whereas *die* does not, results in a significant gender-pronoun interaction starting approximately 400-800 ms after the pronoun. Thus, the eye-movements also show a pattern incompatible with an accessibility-hierarchy type explanation.

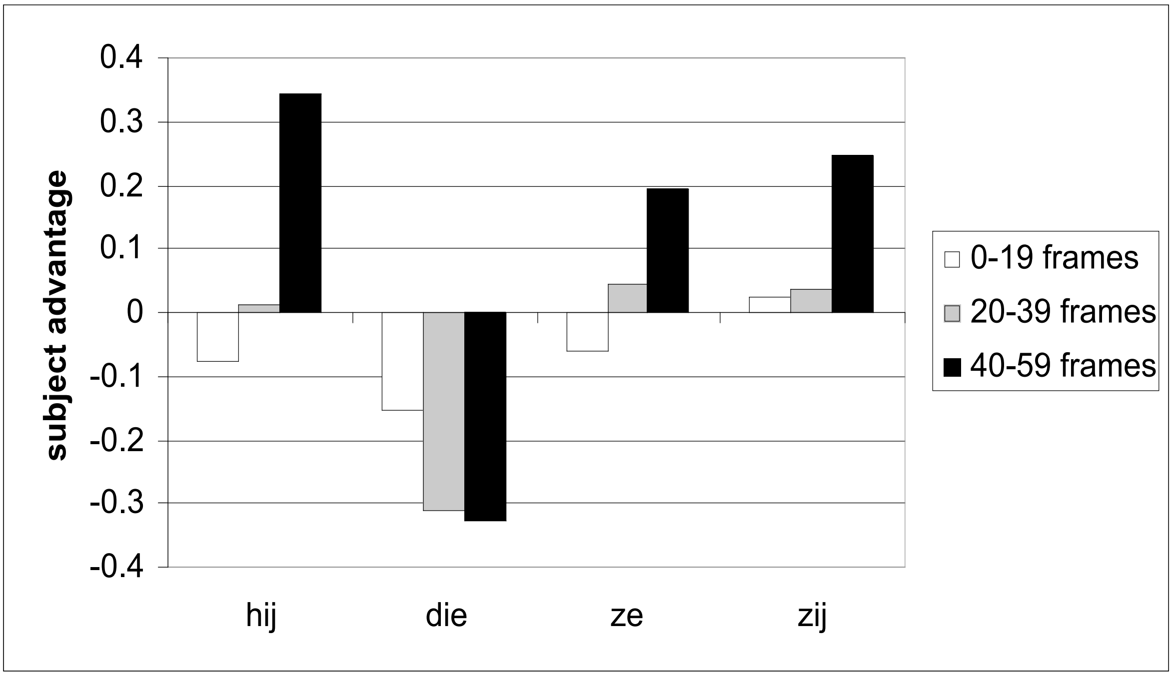


Figure 2. The difference between the proportion of time spent looking at the subject and the proportion of time spent looking at the object, during three time windows
(Positive numbers indicate a subject preference, and negative numbers indicate an object preference. Note: There are 30 frames per second.)

3.2 Discussion

Overall, the results of the eye-tracking study show that the pronoun *hij* 'he' and the demonstrative *die* 'that' differ in their referential properties: *hij* is significantly more likely than *die* to be interpreted as referring to the subject of the preceding sentence, from which we can infer that *hij* is used to refer to more salient referents than *die*. However, this pattern does not extend to the long and short form of the feminine pronouns, *ze* and *zij*, since both tend to be interpreted as referring to the subject of the preceding sentence in the eye-tracking experiment.

Thus, contra accessibility-based approaches, the eyetracking results indicate that the full form of the feminine pronoun is not used to refer to less salient or less prominent referents than the reduced form. In other words, it looks like the referential properties of these two forms cannot be defined in terms of salience. This brings up two important questions. First, how does the finding that *ze* and *zij* both show a subject preference in the eyetracking data square with the results of the sentence completion study, where *ze* and *zij* both showed a subject preference but *ze* had a significantly stronger subject preference than zij? Second, we are inevitably faced with the question of what governs the choice of *ze* vs *zij*, if it is not the salience of the antecedent? To shed some light on this question, we conducted a small corpus study which investigates naturally-occurring uses of *zij*. As we will see in the next section, many occurrences of *zij* have to do with contrast, not salience.

4. Preliminary corpus study

Thirty-five occurrences of *zij* in matrix subject position were analyzed. These tokens are from a novel by Renate Dorrestein, *Het Hemelse Gerecht* (Pandora, 1990). Each item was coded for the following factors:

(i) grammatical role of the most recent instantiation of the antecedent
(ii) distance between occurrence of *zij* and most recent mention of antecedent (e.g., in same sentence but different clauses; separated by one or more main clauses etc.)
(iii) whether the referent of *zij* was being contrasted with other referents
(iv) whether there were any competing referents present (i.e. singular feminine referents) between the mention of the antecedent and the pronoun *zij*.

4.1 Results, discussion

As Figure 3 shows, in our corpus *zij* prefers preceding subjects over objects, which matches the eye movement patterns:

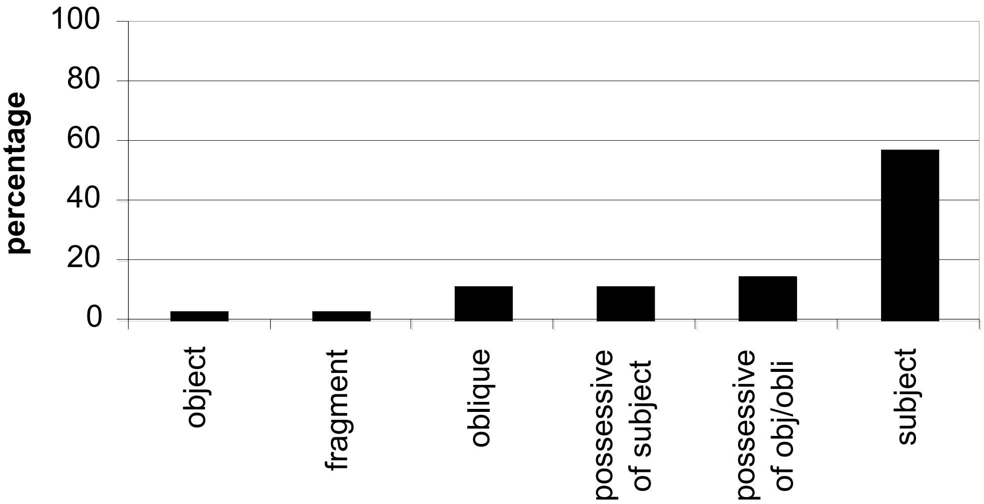


Figure 3. Grammatical role of antecedent of *zij*

However, what does this corpus study tell us about what prompts use of *zij* over *ze*? If *ze* is the most reduced form, what is the referential function of *zij*? For example, what role does contrast play? The other factors that were used in the coding reveal that the majority of the occurrences of *zij* in our corpus fit into one of the following categories:

(a) The referent of *zij* is in a contrast relation to other entities in the discourse
(b) If the referent of *zij* is not in a contrast relation to anything, *zij* refers to a non-subject
(c) If neither (a) nor (b) holds – i.e. *zij* refers to a preceding subject that does not contrast with anything else – then the mention of the antecedent is separated from the pronoun by at least one main clause.

First, let us consider some examples where *zij* is used in cases of contrast. This was the most common context for *zij*. In (6a), it is clear that the two sisters who are the main characters in the novel, Irthe and Ange, are being compared in terms of their hair. Irthe has long hair, whereas Ange wears hers short. In (6b), Ange contrasts with Gilles in that she cannot see outside whereas he seems to be able to.

(6a) "..." roept Irthe uit, terwijl ze de lange rode haren over haar schouder zwiert. Anges haar is eerder rossig, **zij** dragt het kortgeknipt… (Het Hemelse Gerecht, 19)
"…" Irthe calls out while she tosses her long red hair over her shoulder. Ange's hair is more reddish-brown, ***she*** *wears it short…*

(6b) [context: Gilles and Ange are in the kitchen, and Ange notices Gilles looking outside intently. She tries to look too, knowing that outside are a garden, a river, the whole world.]
….maar hoe Ange zich ook inspant om van dat alles een glimp te ontwaren, **zij** ziet in de donkere ruit slechts de weerspiegeling van haar eigen keuken… (15)
…but no matter how Ange exerts herself trying to catch a glimpse of all that, ***she*** *sees in the dark pane nothing but her own kitchen.*

However, even though such contrast uses are very common, not all uses of *zij* can be interpreted as involving a salient contrastive relation. In some cases, *zij* is simply used to refer to a non-subject referent (7a), or to refer to a referent that was realized as the subject some time ago, as in (7b).

(7a) [Irthe is having a busy night at the restaurant she runs with her sister.]
Om momenten als deze komt hun bedrijf haar voor also een circus, en is **zij** de leeuw die door brandende hoepels springt. (46)
At times like this her business seems to her like a circus, and ***she*** *is the lion that jumps through the burning hoops.*

(7b)
Haast bezwijkt Irthe onder haar bezorgde blik. Ange? Hoor eens? Ik moet je wat vertellen! Maar dat is immers onmogelijk. Om Anges geluk niet te verstoren heft **zij** altijd het stilzwijgen bewaard. (69)
Hastily Irthe gives way under her [Ange's] worried look. Ange? Listen for once? I have to tell you something. But that is impossible, after all. In order to not interfere with Ange's happiness ***she*** *[Irthe] has always kept quiet.*

On the whole, these findings reveal that *zij* is most often used in cases of contrast, but not all uses of *zij* can be construed contrastively. In fact, the corpus examples suggest that use of *zij* may be driven by a number of different factors. Clearly, more work is needed in order to better understand the referential properties of *zij*, but it does seem that contrast plays an important role.

4.2 Implications for experimental results

Let us now consider how the results of the corpus studies and the two experiments fit together. In the sentence completion experiment, we saw that the masculine pronoun *hij* and the demonstrative *die* have clear referential biases: *hij* prefers subjects and *die* prefers objects. The two feminine forms, the reduced form *ze* and the full form *zij*, have less clear preferences. Both prefer subjects over objects, but *ze* has a much stronger preference than *zij*. As mentioned earlier, these results are compatible with a view that *zij* is ranked lower on the salience hierarchy than *ze*, i.e. that *zij* refers to entities that are slightly less salient than those that *ze* refers to. However, this view is not supported by the eyetracking results, which show that *ze* and *zij* both have equally strong subject biases. How can we reconcile these two sets of results?

We would like to hypothesize that if, as the corpus data and Haeseryn *et al*'s grammar suggest, contrast is relevant for the use of *zij*, then the seemingly divergent experimental results can be reconciled. In the sentence completion experiment, participants could presumably construe *zij* contrastively if they wanted to, since they could continue the fragment any way they wished. This, combined with the idea that an entity in any grammatical position can be contrastive, might explain why, in the sentence completion task, *zij* does not have as strong a subject preference as *ze* does: in some cases, perhaps *zij* is used to refer back to a contrastively-interpreted object. In the eyetracking experiment, on the other hand, no contrast is present as the pronouns are not used contrastively in the stories. Maybe, then, in the absence of contrast people simply defaulted back to the preceding subject as the referent for *zij*. Clearly, further work is needed in this area, and the ideas presented here are still very speculative. However, this direction seems to us to be a promising avenue for future work.

5. Conclusions and crosslinguistic patterns

In sum, in this paper we have presented the results of two experiments and a small corpus study. Our results suggest that the full vs. reduced pronoun choice (*zij* vs. *ze*) is not triggered by referent salience, but the choice of a demonstrative over a pronoun (*die* vs. *hij*) is. Corpus examples indicate that use of full form of pronouns may in fact be prompted by contrast. Overall, these results suggest the referential properties of different anaphoric forms within one language cannot be captured by a unified notion of salience.

Crosslinguistic evidence that further corroborates the claim that salience is not enough to capture the referential properties of different forms comes from Finnish and Estonian (e.g. Kaiser 2000, 2003, to appear). Finnish has a gender-neutral third person pronoun *hän* 'she/he' as well as a demonstrative *tämä* 'this' that can be used to refer back to humans, similar to Dutch *die* 'that.' As shown by Kaiser (2003), these two forms differ strikingly in their sensitivity to the antecedent's grammatical role and word order, and cannot be mapped onto a unified salience scale. Interestingly, Estonian has form that is historically related to the Finnish demonstative *tämä*, namely *tema*. In Estonian, *tema* is the full form of the third person pronoun, and *ta* is the reduced form. Pajusalu (1995, 1996, 1997) and Kaiser (2003) claim that the choice of *tema* over *ta* is triggered by contrast. Examples from Kaiser's corpus are provided below. In (7a), there is a clear salient opposition between Sir Hartman and Vendela: she can read whereas he cannot. Similarly, in (7b), *tema* triggers a contrastive interpretation: It indicates that there is a salient opposition between Vendela and Father Henrik because she is the one who will actually take care of the knight.

(7a) [context: Vendela has just told Sir Hartman that she can read and that she even owns a book, which was quite a rare possession in Finland in the year 1371]
Rüütel Hartman mõtiskles selle üle, lebades mõnusalt laas voodis. **Tema** ei osanud lugeda, selleks polnud mingit vajadust – lugemine oli pastorite osa. (K. Utrio, 1989/1996, *Vendela*, 107)

'Sir Hartman thought about this, resting comfortably in the wide bed. He couldn't read, there was no need for it – reading was for pastors.'

(7b) [context: Father Henrik wants to come along to take care of Sir Hartman, who is seriously ill. The head of Sir Hartman's men explains to him:]
See [...] sõltub täielikult sellest, kas Domina Vendela lubab sul kaasa tulla või mitte. Domina Vendela on ravitseja. **Tema** ravib rüütlit... (K. Utrio, 1989/1996, *Vendela* 94)

'It [...] depends entirely on whether Domina Vendela allows you to come along or not. Domina Vendela is a healer. **She** will take care of the knight…'

In conclusion, the Dutch data as well as additional evidence from Finnish and Estonian indicate that the notion of salience/accessibility is not enough to capture the referential properties of different referential forms. We need to investigate the role of factors such as contrast in order to better understand the discourse properties of different anaphoric forms.

References

Ariel, M. 2001. Accessibility Theory: an overview. In *Text Representation, Linguistic and psycholinguistic aspects*, ed. T. Sanders, J. Schilperoord & W. Spooren, 29-87. Amsterdam/Philadelphia: John Benjamins.

Ariel, M. (1990). *Accessing NP Antecedents.* Routledge/Croom Helm.

Brennan, S., Friedman, M. & Pollard, C. (1987). *A Centering Approach to Pronouns.* ACL 25, 155-162.

Bresnan, J. 2001. The Emergence of the Unmarked Pronoun. *Optimality-theoretic Syntax*, 113-142. MIT Press.

Cardinaletti, A. & Starke, M. 1999. The typology of structural deficiency: A case study of the three classes of pronouns. In *Clitics in the Languages of Europe*, ed. H. van Riemsdijk, 145-233. Berlin/New York: Mouton de Gruyter.

Comrie, B. 1997. Pragmatic binding: Demonstratives as anaphors in Dutch. In *Proceedings of the Twenty-Third Annual Meeting of the Berkeley Linguistics Society*, ed. M.L. Juge & J.L. Moxley, 50-61. Berkeley, CA.

Donaldson, B. 1997. *Dutch – A comprehensive grammar*. New York: Routledge.

Givón, T. 1983. *Topic continuity in discourse: A quantitative cross-language study.* Amsterdam: John Benjamins.

Grosz, B., Joshi, A., & Weinstein, S. 1995. Centering: A Framework for Modelling the Local Coherence of Discourse. *Computational Linguistics*, 2(21).

Gundel, J.K., Hedberg, N. & Zacharski, R. (1993). Cognitive Status and the Form of Referring Expressions in Discourse. *Language* 69:274-307.

Haeseryn, W. et al. (1997). *Algemene Nederlandse Spraakkunst*. Band 1. Martinus Nijhoff.

Kirsner, R.S. & van Heuven, V.J. 1988. The significance of demonstrative position in Modern Dutch. *Lingua* 76:209-248.

Kirsner, R.S., van Heuven, V.J. & Vermeulen, J.F.M. 1987. Text-type, context and demonstrative choice in written Dutch: Some experimental data. *Text* 7(2):117-144.

Kaiser, E. (to appear) When salience isn't enough: Pronouns, demonstratives and the quest for an antecedent. To appear in R. Laury (ed.), *Minimal reference in Finnic: The use and interpretation of pronouns and zero in Finnish and Estonian discourse.* Helsinki, Finland: Suomalaisen Kirjallisuuden Seura.

Kaiser, E. (2003). *The Quest for a Referent: A Crosslinguistic Look at Reference Resolution*. Ph.D. dissertation, U. Pennsylvania

Kaiser, E. (2000) Pronouns and demonstratives in Finnish: Indicators of Referent Salience. In P. Baker, A. Hardie, T. McEnery and A. Siewierska (eds.), *Proceedings of the*

Discourse Anaphora and Anaphor Resolution Conference. Lancaster, UK: University Center for Computer Corpus Research on Language, Technical Papers vol.12, 20-27.
Pajusalu, R. 1995. Pronominit *see, tema* ja *ta* viron puhekielessä. *Sananjalka* 37:81-93.
Pajusalu, R. 1996. Pronoun systems of Common Estonian and Estonian dialects in a contrastive perspective. In *Estonian: Typological Studies*. Publications of the Department of Estonian of the University of Tartu, Volume 4, 19-164.
Pajusalu, R. 1997. Eesti pronoomeneid I. Ühiskeele *see*, *too* ja *tema/ta*. *Keel ja Kirjandus*, 24-30 and 106-115.
Rullmann, H. 2001. *Dutch Demonstrative Pronouns in Discourse*. Talk presented at the 7th Germanic Linguistics Annual Conference, Banff, Alberta, Canada.
Stevenson, Rosemary J., Crawley, Rosalind J. & Kleiman, D. 1994. Thematic roles, focus and the represenation of events. *Language and Cognitive Processes* 9:519-548.

THE QUANTIFICATIONAL FUNCTION OF THE JAPANESE NUMERAL CLASSIFIER

Mana Kobuchi-Philip
UiL-OTS, Utrecht University

mana.kobuchi@let.uu.nl

Abstract

This paper presents a new quantificational analysis of the Japanese numeral quantifier (NQ) construction. It is proposed that the classifier within the NQ functions as the domain of quantification for the numeral, denoting a set of atomic individuals. This accounts for the predominant distributive reading of the floating NQ sentence, both with object classifiers and event classifiers, as a direct consequence of the atomicity condition of the classifier denotation. The analysis correctly predicts that, unlike the floating NQ, the non-floating NQ will show a collective/distributive ambiguity because it forms a plural term, which can always be interpreted as a group individual or as a sum of individuals. The analysis also provides a semantic account of the well-known classifier-NP agreement phenomenon.

1. The Japanese Numeral Quantifier

The Japanese numeral quantifier (NQ) consists of a numeral and a classifier in that order, as the following exemplifies:

(1) a. san-nin $\quad$ b. san-kumi $\quad$ c. ni-hon $\quad$ d. ni-hai
3-$\text{CL}_{\text{human individual}}$ $\quad$ 3-CL_{group} $\quad$ 2-$\text{CL}_{\text{long object}}$ $\quad$ 2-$\text{CL}_{\text{glass/cup}}$

In semantic interpretation, the NQ is associated with an NP ('host NP'). For example, (1a) *san-nin* can be construed with a common noun such as *gakusei* 'student' to yield the meaning 'three students'. The Japanese NQ occur either inside the DP that contains its host NP, i.e. as a 'DNQ', or syntactically associated with a predicate, i.e. as an 'FNQ'. (2a) and (2b) are sentences with a DNQ construed with a subject NP and an object NP, respectively. (3a) and (3b) are sentences with an FNQ construed with a subject NP and an object NP, respectively:

(2) a. **san-nin**-no **gakusei**-ga hon-o katta. 'Three students bought a book'
3-CL-GEN student-NOM book-ACC bought
b. John-ga **san-satsu**-no **hon**-o katta. 'John bought three books.'
J-NOM 3-CL-GEN book-ACC bought

(3) a. **gakusei**-ga **san-nin** hon-o katta. 'Three students bought a book.'
student-NOM 3-CL book-ACC bought
b. John-ga **hon**-o **san-satsu** katta. 'John bought three books.'
J-NOM book-ACC 3-CL bought

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference "sub8 – Sinn und Bedeutung". Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany*

2. Classifier-Host NP Agreement

As is well-known, the Japanese classifier must agree with the host NP. This is illustrated in the following sentences:

(4) a.	**gakusei**-ga	**san-nin**	kita.		'Three **individual** students came.'
	student-NOM	3-CL	came		
b.	#**gakusei**-ga	**san-gen**	kita		(lit.)'Three **buildings** of students came.'
	student-NOM	3-CL	came		
c.	**gakusei**-ga	**san-kumi**	kita.		'Three **groups** of students came.'
	student-NOM	3-CL	came		
(5) a.	John-ga	**biiru**-o	**ni-hon**	nonda.	'John drank two **bottles** of beer.'
	J-NOM	beer-ACC	2-CL	drank	
b.	#John-ga	**biiru**-o	**ni-mai**	nonda	(lit.)'John drank two **sheets** of beer.'
	J-NOM	beer-ACC	2-CL	drank	
c.	John-ga	**biiru**-o	**ni-hai**	nonda.	'John drank two **glasses** of beer.'
	J-NOM	beer-ACC	2-CL	drank	

(4a) is well-formed because *nin* is the classifier for human beings and *gakusei* is a kind of human being. In contrast, (4b) is ill-formed because *ken* is the classifier for buildings, and students cannot easily be taken to have building properties. Likewise, (5a) is well-formed because *hon* is the classifier for long slender objects and a beer bottle fits this description, but (5b) is ill-formed because *mai* is the classifier for flat, sheet-like objects and beer does not usually come in flat, sheet-shaped packages. Japanese classifier-host NP agreement is often analyzed as syntactic agreement (e.g. Kitahara 1992). However, there are two basic observations that argue strongly against such an analysis. First, consider the grammatical minimal pairs (4a)-(4c) and (5a)-(5c). These contrasts illustrate a very general fact about Japanese classifier-host NP agreement, namely that the classifier has a meaning. This is not a property of syntactic agreement affixes. Consider, for example, a real case of syntactic agreement such as adjective-noun agreement in the Spanish NP *casa roja* 'red house'; the agreement affix has no semantic content. Similarly, the syntactic agreement affix in cases of subject-verb agreement, e.g. English *John walks*, is completely inert semantically. Secondly, classifier selection is context-sensitive and the ill-formedness of a classifier-host NP mismatch is exactly analogous to a selectional restriction violation. For example, whether (5a) or (5c) is pragmatically licensed depends entirely on the speaker's beliefs about the vessel John used to drink beer. Moreover, there are conceivable, albeit unlikely, contexts in which (5b) could be perfectly well-formed, e.g. aboard a spacecraft where beer was stored in freeze-dried wafers. Given these basic observations, Japanese classifier-host NP agreement does not appear to be syntactic. Rather, it appears to be semantic. This raises a first question: What role does syntax play in this evidently semantic agreement phenomenon?

3. Semantic Difference between DNQ and FNQ Sentences

It has been observed that the Japanese FNQ sentence generally requires a distributive reading. In contrast, the DNQ sentence is always ambiguous between distributive and collective readings.[1] This is seen in contrasts such as the following:

(6) a. **san-nin**-no **gakusei**-ga peepaa-o kaita (DNQ)
3-CL-GEN student-NOM paper-ACC wrote
'Three students together/each wrote a paper.
b. **gakusei**-ga, **san-nin** peepaa-o kaita (FNQ)
student-NOM 3-CL paper-ACC wrote
'Three students each wrote a paper.'

(7) a. **futa-tsu**-no **suiso-genshi**-ga kono ondo-de
2-CL-GEN hydrogen-atom-NOM this temperature-at
hito-tsu-no suiso-bunshi-o tsukuru (DNQ)
1-CL-GEN hydrogen-molecule-ACC form
'Two hydrogen atoms form a hydrogen molecule at this temperature.'
b. #**suiso-genshi**-ga kono ondo-de
hydrogen-atom-NOM this temperature-at
futa-tsu hito-tsu-no suiso-bunshi-o tsukuru (FNQ)
2-CL 1-CL-GEN hydrogen-molecule-ACC form
'(lit.) Two hydrogen atoms each form a hydrogen molecule at this temperature.'

The sentences in (6) contain a mixed predicate *peepaa-o kaita* 'wrote a paper'. The DNQ sentence (6a) is ambiguous between distributive and collective readings as shown in the English glosses, while the FNQ sentence (6b) can only be interpreted with a distributive reading. The FNQ sentence's association with a distributive reading is even clearer in (7) with the predicate *hitotsu-no suiso-bunshi-o tsukuru* 'form a (single) hydrogen molecule'. This collective predicate forces the DNQ sentence (7a) to have a collective reading, but leads to ill-formedness in (7b) because FNQ requires a distributive reading.[2] The ill-formedness here is parallel to that of an English sentence such as **Each boy gathered in the classroom*. Thus, we face a second question: Why does the FNQ sentence generally require a distributive reading while the DNQ sentence does not.

4. Previous Analyses

Let us look at some previous analyses to see whether they can address these two questions. We will focus on the second one first. Let us begin by considering the traditional analysis of an English sentence such as (8a):

[1] To be precise, this ambiguity holds when the DNQ sentence has a mixed predicate. Needless to say, the DNQ sentence with a collective predicate must be interpreted under a collective reading, and the DNQ sentence with a distributive predicate must be interpreted under a distributive reading.

[2] There is a special type of collective predicate that can occur with an FNQ. In such cases, the FNQ functions as an amount term, rather than an object quantifier. See Kobuchi-Philip (2003) for details.

(8) a. Three students wrote a paper.

b.

Q	A	B
Num	NP	VP
3	student	wrote a paper

c. $|[[NP]] \cap [[VP]]| \geq 3$

This sentence can be quantificationally analyzed as in (8b). The numeral, the host NP, and the VP function as the quantifier, the domain of quantification, and the nuclear scope, respectively. The sentence is analyzed as an assertion that the cardinality of the intersection of the NP denotation and the VP denotation is three, as shown in (8c). This basic approach is what Fukushima (1991) adopts for Japanese. Fukushima's analysis of the Japanese FNQ sentence is illustrated in (9):

(9) a. **gakusei**-ga, **san-nin** peepaa-o kaita 'Three students wrote a paper.'
student-NOM 3-CL paper-ACC wrote

b.

Q	A	B
NQ	NP	VP
3-nin	gakusei	peepaa-o kaita
3-CL	student	wrote a paper

c. $(|\underbrace{\lambda x[gakusei'(x)]}_{\substack{\text{student}\\ |\\ \text{(NP-denotation)}}} \cap \underbrace{\lambda x[peepaa\text{-}o\ kaita'(x)]}_{\substack{\text{wrote a paper}\\ |\\ \text{(VP-denotation)}}}| \geq 3) \wedge (\underbrace{\lambda x[gakusei'(x)]}_{\substack{\text{student}\\ |\\ \text{(NP-denotation)}}} \subseteq \underbrace{\lambda x[nin'(x)]}_{\substack{\text{CL}\\ |\\ \text{(CL-denotation)}}})$

(9a) is quantificationally analyzed as in (9b). The NQ *san-nin* '3-CL', the host NP *gakusei* 'student', and the VP *peepaa-o kaita* 'wrote a paper' function as the quantifier, the domain of quantification, and the nuclear scope, respectively. The meaning of (9a) under this analysis is represented as (9c). Notice that (9c) consists of two parts. The left conjunct captures the quantification proper, expressing the proposition that the cardinality of the intersection of the NP denotation and the VP denotation is three. The right conjunct captures the relationship between the NP denotation and the classifier denotation, describing it as a subset relation, i.e. the former is a subset of the latter. Fukushima's analysis works for basic FNQ sentences like (9a). However, several objections can be raised. First, under this analysis the classifier does not participate in the quantification proper, despite the fact that it is syntactically, if not morphologically, composed with the numeral. Thus, we have a mapping problem. Secondly, the analysis treats the interpretation of an FNQ sentence on a par with that of a DNQ sentence, failing to capture the essential semantic difference as regards the unavailability of a collective reading for the FNQ sentence. Third, the type of Japanese FNQ sentence containing what I call an 'event classifier' such as *hatsu* 'blast/shot' poses a severe empirical problem. Consider the application of Fukushima's analysis to a sentence such as (10a):

(10) a. John-ga **pisutoru**-o, **san-patsu** utta. 'John shot three shots of a pistol.'
J-NOM pistol-ACC 3-CL shot
b. │□y[pisutoru'(y)] □ □x[utta'(x)(j)]│≥ 3 □ □y[pisutoru'(y)] □ hatsu'
'pistol' 'shot' 'pistol' CL_{shot}

First, (10b) asserts that there are three pistols which John shot (with). But this does not have to be the case: (10a) is also true if John shot a single pistol three times. Second, the event classifier *hatsu* denotes blast/shot units. This is a type of event rather than a type of object; consequently, the subset relationship in the right conjunct of (10c) never holds, making the entire proposition (10c) necessarily false. Thus, Fukushima's analysis cannot capture FNQ sentences with an event classifier, which means that we need a completely distinct analysis for such sentences.

Let us now consider the Distributivity operator (D-operator) approach. Link (1987) argues that an English floating quantifier (FQ) such as *all* converts a VP denotation such as (11a) into (11b) with a D-operator. Under this analysis, the distributive reading of (12a) would be as shown in (12b).

(11) a. VP: □x[VP(x)] b. ^{D}VP: □x□y[y□ □ □ VP(y)]

(12) a. Three men all lifted a piano.
b. □x[(3 men)'(x) □ □y[y□□ x □ □z[piano'(z) □ lifted'(y,z)]]]

Applying this approach to the Japanese FNQ sentence, modifying it slightly to take into account the classifier, the logical representation of (13a) would be as shown in (13b):

(13) a. **otoko**-ga, **san-nin** piano-o hakonda.
man-NOM 3-CL piano-ACC carried
'Three men carried a piano.'
b. □x[(3 nin)'(x) □ otoko'(x) □ □y[y□□□ x □ □z[piano'(z) □ hakonda'(y,z)]]]
CL 'man' 'piano' 'carried'

(13b) accurately captures the meaning of (13a). However, the D-operator approach is not satisfactory since it only meets the condition of descriptive adequacy. It does not provide an explanation of why a D-operator obligatorily occurs with an FNQ sentence but only optionally with a DNQ sentence. Furthermore, this analysis faces the same problem as Fukushima's analysis with respect to the event classifier sentence. Under a D-operator approach, (14a) would be analyzed as (14b):

(14) a. John-ga **pisutoru**-o **ni-hatsu** utta. 'John shot two shots of a pistol.'
J-NOM pistol-ACC 2-CL shot
b. □x[(2 hatsu)'(x) □ pisutoru'(x) □ □y[y□□ x □ [utta'(j,y)]]]
'shot' 'pistol' 'shot'

The variable x is required to have both the property of being two shots (an event property) and of being a pistol (an object property). Since this is semantically incoherent, (14a) is falsely predicted to be ill-formed.

Finally, let us consider the analysis recently proposed by Nakanishi (2002a, b). Nakanishi sheds new light on the semantic difference between Japanese DNQ and FNQ sentences when this NQ functions as an amount term and is subject to Schwarzschild's (2002) 'monotonicity constraint'. Generalizing this to all NQs, she attempts to account for the obligatory distributive reading of the FNQ sentence as a consequence of this monotonicity constraint. Consider first the DNQ sentences in (15), in which the DNQ functions as an amount term rather than quantifying over objects:

(15) a. **mizu san-rittoru**-ga koboreta. 'Three liters of water spilled.'
water 3-CL-NOM spilled
b. ***mizu san-do**-ga koboreta. (intended) 'Water whose temperature is three degrees spilled.'
water 3-CL-NOM spilled

(15a) is well-formed because it obeys the monotonicity constraint in the nominal domain: There is a correlation between a subpart of 3 liters and a subpart of water. In contrast, (15b) is ill-formed because it violates the monotonicity constraint: It is not the case that a subpart of water has a lower degree. On the basis of this kind of data, Nakanishi persuasively argues that the DNQ functioning as an amount term obeys the monotonicity constraint in the nominal domain. Now consider the FNQ sentences in (16), where the FNQ is also an amount term:

(16) a. **yuki**-ga kinoo **san-ton** John-no ie-no yane-ni tsumotta
snow-NOM yesterday 3-CL J-GEN house-GEN roof-on piled up
'Three tons of snow piled up on the roof of John's house yesterday.'
b. ***yuki**-ga kinoo **san-ton** John-no ie-o oshitsubushita
snow-NOM yesterday 3-CL J-GEN house-ACC destroyed
(intended) 'Three tons of snow destroyed John's house yesterday.'

Here, Nakanishi insightfully observes that well-formedness depends on satisfaction of the monotonicity constraint with respect to events denoted by the predicate. (16a) is well-formed since there is a correlation between a subpart of 3 tons and a subevent of piling-up-event. In contrast, (16b) is ill-formed since there is no correlation between a subpart of 3 tons and a subevent of destroying John's house. (The subevents of destroying John's house are not themselves events of destroying John's house.) This shows, Nakanishi persuasively argues, that an amount term FNQ is subject to the monotonicity constraint in the verbal domain. Given this general observation, Nakanishi then attempts to account for the obligatory distributive reading of the Japanese FNQ sentence by treating the FNQ as a kind of amount term. Consider (17):

(17) a. **gakusei**-ga, **san-nin** peepaa-o kaita. 'Three students wrote a paper.'
student-NOM 3-CL_{human} paper-ACC wrote
b. e_1 = student s_1 wrote a paper
e : e_2 = student s_2 wrote a paper
e_3 = student s_3 wrote a paper

According to Nakanishi, an FNQ sentence such as (17a) can be well-formed only under a distributive reading because only under a distributive reading is the monotonicity constraint satisfied in the verbal domain. That is, assuming that the distributive reading entails the presupposition of subevents, as represented in (17b), the monotonicity constraint is obeyed in the verbal domain since a subpart of *3-nin* (e.g. s_1) can be correlated with a subevent of e represented in (17b) (e.g. e_1). Under a collective reading, in contrast, there is only one event so there is no subevent with which a subpart of *3-nin* may be correlated, violating the monotonicity constraint. Since the monotonicity constraint can never be violated, the collective reading is ill-formed.

As elegant as it is, Nakanishi's analysis faces some severe empirical problems. First, consider the case of a DNQ sentence such as (18), which must obey the monotonicity constraint in the nominal domain, according to Nakanishi's proposal:

(18)	**gakusei san-nin**-ga	peepaa-o	kaita.	'Three students wrote a paper.'
	student 3-CL-NOM	paper-ACC	wrote	

To satisfy the monotonicity constraint in the nominal domain, there must be a correlation between a subpart of *3-nin* and a subpart of students. There is such a correlation under a distributive reading of (18). But now the problem is that the monotonicity constraint will not be obeyed in the nominal domain under a collective reading of (18). The minute the students are taken as a group, there are no longer any subparts of students. A group of people is an individual object just as much as a collective action is an individual event. Thus, just as the monotonicity constraint rules out a collective reading for the FNQ sentence in (17a), it will rule out a collective reading for the DNQ sentence in (18). Clearly, this is a very false prediction. Moreover, it is unclear how the theory could be modified to capture the facts since what is needed seems to be a stipulation that the monotonicity constraint sometimes need not apply in the nominal domain, in which case, the theory becomes incoherent.

Another problem for Nakanishi's analysis derives from its dependence on an exclusively event-based semantic analysis of FNQ quantification. This leads to a problem capturing the fact that the numeral indicates the cardinality of objects rather than events in sentences such as (19c):

(19) a. e_1 = John danced yesterday at time t_1.
e_2 = John danced yesterday at time t_2.
e_3 = John danced yesterday at time t_3.

b. gakusei-ga	kinoo	san-kai	odotta.	'A student danced three times.'
student-NOM	yesterday	3-CL_{time}	danced	
c. **gakusei**-ga	kinoo	**san-nin**	odotta	'Three students danced.'
student-NOM	yesterday	3-CL	danced	

In the situation represented in (19a), a single student, John, dances on three different occasions. (19b) precisely describes this situation. In contrast, (19c) is false of this situation. However, under Nakanishi's account, (19c) is predicted to be true of (19a). If the numeral of (19c) is replaced with a large number, say 300, then it could in principle true of a situation similar to (19a) under Krifka's (1990) event related reading.[3] (In that case the adverb *kinoo* 'yesterday' should also be replaced with another adverbial indicating a longer period of time.) However, it seems to be extremely difficult to interpret (19c) under the event related reading, if possible at all. Apparently, the event related reading requires the cardinality to be very large, i.e. too large for verification under an object related reading.[4]

5. An Alternative Analysis

Given the problems of the analyses reviewed in the precious section, I propose an alternative quantificational analysis which pays special attention to the classifier. Following the general consensus in the semantics literature on the Japanese FNQ and on FQs in general (Fukushima 1991, Nakanishi 2002a,b, Dowty and Brody 1984, Link 1987, Roberts 1986, Doetjes 1997), I will assume that the Japanese FNQ is syntactically an adverb which forms a constituent with a predicate, while the Japanese DNQ forms a constituent with the host NP (see Kobuchi-Philip 2003 for a review of the empirical arguments). Assuming this simple syntax, I propose that the basic quantificational structure of the Japanese NQ sentence is as shown in (20):

(20) a. DNQ

S

VP

Num +	CL	NP
Q	A	B
san	nin	gakusei
3	CL	student

b. FNQ

S

NP

Num +	CL	VP
Q	A	B
san	nin	hon-o katta
3	CL	bought a book

This analysis receives primary support from conservativity tests, as demonstrated in (21). In each case, the entailment indicated by an arrow holds:

(21) Conservativity Tests

a. subject-oriented FNQ
gakusei-ga, **san-nin** peepaa-o kaita.
student-NOM 3-CL paper-ACC wrote
'Three students wrote a paper.'

3 nin peepaa-o kaita
CL wrote a paper
⇒ Three nin are nin that wrote a paper.

[3] For example, an English sentence such as (i) can be interpreted under an ordinary object oriented reading, as paraphrased in (ii), or under a special event related reading, as paraphrased in (iii):
(i) 4000 ships passed through the lock last year.
(ii) There were 4000 ships and they passed through the lock.
(iii) There were 4000 passages of a ship through the lock.

[4] The only type of context licensing an event related reading that I can think of is one in which a large number of dancings are being counted, for example, in some statistical population study.

b. object-oriented FNQ
John-ga **piza**-o, **ni-mai** tabeta.
J-NOM pizza-ACC 2-CL ate
'John ate two slices of pizza.'

2 mai John-ga tabeta
CL John ate
□ Two mai are mai that John ate.

c. event classifier (FNQ only)
pisutoru-ga, **ni-hatsu** utareta.
pistol-NOM 2-CL was shot
'A pistol was shot twice.'

2 hatsu utareta
CL was shot
□ Two hatsu are hatsu that were shot.

A crucial aspect of this proposal is a special semantic constraint on the classifier denotation which I call the ATOMICITY CONDITION. This is a requirement that the lexical denotation of a classifier only consist of a set of atoms. Unlike ordinary nouns, it cannot also contain sums. To clarify what is intended here, let us first look more closely at the Japanese common noun. I will assume that a Japanese common noun such as *gakusei* 'student' denotes a set containing both sums and atoms. The basic motivation for this is the fact that a Japanese bare noun can be interpreted either as singular or plural, as illustrated in (22). A similar claim has been made for Korean by Kang (1994). Thus, we may represent the denotation of the Japanese common noun *gakusei* as shown in (23):

(22) gakusei-ga kita — 'A(/the) student came.' or
student-NOM came — 'Some(/the) students came.'

(23) gakusei 'student' :
{$a \sqcup b \sqcup c$, (------ san-nin-no gakusei 'three students')
$a \sqcup b$, $a \sqcup c$, $b \sqcup c$, (------ futa-ri-no gakusei 'two students')
a, b, c} (------ hito-ri-no gakusei 'one student')

Now, let us consider the denotation of the classifier. As we mentioned in the outset, each classifier has its own meaning. For example, the classifier *nin* is a unit for human individuals. Therefore, this must be a part of the lexical content of this classifier. That is, the classifier *nin* denotes a set of objects each of which has the property of being a human being.[5] Now, if the classifier denotation also included both sums and atoms like the common noun denotation, we would face a tremendous difficulty capturing the basic truth conditions of Japanese NQ sentences. Suppose that there were four human individuals a, b, c and d in the domain of discourse and that the denotation of the classifier *nin* included both sums and atoms. Then, the set denoted by the classifier *nin* 'human individuals' would include the following elements:

[5] To be precise, the property is that of being a whole human being, i.e. being a person, not merely the property of being human. Thus, the denotation of *nin* does not include, for example, individual human fingers or human muscle tissue, etc. For the clarification of this point I thank Arnim von Stechow (p.c).

(24) $\{a \sqcup b \sqcup c \sqcup d,$
$a \sqcup b \sqcup c,\ a \sqcup b \sqcup d,\ a \sqcup c \sqcup d,\ b \sqcup c \sqcup d,$
$a \sqcup b,\ a \sqcup c,\ a \sqcup d,\ b \sqcup c,\ b \sqcup d,\ c \sqcup d,$
$a, b, c, d\}$

Now, if the quantifier were ‘three’, the quantification computation would have to select three elements from this domain. However, no constraints are placed on which elements are selected. Consider, then, the hypothetical situations (25a) and (25b):

(25) a. $\{a \sqcup b \sqcup c \sqcup d,$
$a \sqcup b \sqcup c,\ a \sqcup b \sqcup d,\ a \sqcup c \sqcup d,\ b \sqcup c \sqcup d,$
$a \sqcup b,\ \underline{a \sqcup c},\ a \sqcup d,\ b \sqcup c,\ b \sqcup d,\ c \sqcup d,$
$\underline{a}, b, \underline{c}, d\}$

b. $\{\underline{a \sqcup b \sqcup c \sqcup d},$
$a \sqcup b \sqcup c,\ a \sqcup b \sqcup d,\ a \sqcup c \sqcup d,\ b \sqcup c \sqcup d,$
$a \sqcup b,\ a \sqcup c,\ a \sqcup d,\ b \sqcup c,\ b \sqcup d,\ c \sqcup d,$
$\underline{a}, b, \underline{c}, d\}$

If the three underlined elements in (25a) were picked, then the number of elements would indeed be three, yet the number of human individuals would only be two, namely a and c. Worse, if the three underlined elements in (25b) happened to be picked, then the number of elements would be three, but the number of human individuals would now be as many as four, namely, a, b, c and d. Clearly, there is a major problem here: We are not capturing the basic meaning of the NQ. The problem has a simple solution, though. To capture the basic truth conditions of the NQ, each element selected from the classifier denotation must be exactly one human being. This is guaranteed if the classifier denotation lexically only contains atoms, as represented in (26):

(26) $\{a, b, c, d\}$

This is what the atomicity condition does. Given the effect of the atomicity condition, which I assume applies in the lexicon, we can guarantee that the elements selected by the quantifier will always be a set of distinct individuals. Note that our assumption here simply reaffirms Kratzer’s (1989) and Chierchia’s (1998) general observation that the domain of numeral quantification must be atomic. Given the atomicity condition, then, the lexical denotation of an object classifier and of an event classifier can be represented as in (27). The difference between these two types of classifier is that one denotes a set of atomic objects while the other denotes a set of atomic events.

(27) a. Object classifier (type <e,t>)
nin ($CL_{\text{human individuals}}$): $□x_e□y_e[nin'(y)\ □\ x^{□}□\ y]$
‘human’
satsu (CL_{volume}): $□x_e□y_e[satsu'(y)\ □\ x^{□}□\ y]$
‘volume’ (=bound paper)
b. Event classifier (type <s,t>)
hatsu (CL_{shot}): $□e_{1s}□e_{2s}[hatsu'(e_2)\ □\ e_1^{□}□\ e_2]$
‘blast/shot’

Given such classifier denotations, the logical representation of the Japanese NQ sentence in (28a), (29a), and (30a) is, under my proposal, as shown in (28b), (29b) and (30b), respectively:

(28) DNQ sentence with object classifier
a. **san-nin**-no **gakusei**-ga peepaa-o kaita. ‘Three students wrote a paper.’
3-CL-GEN student-NOM paper-ACC wrote
b. □y□K[K□(□u□v[nin'(v)□u□□ v]□ gakusei') □ │K│≥3□⊔K=y] □ peepaa-o kaita'(y)]
‘nin’ ‘student’ ‘wrote a paper’

(29) FNQ sentence with object classifier
a. **gakusei**-ga, **san-nin** peepaa-o kaita. ‘Three students wrote a paper.’
student-NOM 3-CL paper-ACC wrote
b. □y[gakusei'(y) □ □K[K□(□u□v[nin'(v)□u□□ v]□ peepaa-o kaita')□│K│≥3□⊔K=y]]
‘student’ ‘nin’ ‘wrote a paper’

(30) FNQ sentence with event classifier
a. **pisutoru**-ga, **san-patsu** utareta. ‘Three shots of a pistol were shot.’
pistol-NOM 3-CL were shot
b. □e_3□K[K□(□e_1□e_2[hatsu'(e_2)□e_1□□ e_2]□ □e_4□y[pisutoru'(y) □ utareta’(y)(e_4)])
‘hatsu’ ‘pistol’ ‘were shot’
□│K│≥3□⊔K=e_3]

Given this analysis, the obligatory distributive reading of the FNQ sentence is a direct consequence of the atomicity condition imposed by the classifier denotation after application of the most basic syntactic operation of all, namely function composition (or ‘merge’ in the Minimalist framework). As seen in (29b), the classifier denotation and the predicate denotation intersect, and, since the elements in the classifier denotation are all atomic, each element must be atomic and must have the property denoted by the predicate. A distributive reading results as a consequence of elementary principles of set theory. The same mechanism is applicable with the FNQ sentence that contains an event classifier. In (30b), quantification is over events instead of objects. Here, the NP *pisutoru* ‘pistol’ denotes a property of one of the participants of the event type denoted by the predicate, and is not directly involved in the quantification proper. This set of events denoted by the predicate intersects with the set of events denoted by the classifier *hatsu*, namely, a set of blasting-events. Again, these blasting-events are all atomic. Therefore, the sentence asserts that there are three atomic blasting-events which are pistol-shooting-events (rather than arrow-shooting-events or such). As noted earlier, (30b) can be true even when a single pistol is involved. The semantic interpretation in (30b) readily accommodates this fact since the FNQ is not directly associated with *pisutoru*. Such FNQ sentences actually have no host NP.

Now, it might seem that the analysis faces a problem since it would seem to falsely predict that the DNQ sentence also cannot have a collective reading, one of the problems for Nakanishi’s proposal. That is, for sentence (28a), the atomicity constraint has its usual effect in composition with the NP denotation, and so the sum K is a sum of three individual students. However, note that the sum K has exactly the same structure and content as the denotation of the English plural term *three students*: As indicated in (31a) below, a plural term is always ambiguous in that it can be construed either as an individual sum or as a group atom, the latter derived from the former by an application of a group operator, as discussed by Link (1984) and Landman (2000). Analogously, the sum generated in the computation of the Japanese DNQ may optionally be reanalyzed as a group atom via application of the group operator as shown in (31b):

(31) a. three students: $a \sqcup b \sqcup c$ or $\uparrow(a \sqcup b \sqcup c)$ (Link 1984, Landman 2000)
b. san-nin-no gakusei : $a \sqcup b \sqcup c$ or $\uparrow(a \sqcup b \sqcup c)$
3-CL-GEN student
'three students'
c. $\exists y \exists K[K = (\lambda u \exists v[nin'(v) \wedge u \sqsubseteq v] \cap gakusei') \wedge |K| \geq 3 \wedge \uparrow(\sqcup K) = y]$
$\wedge$ peepaa-o-kaita'(y)]
'nin' 'student' | 'wrote a paper'
Group operator

Thus, the distributive/collective ambiguity of the Japanese DNQ sentence is captured by a general mechanism that applies to all plural terms in all languages. No additional stipulation is necessary. It is important to note that the same operation cannot be performed on an FNQ sentence to yield a collective reading. Consider the FNQ sentence in (32a), analyzed as shown in (32b). Suppose a group operator applied to the sum K, as shown in (32c):

(32) a. **gakusei**-ga, **san-nin** peepaa-o kaita. 'Three students wrote a paper.'
student-NOM 3-CL paper-ACC wrote
b. $\exists y[gakusei'(y) \wedge \exists K[K = (\lambda u \exists v[nin'(v) \wedge u \sqsubseteq v] \cap peepaa\text{-}o\text{-}kaita') \wedge |K| \geq 3 \wedge \sqcup K) = y]]$
'student' 'nin' 'wrote a paper'
c. $\exists y[gakusei'(y) \wedge \exists K[K = (\lambda u \exists v[nin'(v) \wedge u \sqsubseteq v] \cap peepaa\text{-}o\text{-}kaita') \wedge |K| \geq 3 \wedge \uparrow(\sqcup K) = y]]$
'student' 'nin' 'wrote a paper'

This would have no effect on the atomicity of the individuals in the intersection of the classifier and the predicate denotations. So, it could not eliminate the distributive reading. In (32c), the effect of the group operator is, if anything, only that the three individual paper-writers may also be taken as a group, as a kind of independent after-thought. Furthermore, note that quite generally, the group operator may not optionally apply in the verbal domain. This is demonstrated by the fact that a lexically distributive predicate such as *walk* cannot possibly be assigned a collective reading. If it could, (33a) would be as invalid as (33b):

(33) a. Three boys walked. --> One boy walked.
b. Three boys carried it -/-> One boy carried it.

6. Agreement between CL and NP

Let us return now to our first question concerning the classifier-host NP agreement phenomenon, illustrated again in (35) and (36). We may now see what role syntax plays in this phenomenon. Just like selectional restrictions, the semantic agreement of the classifier-host NP relation is based on the basic syntactic operation of function composition. That is, syntactic composition is conditioned by a lexical semantic requirement, i.e. selectional restrictions must be satisfied.

(35) a. **san-nin**-no **gakusei**-ga kita. 'Three **person-units** of students came.'
3-CL-GEN student-NOM came
b. #**san-biki**-no **gakusei**-ga kita 'Three **animal-units** of student came.'
3-CL-GEN student-NOM came

(36) a. **gakusei**-ga **san-nin** kita. 'Three **person-units** of students came.'
student-NOM 3-CL came
b. #**gakusei**-ga **san-biki** kita. 'Three **animal-units** of student came.'
student-NOM 3-CL came

The Japanese classifier-host NP agreement observed in (35) and (36) is directly analogous to that seen in the English minimal pairs in (37) and (38):

(37) a. **A handful of students** disobeyed the teacher.
b. #**A liter of students** disobeyed the teacher.

(38) a. **A branch suddenly** hit the car.
b. #**A branch deliberately** hit the car.

In (37) *handful* and *liter* are inside the subject DP and must compose with the NP *students* to yield a combined meaning for the subject. While *handful* is semantically compatible with *students*, *liter* is not. This directly determines the well-formedness of (37a) and the ill-formedness of (37b). Likewise, in (35), the composition of *gakusei* and the DNQ must yield a coherent combined meaning. This happens in (35a) but not in (35b). In (38), the adverbs *suddenly* and *deliberately* must compose coherently with the predicate *hit the car* and then the adverb+predicate constituent must coherently compose with the subject. The composition of *suddenly* and *hit the car* yields a coherent combined meaning, as does the composition of *a branch* and *suddenly hit the car*, so (38a) is well-formed. In contrast, in (38b), although *deliberately* composes coherently with *hit the car*, the composition of *a branch* and *deliberately hit the car* violates the selectional restrictions of *deliberately*, causing the sentence to be ill-formed (except in fairly tales). Likewise, in (36), the FNQ must first compose coherently with the predicate, and subsequently, this complex predicate must compose coherently with the subject. This happens in (36a) but not in (36b). In (36b), the composition of *san-biki* and *kita* is well-formed; but the subsequent composition of *gakusei* and *san-biki kita* violates the selectional restrictions of *hiki*. The denotation of *san-biki kita* is a set of three objects each of which has the property of being an animal (not a person) and of arriving. This cannot intersect with the subject denotation, which does not contain any animal. Thus, (36b) is ill-formed in ordinary contexts of use. It is necessarily false if taken literally and can only be used as a joke.

7. Conclusion

Aside from the possibility of an application of the D-operator approach, there are two basic types of quantificational analyses for the Japanese FNQ construction in the literature. In one, the domain of quantification is the NP. In the other, the domain of quantification is the event denoted by the predicate. Both types of analyses, as well as the D-operator approach, are descriptively inadequate. I propose an alternative quantificational account in which the classifier functions as the domain of quantification for the numeral. The atomicity constraint of the classifier denotation is a logically necessary requirement. Due to this constraint, the analysis straightforwardly accounts for the obligatory distributive reading of the FNQ sentence, both for the sentence with an object classifier and for the sentence with an event classifier. The generation of a plural term in DNQ quantification leads to the observed collective/distributive ambiguity of DNQ sentences due to a general phenomenon concerning plural term interpretation in all languages. Thus, the analysis captures the truth conditions of Japanese DNQ and FNQ sentences in a unified fashion. Furthermore, the agreement between the classifier and the NP in Japanese falls out naturally from the proposal as an instance of another very general, universal, phenomenon, namely selectional restriction.

References

Chierchia, G. 1998. “Reference to Kinds across Languages.” *Natural Language Semantics*. 6. 339-405.
Doetjes, J. 1997. *Quantifiers and Selection: On the Distribution of Quantifying Expressions in French, Dutch and English*. Ph.D. Diss. Leiden University.
Dowty, D. and B. Brodie. 1984. “The Semantics of ‘Floated’ Quantifiers in a Transformationless Grammar.” In M. Cobler, S. Mackaye, and M. T. Wescoat (eds.) *Proceedings of West Coast Conference on Formal Linguistics*. 3. Stanford, CA: CSLI. 75-90.
Fukushima, K. 1991. *Generalized Floating Quantifiers*. Ph.D. Diss. University of Arizona.
Kang, B.-M. 1994. “Plurality and Other Semantic Aspects of Common Nouns in Korean.” *Journal of East Asian Linguistics*. 3. 1-24.
Kitahara, H. 1992. “Numeral Classifier Phrase inside DP and the Specificity Effect.” In S. Choi (eds.) *Japanese and Korean Linguistics*. 3. 171-186.
Kobuchi-Philip, M. 2003. *Distributivity and the Japanese Floating Numeral Quantifier*. Ph.D. Diss. CUNY Graduate Center.
Kratzer, A. 1989. “An Investigation of the Lumps of Thought.” *Linguistics and Philosophy*.12.607-653.
Krifka, M. 1990. “Four Thousand Ships Passed Through the Lock: Object-Induced Measure Functions on Events.” *Linguistics and Philosophy*. 13. 487-520.

Landman, F. 2000. *Events and Plurality*. Dordrecht: Kluwer.

Link, G. 1984. “Hydras. On the Logic of Relative Clause Constructions with Multiple Heads.” On F. Landman and F. Veltman (eds.) *Varieties of Formal Semantics*. Dordrecht: Foris. 245-257.

Link, G. 1987. “Generalized Quantifiers and Plurals.” In P. Gärdenfors (ed.) *Generalized Quantifiers. Linguistic and Logical Approaches*. Dordrecht: Reidel. 151-180.

Nakanishi, K. 2002a. “Semantic Properties of Floating Quantifiers and Their Syntactic Implications.” Talk Presented at Japanese/Korean Linguistics 12.

Nakanishi, K. 2002b. “Semantics of Measure Functions.” Talk Presented at NELS 33. MIT.

Roberts, C. 1986. *Modal Subordination, Anaphora and Distributivity*. Ph.D. Diss. University of Massachusetts at Amherst.

Scope of Focus Particles: Abstract ONLY in Korean[1]

Youngjoo Lee
Massachusetts Institute of Technology
youngjoo@mit.edu

Abstract

The focus particle *man* 'only' in Korean shows different scopal behavior depending upon its syntactic environment. This non-uniform scope pattern cannot be accounted for if the particle is a scope-bearing element. This paper argues that the particle *man* is not a scope-bearing element, but an agreement morpheme that indicates the presence of a null head ONLY. Under this proposal, the particle *man* does not carry the exhaustive meaning of *only*, but the null head does. Therefore, it is the position of the ONLY head, not that of the particle, that determines the scope relation with respect to other quantificational elements. This paper also claims that there is a strong correlation between syntax and morphology (cf. Baker's Mirror Principle). Thus, the relative order among the particle, case marker, and postposition reflects the hierarchy of corresponding functional heads. This helps detect the position of the ONLY head. The proposed analysis accounts for the scope patterns without making special stipulations about *man*-phrases.

1 Introduction

The focus particle *man* 'only' in Korean shows different scopal behavior depending upon the syntactic environment it appears in. Interestingly, the scope of a *man*-phrase varies with its morphological marking.[2] If a *man*-phrase is case-marked, its scope is fixed to its case position no matter where it appears in the sentence. By contrast, if it is marked by a postposition, its surface position affects scope relations.

This non-uniform scope pattern cannot be accounted for if the particle is a scope-bearing element. Thus, I argue that, despite appearances, the particle *man* is not a scope-bearing element. Specifically, I argue that the particle *man* is actually an agreement morpheme that indicates the presence of a null head ONLY. This null head carries the exhaustive meaning of English *only*, and the particle has no meaning of its own. Therefore, it is the position of the ONLY head, not that of the particle, that determines the scope relation with respect to other quantificational elements. I also argue for a strong correlation between syntax and morphology, as claimed by Baker (1985) in the name of the Mirror Principle: the relative order among the particle, case marker, and postposition reflects the hierarchy of corresponding functional heads. Thus we can infer the position of the ONLY head from the order of nominal affixes. The proposed analysis accounts for the peculiar scope patterns without making special stipulations about *man*-phrases, unlike the commonly held view that takes the particle to be a quantificational element.

This paper is organized as follows. After presenting the scope puzzle in section 2, I put forward the main proposal and analysis in section 3. Section 4 enumerates and confirms predictions of the null head analysis. Finally, section 5 concludes the paper.

---

[1] My greatest thanks go to Danny Fox and Irene Heim for their valuable suggestions, insightful questions, and guidance. Many thanks also to Noam Chomasky, Kai von Fintel, Jon Gajewski, Sabine Iatridou, Alec Marantz, Shigeru Miyagawa, David Pesetsky, and Shoichi Takahashi for very helpful comments and questions. Thanks are also due to the audience and organizers of Sinn und Bedeutung VIII in Frankfurt, especially Shin-Sook Kim, for organizing a nice conference. All remaining errors are mine.

[2] Throughout the paper, the term '*man*-phrase' refers to an XP that is accompanied by *man*.

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference "sub8 – Sinn und Bedeutung".*
Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany

2 The scope puzzle

This section presents the scopal behavior of *man*-phrases in scrambling contexts. The discussion will lead to the conclusion that we cannot account for the scope pattern of *man*-phrases if the particle *man* is a scope-bearing element.

Let us start with case-marked *man*-phrases. Case-marked *man*-phrases appear to obligatorily reconstruct when scrambled clause-internally. That is, clause-internal scrambling does not induce ambiguity. The relevant examples are illustrated below.

(1) a. **Motun**-salam-i John-**man-ul** salanghanta.
every-person-NOM John-only- ACC love
'Everyone loves only John.'
(i) Everyone loves John and no one else. (every > only)
(ii) *John is the only one whom everyone loves. (*only > every)

b. John-**man-ul**$_1$ [**motun**-salam-i t_1 salanghanta].
John-only-ACC every-person-NOM love
'Only John, everyone loves *t*.'
(i) Everyone loves John and no one else. (every > only)
(ii) *John is the only one whom everyone loves. (*only > every)

The sequence of a universal quantifier and a *man*-phrase in (1a) only allows a surface scope reading whereby *everyone* takes scope over *only John*. So (1a) is true iff each person loves John and no one else. The other reading, where John is the only one whom everyone loves, is not available. In (1b), the *man*-phrase is scrambled across the subject quantifier *everyone*. Here the scope relation remains the same as in (1a). Wide scope for *man* is still not possible.[3] Notice that the particle *man* precedes the case marker.

Now we turn to *man*-phrases marked by a postposition. Postposition-marked *man*-phrases show different scopal behavior from case-marked ones. The scrambled PP-*man* phrase can take scope in the surface position, thus creating ambiguity, as shown in (2).

(2) a. **Motun**-salam-i John-**hako-man** akswuhayssta.
every-person-NOM John-with-only shook_hands
'Everyone shook hands only with John.'
(i) Everyone shook hands with John and with no one else. (every > only)
(ii) *John is the only one with whom everyone shook hands. (*only > every)

b. John-**hako-man**$_1$ [**motun**-salam-i t_1 akswuhayssta].
John-with-only every-person-NOM shook_hands]
'Only with John, everyone shook hands *t*.'
(i) Everyone shook hands with John and with no one else. (every > only)
(ii) John is the only one with whom everyone shook hands. (only > every)

---

[3] In order for the *man*-phrase to take scope over the subject QP, the *man*-phrase must appear in the sentence initial position without any case marker, as shown in (i). The sentence also has the narrow scope reading of the *man*-phrase, thus allowing ambiguity. In the interest of space, I leave the analysis of (i) for another occasion.

(i) John-**man**$_i$ [**motun**-salam-i e_i salanghanta].
John-only every-person-Nom love
'Only John, everyone loves *e*.'
a. Everyone loves John and no one else. (every > only)
b. John is the only one whom everyone loves. (only > every)

Without scrambling, the base order between the two elements determines the scope relation, as in (2a). If the PP is scrambled as in (2b), however, the *man*-phrase can take scope over the subject quantifier. Note also that the particle follows the postposition.

This non-uniform behavior of *man*-phrases contrasts with the scopal behavior of quantifier phrases (QPs). It is well known that scrambled QPs optionally reconstruct and induce ambiguity in so-called scope-rigid languages (See Hoji 1985 for Japanese, Ahn 1990, Sohn 1995 for Korean, among many others). The sentences in (3) exemplify the relevant facts for Korean.

(3) a. **Nwukwunka**-ka   **manhun**-salam-ul   salanghanta.
someone-NOM   many-person-ACC   love
'Someone loves many people.'
(i) There is someone who loves many people.   (some > many).
(ii) *There are many people who are loved by someone.   (*many > some).

b. **Manhun**-salam-ul$_1$ [**nwukwunka**-ka t_1 salanghanta].
many-person-ACC   someone-NOM   love
'Many people, someone loves *t*.'
(i) There is someone who loves many people.   (some > many).
(ii) There are many people who are loved by someone.   (many > some).

When two quantifiers are in their base positions, as in (3a), the surface word order determines the scope relation between the two. When there is scrambling, however, the wide scope reading of the object QP becomes available, as in (3b). The scrambled QP can but need not undergo reconstruction, thus the sentence is ambiguous.[4] A schematic summary of the scope patterns is given in (4). The solid line indicates obligatory reconstruction, and the dotted line optional reconstruction.

(4) a. [**TP DP-man-Acc$_i$**   [**TP**   QP t_i verb]]   (unambiguous: 1b)

b. [**TP PP-man$_i$**   [**TP**   QP t_i verb]]   (ambiguous: 2b)

c. [**TP**   **QP$_i$**   [**TP**   QP t_i verb]]   (ambiguous: 3b)

Suppose that the *man*-phrase is a QP of type <et, t>, that is, the set of properties that no one other than John has (J.-W. Choe 1998). Then, the non-ambiguity in (4a) is puzzling. Apparently, it undergoes obligatory reconstruction when scrambled, unlike QPs. To solve this, one might stipulate that the *man*-phrase must reconstruct, e.g. that it is a special QP that can only undergo PF movement/scrambling (cf. Aoun and Benmamoun 1998, Sauerland and Elbourne 2002). However, this account lacks reasonable motivation, and faces empirical problems once we consider (4b). The stipulation does not hold for the case of PP-*man*, and we need another stipulation to distinguish the two cases. Any account that treats the *man*-

[4] When the *man*-phrase occurs in the subject position and a QP occupies an object position (e.g. *Only Mary loves everyone*), scrambling of the object QP induces an ambiguity. This is because what moves is a QP, not a *man*-phrase, and the scrambled QP can optionally reconstruct as shown in (3). For this reason, all the *man*-phrases in this paper are accusative-marked.

phrase as a QP without further assumptions would fail to account for both the non-ambiguity of (4a) and the ambiguity of (4b).

3 Proposal and analysis

3.1 Proposal: *man* is an agreement morpheme

This section proposes that the particle *man* is an agreement morpheme. As the Nominative case marker is an indication of the T(ense) head under standard assumptions, *man* is an indication of a null ONLY head. Under this proposal, the null ONLY head, rather than the particle, carries the quantificational/exhaustive meaning of English *only*. Therefore, the position of the null head, not the surface position of the particle, determines the scope relation with respect to other quantificational elements in the sentence.[5] [6]

I propose (5) as the lexical entry for the head ONLY, where ALT is the set of alternatives created by focus marking. It is the result of replacing the focused element by contextually plausible alternatives (see Rooth 1985).

(5) $[\![\text{ONLY}]\!] = \lambda P_{<e,t>}.\lambda x_e.P(x) = 1 \ \& \ \forall z_e \in ALT(x): P(z) = 1 \rightarrow z = x$

The ONLY head takes two arguments (a predicate and an individual), and asserts that the individual argument is the only element that satisfies the predicate argument. Since the individual argument is focused, ALT(x) is a set of individuals. Basically, it is a covert *only* (cf. Horn 1969).

I also claim that the ONLY head can occur in several distinct positions in the clause, as long as the semantic conditions imposed by (5) are satisfied. That is, there is no one fixed position for the null head. It can be above TP (high ONLY-P) or below TP (low ONLY-P). Now that the ONLY head can appear in various positions and it is phonologically null, a crucial task is to detect the position of this head. I argue that the position of ONLY can be detected, thanks to the strong correlation between morphology and syntax (cf. Baker's (1985) Mirror Principle). Specifically, I argue that the relative order among the focus particle, case marker, and postposition reflects the hierarchy of the corresponding functional heads.[7] Take for example *John-man-i* 'John-only-Nom'. Since the particle *man* precedes the case marker, we conclude by the Mirror Principle that the ONLY head is lower than the Nominative case checking/assigning head, namely T (since Korean is a head-final language).

Having said this, let us move to see how this works in interpreting sentences containing a *man*-phrase. We start with the simple sentence in (6).

(6) John-**man-i** oassta.
John-only-NOM came
'Only John came.'

In (6), the particle precedes the nominative marker, and the Mirror Principle tells us that ONLY-P is lower than TP. I claim that the subject, which is generated VP-internally, moves first to [Spec, ONLY-P], and then undergoes a second movement to [Spec, TP] to check the Nominative feature (Chomsky 1995, S. Cho 2000). The DP picks up the affixes through derivation, and the order of the affixes reflects the derivational steps. The derivation is

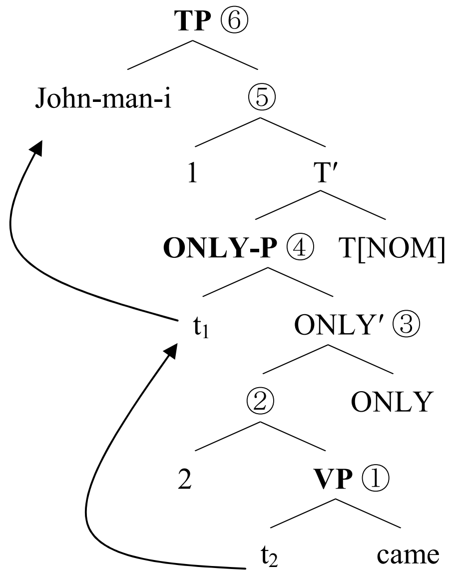
5 For the role of abstract heads in semantics literature, see Karttunen (1977) for question, and Laka (1990), Ladusaw (1992), von Stechow (1993), Beck & Kim (1997), Kelepir (2001), Penka (2002), and Ovalle & Guerzoni (2002) for negation.

6 I will continue to gloss *man* as 'only' for the sake of convenience.

7 This idea was suggested to me by Danny Fox.

illustrated in (7a) along with the semantic composition in (7b). As one can verify, the tree correctly derives the compositional meaning of the sentence.[8]

(7) a.



b. ⟦①⟧ = x came
⟦②⟧ = λx.x came
⟦③⟧ = $\lambda y.y$ came & $\forall z_e \in ALT(y)$: z came → z = y
⟦④⟧ = u came and & $\forall z_e \in ALT(u)$: z came → z = u
⟦⑤⟧ = $\lambda u.u$ came and & $\forall z_e \in ALT(u)$: z came → z = u
⟦⑥⟧ = John came and $\forall z_e \in ALT(John)$: z came → z = John

The focused phrase *John* undergoes focus movement to [Spec, ONLY-P], creating a lambda-predicate.[9] This predicate is the first argument of ONLY, and the focused phrase in [Spec, ONLY-P] becomes the second argument of the ONLY head. This movement is obligatory although it sometimes applies string-vacuously, and thus has no effect on word order. One might wonder why we complicate the system by introducing the abstract ONLY head. When we look at simple cases like this, the motivation is not clear. Yet, this approach offers a non-stipulative account for the scope puzzle, as will be shown in the next section.

3.2 Deriving the compositional meaning

Based on the proposal made in the above section, this section solves the scope puzzle noted in section 2. I first discuss case-marked *man*-phrases, and then turn to PP-*man* cases.
The scope pattern of the case-marked *man*-phrase is repeated in (8). The point here is that clause-internal scrambling of the *man*-phrase does not affect scope interpretation. Sentence (8b) is not ambiguous.

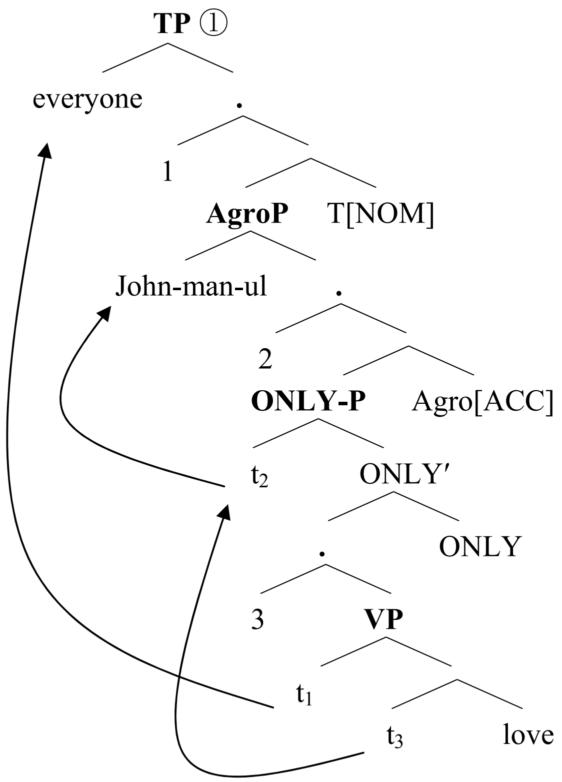
[8] Throughout this paper, I adopt Heim & Kratzer's (1998) framework for semantic representation, e.g. numerical index as the variable binder. I also assume for convenience that case heads (T and Agro) are semantically vacuous.
[9] The lambda-abstractor in the first movement in (7) is in an unusual place, not directly under the moved element, as also pointed out by von Fintel (2001). There are other possible implementations that do not involve this choice (e.g. late merge of the ONLY head or movement to the sister node of the ONLY head), but the analysis does not hinge on the choice on this issue.

(8) a. **Motun**-salam-i John-**man-ul** salanghanta.
every-person-NOM John-only-ACC love
'Everyone loves only John.'
(i) Everyone loves John and no one else. (every > only)
(ii) *John is the only one whom everyone loves. (*only > every)

b. John-**man-ul**$_1$ [**motun**-salam-i t_1 salanghanta].
John-only-ACC every-person-NOM love
'Only John, everyone loves *t*.'
(i) Everyone loves John and no one else. (every > only)
(ii) *John is the only one whom everyone loves. (*only > every)

Let us start with (8a). From the order *man-ul* 'man-acc', we conclude by the Mirror Principle that ONLY-P is lower than AgroP where Accusative is assigned/checked. The AgroP is in turn below TP that contains the universal quantifier in its spec position. Therefore, the universal quantifier takes scope over the ONLY head. The structure of (8a) is given in (9a) along with the semantic value of the top node in (9b).

(9) a.

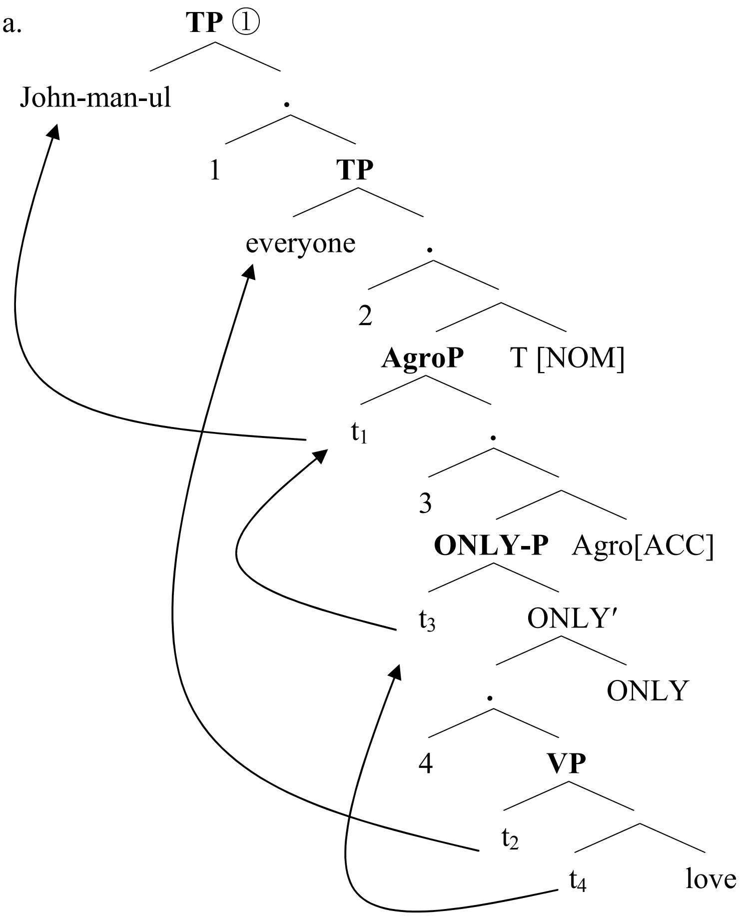


b. ⟦①⟧ = For each person x, x loves John & $\forall w_e \in ALT(John)$: x loves w → w = John

The reading in (9b) is the meaning we want: each person has the property of loving John and no one else. Note that we must not allow reconstruction of the subject QP to its θ-position (t_1), since it will produce the unattested reading (*only* > *every*). This is independently justified from the behavior of QPs in the scope-rigid languages. If the reconstruction were possible, sentences in the base order would be ambiguous, as in English (cf. (3a)).

Next, consider (8b) where *John-man-ul* ‘John-only-Acc’ is scrambled to the sentence initial position. Since *man* is a mere agreement morpheme, the *man*-phrase is a referential expression, not a QP. Given this, it is natural that scrambling of the *man*-phrase does not affect meaning, as is the case with referential expressions. The structure of (8b) is given in (10a), where the clausal structure remains the same as in (9a), except that the *man*-phrase is adjoined to TP via scrambling. The semantic value of the top node is given in (10b).

(10) a.



b. ⟦①⟧ = For each person x, x loves John & $\forall w_e \in ALT(John)$: x loves w → w = John

The semantic values of (9b) and (10b) are the same: each person loves no one other than John. Even though *John* is interpreted in the scrambled position in (10a), the same reading results since the ONLY head is still below AgroP. This explains the apparent “reconstruction” effect, although there is no reconstruction of a QP in the real sense. What determines the scope relation is not the surface position of the particle, but the position of the ONLY head.

One might wonder at this point why ONLY-P should be below AgroP and if there is any principled reason to rule out ONLY-P above AgroP. In principle, the present analysis does not rule out such a configuration. What it rules out, however, is the form where the particle is preceded by an overt case marker, for example **Mary-lul-man*. We assume that the case marker is realized as a zero variant when it is followed by the particle *man* and some other particles such as *to* ‘also’, which disallows case marking in any position. Therefore, when case marking is covert, *DP-man* can be a spell-out of *DP-Case-man* or *DP-man-Case*. This

means, then, that if *DP-man* appears without case marking in the S-initial position, it does not guarantee the low ONLY-P and thus ambiguity is expected. This is indeed the case (cf. fn 3).
Now we turn to the scope pattern of PP-*man* case. The *man*-phrase marked by a postposition does not have a fixed scope, unlike the case-marked one. Its scope seems to be affected by its surface structure. The data is repeated in (11).

(11) a. **Motun**-salam-i John-**hako-man** akswuhayssta.
every-person-NOM John-with-only shook_hands
'Everyone shook hands only with John.'
(i) Everyone shook hands with John and with no one else. (every > only)
(ii) *John is the only one with whom everyone shook hands. (*only > every)

b. John-**hako-man**$_1$ [**motun**-salam-i t_1 akswuhayssta].
John-with-only every-person-NOM shook_hands]
'Only with John, everyone shook hands *t*.'
(i) Everyone shook hands with John and with no one else. (every > only)
(ii) John is the only one with whom everyone shook hands. (only > every)

Why are postpositions different from case markers? The ordering among affixes provides an answer to this question. Postpositions precede the particle *man*; this shows that ONLY-P is higher than VP, where PP is generated. But it does not tell us whether ONLY-P is higher than TP or lower than TP, whose spec position is occupied by the subject QP. By contrast, case markers explicitly specify that ONLY-P is lower than AgroP or TP since they always follow the particle.
With this contrast in mind, we derive the scope patterns in (11). First, in (11a), ONLY-P is positioned above VP (as inferred from the morpheme order *hako-man* 'with-only') but below TP. If the ONLY-P were located above TP, we expect the *man*-phrase to occur to the left of the subject QP since focused phrases move overtly to [Spec, ONLY-P]. The structure of (11a) is represented in (12).

(12) $[_{\mathbf{TP}}$ **everyone** λx $[_{\mathbf{ONLY\text{-}P}}$ with_John $[\ \lambda y\ \ [_{\mathrm{VP}}\ x\ \ y$ shake_hands]] $_{\mathbf{ONLY}}]\ _{\mathbf{T}}]$

Focus Movement

Since the subject QP is above ONLY-P in (12), the scope relation follows from this syntactic configuration: for each person x, x shook hands with John, and for all alternatives z to John, if x shook hands with z, z is John.[10]
Let us next see the case of the ambiguous sentence in (11b). I argue that the two readings are due to different positions of ONLY-P, not to the reconstruction of the *man*-phrase as a QP. On the first reading, where *everyone* takes scope over the *man*-phrase, ONLY-P is still below TP. The *man*-phrase undergoes scrambling after focus movement. Thus, the clausal structure is the same as the one in (12) except that the PP is adjoined to TP. The same interpretation obtains, even though the *man*-phrase is interpreted in the scrambled position.

(13) $[_{\mathbf{TP}}$ with_John λz $[_{\mathbf{TP}}$ **everyone** λx $[_{\mathbf{ONLY\text{-}P}}\ z\ [\ \lambda y\ [_{\mathrm{VP}}\ x\ \ y$ shake_hands]] $_{\mathbf{ONLY}}]\ _{\mathbf{T}}]]$

Scrambling Focus Mvt.

[10] I assume that the postposition moves along with the focused element in the overt syntax, but reconstructs at LF for semantic interpretation. Under this assumption, there is no need to adjust the entry of ONLY for the PP case. Thanks to Irene Heim for suggesting this possibility.

On the second reading of (11b) (*only* > *every*), the ONLY head takes scope over the subject QP. That is, ONLY-P is positioned above TP. The S-initial appearance of the *man*-phrase is due to focus movement, not to scrambling. The structure is represented in (14).

(14) [**ONLY-P** with_John [λy [**TP** **everyone** λx [VP x y shake_hands] **T**]] **ONLY**]

Focus Movement

Thus, the S-initial appearance of a *PP-man* could either be due to scrambling as in (13) or to focus movement as in (14), whereas that of a case-marked *man*-phrase could only be due to scrambling. The order of the postposition and the focus particle is compatible with both positions of ONLY-P (high ONLY-P above TP and low ONLY-P below TP), and the surface position does not distinguish focus movement from scrambling. This is why postpositions behave differently from case markers. Overt case marking rules out the high ONLY-P, and thus brings about the scope-fixing effect.

This section showed how the current proposal accounts for the scope patterns of the *man*-phrase. I showed that the apparent reconstruction of the *man*-phrase is not the reconstruction of a QP, and that the scope is determined by the position of the ONLY head. The difference between case markers and postpositions is correlated with the distribution of the particle with respect to case markers and postpositions. The current proposal derives this correlation without stipulations, unlike the QP approach under which the *man*-phrase is a QP that shows a non-uniform behavior.

4 Further predictions on scope

This section introduces further predictions of the null head analysis, and shows that each prediction is indeed borne out. The result provides further support to the proposed analysis.

4.1 Multiple Occurrences

The first prediction is that multiple occurrences of the particle *man* would be able to indicate the presence of a single instance of the ONLY head. Suppose that the ONLY head can host more than one focused phrase in its spec position. Then, the number of particles in a sentence would not necessarily match the number of ONLY heads in the syntactic tree. Interpretation would depend on the number of ONLY heads, not on the number of particles.[11]

This prediction is borne out. When the particle occurs twice in a sentence, the sentence is ambiguous between one ONLY and two ONLY's, as illustrated in (15).

(15) John-**man** sakwa-**man** mekesse.
John-only apple-only ate
'Only John ate only apples.'
(i) John is the only one who ate only apples. Others ate other fruits as wells as apples.
(ii) John is the only one who ate something, and John ate only apples (not other fruits).

The first reading involves two ONLY heads. It says John is the only one who has the property of eating only apples. By contrast, the second reading involves just one ONLY head, and says that the pair <John, apples> is the only element that satisfies the eating relation.[12] If it were

[11] Thanks to Kai von Fintel and Danny Fox for bringing this prediction to my attention.

[12] Here the ONLY head takes a relation (of type <e, et>) and two individuals as arguments. The new entry would be the following:

(i) $[\![\text{ONLY}]\!] = \lambda R_{<e,<e,t>>}.\lambda x_e.\lambda y_e.R(x)(y) = 1\ \&\ \forall z_e \in ALT(x) \forall w_e \in ALT(y)$:

the particle *man* that carried the exclusive meaning, the second reading would not arise. This lends further support to the claim that *man* is a mere agreement morpheme.[13]

4.2 Scope splitting

The second prediction is that if the scrambled *man*-phrase contains a scope-bearing element, the scope of the new scope-bearing element can be dissociated from the ONLY head. This is so because the new scope-bearing element, contained in the *man*-phrase, can be interpreted in the scrambled position, while the ONLY head still can be lower than TP. Suppose there is a subject QP intervening between the scrambled *man*-phrase and the low ONLY head. Then, the subject QP would be able to take scope between the new scope-bearing element and the ONLY head. The present analysis predicts this dissociation to be possible, and this section confirms this prediction.[14]

For this, we introduce a conjoined DP as a new scope element. Consider the following sentences, where a *man*-phrase contains a conjoined DP.

(16) a. **Nwukwunka-**ka John-**kwa**-Bill-**man**-ul salanghanta.
someone-NOM John-and-Bill-only-ACC love
'Someone loves only John and Bill.'
(i) There is someone who loves only John and Bill. (some > only >and)
(ii) *There is someone who loves only John and someone who loves only Bill. (*and > some > only)

b. John-**kwa**-Bill-**man**-ul$_1$ [**nwukwunka**-ka t_1 salanhanta].
John-and-Bill-only-ACCc someone-NOM love
'Only John and Bill, someone loves *t*.'
(i) There is someone who loves only John and Bill. (some > only > and)
(ii) There is someone who loves only John and someone who loves only Bill. (and > some > only)

Sentence (16a) is not ambiguous. It only allows a surface scope reading. For this reading to be true, there should be someone who loves John and Bill and loves no one else. Sentence (16b), by contrast, has two readings. In one reading, one and the same person loves only John and Bill, as in (16a). In the other reading, there must be two different people involved such that one person loves only John, and the other person loves only Bill.

The ambiguity of (16b) is interesting since scrambling of case-marked *man*-phrases has not induced ambiguity so far. This ambiguity, however, does not make a counterexample to our analysis. Compare the scope relations in the two readings. In (16a) and in the first reading of (16b), the subject QP takes scope over both the conjunction and the ONLY head. In the second reading of (16b), the conjunction takes scope over the subject QP, which in turn takes scope over the ONLY head. In both cases, the scope relation between the subject QP and the ONLY head remains the same. The former takes scope over the latter. What differentiates the

---

$R(z)(w) = 1 \rightarrow z = x \ \& \ w = y$

[13] One can think of this in parallel to negation in negative concord languages, where multiple occurrences of negation can contribute a single instance of negation. For instance, in the following English and Italian sentences, the two negations do not cancel each other out. The interpretation involves only one negation.

(i) a. Maria **didn't** say **nothing** to **nobody**. (Nonstandard English)
b. Mario **non** ha parlato di **niente** con **nessuno**. (Italian)
'Mario hasn't spoken with anyone about anything.' (Ladusaw 1992:237)

[14] I thank Danny Fox and Sabine Iatridou for bringing this question and prediction to my attention.

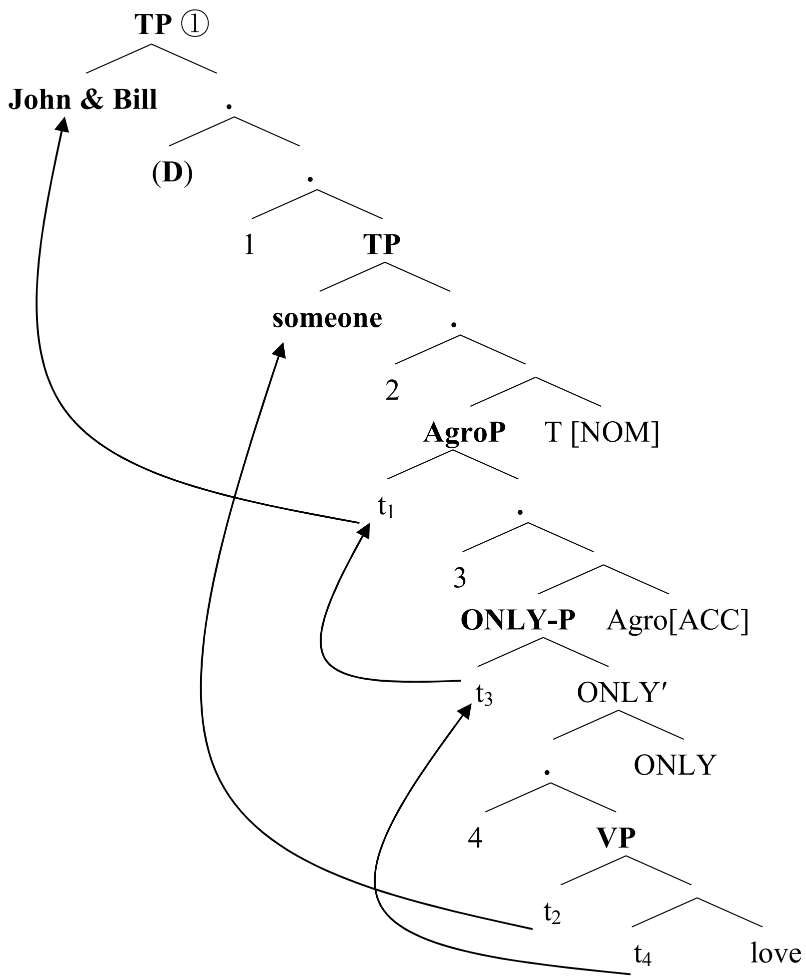
two cases is where the conjoined DP is interpreted. If the conjoined DP is interpreted in the scrambled position, the scope of the conjunction is split from the ONLY head (*and* > *some* > *only*).

Let me spell out how this reading is derived. In the interest of space, we focus on the scrambled sentence, but the interpretation of the non-scrambling case should be straightforward. Based on the morpheme order *man-ul* 'only-acc', we conclude that the ONLY head is positioned lower than Agro. Next, in order to interpret the conjunction, we introduce a D(istributivity) operator. Following Link (1983), Roberts (1987), and Beck (2000) among others, I assume the following lexical entry for the D-operator.

(17) $[\![D]\!] = \lambda f_{<e,t>}.\ \lambda X_e. \forall x \in X: f(x) = 1$

The D-operator takes two arguments, a predicate and a group individual, which is marked by a capital letter to be distinguished from an atomic individual. It asserts that the property *f* holds for all the atomic individuals that are parts of the group individual *X*. The structure of (16b) is illustrated in (18), where the scrambling of the conjoined DP *John & Bill* creates a new position for the D operator to apply.

(18)



In the above structure, the readings diverge depending upon whether we apply the D-operator. Without the D-operator, the first reading in (16b) obtains (*some* > *only* > *and*). For this reading to be true, there should be someone who loves only John and Bill. That person does not love Tom, for example. The reading we are interested in (*and* > *some* > *only*) arises when the D-operator is present. In this reading the one who loves only John does not love Bill and the one who loves only Bill does not love John. The two values of the top node are given below. The one in (19a) is without the D-operator, and the one in (19b) is with the D-operator in the tree.

(19) a. ⟦ ①⟧ = There is someone x such that x loves John and Bill & $\forall w_e \in$ ALT(J&B): x loves w $\rightarrow$ w $\in$ J & B[15]

b. ⟦ ①⟧ = $\forall z \in$J&B: there is someone who loves only z, i.e. there is someone who loves only John and there is someone who loves only Bill.

The existence of this reading confirms our second prediction. The scope of a scope-bearing element within the *man*-phrase can be split from the scope of the ONLY head.[16] At the same time, it provides another argument against the QP approach to the *man*-phrase as discussed in section 2. If the *man*-phrase were a special QP that must reconstruct, scope splitting between the conjunction and the ONLY head would not be allowed, and no difference is predicted between (16a) and (16b).

5 Concluding Remarks

This paper presented a theory of the scope-taking properties of the Korean focus particle *man* 'only'. I argued that the particle is an agreement morpheme rather than a scope-bearing element. The particle merely indicates the presence of a head ONLY, which carries the quantificational meaning. I claimed that this null head can appear at various points in the tree,

[15] I assume that the set of alternatives to a group individual still includes atomic individuals (for reasons that I cannot discuss here in the interest of space). Under this assumption, we need to adjust the entry so that we do not wrongly rule out some elements from the set of alternatives:

(i) ⟦ ONLY⟧ = $\lambda P_{<e,t>}.\lambda x_e.P(x) = 1 \ \& \ \forall z_e \in ALT(x): P(z) = 1 \rightarrow [P(x) \Rightarrow P(z)]$
(cf. von Fintel 1997)

The new entry says that if some alternative satisfies the predicate, the resulting proposition *P(z)* is entailed by the presupposed proposition *P(x)*. With respect to our example, this means that if x loves w among the alternatives, w is a part of *J&B*. That is, w is John, Bill, or John & Bill. I thank Danny Fox and Irene Heim for pointing this out to me.

[16] There is one problem here, which the present account is not equipped to deal with at this point. If the *man*-phrase contains a QP of type <et, t> rather than a conjoined DP, the sentence is still interpretable with our current entry for ONLY, but it leads to a wrong result:

(i)	Mary-ka	motun-[kyoswu]$_F$-man-ul	mannassta.
	Mary-Nom	every-professor-Acc	met
	'Mary met only every [professor]$_F$.		

Judgments on this sentence vary among speakers (The same sentence in English seems controversial, too. See Bonomi & Casalegno (1993) and von Fintel (1997) for conflicting views). For most speakers, it means that Mary met no one other than professors. For some speakers, which are very few, it means that Mary met every professor, but she did not meet every student, for example. Thus, the second reading allows Mary to have met some students, as long as she did not meet all of them. The present account can derive the first reading, if *motun kyoswu* 'every professor' is assumed to denote the group individual that consists of all contextually relevant professors. In order to derive the second reading (if it is possible at all), however, we need to adjust the entry of the ONLY head. If *motun kyoswu* 'every professor' is interpreted as a QP of type <et, t>, the current semantics of ONLY wrongly predicts sentence (i) to mean that for all x, if x is a professor, Mary met only x. This is contradictory since it is not possible for Mary to meet only Professor A and meet only Professor B at the same time.

therefore its position (not that of the particle itself) determines the scope relation with respect to other quantificational elements. I also argued for a new correlation between the order of nominal affixes and the scope of focus particles, thus supporting Baker's Mirror Principle in a new area outside the verbal domain. Specifically I argued that the relative order among the particle, case marker, and postposition reflects the hierarchy of functional heads, which played a crucial role in identifying the position of the ONLY head. The proposed analysis accounted for the puzzling scope facts without stipulations, and also derived the correlation between the particle's distributional properties and its scopal behavior.

References

Ahn, S.-H.: 1990, *Korean Quantification and Universal Grammar*, PhD dissertation, University of Connecticut, Storrs.

Aoun, J. and E. Benmamoun: 1998, 'Minimality, Reconstruction, and PF movement', *Linguistic Inquiry* **29**, 569-597.

Baker, M.: 1985, 'The Mirror Principle and Morphosyntactic Explanation', *Linguistic Inquiry* **16**, 373-415.

Beck, S.: 2000, 'Star Operators* Episode 1: Defense of the Double Star', In K. Kusumoto and E. Villalta (eds.), *University of Massachusetts occasional papers in linguistics 23: Issues in semantics*, pp. 1-23. Department of Linguistics, University of Massachusetts, Amherst.

Beck, S. and S.-S. Kim: 1997, 'On *wh*- and Operator Scope in Korean', *Journal of East Asian Linguistics* **6**, 339-384.

Beghelli, F. and T. Stowell: 1994, 'The Direction of Quantifier Movement', *GLOW Newsletter* **32**, 56-57.

Bonomi, A. and P. Casalegno: 1993, '*Only*: Association with Focus in Event Semantics', *Natural Language Semantics* **2**, 1-45.

Büring, D. and K. Hartmann: 2001, 'The Syntax and Semantics of Focus-Sensitive Particles in German', *Natural Language and Linguistic Theory* **19**, 229-281.

Cho, S.: 2000. *Three Forms of Case Agreement in Korean*, PhD dissertation, State University of New York, Stony Brook.

Choe, H. S.: 1995, 'Focus and Topic Movement in Korean and Licensing', In K. Kiss (ed.), *Discourse Configurational Languages*, pp. 269-334. Oxford University Press, Oxford.

Choe, J.-W.: 1998, 'The Formal Analysis of the Particle *man* (in Korean)', *Korean Semantics* **3**, 41-65.

Chomsky, N.: 1995, *The Minimalist Program*, MIT Press, Cambridge, MA.

von Fintel, K.: 1997, 'Bare Plurals, Bare Conditionals, and *Only*', *Journal of Semantics* **14**, 1-56.

von Fintel, K. 2001, 'Why Focus Movement is Weird', Lecture Notes, MIT.

Heim, I. and A. Kratzer: 1998, *Semantics in generative grammar*, Blackwell, Oxford.

Hoji, H.: 1985, *Logical Form Constraints and Configurational Structures in Japanese*, PhD dissertation, University of Washington, Seattle.

Horn, L.: 1969, 'A Presuppositional Analysis of Only and Even', In R. I. Binnick, A. Davison, G. M. Green, and J. L. Morgan (eds.), *Papers from the 5th Regional Meeting*, pp. 98-107. Chicago Linguistic Society, Chicago.

Karttunen, L.: 1977, 'Syntax and Semantics of Questions', *Linguistics and Philosophy* **1**, 3-44.

Kayne, R.: 1998, 'Overt vs. Covert Movement', *Syntax* **1**, 128-191.

Kelepir, M.: 2001, *Topics in Turkish Syntax: Clausal Structure and Scope*, PhD dissertation, MIT, Cambridge, MA.

Kim, K.-s.: 2002, ‘Focus Projection of the Korean Focus Particle *man* ‘only’’, In G. Iverson and S.-C. Ahn (eds.), *Explorations in Korean Language and Linguistics*, pp. 259-276. Hankook Publishing Company, Seoul.

Kiss, K.: 1998, ‘Identificational Focus versus Information Focus’, *Language* **74**, 245-273.

Krifka, M.: 1996, ‘Frameworks for the Representation of Focus’, Paper presented at Conference on Formal Grammar, 8th European Summer School in Logic, Language, and Information, Prague, Czech Republic, August, 1996.

Ladusaw, W.: 1992, ‘Expressing Negation’, In C. Barker and D. Dowty (eds.), *Proceedings of Semantics And Linguistic Theory 2*, pp. 220-229. CLC Publications, Cornell University, Ithaca, NY.

Laka, I.: 1990, *Negation in Syntax: On the Nature of Functional Categories and Projections*, PhD dissertation, MIT, Cambridge, MA.

Link, G.: 1983, ‘The Logical Analysis of Plurals and Mass Terms: a Lattice-Theoretical Approach’, In R. Bauerle, C. Schwarze, and A. von Stechow (eds.), *Meaning, use, and interpretation of language*, pp. 302-323. De Gruyter, Berlin.

Ovalle, L. and E. Guerzoni: 2002, ‘Double Negation, Negative Concord, and Metalinguistic Negation’, Paper presented at the 38th Chicago Linguistic Society, University of Chicago, Chicago, Ill., April. 2002.

Penka, D.: 2002, *Zur Semantik der Negative Indefinita im Deutschen*, Tübingen-Lingusitik-Report Nr.1, Universität Tubingen.

Rizzi, L.: 1997, ‘The Fine Structure of the Left Periphery’, In L. Haegeman (ed.) *Elements of Grammar*, pp. 281-337. Kluwer, Dordrecht.

Robert, C.: 1987, *Modal Subordination, Anaphora, and Distributivity*, PhD dissertation, University of Massachusetts, Amherst.

Rooth, M.: 1985, *Association with Focus*, PhD dissertation, University of Massachusetts, Amherst.

Sauerland, U.: 1998, ‘Plurals, Derived Predicates and Reciprocals’, In U. Sauerland and O. Percus (eds.), *MIT working papers in linguistics 25: The interpretive tract*, pp. 177-204. MIWPL, Department of Linguistics and Philosophy, MIT, Cambridge, MA.

Sauerland, U. and P. Elbourne: 2002, ‘Total Reconstruction, PF Movement, and Derivational Order’, *Linguistic Inquiry* **33**, 283-319.

Sohn, K.-W.: 1995, *Negative Polarity Items, Scope, and Economy*, PhD dissertation, University of Connecticut, Storrs.

von Stechow, A.: 1993, ‘Die Aufgaben der Syntax’, In J. Jacobs, A. von Stechow, W. Sternefeld, and T. Vennemann (eds.), *Syntax – Ein internationals Handbuch zeitgenössischer Forschung*, pp.1-88. De Gruyter, Berlin.

Middles as Disposition Ascriptions

Marika Lekakou,
University College London

m.lekakou@ucl.ac.uk

Abstract

Any analysis of middles has to account for the fact that across languages there is variation in their syntax. English and Dutch employ an unergative verb, whereas in French and Greek it is passives that can encode the middle interpretation. I propose to treat 'middle' as the targeted interpretation, which different languages express in different ways, depending on the means available to them with respect to encoding genericity. I qualify middles as disposition ascriptions to the internal argument, and argue that their core properties follow from this characterization.

1 Introduction

The syntactic properties of the so-called '(personal) middle construction' in (1) and its equivalent in other languages have received a fair amount of attention in the literature (Roberts 1987, Tsimpli 1989, Fagan 1992, Stroik 1992, Hoekstra and Roberts 1993, Ackema and Schoorlemmer 1994, 1995, 2002, Steinbach 2002). Its semantic properties have been explored signigicantly less.

(1) This book reads easily.

The need to examine the semantics of middles becomes even more pressing, once we acknowledge the cross-linguistic variation in the realization of the latter. In this paper, I attempt a novel semantic characterization of the middle and propose to derive the cross-linguistic variation in its realization from the different ways in which languages encode genericity in the verbal morphology. Section 2 contains some of the facts pertaining to the cross-linguistic variation as well as the core properties that middles share across languages. In section 3 I briefly present my proposal of how to derive middles across the two types of languages identified: English/Dutch and Greek/French. Section 4 is devoted to a discussion of genericity, with the aim of ultimately bringing to the fore a characteristic of middles from which their core semantic properties fall out, to wit dispositionality. Section 5 conludes.

2 The non-existence of the middle construction

(2) contains examples of middles in English, Dutch, Greek and French:

(2) a. This book reads easily.
b. Dit boek leest gemakkelijk.
this book read-3SG easily
'This book reads easily.'

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference "sub8 – Sinn und Bedeutung". Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany*

c. Afto to vivlio δjavazete efkola.
this the-NOM book read-NONACT.IMPERF.3SG easily

d. Ce livre se lit facilement.
this book REFL read-3SG easily
'This book can be read easily.'

English and Dutch middles employ an intransitive verb, whereas Greek and French employ a (reflexive) passive. Even in the absence of passive morphology, there are certain similarities that such sentences share with passives: the external argument, which would normally occupy the subject position, is suppresed, and it is the internal argument which is the subject of the sentence. These simliarities have led authors such as Hoekstra and Roberts (1993), Roberts (1987), Stroik (1992) to argue that middles in English and Dutch involve syntactic A-movement of the object to subject position, and the assignment of the agent argument to a phonologically null syntactic element (either a *pro* within the VP, as in Hoekstra and Roberts (1993), or a PRO adjoined to VP, as in Stroik (1992)). Such analyses, which assimilate middle to passive formation even in languages such as English and Dutch, rest on the assumption that there is a middle construction definable in syntactic terms across languages. More crucially for the syntax-lexical semantics interface, such analyses are imposed by adherence to Baker's Uniformity of Theta-role Assignment Hypothesis (UTAH). The UTAH dictates that internal arguments are always base-generated in a unique syntactic position (sister of V); therefore, since the syntactic subject of the middle corresponds to the internal argument, it can only appear in its surface position via syntactic movement from its underlying position.

However, the empirical data speak against such a neat picture. The full array of arguments concerning the cross-linguistic variation in the syntax of middles cannot be provided here, but see Ackema and Schoorlemmer (1994, 1995) for an extensive discussion of the English and Dutch case, and Lekakou (2002, 2003, forthcoming), Ackema and Schoorlemmer (2002) for the two types of middle more generally. Ackema and Schoorlemmer (1994, 1995) in particular have provided compelling evidence to the effect that the subject of the middle in English and Dutch is base-generated in its surface position, and not moved there: contrary to the predictions of movement analyses, Dutch and English middles fail the unaccusativity diagnostics, thus qualifying as unergative, and not unaccusative verbs. Moreover, the implicit argument of middles does not show any signs of syntactic activity: it cannot license agent-oriented adverbs, purpose clauses, or *by*-phrases (cf. (3) below). The suppressed argument of passives, by contrast, is syntactically active (cf. (4)):

(3) This book reads easily *by anyone/*in order to impress the teacher/*carefully.

(4) The bank was robbed by unidentified criminals/ in order to save the poor/carefully.

Such considerations cast doubt on the validity of a movement analysis for English and Dutch middles. On the other hand, there are good reasons to assume such a movement analysis for French and Greek, where middles are syntactically indistinguishable from (reflexive) passives and thus behave as unaccusatives (cf. among others Wehrli (1986), Zribi-Hertz (2003), Tsimpli (1989), Lekakou (2003)). In these languages, the agent is syntactically active, to the effect that it can take the guise of a *by*-phrase:

(5) Afto to vivlio δjavazete efkola akomi ki apo peδja.
this the book-NOM read-NONACT.IMPERF.3SG easily even and by children

'This book can be read easily even by children.' [1]

(6) Ce livre se lit facilement par tout le monde.
this book REFL read-3SG easily by all the world
'This book can be read easily by anyone/everyone.'

Given this state of affairs, any attempt to define syntactically 'the middle construction' in a cross-linguistically coherent way is doomed to fail; the 'middle construction' as a syntactic animal does not exist.

A different approach, within which the cross-lingustic variation can be accounted for, is to treat the middle as a semantic notion. This was first pursued by Condoravdi (1989), who emphasized that there is no such thing as 'middle verbs' or a 'middle forming operation'. Especially since 'middles' are parasitic on independently existing structures—unergatives, passives—, it makes more sense to think of the former as a particular interpretation that the latter may receive. The real question then becomes, which factor determines the choice of structure to be employed in a given language? This is the ultimate question that I wish to answer, and I will provide my contribution in the following subsection.[2]

Our aim is then two-fold. We want to account for the cross-linguistic variation, and in order to do that we need an explicit characterization of the middle interpretation (henceforth MI). Condoravdi (1989) argues that middles are generic sentences. (7a) thus receives the representation in (7b) (from Condoravdi (1989):

(7) a. This book reads easily.
b. Gen [e: book(x), read(e), Patient (e,x)] [easy(e)]

More in particular, it seems that there are three basic ingredients common to middles across languages. (8) contains the essential properties of what I consider the core of the middle semantics:[3]

(8) The core components of the middle interpretation:
a. The internal argument (the understood or notional object) is the subject of the sentence.
b. The reading is non-eventive; middles do not make reference to an actual event having taken place, they rather report a property of the grammatical subject. The otherwise eventive verb becomes a derived stative and, more precisely, receives a generic interpretation.
c. The agent is syntactically suppressed and receives an arbitrary interpretation.

In the following section, I will briefly present my analysis of middles across languages, which capitalizes on the (un)availability of imperfective aspect to encode genericity. In

[1] The *by*-phrase is accompanied by *akomi ke*, 'even', but not necessarily. I will return to this in the following subsection.

[2] The reader is thus advised to interpret 'middle' as 'the structure that conveys the middle interpretation'. I will be using such abbreviations throughout for ease of exposition.

[3] There are obviously more issues that I do not address here, such as the role of the adverb and the restrictions on the aspectual classes of verbs eligible for middle formation. I have nothing to say at this stage on the second issue. As for the first one, one would be inclined to agree with Condoravdi (1989) and McConnell-Ginet (1994) who argue that the adverb is required in order to provide the scope for the generic operator. An indication that this cannot be the whole story is given at the end of the paper.

the second part of this paper, I will argue that we can compress (8) into a single statement from which the properties listed in (8) all follow:

(9) (MI) = the ascription of a dispositional property to the understood object.

3 The realization of the middle semantics across languages

3.1 Licensing the arbitrary agent

The understood agent, even in languages like English and Dutch where it doesn't show any syntactic activity, is nonetheless semantically present, and receives an arbitrary interpretation. Several authors have tried to link this fact to the genericity that middles exhibit (cf. Lyons (1995)). For instance, Ackema and Schoorlemmer (1994) propose the following:

(10) A verb has an event role iff it has a fully specified action tier.

Ackema and Schoorlemmer (1994) assume a Jackendoffian level of presyntactic representation, which comprises two tiers, the action tier and the thematic tier. For them, the essence of middle formation is the assignment of an arbitrary interpretation to the agent, which does not project in the syntax. This results in a not fully specified Action tier, which in turn according to (10) has the effect of the otherwise eventive verb 'becoming' a stative one, and more precisely an individual level (i-level) predicate, in Kratzer (1995)'s sense.

The Krazterian analysis of i-level predicates has not remained unchallenged (cf. Chierchia (1995), Jäger (2001) among others) (nor has Ackema and Schoorlemmer's claim that middles are i-level predicates (Steinbach 2002)). Besides, one would like to know why anything like (10) should hold. I propose to take the arbitrary interpretation of the agent quite literally:

(11) The agent in middles is a covert free-choice *any(one)*—ANY*.[4]

Like its overt counterpart, ANY* needs to be licensed. In the case of middles it is licensed by genericity—the generic operator **Gen**. The crosslinguistic variation concerning the realization of middles is related to the form **Gen** takes in the languages in question. I propose the following:

(12) Syntactically active ANY* needs to be licensed in the syntax.

ANY* can only be syntactic, i.e. projected in the syntax, if its licensor is present in the syntax. This is what happens when the aspectual system of a given language realizes the opposition generic-nongeneric in the morphosyntax. As I will illustrate below,

[4]In this respect, my proposal is different from Condoravdi (1989)'s, who argues that the Agent is absent from all levels of representation, not just the syntactic, or the semantic (cf. 7b), but also from the level of argument structure. Condoravdi's claim is that the agent can be had as an entailment of the lexical meaning of the verb, whenever the latter includes one. According to her, this move is required in any event for the case of English. It also, however, makes it impossible to distinguish between middles and generic unaccusatives. It is, for example, unclear on what grounds Condoravdi would be able to deny generic unaccusatives like *The sun rises from the East* the status of a middle.

Greek and French pattern together with respect to an important aspect of their aspectual system: their imperfective verbal forms encode **Gen**. English and Dutch belong to a class of languages in which **Gen** is morphosyntactically absent, that is, it is only present semantically.

On the basis of this line of reasoning, I make the following typological prediction:

(13) A language will employ a passive structure to convey the middle interpretation iff **Gen** is encoded in imperfective morphology.

3.2 The nature of Gen qua imperfective aspect

What does it mean precisely for **Gen** to be morphologically encoded? I propose to understand this in the following way:

(14) A language encodes **Gen** in imperfective morphology iff in at least one tense it has two distinct verb forms for generic and nongeneric uses, i.e. iff genericity $\Longrightarrow$ imperfectivity.[5]

Let's see how the languages in question fare with respect to 14. In Greek, all verbs are obligatorily inflected for aspect. Episodic sentences contain perfectively marked verbs. Generic/habitual sentences require imperfective aspect:

(15) a. O γianis eγrafe ena γrama kathe mera.
the-NOM John write-PAST.IMPERF.3SG one letter every day
'John used to write a letter every day.'

b. * O γianis eγrapse ena γrama kathe mera.
the-NOM John write-PAST.PERF.3SG one letter every day
'John wrote a letter every day.'

The same situation obtains in French, where distinct verb forms are used for episodic and generic/habitual sentences:

(16) a. Jean écrivit une lettre hier/ *chaque jour.
Jean write-PAST.PERF.3SG one letter yesterday/ every day
'Jean wrote a letter yesterday/everyday.'

b. Jean écrivait une lettre chaque jour.
Jean write-PAST.IMPERF.3SG one letter every day
'John used to write one letter every day.'

c. Jean a écrit une lettre hier/ *chaque jour.
John has written one letter yesterday/ every day
'John has written a letter.'

[5](14) requires a certain level of abstraction in the following sense. There is probably no tense/aspect that is entirely incompatible with (at least) habituality. For instance, *Linguistics students are working harder and harder these days* or *John has always left for work at 8 am* are perfectly ok, even though they employ the Progressive and the Present Perfect respectively, and not, say, the Present or Simple Past. This possibility, obviously related to the presence of Q-adverbs or temporal frame adverbials, does not render either the progressive or the present perfect 'generic tenses'. Thanks to Gerhard Schaden and Jenny Doetjes for discussion.

Greek and French encode **Gen** in imperfective morphology, in the sense of (14). By (12), Greek/French imperfective aspect licenses a syntactically active ANY*. Greek/French type middles will employ a passive structure to convey the middle interpretation.

English does not distinguish morphologically between perfective and imperfective. Giorgi and Pianesi (1997) have claimed that, in the absence of any inflectional morphology, the English verbal forms area associated with the feature [+*perfective*]. The feature [-*perfective*] is never instantiated in English, since there is no corresponding morpheme (cf. also Comrie (1976), according to whom English realizes the distinctions progressive-nonprogressive and perfect-nonperfect, but crucially not generic-nongeneric).
That English does not have **Gen** in the sense of (14) is illustrated below:

(17) a. John drove to school (yesterday).
b. John drove to school (as a teenager).

The same can be claimed for Dutch, on the basis of similar data:

(18) a. Jan fietste gisteren naar school.
Jan cycled yesterday to school
'Yesterday, John cycled to school.'
b. Als tiener fietste Jan naar school.
as teenager cycled Jan to school
'As a teenager, John cycled to school.'

By (12), English and Dutch middles cannot have a syntactically active ANY*, since its licensor is morphologically covert **Gen**.

For reasons of space, I will not go into the derivations for the two types of middle. I refer the interested reader to Lekakou (2003, forthcoming).

The semantics of **Gen** will be discussed in the following section. As for ANY*, it is tempting to assume Kadmon and Landman (1993)'s analysis of *any*, whereby the latter is an indefinite which comes with two additional semantic/pragmatic characteristics, namely widening and strengthening. The widening effected by *any* (and by ANY*) is implicated in the Greek example (5), which features an (optional *even*) *by*-phrase. The Greek 'even', *akomi ke*, effects additional widening of the interpretation of the implicit agent.[6]

3.3 Interim Summary

So far, I have assumed a list of three core properties, (8), as an informal characterization of the MI, and have proposed a way to link property (c) with property (b). In the rest of the paper, I will motivate property (a), which is more of a syntactic, rather than semantic description. I will argue that all three properties follow from the statement in (9). This will become possible by granting middles the status of a particular type of generic sentence, namely a disposition ascription.

[6] Thanks to Cleo Condoravdi for discussion on this point.

4 'In virtue of' generalizations

4.1 NP genericity

Although the genericity of middles is of the sentence type, and not the NP type (in the sense of Krifka et al. (1995)), I will start by discussing the latter case, with the aim of highlighting the import that 'in virtue of' generalizations have on genericity in general, and of pointing to a feature of such generalizations that is of interest in connection to middles: the fact that their conversational background incorporates properties of the subject.

It is a well-established fact that sentences containing singular indefinite (SI) and bare plural (BP) generic NPs are very similar but at the same time different. SIs differ from BPs in (at least) their felicity conditions and in expressing a somewhat stronger non-accidental generalization (Cohen 2001, Greenberg to appear).

Greenberg (to appear) argues that there are two types of nonaccidental generalizations: descriptive, and 'in virtue of' generalizations. SIs always denote the latter, i.e. they assert that the generalization is non-accidentally true in virtue of some property that the subject referent is taken (by the speaker) to have (and that the hearer has to accomodate). On the other hand, descriptive generalizations merely assert the existence of a pattern. BPs can denote both types of non-accidental generalization. The following is her illustration of the different readings.

(19) a. A boy doesn't cry.
 b. The generalization 'Every boy doesn't cry (in any relevant situation)' is nonaccidentally true in virtue of some property, associated with the property of being a boy (e.g. the property of being tough).

(20) a. Boys don't cry.
 b. The generalization 'every boy deosn't cry (in all relevant, e.g. tear inducing situations)' is not accidental: not limited to actual boys in actual (relevant) situations, but is expected to hold for other, nonactual boys in other, nonactual(relevant) situations, as well.
 c. The generalization 'Every boy doesn't cry (in any relevant situation)' is nonaccidentally true in virtue of some property, associated with the property of being a boy (e.g. the property of being tough).

On the 'in virtue of' generalization, the accessibility relation restricting the generic quantifier involves a property that the speaker has in mind, in virtue of which the generalization reported is true. For example, if the property in(19a) is ˆ**be tough**, then we only consider worlds where boys are tough in order to evaluate the sentence.

How do we choose the 'in virtue of' property? And how do we avoid all SI sentences coming out as true? Greenberg assumes that we only choose a property associated with the subject referent and claims that this association relation is determined by our stereotypes, norms, beliefs etc. about the actual world. In effect, besides the accessibility relation which tells us to look at worlds where the subject referent has the 'in virtue of' property, there is another Kratzerian accessibility relation, which effects the association between the subject-referent property and the 'in virtue of' property. To be concrete, consider (19a) and let the property ˆ**boy** be represented as ˆ**P**, the property ˆ**be tough** as ˆ**S**, and the property ˆ **do not cry** as ˆ**Q**.

Greenberg's formal definition of 'associated properties' follows:

(21) ˆS is associated with ˆP in w iff there is a Kratzerian accessibility function *f* from worlds to sets of propositions (e.g. epistemic, deontic, stereotypical, legal, etc.) s.t. $\forall$w"[w"R_fw]$\rightarrow$[$\forall$x [P(x,w")] $\rightarrow$ [S(x,w")]]

The truth conditions of SI sentences will then look like this:

(22) A SI sentence is true in w iff:
$\exists$ˆS $\forall$w' [$\forall$x [P(x,w')] $\rightarrow$ [S(x,w') & ˆS is associated in w with ˆP]] $\rightarrow$
[$\forall$x,s [P(x,w') & C(s,x,w')] $\rightarrow$ [Q(s,x,w')]]

There is thus a double modality in SI sentences (and the 'in virtue of' readings more generally) which is responsible for the more law-like flavour that SIs have.

4.2 Sentence-level genericity: dispositionals

So far, the distinction between 'in virtue of' and descriptive generalizations has been applied to NP genericity. The discussion in Greenberg (to appear) was inspired by the analysis offered by Brennan (1993) for modal auxiliaries. Brennan (1993) analyses certain modals, in particular dynamic modals (i.e. ability *can* and dispositional *will*), not as S(entence)-operators, but as VP-operators. On this view, a dynamic modal combines with a VP, resulting in a modal property denoted of the subject; "VP-operator modals relate properties and individuals" (Brennan 1993, 43). The intuition behind this idea is that, "in uttering a root modal sentence, the speaker typically relies on information about the syntactic subject" (Brennan 1993, 66).

Brennan's innovation is the introduction of a different accessibility relation that restricts dynamic modals, which differs form the one restricting epistemic modals (which are still S-operators) on two counts: first, although the latter constists of propositions (those that in Kratzer (1991) are introduced by *in view of*), the former consists of properties (introduced by *in virtue of*). Second, and most crucially, the accessibility relation of dynamic modals consists of properties of the subject, and in that sense, it is keyed to the syntactic subject. Dynamic (readings of) modals are thus subject oriented (cf. Barbiers (1995)). This is supported by Brennan's observation that overt *in virtue of* adverbials are obligatorily subject-controlled only when combined with dynamic modals (Brennan 1993, 48-52):

(23) Joan can sing arias in virtue of her natural ability.

(24) In virtue of her patience, Joan will listen to anything.

(25) * In virtue of being a graduate student, Joan may be intelligent.

(26) * In virtue of winning a Guggenheim, Joan must be intelligent.

(27) ?? In virtue of the rock being lightweight, Mary can lift it.

(28) ?? Mary will agree to anything in virtue of the loose atmosphere in the office.

(29) They did not award him the prize in virtue of his reputation.

When combined with dynamic modals, *in virtue of* adverbials are property-denoting expressions that fix the set of accessible worlds, and thus restrict the accessibility relation.

A model for the semantics of such expressions is given in (30) (Brennan 1993, 65). Accessibility keyed to an individiual (the subject) is defined in (31) (Brennan 1993, 64). The semantics of root *must* and dynamic *will* is given in (32) (Brennan 1993, 67):

(30) The meaning of *(in virtue of) her physical properties* will be that function f from W×D into the power set of the power set of W×D, which assigns to any world-individual pair, $\langle$w,d$\rangle$, in W×D, the set of all those (relevant) physical properties that d has in w.

(31) *Accessible for d:* a world w' is accessible from a world w for an individual d, $\langle$w,d$\rangle$ R w', iff $\langle$w',d$\rangle \in \mathcal{P}$
(where $\mathcal{P}$ is an arbitrary property-denoting expression restricting the modal)

(32) Property-level *must* and *will* (*must₂* and *will₂*):
Must₂ and *will₂* denote that function v of type schema $\langle$ˆIV,IV$\rangle$ such that for any index w, any assignment g, any conversational backgrounds h_x, j, and any expression P of type $\langle$s,$\langle$e,t$\rangle\rangle$,
$[\![v(\hat{\ }P)]\!]^{w,g,h_x,j} : D \Rightarrow 2.$
For any d $\in$ D $[\![v(\hat{\ }P)]\!]^{w,g,h_x,j} = 1$ iff
$\forall$ w' $\in$ W if
(i) w' is accessible from w for d given h_x,
(ii) w' is maximally close to the ideal established by j(w), then
(iii) $\langle$w',d$\rangle \in [\![P]\!]^g$

The conversational background h_x corresponds to the accessibility relation as defined in (31). *j* is the Kratzerian ordering source, which Brennan assumes is determined by a stereotypical conversational background.

I propose to extend Brennan's analysis of dispositional *will* to dispositional generics. For canonical disposition ascriptions of the type illustrated in (33), Fara (2001) seems to share Brennan (1993)'s intuition. His truth conditions for (33) are given in (34):

(33) Sugar is disposed to dissolve when put in water.

(34) '*N* is disposed to *M* when *C*' is true iff *N* has an intrinsic property in virtue of which it *M*s when *C*.

Fara argues that 'to attribute to an object a disposition to do so-and-so is to say not just that it does so-and-so, but that it has some intrinsic property in virtue of which it does so-and-so' (Fara 2001, 35-36). He too makes the assumption that disposition ascriptions need not take the guise of sentences like (33). The classical examples of dispositional predicates are adjectives like *fragile* and *soluble*, and -*able* adjectives more generally (cf. Chierchia & McConnell-Ginet 1990). At least some generic sentences, as we have already seen above, are dispositional (cf. also sentences like *This car goes 250 km/h* which have both a dispositional and a habitual reading). In fact, I am assuming that disposition ascriptions, whichever form they take, are generic statements (cf. Dahl (1975), Krifka et al. (1995). As I will argue in the following subsection, the class of dispositional generics also includes middles.

The essense of disposition ascriptions is that they express 'in virtue of' generalizations. Following Brennan (1993), I suggest that the implementation of this is that the accessibility relation restricting such generalizations is keyed to the subject, and that therefore all disposition ascriptions are subject-oriented:

(35) Dispositional (readings of) generic sentences are subject-oriented.

That this is true of canonical disposition ascriptions is evident from the following example:

(36) ?? Bread is disposed to turn into gold when touched by Midas.

The myth has it that Midas had a special property, in virtue of which he could turn anything into gold, merely by touching it. The problem with (36) is that it is dispositional on its subject, whereas the relevant property resides with the referent of a non-subject NP, namely Midas. Bread has no inherent property in virtue of which it turns into gold when Midas touches it; it is Midas whose properties are responsible for the phenomenon.

I thus assume that Brennan's accessibility relation restricts the modal operator in disposition ascriptions . When the operator is **Gen**, the latter is a VP-operator of the dynamic *will* type, whose semantics was given in (32). Although a modal semantics of **Gen**, and indeed one that assimilates the latter to a necessity (universal) operator, is more or less standard, the view that we might need more than one variety of **Gen** is not. The claim is supported by the diversity of the phenomena subsumed under the label 'genericity', and in particular the differences between habituals and other generics. See Laca (1990), Scheiner (2003), Van Geenhoven (2003) among others.

The proposal I am making generates the following prediction: according to (35), cases (a) and (b) below can only express descriptive, and not 'in virtue of', generalizations: (a) sentences with generic bare plurals in non-subject position (such as the cases of generic objects that Laca (1990) discusses) and (b) generic sentences which attribute a property to non-subject arguments (such as the well-known ambiguous examples that Krifka et al. (1995) cite (p.24)).[7]

In the final section, I will present a piece of evidence in favour of the existence of more than one null generic operators.

4.3 Middles as dispositionals

Let us now return to middles. A first indication that middles are dispositional predicates[8] is the fact that the paraphrase that they most frequently receive is the -*able* adjective, which, as mentioned already, is the dispositional predicate *par excellence.* If middles are indeed dispositionals, and if (35) is correct, we have an explanation for why the understood object surfaces in subject position in middles.

I start with some data. By treating middles on a par with dispositional modals, we predict that in this case too, *in virtue of* adverbials can only be subject-controlled. This prediction is borne out. The sentences below do not feature an *in virtue of* adverbial, but a *because* clause, a fact which, I take it, strengthens the argument. Van Oosten (1977) first noted the contrast between (37) and (38), and Dowty (2000) offers (39):

(37) The clothes wash with no trouble because...
    a. ... they're machine-washable.

[7] A fact worth noting in connection to this is that singular indefinites, which only express 'in virtue of' generalizations, can only have a generic interpretation in subject position. See Cohen (2001) for discussion, and for a proposal of a mixed approach to genericity.

[8] This claim was made by Sally McConnell-Ginet in a handout of class lectures.

b. * ... I have lots of time.

(38) It's no trouble to wash the clothes because...

a. ... they're machine-washable.

b. ... I have lots of time.

(39) This car drives well...

a. ... because the suspension is engineered well.

b. ?? ... because we're driving on smooth pavement.

Van Oosten argues that the constrast is explained by (40):

(40) Responsibility condition
The subject of a middle (the logical object) must have properties such that it can be understood to be responsible for the action expressed by the predicate.

According to her, (40) holds of all (nonstative) subjects, because responsibility is a general trait of (agentive) subjects, which is why middles, but not sentences like (38), are subject to this constraint.[9]

Something similar to (40) is discussed in McConnell-Ginet (1994), from where the following examples originate:

(41) ? Cars park easily.

(42) Small cars park easily.

Sentence (42) is a definite improvement over (41). What is communicated is that small cars, in virtue precisely of being small, are easy to park. McConnell-Ginet (1994) admits this feature of the middle in the semantic representation, by designating the syntactic subject as the causer. According to her, the middle in (42) means something like: 'some property of small cars is such that (the STATE of) their having that property is what CAUSES parking them to be generally easy' (McConnell-Ginet 1994:241). She provides the following formulation of the property predicated of small cars in (42) (y_i* stands for a null reflexive that she assumes exists in English middles):

(43) $\lambda x \lambda e.[\text{easy}(\text{parking}(y_i^*))(e)\ \&\ x = \text{Causer}(e)\ \&\ x = y_i^*]$

There is no need to stipulate conditions like (40); nor to formally represent this feature of the meaning of middles in the way it is done in (43). (In some systems, for instance in Reinhart (2003), it would in fact be impossible to do so.) If middles are dispositionals, then (40) is associated with the latter more generally. Treating middles as dispositionals entails precisely that there is some property inherent to the subject which enables or facilitates the action denoted by the verb. Unless we were to somehow generalize (43) to all dispositionals, it seems to me that characterizing middles as disposition ascriptions is to be preferred.

Building on what we've said so far, the property predicated of the syntactic subject in (42) will look like this:

[9] By 'subject', van Oosten means 'underived subject', as she shows that subjects of passives are not interpreted as responsible. That this cannot be entirely true is enforced by considering languages like Greek, where middles are parasitic on passives.

(44) $[\![\mathrm{Gen}(\hat{}\mathrm{VP})(\mathrm{d})]\!]^{\mathrm{w,g,h_x,j}} = 1$ iff
$\forall$ w' $\in$ W if
(i) w' is accessible from w for d given h_x,
(ii) w' is maximally close to the ideal established by j(w), then
(iii) $\langle$w',d$\rangle \in [\![\mathrm{VP}]\!]^{\mathrm{g}}$

In the beginning of this subsection, I presented empirical evidence that middles are subject-oriented, much in the way that dynamic readings of modals are (cf. (23)–(29)). If that is correct, then we have evidence for (35). From this it follows that we have discovered what constitutes a semantic reason for why the object occupies the subject position in middles across languages: if it is to be ascribed a dispositional property, it needs to appear in subject position. Moreover, (35) is to also be held responsible for the demotion of the agent. The latter would normally be the most eligible candidate for the subject position. Now that the semantics requires the understood object to appear in that position, the agent has to be suppressed in one way or the other.

I speculate that the interpretation that the implicit agent receives is also related to the dispositional semantics of middles. Note the oddity of (45):

(45) ?? Sugar is disposed to dissolve when put into water by John.

It makes little sense to ascribe a disposition to an entity that only manifests itself when a specific agent is involved. Dispositions, I presume, hold across agents (whenever they are involved). This is the desired result, but obviously more research is needed in order to determine whether we do not really need to stipulate the precise interpretation of the agent in middles, i.e. its free-choice reading.

I repeat below what we started with, namely the three core properties of the (MI), having now restated property (i) so that it makes reference to the dispositionality element:

(46) The core components of the (MI):
a. The internal argument is ascribed a dispositional property.
b. An otherwise eventive verb becomes a derived stative and, more precisely, receives a generic interpretation.
c. The agent receives an arbitrary, free choice interpretation.

Property (a), in conjunction with the subject-orientedness of disposition ascriptions argued for above, is responsible for the promotion of the understood object to subject position (which takes place at a pre-syntactic level for English and Dutch, and in the syntax for Greek and French). Property (b) follows from (a): a disposition ascription is a generic statement. Property (c) also follows, in the sense of the syntactic suppression. As far as the interpretation is concerned, this could also be said to follow, given the incompatibility of disposition ascriptions and specific agents.

Now the core of the middle semantics can be reduced to the statement in (9), repeated below as (47):

(47) The middle ascribes a disposition to the internal argument.

5 Concluding remarks

In this paper I have argued for an approach that treats the 'middle construction' as a particular interpretation that independently available structures receive. The locus of the cross-linguistic variation was taken to be the morphological means available to languages with respect to encoding genericity. I proposed a treatment of the **Gen** employed in dispositionals, of which middles were argued to be an instance, along the lines of Brennan (1993)'s analysis of dynamic modals.

My focus has been the case of so-called personal middles, derived from transitive verbs, whose subject corresponds to the understood object. Verbs lacking an internal argument can in some languages (Dutch, German) give us impersonal middles, whose syntactic and semantic properties remain an issue open for further research.

Another issue awaiting further investigation is the nature of disposition ascriptions. I have argued that in the case of dispositional generics, **Gen** is a VP-operator. This potentially leads to a proliferation of silent generic operators, which might be viewed as an unwelcome consequence. In support of the view defended here, I would like to point to a thus far unnoticed constrast between middles and generic passives. There are two contexts that reveal the non-identity of their intepretation. In the absence of an adverbial, the passive is habitual, but the middle is not. And conjoining the two does not result in contradiction:

(48) a. Linguistics articles just don't read!
b. Linguistics articles just aren't read!

(49) This book reads easily, but it isn't easily read.

One explanation for the data above is that generic passives and middles employ different generic operators. In the spirit of the cross-linguistic account of middles defended here, this would be related to the morphology of the periphrasis employed in English for (generic) passives (recall that Greek passives/middles are synthetic). In addition to bringing out the aspectual difference between generic passives and middles, the data above also suggest that the role of *easily* has not been investigated thoroughly.

Acknowledgments

This research was carried out with the financial support of the Lilian Voudouris Foundation. I wish to thank the audiences at Sinn und Bedeutung 8 and the 6th ICGL, especially Cleo Condoravdi, Sabine Iatridou and Elena Anagnostopoulou, as well as Ad Neeleman. Special thanks to Kriszta Szendröi, and to Øystein Nilsen, without whose help this paper would have looked very different. All errors are mine.

References

Ackema, P. and Schoorlemmer, M. 1994. The middle construction and the syntax-semantics interface. *Lingua* **93**, 59–90.

Ackema, P. and Schoorlemmer, M. 1995. Middles and nonmovement. *Linguistic Inquiry* **26**(2), 173–197.

Ackema, P. and Schoorlemmer, M.: 2002. Middles. University of Nijmegen and University of Utrecht.

Barbiers, S.: 1995. *The Syntax of Interpretation*. PhD thesis. Leiden University.

Brennan, V.: 1993. *Root and Epistemic Modal Auxiliary Verbs*. PhD thesis. UMass.

Chierchia, G.: 1995. Individual level predicates as Inherent Generics. *in* G. Carlson and F. J. Pelletier (eds), *The Generic Book*. Chicago University Press. Chicago.

Cohen, A. 2001. On the Generic Use of Indefinite Singulars. *Journal of Semantics* **18**(3), 183–209.

Comrie, B.: 1976. *Aspect. An introduction to the study of verbal aspect and related problems*. Cambridge University Press. Cambridge.

Condoravdi, C. 1989. The middle: where semantics and morphology meet. *MIT Working Papers in Linguistics* **11**, 18–30.

Dahl, O.: 1975. On generics. *in* E. Keenan (ed.), *Formal Semantics of Natural Language*. Cambridge University Press. pp. 99–111.

Dowty, D. 2000. The semantic asymmetry of 'argument alternations' (and why it matters). *Groninger Arbeiten zur germanistischen Linguistik*. Available at http://www.ling.ohio-state.edu/∼dowty.

Fagan, S.: 1992. *The syntax and semantics of middle constructions. A study with special reference to German*. Cambridge University Press.

Fara, M.: 2001. *Dispositions and their ascriptions*. PhD thesis. Princeton University.

Giorgi, A. and Pianesi, F.: 1997. *Tense and Aspect – From Semantics to Morphosyntax*. Oxford University Press. New York.

Greenberg, Y.: to appear. Two types of Quantificational Modalized Genericity, and the Interpretation of Bare Plural and Indefinite Singular NPs. *Proceedings of SALT 12*.

Hoekstra, T. and Roberts, I.: 1993. Middle constructions in Dutch and English. *in* E. Reuland and W. Abraham (eds), *Knowledge and Language II. Lexical and Conceptual Structure*. pp. 183–220.

Jäger, G. 2001. Topic-Comment Structure and the Contrast Between Stage Level and Individual Level Predicates. *Journal of Semantics* **18**, 83–126.

Kadmon, N. and Landman, F. 1993. Any. *Linguistics and Philosophy* **16**, 353–422.

Kratzer, A.: 1991. Modality. *in* A. von Stechow and D. Wunderlich (eds), *Semantics: An iternational handbook of contemporary research*. de Gruyter. Berlin. pp. 639–650.

Kratzer, A.: 1995. Stage-Level and Individual-Level Predicates. *in* G. Carslon and F. J. Pelletier (eds), *The Generic Book*. Chicago University Press. Chicago. pp. 125–175.

Krifka, M., Pelletier, F. J., Carlson, G., ter Meulen, A., Link, G. and Chierchia, G.: 1995. Genericity: An Introduction. *in* G. Carlson and F. J. Pelletier (eds), *The Generic Book*. Chicago University Press. Chicago. pp. 1–124.

Laca, B. 1990. Generic objects. *Lingua* **81**, 25–46.

Lekakou, M. 2002. Middle semantics and its realization in English and Greek. *UCL Working Papers in Linguistics* **14**, 399–416.

Lekakou, M.: 2003. Greek passives on the middle interpretation. To appear in Proceedings of the 6th International Conference on Greek Linguistics.

Lekakou, M.: forthcoming. *Middles across languages.* PhD thesis. University College London.

Lyons, C.: 1995. Voice, aspect and arbitrary arguments. *in* J. Smith and M. Maiden (eds), *Linguistic theory and the Romance languages.* John Benjamins. Amsterdam. pp. 77–114.

McConnell-Ginet, S.: 1994. On the Non-Optionality of Certain Modifiers. *in* M. Harvey and L. Santelmann (eds), *Proceedings of SALT 4.* Cornell University. Ithaca. pp. 230–250.

Reinhart, T. 2003. The Theta system—an overview. *Theoretical Linguistics.* Available at http://www.tau.ac.il/~reinhart/ling_dl/download.htm.

Roberts, I.: 1987. *The Representation of Implicit and Dethematized Subjects.* Foris Publications. Dordrecht.

Scheiner, M.: 2003. Temporal anchoring of habituals. To appear in Proceedings of ConSole XI.

Steinbach, M.: 2002. *Middle Voice. A comparative study of the syntax-semantics interface of German.* John Benjamins. Amsterdam.

Stroik, T. 1992. Middles and Movement. *Linguistic Inquiry* **23**, 127–137.

Tsimpli, I. 1989. On the properties of the passive affix in Modern Greek. *UCL Working Papers in Linguistics* **1**, 235–260.

Van Geenhoven, V.: 2003. The semantic diversity of characterizing sentences. Talk given at the 14th Amsterdam Colloquium, Amsterdam December 2003.

Van Oosten, J. 1977. Subjects and agenthood in English. *Chicago Linguistic Society* **13**, 451–471.

Wehrli, E.: 1986. On some properties of the French Clitic *se. in* H. Borer (ed.), *The syntax of pronominal clitics.* Academic Press. San Fransisco. pp. 263–283.

Zribi-Hertz, A.: 2003. On the syntax and semantics of the French mediopassive *SE*: some comparative update. Talk given in Amsterdam, January 2003.

THE SEMANTICS OF NOUNS DERIVED FROM GRADABLE ADJECTIVES[1]

David Nicolas

dnicolas@gmx.net

Abstract

What semantics should we attribute to nouns like *wisdom* and *generosity*, which are derived from gradable adjectives? We show that, from a morphosyntactic standpoint, these nouns are mass nouns. This leads us to consider and answer the following questions. How are these nouns interpreted in their various uses? What formal representations may one associate with their interpretations? How do these depend on the semantics of the adjective? And where lies the semantic unity of nouns like *wisdom* and *generosity* with the more familiar concrete mass nouns, like *wine* and *furniture*?

1 Introduction

The topic of this paper is what semantics should we attribute to nouns derived from gradable adjectives? A gradable adjective, like *wise*, is one that describes a property that comes into degrees, so that it accepts modifiers like *very*: *July is very wise*. (By contrast, an adjective like *perpendicular* is not gradable: two lines may be *perpendicular*, but not **very perpendicular*.) From the adjective *wise*, English has derived the noun *wisdom*. Other examples of such pairs include: *generous → generosity, hostile → hostility, friendly → friendliness.*

We begin by examining how these nouns can be used, that is, what their morphosyntactic distribution is. This leads us to conclude that they are mass nouns. We then look at the interpretations that these nouns can receive in these constructions.

After which we address the following questions: What formal representations may one associate with these interpretations? How do these depend on the formal representation associated with the adjective? And in what respects is the semantics of deadjectival mass nouns similar to that of concrete mass nouns, like *wine* and *furniture*, on which research in formal semantics has focused?[2]

2 The uses of nouns derived from gradable adjectives

We find, first, that a noun derived from a gradable adjective can appear together with a possessive phrase: *Julie's courage*, *the courage of Julie and Tom*, or in a definite nominal expression with a relative (non-possessive) phrase: *the courage that Julie showed, the courage that Fred attributed to Julie and Tom*. We group theses uses together as the possessive or relative phrase identifies the bearer(s) of the property described by the noun.

[1] I want to thank Paul Egré, Brendan Gillon, Friederike Moltmann, Philippe Schlenker, Benjamin Spector, Arnim von Stechow and Lucia Tovena for comments on some of the ideas developed in this chapter.

[2] For reviews of the literature, see Pelletier & Schubert (1989), Krifka (1991) and Nicolas (2002).

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference "sub8 – Sinn und Bedeutung". Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany*

Second, the noun can appear together with an indefinite, mass determiner like *some, much, a lot of* or *a little*[3]: *July has much / a little courage, John found some / a lot of courage in those men*.

Third, the noun can appear in comparative constructions, its grammatical number being singular: *July has less / more wisdom than Tom, John saw more courage in his opponents than in his teammates*.

Fourth, the noun may be used bare, that is, without any determiner, in sentences that are not comparative: *Julie has encountered hostility*, *John found courage in those men, Friendliness is nice.* We see in particular that, in all the contexts in which the noun is combined with a mass determiner, the noun can appear with no determiner.

Fifth, the noun is in general invariable in grammatical number: it seems hard, for instance, to talk of *wisdoms* or *friendlinesses*; doing so requires a special context and induces a change in meaning.

Finally, the noun may sometimes be used together with a count determiner, most notably in expressions of the form [*a(n)* + adjective + noun]: *a(n) exceptional / great / high wisdom*.[4]

This pattern of uses is the same as the one we find for concrete mass nouns, like *wine* or *furniture*: nouns like *wisdom* and nouns like *wine* or *furniture* have the same morphosyntactic distribution. This means, quite simply, that they are all mass nouns.[5]

This immediately raises three questions: What formal representations may one associate with the interpretations of nouns like *wisdom*? How do these depend on the formal representation associated with the adjective? And where lies the semantic unity of nouns like *wisdom* with the more familiar concrete mass nouns?

Before answering these questions[6], let us see w hat interpretations mass nouns like *wisdom* receive in their various uses.

---

[3] We call "mass" any determiner that is characteristic of mass nouns. On mass nouns, count nouns and their characteristic determiners, see note 5 below.

[4] We call "count" any determiner that is characteristic of count nouns; cf. the next note.

[5] In many languages, including English, common nouns divide into two morphosyntactic subclasses, mass nouns and count nouns (Gillon 1992). A defining characteristic of mass nouns, like *milk*, is that they are invariable, while count nouns, like *cat*, can be used in the singular and in the plural. Depending on the language, this basic morphosyntactic difference between the two types of noun is often supplemented by differences as to the determiners they can combine with. Thus, in English, mass nouns can be used with determiners like *much* and *a lot of,* but neither with *one* nor *many*. On the contrary, count nouns can be employed with numerals like *one* and determiners like *many*, but not with *much*.

It is of course well-known that mass nouns can, in certain contexts, be used as count nouns (*You should take a hot milk with some honey*), and vice versa (*You will find a lot of rabbit around here*). One then talks of conversion. Conversion is a common grammatical possibility, whereby a member of a grammatical category is used in the morphosyntactic environment characteristic of another grammatical category. For instance, proper names can be used as common nouns: *The professor has two Picassos in his class* (cf. Gillon 1992, Kleiber 1994, Nicolas Submitted). Uses of nouns like *wisdom* in the plural or with a count determiner are cases of conversion, from mass to count.

[6] The first two questions will be dealt with in section 4, while the third will be answered in the conclusion (section 5).

3 The interpretations of nouns derived from gradable adjectives

3.1 The interpretation of possessive and definite uses

Take sentences like:

Julie's generosity attracted Tom.

They may be understood in two ways. First, as meaning something like:

(1) The particular generosity that Julie (and Julie alone) had attracted Tom.

Second, as meaning something like:

(2) (The fact) that Julie was generous attracted Tom.

Under the first interpretation, the noun phrase *Julie's generosity* refers to an instance of a property, an instance of generosity.[7] Julie's generosity is unique to her, and differs from, say, Tom's. Under the second interpretation, the expression *Julie's generosity* refers to a fact, that Julie was generous, and it is this which is understood to attract Tom, rather than the particular generosity that Julie had. A natural hypothesis is thus that expressions like *Julie's generosity* are ambiguous between two interpretations, an "instance-interpretation" as characterized in (1) and a "fact-interpretation" as in (2).

A datum in favor of this hypothesis is of course the availability of the paraphrases in (1) and (2): these paraphrases capture the intuition that sentences like *Julie's generosity attracted Tom* may be understood in two different ways. But the crucial datum comes from the existence of predicates that license one interpretation but not the other.

We observe first that there are predicates, like *admit* and *confess*, that accept expressions like *Julie's generosity* as argument, license a fact-interpretation but do not give rise to an instance-interpretation:

Tom admitted / confessed his sadness to Julie.[8]

While these sentences can be understood as *Tom admitted / confessed to Julie that he was sad*, they could not be taken to mean something that could be paraphrased as: *Tom admitted / confessed to Julie the particular sadness that he alone had*. *Admit* and *confess* require that the referent of his sadness be a fact.[9]

---

[7] Instances of properties are also known to philosophers as moments, tropes or modes (see Mulligan et al. 1984 and Lowe 1998). Julie's smile, Julie's love for Tom, and the red of Julie's shirt are other examples of instances of properties. The ontology defended by Lowe (1998) offers a general, metaphysical framework congenial to the views defended in this paper. In this framework, the relationship between individuals, kinds, property instances and properties comes out as follows. July instantiates the kind HUMAN BEING. And July possesses the property of generosity, in virtue of possessing a particular instance of generosity. But we could not say that she possesses the kind HUMAN BEING, nor that she instantiates the property of generosity. So, in this ontology, an individual instantiates a kind, while she possesses properties; instantiation and property possession are categorically distinct relations.

[8] Adapted from a similar example given in French by Van de Velde (1995: 141).

[9] Notions like "factives" and "factive contexts" have been discussed in the literature (see, e.g. Kiparsky and Kiparsky 1971, Delacruz 1973). So has Vendler's idea that gerunds of the form *her performing the song* would refer to facts (Asher 1993, Vendler 1968, Kistler 1999). However, we have found very few predicates that, with expressions like *Julie's generosity*, license a fact-interpretation and (clearly) refuse an instance-interpretation. Consider for example "factive predicates" like *surprise*, *bother* and *attract*. These predicates are said to be factive because, when they take a clausal subject, they presuppose that the embedded sentence be true. If the sentence *That Julie was generous surprised Tom* is true, this entails that the sentence embedded in the subject (*Julie was generous*) is also true. Nonetheless, in general, these predicates accept many things as the

Second, we find that there are predicates, like *describe* and *admire*, that accept expressions like *Julie's generosity* as argument, license an instance-interpretation but do not give rise to a fact-interpretation:

Tom described Julie's wisdom.

Tom admired Julie's wisdom.

In these sentences, the expression *Julie's wisdom* may not be understood as meaning something like: *that Julie was wise*. These predicates license only the instance-interpretation, where the expression may be paraphrased as: *the wisdom that Julie alone had*.

Finally, as observed at the beginning of this section, there are predicates, like *attract* and *surprise*, that allow for the two interpretations:

Julie's generosity attracted Tom.

Julie's generosity surprised Tom.

We can thus conclude that expressions like *Julie's generosity* are ambiguous between an instance-interpretation and a fact-interpretation. Given their meaning, certain predicates allow for only one of these two interpretations, while some accept both.

3.2 The interpretation of indefinite and comparative uses

Consider now uses of the noun together with an indefinite determiner characteristic of mass nouns, like *much* or *a lot of*:

Julie has much wisdom.

Julie has a lot of wisdom.

The determiner quantifies over wisdom, and these sentences express something concerning the degree of Julie's wisdom.

Something similar is observed when the noun is used in a comparative construction:

Julie has more / less wisdom than Tom.

The degree of Julie's wisdom is compared to the degree of Tom's wisdom.

In all these uses, something is expressed concerning the degree of Julie's wisdom. We will refer to this as the "degree-interpretation".

However, we do not want to suggest that *wisdom* would be ambiguous between three interpretations, in terms of instances, facts and degrees. Rather, in definite and possessive constructions, *wisdom* is ambiguous between an instance-interpretation and a fact-interpretation, while in indefinite and comparative uses, something is expressed concerning degrees of wisdom.

3.3 The interpretation of bare uses

Nouns like *wisdom* can also occur without any determiner, outside of comparative constructions:

Julie has encountered hostility.

---

referent of their subject, including ordinary people (Julie), property instances (the generosity that Julie alone had) and facts (the fact that Julie was generous).

Honesty is nice.

Lord Byron invented snobbism.

These sentences differ in their interpretations. The first makes an existential claim concerning an instance of a property: Julie has encountered an instance of hostility from a certain individual directed towards her. The second makes a general claim concerning instances of a property: generally, instances of honesty are nice (cf. Moltmann, to appear). The third tells us of the creation of a new property.

3.4 The interpretation of count uses

Consider now a sentence like:

Julie showed a great wisdom.

Its interpretation parallels that of a comparable sentence, where *wisdom* is replaced by a concrete mass noun like *wine*:

Julie bought a great wine.

This sentence says that Julie bought an instance (or instances) of wine that is (are) of a particular type, to which the predicate expressed by the adjective applies (this type of wine is identified as great). Similarly, the sentence that concerns wisdom says that the instance of wisdom showed by Julie is of a particular type, to which the predicate expressed by the adjective applies (this type of wisdom is identified as great).

4 The semantics of the noun and its link with that of the adjective

The questions we now want to address are: What formal representations may one associate with the interpretations of nouns derived from gradable adjectives?[10] And how do these depend on the formal representation associated with the adjective?

4.1 Modeling possessive and definite uses

We will treat here only the instance-interpretation of sentences like *Julie's wisdom surprised Tom*, reserving the fact-interpretation for future work.[11] Under this interpretation, the subject refers to an instance of wisdom, namely the particular wisdom that Julie alone had. A simple model of such sentences is obtained as follows.

We take a noun like *wisdom* to denote a relation between an instance x of a property and a bearer i of that property:

Wisdom: $\lambda x\ \lambda i$ wisdom(x,i)

Now, the expression *Julie's wisdom* has the same meaning as the expression *the wisdom of Julie*. An element of definiteness is thus part of the meaning of *Julie's wisdom*. We may take

[10] We will focus on the normal uses of nouns like *wisdom*, that is, on the cases where they are used as mass nouns. Sentences where they are used as count nouns are cases of conversion; cf. section 2 and Nicolas (Submitted).

[11] This interpretation is available with all derived nouns, when they are headed by a possessive construction: *Julie's generosity surprised Tom / Julie's love for Ted surprised Tom / Ted's walk to Greece astonished Julie.*

There must exist a general mechanism that, given a derived noun, constructs an interpretation in terms of fact: that July was generous surprised Tom.
We may note that this mechanism is lexicalized in an overt construction: *the fact that* + S, where S is a sentence. Semantically, it constructs a fact, given a proposition, like the proposition expressed by the sentence S.

this element to be provided by an implicitly present, definite article *the*. It imposes semantic conditions that we label 'the' in our model.[12] The expression *Julie's wisdom* thus translates as follows (with j the referent of *Julie*):

Julie's wisdom: the x [wisdom(x,j)]

Finally, the truth conditions of the full sentence are (with t the referent of *Tom*):

Julie's wisdom surprised Tom is true iff the x [wisdom(x,j)] is such that surprised(x,t)

So now, what about indefinite and comparative uses?

4.2 Modeling indefinite and comparative uses

The solution becomes clear once we compare them with similar sentences with concrete mass nouns like *wine*.

4.2.1 Measure functions for concrete mass nouns

Instead of looking directly at:

Julie has a lot of wisdom.

Julie has more wisdom than Tom.

we consider:

Julie has a lot of wine.

Julie has more wine than Tom.

The first question we should ask ourselves is, how the sentences with concrete mass nouns like *wine* should be modeled? Higginbotham (1995) argues that to deal with such sentences, and also with the quantification of mass nouns in general, we need the notion of a measure function. In this case, the measure function will be a function μ that associates to any instance of wine x something that represents the quantity of wine that x contains.

Then we get:

Julie has a lot of wine is true iff Julie has some wine and the quantity of Julie's wine is a lot

To be more precise, we can say, with Higginbotham, that the predicate "a-lot" is satisfied by a quantity of wine if this quantity is greater than a certain standard quantity of wine c°:

Julie has a lot of wine is true

iff $\exists$y [wine(y) $\wedge$ has(j,y)] $\wedge$ the x [wine(x) $\wedge$ has(j,x)] is such that μ(x) > c°

iff the x [wine(x) $\wedge$ has(j,x)] is such that μ(x) > c° {where c° is a standard quantity of wine}

This measure function can also be used to deal with comparatives:

Julie has more wine than Tom is true

[12] We do not want to be tied to any account of the semantic conditions imposed by the definite article. Let us, however, cite Sharvy (1980) as a good example of how these conditions may be made precise. He characterizes them in terms of the notion of a supremum:
the x [N(x)] = ιx [x=SUP_y (y is such that N(y))] {where ι is the iota operator}
That is, an expression of the form *the N* (like *the cat, the cats, the wine, the wisdom of Julie*) denotes the entity x which is the supremum of all the entities y to which the predicate N that corresponds to the nominal expression *N* applies in the circumstance. When the predicate can apply only to a single entity (as with *cat* or *wisdom of Julie*), this turns out to be equivalent to the more familiar, Russellian condition: $\exists$!x Nx.

iff the quantity of Julie's wine is greater than the quantity of Tom's wine

iff the x [wine(x) □ has(j,x)] and the v [wine(v) □ has(t,v)] are such that □(x) > □(v)

4.2.2 Measure functions for (mass) nouns derived from gradable adjectives

This account extends to nouns like *wisdom*, as long as we interpret differently the measure function □. Obviously, in the case of wisdom, we cannot talk of a quantity of wisdom, at least not in the same sense as we talk of a quantity of wine. But we certainly may talk of a degree of wisdom. So we just have to take the measure function to associate to an instance of wisdom a degree of wisdom. More precisely, when an instance x of wisdom manifests itself in an individual j, the measure function □ will associate to x the degree of wisdom of that person in the circumstance. Here is then what we get:

Julie has a lot of wisdom may be paraphrased as: Julie has wisdom (an instance of wisdom manifests itself in Julie) and Julie's wisdom is a lot. That is:

Julie has a lot of wisdom is true

iff □y wisdom(y,j) □ the x [wisdom(x,j)] is such that □(x) > c°

iff the x [wisdom(x,j)] is such that □(x) > c°

{where c° is a certain standard degree of wisdom}

Julie has more wisdom than Tom is true

iff the x [wisdom(x,j)] and the v [wisdom(v,t)] are such that □(x) > □(v)

4.3 Modeling bare uses

Dealing fully with bare uses would force us to take a stance on an issue that is not our direct concern. This is the general issue of how to model sentences with bare mass nouns and bare plurals. Some researchers take bare plurals and mass nouns to be indefinites (Gillon 1990). Others see them as ambiguous between an indefinite reading and a kind-reading (Wilkinson 1991). Yet others take them to uniformly refer to kinds, and a certain mechanism derives their existential interpretations (Carlson 1977). However, for the purpose of this paper, we do not need to adjudicate between such positions. Indeed, whatever we end up saying concerning bare mass nouns and plurals, we should be able to say it, in the same way, in the specific case of mass nouns derived from adjectives. Thus, concerning the sentences we gave as examples in 3.1.3, any position will give them truth-conditions that will turn out to be essentially equivalent to:

Julie has encountered hostility is true

iff Julie has encountered an instance of hostility from an individual s directed towards him

iff □x □s hostility(x,s,j) □ encountered(j,x)

Honesty is nice is true

iff generally, instances of honesty are nice

If we could avail ourselves of the notion of a "generic" operator, Gen, binding variables x and i, then our sentence would be true iff Gen x,i [honesty(x,i) □ nice(x)]

Lord Byron invented snobbism is true

iff invented(b,sn) {where b stands for Byron and sn stands for the property SNOBBISM}

In other words, in *Lord Byron invented snobbism*, the bare noun *snobbism* functions as the proper name of a property.

4.4 The link with the semantics of gradable adjectives

To specify how the semantics of the noun is linked to that of the adjective, we need first to say how we can model gradable adjectives.

4.4.1 A simple semantics for gradable adjectives

Following Kennedy (1999, 2001), we assume that gradable adjectives denote measure functions, from individuals to degrees (see also Klein, 1991, on adjectives and degrees). We adopt, for this paper, simple assumptions concerning gradable adjectives and degrees. What is important to us is not those assumptions *per se*, but the relationship, in a model where adjectives are associated with degrees, between the semantics of the adjective and that of the derived noun.

We model *Julie is wise* as meaning: the degree at which Julie is wise is superior to a certain standard d°. If j corresponds to *Julie* in the model, and wise is the measure function denoted by the adjective, then we have the following truth-conditions:

Julie is wise is true iff wise(j) > d°

Similarly, for comparative constructions:

Julie is wiser than Tom is taken to be true

iff the degree at which Julie is wise is higher than the degree at which Tom is wise

iff wise(j) > wise(t)

4.4.2 How the semantics of the noun is linked to that of the adjective

We can now specify the links between the semantics of the adjective and the semantics of the derived noun, through two axioms:

Axiom i) An instance of wisdom manifests itself in an individual iff that individual is wise to a certain degree: $\exists$x wisdom(x,j) iff $\exists$d d = wise(j)

Axiom ii) The measure function μ associated with the noun *wisdom* is the measure function denoted by the adjective *wise*: wisdom(x,j) $\rightarrow$ μ(x) = wise(j)

5 Conclusion

5.1 In brief

The model we propose is as follows.

A noun derived from a gradable adjective denotes a two-place relation, between an instance of a property, and an individual in which this instance manifests itself.

Like more familiar concrete mass nouns, this noun has an associated measure function μ. This allows us to capture the interpretation of comparatives like *more* or *less* and quantifiers like *much* or *a lot of*.

The relationship between the semantics of the gradable adjective and that of the derived noun is captured by two axioms, like the ones we have for *wisdom*:

Axiom i) $\exists x$ wisdom(x,j) iff $\exists d$ d = wise(j)

Axiom ii) wisdom(x,j) $\rightarrow$ μ(x) = wise(j)

In particular, the second axiom says that the measure function associated with the noun *wisdom* is the measure function denoted by the adjective *wise*.

This set of assumptions allows us to account in a simple way for the instance-interpretations and degree-interpretations that these nouns are observed to have.

Let us pause, to address the following question: Why not simply say that mass nouns like *wisdom* denote the measure function denoted by the adjective from which they derive (i.e., without attributing to *wisdom* an instance-argument)? Well, in English, *wisdom* is a mass noun just like *wine* is. Now, we recognize that expressions like *Julie's wine* refer. So it is only natural to recognize that expressions like *Julie's wisdom* also refer. In this way, we have a uniform semantics for mass nouns, something that we would not have if we said that only mass nouns like *wine* refer. By doing so, we explain in a straightforward fashion how instance-interpretations arise, while modeling, with the associated measure function, indefinite and comparative uses.

To say it differently, the model here advocated explains us where lies the semantic unity of abstract and concrete mass nouns. Being common nouns, mass nouns have the capacity to refer (and nouns like *wisdom* refer specifically to property instances). Being moreover mass nouns, they not only refer, but have an associated measure function, which allows a comparison of the instances they denote, as required by comparatives and quantifiers.

5.2 Extending the account to other abstract nouns

To finish, another nice feature of this account is that it extends easily to other types of abstract nouns, like *beauty, chaos*, *perpendicularity* and *love*. Let's look at these types of noun in turn.

5.2.1. *Beauty*

In English, a noun like *beauty* is not derived from any adjective. On the contrary, there is an adjective, *beautiful*, derived from the noun. The direction of the derivation turns out to make no difference. Indeed, a natural account for the noun *beauty* exactly parallels that for *wisdom*:

$\exists x$ beauty(x,j) iff $\exists d$ d = beautiful(j)

beauty(x,j) $\rightarrow$ μ(x) = beautiful(j)

Julie's beauty attracts Tom is true iff the x [beauty(x,j)] is such that attracts(x,t)

Julie's beauty is greater than Sue's is true

iff the x [beauty(x,j)] and the v [beauty(v,s)] are such that μ(x) > μ(v)

5.2.2. *Chaos*

Take now a mass noun like *chaos*. It is not derived and, when understood as in *The chaos of the bedroom worries Tom*, its meaning cannot be adequately paraphrased using the derived adjective *chaotic*. Still, it is natural to give it a semantics similar to that of *wisdom*, except that, when understood in this way, there is no link with any adjective. We just take the mass noun *chaos* as denoting a two-place relation, between instances of chaos and entities in which they manifest themselves, and as having an associated measure function that sends an entity to the degree of chaos that it exhibits.

The chaos of the bedroom worries Tom is true iff the x [chaos(x,b)] is such that worries(x,t)

The chaos in the bedroom is greater than the chaos in the kitchen is true

iff the degree of chaos of the bedroom is greater than the degree of chaos of the kitchen

iff the x [chaos(x,k)] and the v [chaos(v,b)] are such that □(x) > □(v)

5.2.3. *Perpendicularity*

What about a noun like *perpendicularity?* The noun is derived from an adjective, *perpendicular*, but this adjective is not gradable. We cannot say that two lines l and m are *very perpendicular*. As a result, the noun *perpendicularity* cannot be quantified: we cannot talk of *a lot of perpendicularity,* or of *more perpendicularity.* So the noun will have no associated measure function. But there will of course remain a link with the meaning of the adjective, captured as follows:

□x perpendicularity(x,l,m) iff perpendicular(l,m)

Since the adjective *perpendicular* is not gradable, the adjective does not denote a measure function, but simply a function to truth values.

5.2.4. *Love*

Finally, take a mass noun like *love*. It is derived from a verb, *to love*. The verb has two arguments, and so the noun may accept up to three arguments: we may talk of *Julie's love for Tom*. The noun *love* will have an associated measure function, which must be also available to the verb *to love*, since we have equivalences like:

Julie has a lot of love for Tom is true iff the sentence *Julie loves Tom a lot* is true

A question that needs to be explored is in what way exactly will this measure function be available to the verb.

In any case, we get truth-conditions like the following:

Julie's love for Tom attracts Fred is true iff the x [love(x,j,t)] is such that attracts(x,f)

Julie has more love for Tom than for Fred is true

iff the x [love(x,j,t)] and the v [love(v,j,f)] are such that □(x) > □(v)

References

Asher, N. (1993), *Reference to abstract object in discourse*, Dordrecht, Kluwer.

Carlson, G. (1977), *Reference to kinds in English*, Ph.D., University of Massachusetts.

Delacruz, E. B. (1973), Factives and proposition level constructions in Montague grammar, In B. H. Partee (ed.) *Montague grammar*, New York, Academic Press.

Gillon, B.S. (1990), Bare plurals as plural indefinite noun phrases, In H. E. Kyburg Jr. et al (eds.) *Knowledge representation and defeasible reasoning*, 119-166, Netherlands, Kluwer.

Gillon, B. S. (1992), Towards a common semantics for English count and mass nouns, *Linguistics and philosophy* **15**, 597-639.

Higginbotham, J. (1995), Mass and count quantifiers, In E. Bach, E. Jelinek, A. Kratzer & B. H. Partee (eds.), *Quantification in natural languages*, 383-419.

Kennedy, C. (1999), *Projecting the adjective*, New York, Garland.

Kennedy, C. (2001), Polar opposition and the ontology of 'degrees', *Linguistics and Philosophy* **24**, 33-70.

Kiparsky, P., & C. Kiparsky. (1971), Fact, In D. D. Steinberg and L. A. Jakobovits (eds.), *Semantics: An interdisciplinary reader in philosophy, linguistics, and psychology*, 345-369, Cambridge, Cambridge University Press.

Kistler, M. (1999), Causes as events and facts, *Dialectica* Vol. 53, **1**.

Kleiber, G. (1994), *Nominales. Essais de sémantique référentielle*, Paris, Collin.

Klein, E. (1991), Comparatives, In A. von Stechow & D. Wunderlich (eds.), *Semantik*, Berlin, Walter de Gruyter.

Krifka, M. (1991), Massennomina, In A. von Stechow, D. Wunderlich (ed.), *Semantics, an international handbook of contemporary research*, 399-417, Berlin, de Gruyter.

Lowe, E. J. (1998), *The possibility of metaphysics*, Oxford, Clarendon Press.

Moltmann, F. (To appear), Properties and kinds of tropes, *Mind*.

Mulligan, K., Simons, P., Smith, B. (1984), Truth-makers, *Philosophy and Phenomenological Research* Vol. XLIV, **3**, 287-321.

Nicolas, D. (2002), *La distinction entre noms massifs et noms comptables. Aspects linguistiques et conceptuels*, Louvain, Peeters.

Nicolas, D. (Submitted), Semantic and pragmatic factors in the interpretation of conversions of count nouns into mass nouns in French.[13]

Pelletier, J. F. , L. K. Schubert (1989), Mass expressions, In D. Gabbay, F. Guenthner (ed.), *Handbook of philosophical logic*, 327-407, D. Reidel Publishing Company.

Sharvy, R. (1980), A more general theory of definite descriptions, *The philosophical review*, Vol. 89, **4**.

Van de Velde, D. (1995), *Le spectre nominal*, Louvain, Peeters.

Vendler, Z. (1968), *Adjectives and nominalizations*, The Hague, Mouton.

Wilkinson, K. (1991), *Studies in the semantics of generic noun phrases*, Ph.D., University of Massachusetts at Amherst.

[13] This paper is available on http://d.a.nicolas.free.fr/research.

A modal analysis of modal subordination

Robert van Rooy*
Institute for Logic, Language and Computation
University of Amsterdam
vanrooy@hum.uva.nl

Abstract

In this paper I will give a modal two-dimensional analysis of presupposition and modal subordination. I will think of presupposition as a non-veridical propositional attitude. This allows me to evaluate what is presupposed and what is asserted at different dimensions without getting into the binding problem. What is presupposed will be represented by an accessibility relation between possible worlds. The major part of the paper consists of a proposal to account for the dependence of the interpretation of modal expressions, i.e. modal subordination, in terms of an accessibility relation as well. Moreover, I show how such an analysis can be extended from the propositional to the predicate logical level.

1 Introduction

Consider the following examples:

(1) a. A thief *might* break into the house. He *might* take the silver.

b. It is *possible* that John used to smoke and *possible* that he just *stopped* doing so.

c. It is *possible* that Mary will come and it is *possible* that Sue will come *too*.

*The research for this paper has been made possible by a fellowship of the Royal Netherlands Academy of Arts and Sciences (KNAW), which is gratefully acknowledged. I am grateful to Cleo Condoravdi and Stefan Kaufmann for inviting me to submit a paper to the special issue. I would like to thank an anonymous referee, Frank Veltman, and Henk Zeevat for valuable comments and discussion.

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference "sub8 – Sinn und Bedeutung".*
Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany

The sequence (1a) was discussed by Roberts (1989) as a problematic example for standard discourse representation theory and dynamic semantics (Kamp, Heim, Groenendijk & Stokhof). The sequence (1b) was already given by Gazdar (1979) as a counterexample to the satisfaction theory of presupposition defended in the seventies by, among others, Karttunen and Stalnaker. The closely related (1c) is even a more serious problem for proponents of the satisfaction theory who claim that a trigger like *too* does not entail what it presupposes, in this case that (it is possible that) Mary will come. The reason is that according to such a *two-dimensional* analysis of presuppositions it is predicted that (1c) can be true and appropriate without there being a possible world in which both Mary and Sue are coming, i.e. the *binding problem.*

In this paper I will formulate a *two-dimensional* theory of presupposition satisfaction in which the binding problem does not arise. I will do this by taking serious the proposal of Stalnaker that presupposition should be thought of as a propositional attitude and represented by an *accessibility relation* between possible worlds. In the most substantial part of the paper, I will show how such a *modal* analysis can account for the phenomenon that the interpretation of one modal can depend on that of another: modal subordination. This modal analysis of modal subordination will be rather different from the more *representational* analyses proposed by, among others, Roberts (1989) and Geurts (1995).

This paper will be organized as follows. First, I will briefly motivate and formalize a two-dimensional analysis of presupposition satisfaction. In section 3, I will discuss the phenomenon of modal subordination and propose a modal analysis in terms of a changing accessibility relation. This analysis will be developed further in the remaining sections to account for disjunctions, conditionals, belief and desire attributions, and the subjunctive mood. Until then I limit myself to the propositional level. In the final substantial section of this paper I will briefly indicate how the analysis can be extended such that also anaphoric dependencies across modals can be taken care of. I will end with some conclusions.

2 Presupposition

2.1 The representation of presuppositions

The notion of presupposition plays a crucial role in dynamic semantics. A context is supposed to represent what is presupposed. Stalnaker (1974, 1998, 2002) has always argued that presupposition should be thought of as a propositional attitude and thus represented in a similar way: by means of an *accessibility relation.* But what do agents presuppose? The standard answer is: that what is common ground between the participants of the conversation. According to discourse representation theory, what is common ground is that what is explicitly represented in a discourse representation structure, a DRS. This DRS, in turn, represents what has been *explicitly* agreed upon by the conversational participants. This suggests that presupposition should by default be fully *introspective*: what is presupposed is also presupposed to be presupposed, and what is not presupposed is also presupposed not to be presupposed.[1] I will represent what is presupposed by a *primitive* accessibility relation R. Although the presuppositional accessibility relation should be fully introspective, the relation should not be based on the assumption that what is presupposed also has to be true: discourse can be based on an assumption that later turns out to be false. So, presupposition should be represented by an accessibility relation that need *not* be *reflexive*.

The non-veridicality of what is presupposed suggests that we should treat the valuation of truth separately from context change – distinguish content from force. In this section I will show how we can systematically account for presupposition satisfaction without giving up the possibility of determining the content of a sentence separately from the way it changes the context. For context change, I will rely mainly on work in dynamic epistemic semantics, where updates are defined in terms of *eliminating arrows* instead of eliminating worlds.[2]

2.2 Formalization

When a speaker presupposes something, he presupposes it in a world or a possibility. A possibility will be represented by a *pointed model*, $\langle R, w\rangle$,[3] where w is a distinguished world representing the actual world and should be thought of as a valuation function from atomic propositions to truth values and where R is the presuppositional accessibility relation that is (by default) *serial*, *transitive* and *Euclidean*.[4] I will take $R(v)$ to be the worlds accessible

[1]See also Fernando (1995) for an analysis of context where full introspection is assumed. Stalnaker (2002) suggests that what is presupposed by an agent is that what she believes is commonly believed by the discourse participants. This has as a result, however, that the attitude of presupposition does not obey negative introspection, because more things can be taken to be commonly believed than what is explicitly agreed upon.

[2]Updating through the elimination of arrows instead of worlds has been used, among others, by Landman (1986a) and Veltman (1996). Its limitations for multi-agent settings are discussed in Gerbrandy (1999).

[3]If we think of a world as representing everything that is the case, including some modal facts, a pointed model should be thought of as such a world.

[4]A relation R is *serial* if $\forall x : \exists y : xRy$; *transitive* if $\forall x, y, z : (xRy \;\&\; yRz) \rightarrow xRz$; and *Euclidean* if $\forall x, y, z : (xRy \;\&\; xRz) \rightarrow yRz$.

from v: $\{u \in W : vRu\}$. As a result, it will be the case that what is presupposed is introspective: $\forall v, w$: if $v \in R(w)$, then $R(v) = R(w)$, although it need not be veridical, i.e., it might be that $w \notin R(w)$. To determine in possibility $\langle R, w\rangle$ whether P is presupposed, we have to check what is presupposed in this possibility, $R(w)$. The two-dimensional (or four-valued) analysis of presupposition that was popular in the seventies treats the logic of truth and that of presupposition at separate dimensions. This is appealing because sometimes a sentence can, intuitively, be true, although its presupposition is false. Standard dynamic semantics treats conjunction in an *asymmetric* way: the second conjunct should be interpreted with respect to the initial context updated with the first conjunct. This is a desirable feature of a framework to account for the asymmetric behavior of presuppositions in conjunctive sentences. In this section I will combine the desirable features of both the two-dimensional and the dynamic analysis of presuppositions. Thinking of presupposition as a non-veridical propositional attitude, we can account for the dynamic aspects of presupposition satisfaction without giving up the idea behind a two-dimensional analysis of presupposition satisfaction. That is, although we will predict that conjunction behaves *asymmetrically* with respect to presupposition satisfaction, '*and*' will still be treated in a *symmetric* way. The reason is that truth and presupposition satisfaction are defined *separately* from the update function (although they will be defined simultaneously). Making use of Beaver's (1995) presupposition operator, I will represent an atomic sentence A that presupposes P as follows: $\partial P \wedge A$. For the time being, I will concentrate only on the truth-conditional connectives. I will assume that a sentence has two values: (i) a sentence is true or false, i.e. 1 or 0; (ii) a sentence has no presupposition failure or it has one, i.e. + or -. The combined *truth* and *presupposition satisfaction conditions* of sentences are given below (where '$\cdot$' is a placeholder):[5]

- $[[A]]^{R,w} = \langle 1/0, +\rangle$, iff $w(A) = 1/0$, if A is atomic (then always defined)
- $[[\neg A]]^{R,w} = \langle 1/0, +\rangle$ iff $[[A]]^{R,w} = \langle 0/1, +\rangle$, $\langle \cdot, -\rangle$ otherwise
- $[[A \wedge B]]^{R,w} = \langle 1, +\rangle$ iff $[[A]]^{R,w} = \langle 1, +\rangle$ and $[[B]]^{Upd(A,R),w} = \langle 1, +\rangle$
  $= \langle \cdot, -\rangle$ iff $[[A]]^{R,w} = \langle \cdot, -\rangle$ or $[[B]]^{Upd(A,R),w} = \langle \cdot, -\rangle$
  $= \langle 0, +\rangle$ otherwise
- $[[\partial A]]^{R,w} = \langle 1, +\rangle$ iff $\forall v \in R(w) : [[A]]^{R,v} = \langle 1, +\rangle$
  $= \langle \cdot, -\rangle$ otherwise

[5]Although I use a four-dimensional logic, I am not explicit about when a sentence is true or false, although its presupposition is not satisfied. But this is needed if we want to allow *Even John was there* to be true although it is not presupposed that John's being there was unlikely (thanks to Kai von Fintel for reminding this to me). However, there is no principle problem of distinguishing those cases as well.

Observe again that the presupposition value of a conjunction is determined in a *symmetric* way. That is, if either A or B has a presupposition failure, the conjunction $A \wedge B$ will have a presupposition failure as well. However, to determine the presupposition value of a conjunction of the form $A \wedge B$ in possibility $\langle R, w\rangle$, we look at the presupposition value of B in possibility $\langle Upd(A, R), w\rangle$ – the update function is being relevant here. This is the point at which we take over the insights of dynamic semantics. The update $Upd(A, R)$ is defined as follows:

- $Upd(A, R) \quad = \quad \{\langle u, v\rangle \in R | \; [[A]]^{R,v} = \langle 1, +\rangle\}$.

Notice that this update function is *eliminative*, but instead of eliminating worlds in $R(w)$ it eliminate tuples, or *arrows*, in R. It eliminates all arrows in R that point to an non-A-world. This has the effect that after the update of R with A, not only all worlds v accessible from w verify A, but also all worlds u accessible from v make A true. Thus, after the update with A it is not only presupposed that A, but it is also presupposed to be presupposed that A. Moreover, on the assumption that R is fully introspective, $Upd(A, R)$ will be fully introspective as well. Also after the update, everything that is not presupposed is also presupposed to be not presupposed.

Our analysis is very similar to standard dynamic semantics. If we would say that $[[\Diamond A]]^{R,w} = \langle 1, \cdot\rangle$ iff $\exists v \in R(w) : [[A]]^{R,v} = \langle 1, \cdot\rangle$ and assume that possibility statements don't have any dynamic effect,[6] we predict just like Veltman (1996) an asymmetry between $\Diamond A \wedge \neg A$ and $\neg A \wedge \Diamond A$; the former is okay, the latter is not. However, this contrast in acceptability is explained in a somewhat difference way: Veltman's explanation appeals to acceptability of update, while we explain the contrast in terms of truth. We predict that the former sequence can be true, but the latter cannot.

If we assume that sentence A presupposes P iff $\forall\langle R, w\rangle$: if $[[A]]^{R,w} = \langle \cdot, +\rangle$, then $\forall v \in R(w) : \; [[P]]^{R,v} = \langle 1, +\rangle$, the above implementation gives rise to the same presuppositional predictions as the standard implementation of the satisfaction account. In particular, on the assumption that *John stopped smoking* gives rise to the presupposition that John used to smoke, this implementation predicts that sentences like *John didn't stop smoking* and *John stopped smoking and Mary is sick* will also gives rise to this presupposition, but *John used to smoke and he stopped doing so* will never give rise to presupposition failure.

Although the predictions of the above implementation of the satisfaction approach are similar to the predictions of the standard approach, there are still some important differences. First, by treating presupposition as a propositional attitude, we can evaluate in a *distributive* way whether a presupposition associated with a sentence is satisfied by

[6] Though we will give a somewhat different analysis of possibility statements later.

what the speaker presupposes. This is possible, of course, because we have represented in a single possibility all the information that is normally represented only in a whole context/information state. Second, and related, we can now account for the dominant view in the seventies that presupposition satisfaction and truth should be evaluated at *different dimensions.*

According to Karttunen & Peters (1979) and others a sentence like *Even Bill likes Mary* presupposes something that it does not entail. Thus, the sentence can be true without it actually being unlikely that Bill likes Mary, because what is presupposed need not be true.[7] Notice that we can now account for this intuition without assuming with Karttunen & Peters (1979) that we should thus *represent* presuppositions separately from assertions. On the other hand, we can also account for the intuition that a factive verb both presupposes and entails that its complement is true.[8] To analyze *Sam realizes that P* we add the following construction to the language: if P is a sentence, $Real(s, P)$ is a sentence too. To interpret the formula, we add a primitive reflexive accessibility relation to the model, K_s, modeling what Sam realizes.[9] The formula is then interpreted as follows:

- $[[Real(s, P)]]^{R,w} = \langle 1, + \rangle$ iff $\forall v \in K_s(w) : [[P]]^{R,v} = \langle 1, + \rangle$
  $= \langle 0, + \rangle$ iff $\exists v \in K_s(w) : [[P]]^{R,v} = \langle 0, + \rangle$, $\langle \cdot, - \rangle$ otherwise

Notice that because K_s is reflexive, according to this analysis the formula entails, but does not presuppose, that P. To account for the presupposition, we represent the sentence *Sam realizes that P* by the following formula $\partial P \wedge Real(s, P)$, which both presupposes and entails that P. If we now represent *Sam does not realize that P* by $\neg(\partial P \wedge Real(s, P))$, this sentence presupposes that P, but can still be true in case P is false (in case $w \notin R(w)$).

3 Modal subordination

3.1 Possibility

According to standard dynamic semantics (Veltman 1996), the embedded sentence of 'possibly A' should be interpreted with respect to the same context as the whole sentence. This

[7] Soames (1989) observed already that this is problematic for the standard way of accounting for presupposition satisfaction in dynamic semantics.

[8] Throughout the paper I will assume the same for an aspectual verb like *stop*.

[9] Our simple update function has limitations here: if we would attribute to Sam attitudes about what the discourse participants presuppose, things go wrong. I will ignore such attributions in this paper. See, among others, Gerbrandy (1999) for an analysis in which this problem is overcome.

gives rise to the prediction that 'possibly A' triggers the same presupposition as *A* itself. However, if it has already been established that it is possible that John used to smoke, i.e. after (2a) has been asserted, (2b) need not presuppose that John used to smoke.

(2) a. It is *possible* that John used to smoke,

b. and it is *possible* that he just *stopped* doing so.

The phenomenon that a modal expressions depends for its interpretation on another modal, as illustrated by (1a) and (2a)-(2b), is known as 'modal subordination'. Consider Roberts's (1a) from the introduction again:

(1a) A thief *might* break into the house. He *might* take the silver.

In both (1a) as in (2a)-(2b), we intuitively get the correct reading if we assume that the modal in the first clause takes scope over the whole sequence. Apart for reasons of compositionality, however, Roberts (1989) showed already that such an analysis would be on the wrong track. It would not be able to account for a slightly different sequence like (3a), where we have a necessity instead of a possibility operator in the second sentence.

(3) a. A thief *might* break into the house. He *would* take the silver.

b. *If* a thief broke into the house, he would take the silver.

Intuitively, the second sentence of (3a) means something like (3b). To account for this, Roberts takes up Kratzer's (1981) idea that the domain of a modal is context dependent, and extends it by proposing that the actual selection goes via 'accommodation' of the material that has been mentioned explicitly in an earlier modal statement. For (1a), (2a)-(2b), and (3a), for instance, this means that the embedded clauses of their first sentences will be accommodated to function as the antecedents of the modals *might*, *possible*, and *would*, respectively. In this way she predicts correctly for all of (1a), (2b) and (3a).

Although Roberts's analysis reflects what intuitively goes on in the examples illustrated above, the exact mechanism that she uses has been rightly criticized by Kibble (1994), Geurts (1995), and others. Not only is her use of accommodation rather *ad hoc* and non-compositional, it also seems to be a much too powerful device, even with the constraints on accommodation that she proposes.[10]

[10] Roberts's (1989) constraints are the following (i) modal subordination 'requires non-factual mood' (p. 701); (ii) 'it must be plausible that the modally subordinate utterance has a hypothetical common ground suggested by the immediately preceding context' (p. 701); and (iii) modal subordination may not make antecedents available to anaphoric expressions that have no explicit representation in the given DRS (p. 705). For a critical discussion of these constraints, see Kibble (1994) and Geurts (1995).

Kibble (1994) and Geurts (1995) propose that instead of selecting the domain of a modal by means of (antecedent) accommodation, we should assume that the domain is picked up *anaphorically*.[11] Moreover, they suggest that modal statements also make such domains anaphorically available for later modals: they introduce propositional discourse variables to the discourse and these are mapped to the set of world-assignment pairs that verify their embedded clauses by assignment functions.

Although these anaphoric analyses of modal subordination are more constrained and appealing than Roberts's, they are not unproblematic. For one thing, they are still too unrestricted: modal statements just introduce and are allowed to pick up propositional discourse markers. This makes it possible that a clause embedded under one kind of modality can figure as the antecedent of a modal expression of a completely different kind. A second problem, due to Kibble (1994), is one that Geurts (1995) shares with Roberts (1989). They both falsely predict that (4c) is an appropriate continuation of (4a)-(4b):[12]

(4) a. John might be at home reading a book$_x$

b. Actually, he's still at the office.

c. *It$_x$'ll be War and Peace.

Although Kibble (1994) allows for interaction, his analysis is rather limited: a *de re* statement represented as $\exists x \Diamond A$ is not really treated as being *about* a particular individual, but almost as if it were a *de dicto* statement, and he also cannot account for clauses in counterfactual or subjunctive mood. Geurts's (1995) analysis doesn't have these limitations, because each possibility of the 'main' context carries the information contained in the subordinated contexts. However, by making use of standard set theory, Geurts does not allow for the situation that if $\langle w, f \rangle$ is a possibility that satisfies the main context (DRS) and also assigns a set of possibilities to newly introduced propositional discourse marker p, that there is a world v such that $\langle v, f \rangle \in f(p)$. A somewhat *ad hoc* analysis is given to assure that this won't happen. In particular, a somewhat arbitrary distinction is made between embedded and unembedded information: although a propositional discourse marker can

[11]Geurts (1995) claims that a modal *presupposes* its domain and assumes an exclusively *anaphoric* account of presupposition (satisfaction) for these cases. Given the important role that (non-global) accommodation plays in Geurts's (1995) analysis of presuppositions, this restriction is somewhat surprising.

[12]Kaufmann (1997) discusses a similar example involving a conditional:
(i) If John bought a book, he'll be home reading it by now.
(ii) John works at a gas station.
(iii) *It'll be a murder mystery.

be mapped to what is presupposed to be possible, it is not allowed there to be a propositional discourse marker that captures what is presupposed in the discourse as a whole. Not only do I believe that this is undesirable for conceptual reasons, it also has an unfortunate empirical consequence. It is predicted that modal statements cannot anaphorically pick up what is presupposed in the entire discourse. Because a modal can, intuitively, use this kind of information as its domain of quantification, a somewhat artificial distinction has to be made between anaphoric and non-anaphoric dependent modals.

One way to overcome this problem is to introduce a distinguished propositional discourse marker that with respect to each world assignment pair represents what is presupposed in that possibility. A straightforward implementation of this idea, however, requires the use of non-wellfounded set theory.[13] In this paper, instead, I will propose a more traditional way to account for presuppositions and modal expressions: in terms of an accessibility relation.

In contrast to Robert's analysis of modal subordination in terms of accommodation, the above described anaphoric analyses keep the subordinated contexts made use of in the interpretation of previous sentences 'in memory' by adding propositional discourse markers to the discourse. Another way to store previously used subordinated contexts was proposed by Kaufmann (1997). Instead of representing a context just by a set of possibilities that verify everything established until now, he represents it by a *stack* of such sets (see also Zeevat (1992)), where a set 'below' the top-level represents a subordinated context. I have no principled objection to such an analysis. Still, I would like to see a less 'representational' approach towards modal subordination where what is presupposed can simply be represented by a single set of possibilities. But now the challenge is how to account for the introduction of subordinated contexts without giving up that we represent what is presupposed in terms of a *single* accessibility relation.

The basic idea is very simple: possibility statements introduce an *ordering* on the worlds. However, because we assume that what is presupposed is a propositional attitude and should be represented by an accessibility relation, we can implement this idea in an appealing way. Following Veltman's (1996) analysis of *normally*, I will assume that the dynamic effect of a possibility statement is that the worlds that make the embedded clause true are the most preferred worlds by eliminating arrows from A-worlds to $\neg A$-worlds.

- $Upd(\Diamond A, R) \;=\; \{\langle u, v\rangle \in R |$ if $[[A]]^{R,u} = \langle 1, +\rangle$, then $[[A]]^{R,v} = \langle 1, +\rangle\}$

According to the update function, possibility statements *disconnect* A-worlds from $\neg A$-worlds, although A-worlds can still be seen from $\neg A$-worlds and from actual world w.

[13] See, however, Fernando (1996) and Frank (1997) for less straightforward implementations of this idea within standard set theory.

Suppose that before the update, $R = \{\langle w, v\rangle, \langle w, u\rangle, \langle v, v\rangle, \langle v, u\rangle, \langle u, u\rangle, \langle u, v\rangle\}$ where v is an A-world and w and u are $\neg A$-worlds. Then R is introspective: $R(w) = R(v) = R(u) = \{v, u\}$. After the update with $\Diamond A$, however, the new accessibility relation $Upd(\Diamond A, R)$ won't be introspective anymore: the tuple $\langle v, u\rangle$ will be eliminated, which means that $Upd(\Diamond A, R)(w) \neq Upd(\Diamond A, R)(v) = \{v\} \neq Upd(\Diamond A, R)(u)$.[14] Thus, if R was Euclidean before the update with $\Diamond A$, it won't be Euclidean anymore afterwards.

Possibility statements will be interpreted as follows:

- $[[\Diamond A]]^{R,w} = \langle 1, +\rangle$ iff $\exists v \in R(w) : [[A]]^{R,v} = \langle 1, +\rangle$
  $= \langle 0, +\rangle$ iff $\exists v \in R(w) : [[A]]^{R,v} = \langle \cdot, +\rangle$ and $\forall v \in R(w)$: if $[[A]]^{R,v} = \langle \cdot, +\rangle$, then $[[A]]^{R,v} = \langle 0, +\rangle$,
  $= \langle \cdot, -\rangle$ otherwise

According to this rule it holds that if A presupposes P, $\Diamond A$ can be used appropriately only if it is assumed to be possible that P is presupposed. Because out of context (or so we assumed) it holds that $\forall v \in R(w) : R(v) = R(w)$, under normal circumstances $\Diamond A$ presupposes the same as A itself. However, it also can account for the sequence (2a)-(2b), where the presupposition of the embedded clause of (2b) is not a presupposition of its embedding sentence as a whole. The reason is that after the interpretation/update of (2a) there is a world v consistent with what is presupposed in the actual world w in which John used to smoke and in which it is presupposed that John used to smoke. Thus, because from such a world v only worlds are accessible in which John used to smoke, the embedded sentence of (2b) can be interpreted appropriately as well.

The concrete accessibility relation R discussed above illustrates what it means that after the update of R with $\Diamond A$, the A-worlds are the *preferred* ones: although in each $v \in R(w)$ it was the case that both $\Diamond A$ and $\Diamond\neg A$ were true, this is only the case for $\Diamond A$ for all $v \in Upd(\Diamond A, R)(w)$.

In the introduction we noted that Karttunen & Peters' (1979) two-dimensional analysis gives rise to the *binding problem*: if it is assumed that *Sue will come too* presupposes, but

[14] This update rule is defined on the assumption that either $w \notin R(w)$ or w is not an A-world, because otherwise we would falsely predict that after the use of the possibility statement only other A-worlds would be accessible from w. In general we cannot make this assumption, of course. Fortunately, we can use a technical trick to solve this problem. Assume that if $w \in R(w)$ and w is an A-world, we don't go to new pointed model $\langle R', w\rangle$, but rather to the pointed model $\langle R', w^*\rangle$ with a new world w^*. This new world is exactly like w of the original pointed model, except that $w^* \notin R(w^*)$ although $w \in R(w^*)$. Because our technical problem has a simple solution, I will ignore this complication in the main text. (Thanks to Frank Veltman and Henk Zeevat for discussion on this point).

does not entail, that somebody different from Sue will come, it falsely predicts that (1c) can be true although there is no possible world in which anyone besides Sue will come.

(1c) It is *possible* that Mary will come and it is *possible* the Sue will come *too*

Our analysis does not give rise to this false prediction. The reason for this is that, although we have defined update separately from truth, the definitions of truth and appropriateness are closely related: for a possibility statement to be true and appropriate, there has to be an accessible world in which the embedded sentence is *both* true and appropriate. Thus, the logics of truth and appropriateness (or presupposition satisfaction) are not as independent of each other as proposed in Herzberger (1973) and Karttunen & Peters (1979).

Notice that if we take $\Box A$ to be an abbreviation of $\neg\Diamond\neg A$, we predict that A has to be interpreted only in possibilities that satisfy the presupposition of A: $\Box A$ has value $\langle 1,+\rangle$ in $\langle R,w\rangle$ iff $\exists v \in R(w) : [[A]]^{R,v} = \langle\cdot,+\rangle$ and $\forall v \in R(w)$: if $[[A]]^{R,v} = \langle\cdot,+\rangle$, then $[[A]]^{R,v} = \langle 1,+\rangle$. But this means that $\Box(\partial P \wedge A)$ can only be true in $\langle R,w\rangle$ iff either P itself is presupposed and A is true in all accessible worlds, or it is presupposed that P is possible and A is true in all accessible P-worlds.

4 Extending the analysis

4.1 Modal Splitting

Now consider (5).

(5) Either John *stopped* smoking, or he just *started* doing so.

Landman (1985) proposed to account for such examples by assuming that the disjuncts should be interpreted with respect to two mutually exclusive *subordinated contexts*, possibly created by an earlier use of a disjunctive sentence that has *split* the context. Our analysis of possibility statements suggests a straightforward analysis (where $\mathcal{A}$ is a set of formulas and R^A is $\{\langle u,v\rangle \in R : [[A]]^{R,v} = \langle\cdot,+\rangle\}$):

- $$\begin{aligned} [\bigvee \mathcal{A}]]^{R,w} &= \langle\cdot,-\rangle \quad \text{iff} \quad \exists A_i : [[\Diamond A_i]]^{R,w} = \langle\cdot,-\rangle \\ &= \langle 1,+\rangle \quad \text{iff} \quad [[\bigvee \mathcal{A}]]^{R,w} \neq \langle\cdot,-\rangle \text{ and } \exists A_i : [[A_i]]^{R^{A_i},w} = \langle 1,+\rangle \\ &= \langle 0,+\rangle \quad \text{otherwise} \end{aligned}$$
- $Upd(\bigvee \mathcal{A}, R) = \bigcap_j(\Diamond A_j, \bigcup_i Upd(A_i,R))$

Thus, I propose that $A \vee B$ requires both $\Diamond A$ and $\Diamond B$ to be appropriate. As for the case of possibility statements, this means that normally all the presuppositions of the disjuncts are also presuppositions of the whole disjunction. However, when the context is split, this doesn't have to be the case. This accounts for the problematic (5), if we assume that the context was split (perhaps after accommodation of the disjunctive presupposition) between, on the one hand, worlds where John smoked before, and, on the other, worlds where he did not.

Questions give rise to modal subordination too:[15]

(6) Did John used to smoke? and did he *stop* smoking?

Although it is standardly assumed that a polar question gives rise to a partition, with respect to modal subordination there seems to be a difference between the positive and the negative answer: only the positive answer can be picked up to figure as the domain of a later modal. To account for this, we can simply assume that the update of R with the yes/no question A? is the same as the update of R with $\Diamond A$. And this gives rise to the following correct predictions: after question (7a), both (7b) and (7c) are appropriate and do not give rise to presuppositional readings:

(7) a. Did anyone solve the problem?

b. It is possible that *it was* John *who* solved the problem.

c. Either *it was* John *who* solved the problem, or the problem was too difficult.

4.2 Indicative conditionals

Conditionals show modal subordination behavior as well. Example (8a) shows that the antecedent of a conditional might depend on an earlier epistemic modal; (8b) shows that the interpretation of an epistemic modal may depend on a conditional sentence used earlier, while (8c) shows that the interpretation of one conditional can depend on the interpretation of another.

(8) a. I might have been wrong. If I *realize* that I was wrong, I will tell everybody.

b. If John feels bad, he will start smoking. His girlfriend might make him to *stop*.

[15]For a different analysis of modal subordination with questions, see van Rooy (1998).

c. If Mary comes, we'll have a quorum. If Susan comes *too*, we'll have a majority.

I will follow Stalnaker (1976) in assuming that not only subjunctive, but also indicative conditionals should be analyzed in terms of selection functions/similarity relations. I will assume that the selected worlds are such that they satisfy the presupposition of the antecedent. Out of context, the same will be presupposed in the selected worlds, or possibilities, as in the actual possibility. However, the selected possibilities might also depend on an earlier introduced subordinated context. To account for this, I make use of a similarity relation between worlds, $u <_w v$, meaning that u is at least as close to w as v is. To make the selected antecedent-worlds explicitly depend on what is presupposed, I will define a new relation $<_{R,w}$ between worlds that is dependent both on $<_w$ and on what is presupposed in $\langle R, w\rangle$ (where $v \approx_w u$ iff neither $v <_w u$ nor $u <_w v$):

- $v <_{R,w} u$ iff (i) $v <_w u$, or
  (ii) $v \approx_w u$ and $R(u) \subset R(v) \subseteq R(w)$, or
  (iii) $v \approx_w u$ and $R(w) \subseteq R(v) \subset R(w)$

Thus, v is closer to w than u with respect to R iff either u is closer to v, or they are equally close, but what is presupposed in v (with respect to R) is more similar to what is presupposed in w than what is presupposed in u. The set of closest A-worlds to $\langle R, w\rangle$ is the following set:

- $f_{\langle R,w\rangle}(A) = \{v \in W \mid [[A]]^{R,v} = \langle 1, +\rangle \ \& \ \neg\exists u \in W : [[A]]^{R,u} = \langle 1, +\rangle \ \& \ u <_{\langle R,w\rangle} v\}$

A conditional sentence of the form *if A then B* is then counted as true in $\langle R, w\rangle$ iff all the with A updated closest A-worlds to $\langle R, w\rangle$ are B-worlds:

- $[[A > B]]^{R,w} = \langle 1, +\rangle$ iff $f_{\langle R,w\rangle}(A) \subseteq \{v \in W \mid [[B]]^{Upd(A,R),v} = \langle 1, +\rangle\}$

Following Stalnaker's (1976) suggestion that the antecedent of an indicative conditional selects, if possible, worlds compatible with what is presupposed, I will assume that the use of an indicative conditional demands there to be an accessible world in which its antecedent is true and appropriate. That is, if $A > B$ represents an indicative conditional, it can only be appropriate in $\langle R, w\rangle$ iff $[[\Diamond A]]^{R,w} = \langle 1, +\rangle$. Notice that this enables us already to account for sequence (8a).

To account for sequences (8b) and (8c), we have to make sure that conditional sentences themselves make subordinated contexts accessible. In these subordinated contexts, both antecedent and consequent should be true and presupposed. This suggests that we should define the update rule for (indicative) conditionals as follows:

- $Upd(A > B, R) \;=\; \{\langle u,v\rangle \in R: \; [[A > B]]^{R,v} = \langle 1,+\rangle$ and if $[[A \wedge B]]^{R,u} = \langle 1,+\rangle$, then $[[A \wedge B]]^{R,v} = \langle 1,+\rangle\}$

According to this rule, all accessible worlds make the conditional true, and worlds in which both the antecedent and consequent are true only 'see' other such worlds. But this means that a later modal or conditional statement that presupposes what is entailed by the antecedent and/or consequent can now also be interpreted appropriately. This enables us to account for (8b) and (8c) as well.

4.3 Belief and Desire

According to Karttunen (1974), Stalnaker (1988), Heim (1992) and Zeevat (1992), a belief attribution as (9a) presupposes (9b):[16]

(9) a. John believes that Mary *stopped* smoking.

b. John believes that Mary used to smoke.

How can we account for this in our two-dimensional approach? We have assumed that what is presupposed can be represented by a primitive accessibility relation in the model. Suppose that our model contains also the accessibility relation B_j which represents what John believes. If $R(w)$ represents what is presupposed in w, then $R_j(w) = \bigcup\{B_j(v) : v \in R(w)\}$ represents what is presupposed in w about what John believes. Now we can adopt the following combined truth- and appropriateness conditions:

- $$\begin{aligned}[[Bel(j,A)]]^{R,w} &= \langle 1,+\rangle \quad \text{iff} \quad \forall v \in B_j(w) : [[A]]^{R_j,v} = \langle 1,+\rangle \\ &= \langle 0,+\rangle \quad \text{iff} \quad \exists v \in B_j(w) : [[A]]^{R_j,v} = \langle 0,+\rangle \\ &= \langle \cdot,-\rangle \quad \text{otherwise}\end{aligned}$$

This immediately accounts for the non-presuppositional reading of the sequence (9b)-(9a). In particular, we don't have to introduce a new update function for belief attributions.

According to Heim (1992), also desire attributions should be interpreted with respect to what is (presupposed to be) believed. The following discourse seems perfectly acceptable:

(10) a. John believes that Mary used to smoke,

b. but he hopes that she *stopped* doing so.

[16]For disagreement, see Geurts (1998).

But as noted by Asher (1987), Heim (1992), and later by Geurts (1998), desire attributions can be conditional dependent on other desire attributions as well:

(11) a. John wants Mary to come,

b. and he wants Bill to *know* that Mary will come.

Intuitively, this suggests that desire attributions can introduce subordinated contexts and can be interpreted with respect to such contexts as well. How can we account for this? Just as before we took R to be a primitive accessibility relation that cannot be reduced to what the participants of the conversation know or believe, I think that now we have to assume the existence of a primitive accessibility relation R_j that represents what has been explicitly established about what John believes. Thus, in the beginning of the conversation $R_j = W \times W$ and $Upd(Bel(j,A), R_j) = \{\langle u, v\rangle \in R_j : [[A]]^{R_j,v} = \langle 1, +\rangle\}$.

I will assume for simplicity the following analysis of desire attributions $Des(j, A)$ is true in w iff all the A-worlds in $B_j(w)$ are preferred to the $\neg A$-worlds in $B_j(w)$.[17] Taking also presupposition satisfaction into account, we define as follows (where $X > Y$ iff $\forall x \in X : \forall y \in Y : x > y$):

- $$\begin{aligned} [[Des(j,A)]]^{R,w} &= \langle \cdot, -\rangle \quad \text{iff} \quad [[\Diamond A]]^{R_j,w} = \langle \cdot, -\rangle \\ &= \langle 1, +\rangle \quad \text{iff} \quad [[\Diamond A]]^{R_j,w} = \langle 1, +\rangle \text{ and} \\ &\quad \{v \in B_j(w) : [[A]]^{R_j,v} = \langle 1, +\rangle\} > \{u \in B_j(w) : [[A]]^{R_j,u} = \langle 0, +\rangle\} \\ &= \langle 0, +\rangle \quad \text{otherwise} \end{aligned}$$
- $Upd(Des(j,A), R) \quad = \quad \{\langle u, v\rangle \in R \mid [[Des(j,A)]]^{R,v} = \langle 1, +\rangle\}$
- $Upd(Des(j,A), R_j) \quad = \quad \{\langle u, v\rangle \in R_j \mid \text{if } [[A]]^{R,u} = \langle 1, +\rangle, \text{ then } [[A]]^{R,v} = \langle 1, +\rangle\}$

The truth condition basically says that the embedded sentence should be interpreted with respect to all worlds in $B_j(w)$ in which this sentence can be interpreted appropriately. It also demands that if A presupposes P, the desire attribution is predicted to be appropriate if either P is presupposed to be believed by the agent, or P is presupposed to be desired. The update rules are similar to what we have discussed above: the first one just demands that the desire attribution has to be true, while the second turns the A-worlds in $R_j(w)$ into the preferred ones.

[17] For a more serious discussion of the interpretation of desire attributions, see Van Rooy (1999).

4.4 Subjunctive mood and negative sentences

In section 3 we saw already that certain examples of modal subordination involving subjunctives are unproblematic for our account. Our analysis of possibility operators and their duals in section 3.1 immediately gives the desired reading for a sequence as (3a):

(3a) A thief *might* break into the house. He *would* take the silver.

But now consider the following example:

(12) I don't smoke. I (also) *would*n't be able to *stop*.

This example is more problematic than (3a) because now there is no modal operator in the first sentence of the sequence that has a non-global effect on the accessibility relation. To account for this example one might propose, again, to accommodate the presupposition locally within the scope of the subjunctive modal. I would like to suggest, however, that also here that we don't need to do so, once we represent what is presupposed by an accessibility relation.

The first idea that comes to mind to account for examples like (12) is to propose that *negative* sentences have an effect similar to that of modals. But it is not straightforward to work out this suggestion, because the worlds that verify the negated clause are not accessible anymore after the interpretation of the first sentence.[18] In this section I would like to suggest tentatively some somewhat different solutions for such examples.

A first proposal would be to assume that the modal in the second sentence is interpreted with respect to an accessibility relation that is determined by taking the complement of the original accessibility relation with respect to which the whole of (12) is interpreted minus the relation resulting from the interpretation of the first sentence of the sequence. Let t be the moment in time at which the second sentence should be interpreted. Then we can define R^{t*} as $\{\langle u, v\rangle \in R^{t-1} | u, v \notin Range(R^t)\}$. Thus, R^{t*} consists of the arrows between worlds in the previous information state, R^{t-1}, that were eliminated by the last assertion. In terms of this accessibility relation, we can analyze the subjunctive mood as follows:

- $[[\text{Would } A]]^{R^t,w} = \langle 1, +\rangle$ iff $\exists v \in R^{t*}(w) : [[A]]^{R^{t*},v} = \langle\cdot, +\rangle$ and $\forall v \in R^{t*}(w) : \text{if } [[A]]^{R^{t*},v} = \langle\cdot, +\rangle, \text{ then } [[A]]^{R^{t*},v} = \langle 1, +\rangle$

[18] Nevertheless, in the original version of this paper I gave such a non-straightforward analysis. A comment of the reviewer made me see that this solution was more problematic than I realized before.

Notice that according to this interpretation rule of a subjunctive modal, the second conjunct of a formula like $\neg A \wedge \text{Would}\ (\partial A \wedge B)$ is predicted to be true with respect to accessibility relation R if all accessible A-worlds are also B-worlds. In particular, we can now account for the sequence (12) without making use of local accommodation.

Still, I don't think this proposal is unproblematic. The most problematic aspect, I believe, is the fact that the suggested analysis can't explain the contrast between positive and negative sentences: why can subjunctive modals only 'pick up' *negated* sentences?

As discussed by Horn (1989), among others, there exists a crucial distinction between the contexts in which positive and in which negative sentences can be used appropriately: in contrast to their positive counterparts, negative sentences require a context in which the truth of the positive sentence is expected, or at least very salient. One way of being salient is to be the *topic* of conversation: a question to be addressed. Geurts (1995) suggested tentatively that this might be the reason why sequences as (12) are appropriate. I think that this is indeed a good suggestion. We have seen in section 4.1 what the dynamic effect is of a (positive polar) question: the worlds in which the positive sentence is true become to be preferred to worlds where it is false. A subsequently used modal expression can then be interpreted with respect to these most preferred worlds. This can't be the whole story, of course, because after the first sentence of (12) these most preferred worlds are eliminated. So, if t is the moment in time at which the second sentence should be interpreted, the relevant accessibility relation should not be R^t, but rather R^{t-1}, i.e., the context of interpretation for the first sentence of (12). I think that this suggestion is a natural one, especially given the fact that *would* is a past-tense modal. If this first sentence presupposes that the topic of conversation is whether I smoke, the most preferred worlds in $R^{t-1}(w)$ are all worlds where I smoke, and the second sentence of (12) can be interpreted appropriately.

5 Indefinites and pronouns

Although we have discussed Karttunen & Peters's (1979) *binding problem* already with respect to possibility statements, the most famous problematic example involves indefinites: their false prediction that the individual that satisfies the presupposition of a sentence like *Someone managed to succeed George V on the throne of England* need not be the one who actually succeeded George V. In this section I will show that this problem will not arise in our framework if we extend it to the predicate-logical case. However, the main goal of this section is to indicate how we can account for modal subordination phenomena that involve anaphoric dependencies across the sentential boundary.

To take indefinites and pronouns into account, we have to make our accessibility relation one between more fine-grained possibilities. In contrast to standard dynamic semantics, I assume that pronouns are (normally) used referentially, referring back to the speaker's reference of its antecedent indefinite. Such a speaker's reference of (an occurrence of) an indefinite depends on the *referential intentions* the speaker has. This kind of information should be represented already in a possibility (actual and non-actual). But this means that these possibilities have to contain more information than the world-assignment pairs as standardly assumed in dynamic semantics. A clause with an occurrence of an indefinite is represented by $\exists x_r A$, where r is a reference function. Let us assume that the set of possibilities I is a set of functions from (i) n-ary predicates to their interpretations; (ii) variables to individuals; and (iii) reference functions to individuals. If $\exists x_r A$ is interpreted in possibility i, then $i(r)$ is the speaker's reference of the occurrence of the indefinite in i, and the dynamic effect will be that from now on x will be assigned to $i(r)$ in i, i.e. $i(x) = i(r)$. Let us define $R[^x/_r]$ as $\{\langle i[^x/_{i(r)}], j[^x/_{j(r)}]\rangle : \langle i,j\rangle \in R\}$, and $R[^x/_d]$ as $\{\langle i[^x/_d], j[^x/_d]\rangle : \langle i,j\rangle \in R\}$. Now we define the update of $\langle R,a\rangle$ with $\exists x_r A$ as follows (where a is the actual possibility):

$$Upd(\exists x_r A, \langle R,a\rangle) \quad = \quad \langle\{\langle i,j\rangle \in R[^x/_r] : [[A]]^{R[^x/_{j(r)}],j} = \langle 1,+\rangle\}, a[^x/_{a(r)}]\rangle$$

Thus, in the actual possibility, the speaker's reference of the indefinite is introduced (although this need not be an individual that makes the sentence true). Also in each possibility that is compatible with what is presupposed the speaker's reference of the indefinite in that possibility is introduced, though they are supposed to verify the sentence.

The (rigid) *truth* and *presupposition satisfaction conditions* of the new clauses are given below (where $\vec{x}$ is an n-ary sequence)):

- $[[P\vec{x}]]^{R,i} = \langle 1/(0),+\rangle$ iff $i(\vec{x}) \in i(P)$ (or $i(\vec{x}) \notin i(P)$) and $i(\vec{x})$ is defined
- $[[\exists x_r A]]^{R,i} = \langle 1,+\rangle$ iff $[[A]]^{R[^x/_{i(r)}],i[^x/_{i(r)}]} = \langle 1,+\rangle$

Notice that the above rules say that $\exists x_r P(x)$ is rigidly true in $\langle R,a\rangle$ if and only if the speaker's referent of the indefinite in a has property P in this world/possibility. Existential sentences, however, don't seem to have such strong truth conditions. As argued for in van Rooy (2001), although speaker's reference is crucial for the analysis of pronouns, it doesn't seem to influence the truth or falsity of the clause in which the indefinite occurs. To account for this, I will follow the same procedure as I proposed in van Rooy (2001), and define the *semantic* notion of truth as an *abstraction* of the more pragmatic notion of rigid truth where speaker's reference is crucial for the interpretation of indefinites. Let us say that $j \approx i$ iff j is a possibility just like i, except that j might assign different individuals to reference functions than i does. Now I define the notion of truth (and presuppositional appropriateness) of sentence A in possibility $\langle R, a\rangle$ in terms of this notion as follows:

- $R, a \models^{+} A$ iff $\exists a' \approx a : [[A]]^{R,a'} = \langle 1, +\rangle$

Now it follows that $R, a \models^{+} \exists x_r Px$ iff $\exists d \in D : [[Px]]^{R[^x/_d],a[^x/_d]} = \langle 1, +\rangle$. But this means that the sentence is true in a just in case there is an individual that has property P in this world, just as expected.

In van Rooy (2001), I argued that the notion of speaker's referent is important for at least two reasons. First, to account for the phenomenon of pronominal contradiction: although speaker's reference has no truth conditional effect on the interpretation of indefinites, it does for the interpretation of *pronouns*. Second, to understand what a discourse referent used in dynamic semantics really represents: a discourse referent represents what is presupposed about *the* actual speaker's referent. I will not discuss these arguments any further here. However, in one sense the present implementation of the second intuition is much more appealing than the one I have given in van Rooy (2001): it's accounted for now in terms of standard set theory making use of a standard way to model propositional attitudes, i.e. an accessibility relation.

The *binding problem* of Karttunen & Peters' (1979), involving indefinites, was due to the fact that they *represented* presupposition and assertion separately. Our analysis, instead, only *interprets* them at different dimensions. We represent their problematic sentence abstractly as follows: $\exists x_r[\partial Px \wedge Qx]$. An easy calculation shows that this formula is predicted to be true and appropriate in $\langle R, a\rangle$, $R, a \models^{+} \exists x_r[\partial Px \wedge Qx]$, just in case $\exists d \in D : \forall i \in R(a) : [[Px]]^{R[^x/_d],i[^x/_d]} = \langle 1, +\rangle$ & $[[Qx]]^{R[^x/_d],a[^x/_d]} = \langle 1, +\rangle$. Thus, it is required that the same individual has to satisfy both the presuppositional part and the assertive part: the binding problem does not occur. This prediction is independent of our assumption that indefinites come with speaker's referents.

How does our analysis of indefinites and pronouns account for anaphoric dependencies across modal statements? Consider the classical sequence of Roberts (1989):

(13) a. A wolf *may* come in. It *would* eat you first.

b. $\Diamond\exists x_r[Wx \wedge Cx] \wedge \Box Ex$

Notice that $[[\Diamond\exists x_r[Wx \wedge Cx] \wedge \Box Ex]]^{R,a} = \langle 1, +\rangle$ iff $[[\Diamond\exists x_r[Wx \wedge Cx]]]^{R,a} = \langle 1, +\rangle$ and $[[\Box Ex]]^{R',a'} = \langle 1, +\rangle$, where $\langle R', a'\rangle = Upd(\Diamond\exists x_r[Wx \wedge Cx], \langle R, a\rangle)$. The first conjunct is true iff $\exists i \in R(a) : i(r) \in i(W) \cap i(C)$. The update of $\langle R, a\rangle$ with the first conjunct results in $\{\langle j,i\rangle \in R[^x/_r] : i(r) \in i(W) \cap i(C)\} \cup \{\langle j,i\rangle \in R : \neg\exists d \in D : d \in i(W) \cap i(C)\}$.[19] If we then only look at possibilities $i \in R'(a)$ where $i(x)$ is defined, the second conjunct is predicted to be true iff $\forall i \in R(a) : \forall d \in D$: if $d \in i(W) \cap i(C)$, then $d \in i(E)$. Thus the second conjunct says that in every possibility where there is a wolf who comes in, it eats you first. I believe that this is the correct reading for the second sentence of (13a).

In section 3.2 we followed Landman's *modal splitting* analysis of disjunctive sentences. Intuitively, such an analysis must be able to predict that (14a) really means (14b).

(14) a. Call this number. The phone will be answered by either a doctor or a secretary. The doctor can tell you right away what's a matter with you, or the nurse can make an appointment for you.

b. Either a doctor will answer and he can tell you what is wrong, or a secretary will answer and she can make an appointment.

Let us assume that $Upd(A \vee B, \langle R,a\rangle) = Upd(A, \langle R,a\rangle) \sqcup Upd(B, \langle R,a\rangle)$, where $\langle R,a\rangle \sqcup \langle R',a'\rangle = \langle R \cup R', a \cup a'\rangle$.[20] If we now represent (14a) as something like $(\exists x_r A \vee \exists y_s B) \wedge (Px \vee Qy)$, this is indeed what we predict. The new possibility will be $\langle Upd(A, R[^x/_r]) \cup Upd(B, R[^y/_s]), a[^x/_{a(r)}, ^y/_{a(s)}]$. Because of the definedness condition, we correctly predict that the first disjunct of the second disjunction will be regarded as a continuation of the first disjunct of the first disjunction, and similarly for the second disjuncts.

6 Conclusion

In this paper I have proposed a modal two-dimensional analysis of presupposition and modal subordination. For the analysis of presupposition I combined the strong points of the standard dynamic analysis and the two-dimensional one: what is presupposed by a sentence follows from the interpretation rules, and presupposition satisfaction is determined (almost) independently from truth. For the analysis of modal subordination I proposed that the embedded clauses of modal statements should be interpreted with respect to possibilities that verify what is presupposed. Roberts (1989, 1996) discusses many more phenomena under the heading of 'modal subordination' than I do in this paper. Some of

[19] Based on the assumption that $[[\exists x_r A]]^{R,i} = \langle 0,+\rangle$ only if $\neg\exists j \approx i : [[A]]^{R[^x/_{j(r)}],j[^x/_{j(r)}]} = \langle 1,+\rangle$.

[20] Notice that because we think of worlds as a combined function from (i) propositional variables to truth values; (ii) discourse referents to individuals; and (iii) variables to individuals, the union of two worlds is well-defined. Notice also that after the update of a world with new information, this can have an effect only on the individuals it assigns to variables.

her additional examples, e.g. bathroom sentences, I would definitely interpret in terms of descriptive pronouns instead of as involving modal subordination (cf. van Rooy, 2001). Other examples, however, in particular those where the interpretation of one quantified phrase depends on that of another, are closer to the ones discussed in this paper. It remains to be seen whether, and if so how, we should extend our analysis to cover these examples as well.

References

[1] Asher, N. (1987), "A typology of attitude verbs and their anaphoric properties", *Linguistics and Philosophy*, **10**: 127-189.

[2] Beaver, D. (1995), *Presupposition and Assertion in Dynamic Semantics*, Ph.D. dissertation, CCS, Edinburgh.

[3] Fernando, T. (1995), "Are context change potentials functions?", In: H. Kamp and B. Partee (eds.), *Contexts in the Analysis of Linguistic Meaning*, Stuttgart/Prague.

[4] Frank, A. (1997), *Context Dependence in Modal Constructions*, Ph.D. dissertation, University of Stuttgart.

[5] Gerbrandy, J. (1999), *Bisimulations on Planet Kripke*, Ph.D. Dissertation, University of Amsterdam.

[6] Geurts, B. (1995), *Presupposing*, Ph.D. Dissertation, University of Stuttgart.

[7] Geurts, B. (1998), "Presuppositions and anaphors in attitude contexts", *Linguistics and Philosophy*, **21**: 545-601.

[8] Heim, I. (1982), *The Semantics of Definite and Indefinite Noun Phrases*, Ph.D. dissertation, University of Massachusetts, Amherst.

[9] Heim, I. (1983), "On the projection problem for presuppositions", In: M. Barlow et al. (eds.), *West Coast Conference on Formal Linguistics*, pp. 114-123.

[10] Heim, I. (1992), "Presupposition projection and the semantics of attitude verbs", *Journal of Semantics*, **9**: 183-221.

[11] Herzberger, H. (1973),"Dimensions of truth", *Journal of Philosophical Logic*, **2**, 535-556.

[12] Horn, L. (1989), *A Natural History of Negation*, University of Chicago Press, Chicago.

[13] Kamp, H. (1981), "A theory of truth and semantic representation", In: J. Groenendijk et al. (eds), *Formal Methods in the Study of Language*, Amsterdam, pp. 277-322.

[14] Karttunen, L. (1974), "Presuppositions and linguistic context", *Theoretical Linguistics*, **1**: 181-194.

[15] Karttunen, L. and S. Peters (1979), "Conventional implicature", In: C.-K. Oh and D. Dinneen (eds.), *Syntax and Semantics, Presupposition*, Vol. 11, Academic Press, New York, pp. 1-56.

[16] Kaufmann, S. (1997), 'What's at stack in discourse', In: P. Dekker et al. (eds.), *Proceedings of the the 11th Amsterdam Colloquium*, ILLC, Amsterdam, pp. 187-192.

[17] Kibble, R. (1994), "Dynamics of epistemic modality and anaphora", In: H. Bunt et al. (eds.), *International Workshop on Computational Semantics*, pp. 121-130.

[18] Kratzer, A. (1991), "The notional category of modality", In: J. Eikmeyer & H. Rieser (eds.), *Words, Worlds, and Contexts*, Berlin, pp. 38-74.

[19] Landman, A. (1986a), *Towards a Theory of Information*, Ph.D. dissertation, University of Amsterdam.

[20] Landman, A. (1986b), "Conflicting presuppositions and modal subordination", In: *Papers from the 22nd Regional Meeting, Chicago Linguistic Society*, pp. 195-207.

[21] Roberts, C. (1989), "Modal subordination and pronominal anaphora in discourse", *Linguistics and Philosophy*, **12**: 683-721.

[22] Roberts, C. (1996), "Anaphora in intensional contexts", In: S. Lappin (ed.), *Handbook of Contemporary Semantics*, Blackwell, pp. 215-246.

[23] Rooy, R. van (1998), "Modal subordination in questions", In: J. Hulstijn & A. Nijholt (eds.), *Twendial '98*, pp. 237-248.

[24] Rooy, R. van (1999), "Some analyses of pro-attitudes", In: H. de Swart (ed.), *Logic, Game theory and Social choice*, Tilburg University Press, Tilburg, pp. 534-548.

[25] Rooy, R. van (2001), "Exhaustivity in dynamic semantics; Referential and Descriptive Pronouns", *Linguistics and Philosophy*, **24**: 621-657.

[26] Sandt, R. van der (1992), "Presupposition projection as anaphora resolution", *Journal of Semantics*, **9**: 223-267.

[27] Soames, S. (1989), "Presupposition", In: D. Gabbay & F. Guenthner (eds.), *Handbook of Philosophical Logic, Volume IV*, pp. 553-616. D. Reidel, Dordrecht.

[28] Stalnaker, R. (1974), "Pragmatic presupposition", In: Munitz and Unger (eds.), *Semantics and Philosophy*, NYP, pp. 197-213.

[29] Stalnaker, R. (1976), "Indicative conditionals", In: A. Kasher (ed.), *Language in Focus*, Reidel, Dordrecht, pp. 179-196.

[30] Stalnaker, R. (1988), "Belief attribution and context", In: R. Grimm and D. Merrill (eds.), *Contents of Thought*, Tuscon, University of Arizona Press, pp. 140-156.

[31] Stalnaker, R. (2002), "Common ground", *Linguistics and Philosophy*, **25**: 701-721.

[32] Veltman, F. (1996), "Defaults in Update semantics", *Journal of Philosophical Logic* **25**: 221-261.

[33] Zeevat, H. (1992), "Presupposition and accommodation in update semantics", *Journal of Semantics* **9**: 379-412.

PAST TENSE MARKING IN AFRIKAANS*

Manfred Sailer
Universität Tübingen, Sonderforschungsbereich 441

sailer@sfs.uni-tuebingen.de

Abstract

The system of past tense marking in Afrikaans provides empirical evidence for the need for scope underspecification and multiple exponency of semantic operators within the system of compositional semantics. *Lexical Resource Semantics* (LRS, Richter and Sailer 2003) has incorporated these two features, allowing for a straightforward account of the data.

1 Introduction

Since Montague (1974) the Fregian concept of *compositionality* has been subject to a particular technical incarnation (Partee 1984). In particular it is assumed that the meaning of a lexical element can be stated as an expression of a formal language, and consequently the meaning of a syntactically complex structure results from applying combinatorial operations (such as functional application) to the meaning of the parts of this structure. These assumptions have led to the development of theories of the syntax-semantics interface such as *Transparent Logical Form* (Stechow 1993). On the other hand these strong assumptions require the syntactic structure to contain many nodes which are not motivated by syntax proper. In particular, for semantically ambiguous sentences a different syntactic representation is assumed for each reading. This consequence was the reason to reject the "naive" concept of compositionality within a number of theories such as *Lexical Function Grammar* or *Head-Driven Phrase Structure Grammar*. Instead, Halvorsen (1995) has coined the notion of *systematic* semantics to capture the idea that even though the interpretation of syntactic structures is not "compositional" in the above-mentioned sense, syntax and semantics are still systematically related to each other.

In this paper we will present empirical evidence for phenomena which are hard to account for within a traditional compositional system. We will argue that the system of past tense marking in Afrikaans can best be described in terms of scope underspecification and multiple exponency of semantic operators. Scope underspecification has become a widely discussed issue in computational semantics (Reyle 1993, Pinkal 1996). Multiple exponency, on the other hand, has not been in focus so far.[1]

In the following we will discuss the interpretation of Afrikaans sentences such as in (1) which contains two morphological past markings: the verb *wou*, and the complex *gekoop het*.

(1)	Jan wou	die boek gekoop	het.	
	Jan wanted.IMP	the book bought.PART	AUX	

*For comments and discussion I would like to thank Gerald Penn, Monika Rathert, Ede Zimmermann two anonymous reviewers and the audience of SuB8. Thanks to Guthrun Love for her help with the English.

[1] Another phenomenon, semantic discontinuity, is one of the major motivations for the assumption of a phonologically empty negative head in German in Penka and von Stechow (2001).

As discussed in the literature (de Villiers 1971, Ponelis 1979, Donaldson 1993, Kleij 1999), sentences of the type illustrated in (1) are systematically ambiguous in Afrikaans In (2) we will indicate the three possible temporal readings,[2] first by an English translation and then by a logical term. In the latter, we use the operator "ˆ" to indicate intensional contexts, and the operator "PAST" to indicate a semantic past tense. In Section 2 we will adopt a more elaborate semantic representation of tense based on Stechow (2002).

(2) a. Jan wanted to have bought the book.
PAST(Jan wants ˆPAST(Jan buys the book))
b. Jan wants to have bought the book.
Jan wants ˆPAST(Jan buys the book)
c. Jan wanted to buy the book.
PAST(Jan wants ˆ(Jan buys the book))

In Section 2 we will introduce some basics of Afrikaans verbal morphology and discuss the temporal value of the past tense forms in simple sentences, and in Section 3 we will discuss some more complex examples. Then we will present the semantic system LRS (*Lexical Resource Semantics*, Richter and Sailer 2001a, 2003) and apply it to simple sentences. In Section 5 we will illustrate the resulting analysis for sentence (1). We will close with a conclusion in Section 6.

2 Basic Data

In this section we will present basic facts about the Afrikaans temporal system. First the inventory of forms will be described (Section 2.1), then we will discuss the temporal interpretation of clauses which contain at most one marker of anteriority in Section 2.2.

2.1 Afrikaans Verbal Morphology

In comparison to the verbal systems of related languages such as Dutch or English, Afrikaans verbal morphology is relatively simple. We will outline this system using a simplification of the terminology from de Villiers (1971).

The copula *wees* (*be*) is the only verb which has a morphological inventory similar to that of related languages.[3] The form *wees* is an infinitive. There is a finite *presens* (present tense) form *is* and a finite *imperfek* (past tense) form *was*. In addition there is a past participle *gewees*. The past participle can combine with either finite forms of the copula (i.e., *is* or *was*) or with the auxiliary verb *het* to form a so called *perfek* (perfect tense). Note that while the combinations *gewees is* and *gewees was* are necessarily finite, *gewees het* can also be used in infinitival contexts.[4]

(3) En inflasie ... sou sekerlik laer kon gewees het, as ...
and inflation would surely lower could been.PART AUX if
'and inflation could certainly have been lower if ... '

[2]In addition to the past tense use, *wou* and *gekoop het* can also be irrealis. Thus we may obtain the readings *Jan would love to have bought the book*, and *Jan would love to buy the book*. We will ignore these irrealis readings throughout this paper.

[3]The verb *hê* (*have*) has almost as many forms as *wees* in formal registers. We will, however, ignore this verb throughout the paper.

[4]Found at: `http://www.accountancysa.org.za/archives/2002jan/columns/wik.htm`

In contrast to this morphological richness, the majority of verbs such as *koop* (*buy*) in (1) have just two forms: a base form, e.g. *koop*, and a past participle, e.g. *gekoop*. The base form is used as a finite verb to form the *presens*. The base form is also used as a bare infinitive, for example as a complement of the verb *wil* (*want*). The participle is used to form the *perfek* when combined with the auxiliary *het*. Like the form *gewees het*, the *perfek gekoop het* can be both finite or infinite. For verbs like *koop* there is no *imperfek* form.

A small group of verbs, such as *wil* (*want*) or *kan* (*can*) have a base form which is used as bare infinitive and as *presens* form. Instead of a past participle, however, these verbs have a morphologically simple *imperfek* (imperfect tense): *wou* (*wanted.IMP*), *kon* (*could.IMP*). The *imperfek* forms also occur as bare infinitives such as in (4).[5]

(4) Ek het niks oorgehad om te kon deel nie
I AUX nothing left over for to could.IMP share NEG
'I didn't have anything left over to be able to share.'

The auxiliary *het* can be used in finite and infinitival contexts (see (1) for the latter). It lacks a participial form, however. Thus a hypothetical "pluperfect tense" realized morphologically as a "double perfect" such as in Southern German dialects or in Yiddish (see (5-a)) cannot be formed in Afrikaans.

(5) a. Yiddish: ikh hob aykh gehat gevarnt ir zolt nit geyn.
I have you.PL had.PART warned.PART you.PL ought not go.INF
'I had warned you (formal) not to go.' (Katz 1987, p.,138)

b. Afrikaans: ek het u gewaarsku *het/ *gehad
I AUX you (formal) warned.PART AUX/ have.PART

2.2 The Interpretation of Tense in Simple Clauses

The way in which Afrikaans makes use of its morphological potential is intriguing. For the purpose of this paper we will confine ourselves to outlining a number of central phenomena. The method of past tense marking differs according to the verb (*wees*, *koop*, *wil*). We will first consider the use of finite *presens* forms in Section 2.2.1. Then we will discuss properties of finite uses of the *perfek* (Section 2.2.2) and of the finite *imperfek* (Section 2.2.3).

2.2.1 *Presens* in Simple Clauses

The terminology introduced above suggests that *perfek* and *imperfek* would be the tenses used to indicate anteriority. In Afrikaans, however, a *presens* can also be used for this purpose if there is another indication of anteriority in the context. This is illustrated in (6) (quoted from de Villiers 1971, p. 47).

(6) a. Hy het dadelik huis toe gestap.
he AUX really house towards stepped.PART
'He really stepped towards his house.'

[5] For the sake of simplicity, we will assume that the forms *wil* and *wou* can be past participles since the combinations *het wil/wou koop* are possible. In a syntactically more adequate system these forms might possibly count as *Ersatzinfinitiv* since bare infi nitives are used in German and Dutch instead of a past participle in similar contexts (see Robbers 1993).
Example (4) is taken from: `http://home.global.co.za/~gfjh7up/s_mug05.htm`

b. Toe stap hy dadelik huis toe.
Then goes he really house towards
'Then, he really stepped towards his house.'

c. Verlede week stap hy huis toe, en daar sien hy sy buurman ...
last week steps he house towards and there sees he his neighbor ...
'Last week, he stepped towards his house and there he saw his neighbor ... '

Parallel data can be given for verbs with an *imperfek* form. Note that except for the case illustrated in (a), either the *presens* or the *imperfek* can be used.

(7) a. Hy wou huis toe stap.
he wanted.IMP house towards step

b. Toe wou/ wil hy huis toe stap.
then wanted.IMP/ wants.PRES he house towards step

c. Verlede week wou/ wil hy huis toe stap ...
last week wanted.IMP/ wants.PRES he house towards step ...

This indicates that the *presens* form does not make explicit reference to the speech time as part of its meaning. Instead, it can require overlap with any contextually given time. We will use the notation in (8-b) for the logical forms of a verb in *presens*.

(8) a. Jan bel.
Jan calls.PRES 'Jan calls.'

b. $\exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e, j))$

We will take s^* to be the contextually given speech time. In accordance with Stechow (2002) we will write $\tau(e)$ for the time of the event. This time overlaps ("$\odot$") with the speech time.

We will also specify the logical form of the verb *wil* (*want*) in (9-b). This specification should be regarded as an outline which contains the necessary ingredients for our analysis rather than a fully fledged semantic analysis.

(9) a. Jan wil bel.
Jan want call 'Jan wants to call.'

b. $\exists s(s \odot s^* \wedge \mathsf{want}'(s, j, {}^\wedge\exists s^*(s^* \approx s \wedge \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e, j)))))$

The verb *wil* denotes a state. States are assumed to be true or false of times. Therefore the verb *wil* introduces a time, s, which appears as a temporal argument of the constant want'. In the *presens*, Jan's desire to call is true of a time s which overlaps with the speech time s^*. In addition what Jan wants is a proposition. This proposition is an intensional object — indicated by the "up" operator. Within the proposition a new "speech time" s^* is introduced. This new s^* is said to correspond to the time of Jan's wanting ($s^* \approx s$).[6] The rest of the logical form is identical to the logical form of the *presens* example in (8).

Note that the base form *bel* is interpreted in the same way whether it is used as a finite verb or as an infinitive under our analysis. In the latter case, however, s^* is not the matrix speech time but shifted by the intensionality of the verb *wil*.

[6]As noted in Katz (2001), in such contexts the embedded event is usually interpreted as occurring after the matrix time. A simple solution would be to incorporate this shifting into the restrictions on the embedded speech time. To keep our logical forms simple, we will ignore this problem.

2.2.2 *Perfek* as Past

Kleij (1999) argues that (in unembedded clauses) the Afrikaans *perfek* is interpreted as semantic past tense, i.e., it corresponds to the Dutch imperfect. In order to remain concise we will present just one of her arguments.

The sentence in (10-a) shows that the *presens* is not only compatible with past tense adverbials, but can also be subject to a future interpretation if modified by *môre* (*tomorrow*). On the other hand, as shown in (b), the *perfek* cannot be subject to a future interpretation of that kind — in contrast to the German *Perfekt* for example. To express the idea of a "future perfect", the future tense auxiliary *sal* must be used (c.f. (c)).

(10) a. Môre sien ek hom.
tomorrow see.PRES I him 'I'll see him tomorrow.'

b. * Môre het ek hom gesien (en dan sal ek alles vir jou vertel).
tomorrow AUX I him seen.PART and then will I everything to you tell

c. Môre sal ek hom gesien het ...
tomorrow will I him seen.PART AUX ...

We may conclude that the Afrikaans *perfek* explicitly locates an event before the speech time. In (11-b) we will present the logical form of a *perfek* sentence.

(11) a. Jan het gebel.
Jan AUX called.PART 'Jan called.'

b. $\exists t(t < s^* \wedge \exists e(\tau(e) \odot t \wedge \mathsf{call}'(e, j)))$

The *perfek* introduces a new time t which is explicitly located before s^*. This assumption immediately explains the ungrammaticality of (10-b). The adverb *môre* requires the event to follow s^*, whereas the temporal meaning specifies anteriority to s^*.

In contrast to the semantic effect of the adverbial *môre* we assume that, analogously to the logical form of *wil* in (9-b), the future auxiliary *sal* in (10-c) introduces a new s^*, which has been shifted . The use of the (infinite form of the) *perfek* is now unproblematic, because the time introduced by the *perfek* precedes this new s^*. Note that we can assume the same temporal interpretation for the finite and the infinite uses of *het*.

2.2.3 *Imperfek* as Past

In simple clauses the distribution of the *imperfek* is identical to that of the *perfek*. To illustrate this point, let us consider the parallel data with a future adverb in (12).

(12) a. Môre is Jan tuis.
tomorrow is.PRES Jan home 'Jan will be home tomorrow.'

b. * Môre was Jan tuis.
tomorrow was.IMP Jan home

c. Môre sal Jan tuis gewees het.
tomorrow will Jan home been.PART AUX
'Jan will have been home tomorrow.'

The parallel data lead us to assume the same temporal interpretation for both the *perfek* and the *imperfek*. To illustrate this we will present the logical form for a simple *imperfek* sentence in (13-b). In this logical form s is the state of Jan's being home. This state is said to be true at a time s which overlaps with a time t which precedes s^*.

(13) a. Jan was tuis.
Jan was.IMP home 'Jan was home.'
b. $\exists t(t < s^* \wedge \exists s(s \odot t \wedge \textsf{be-home}'(s, j)))$

We argued in this section that both the *perfek* and the *imperfek* have the same temporal meaning; that of a past operator. This operator introduces a new time which precedes the given time s^*. In contrast to this we analyzed the *presens* as being temporally unmarked. Thus there is no new time introduced and no explicit reference made to s^*. In the following section we will maintain this basic interpretation of the tenses, but we will argue that there is underspecification and multiple exponency in the use of the past operator.

3 The Interpretation of Tense in the Verbal Complex

Given the interpretation of simple tenses we can now reconsider the data in (1). We will demonstrate that these data corroborate three empirical generalizations about tense marking in Afrikaans:

G1 Every verb in *perfek* or *imperfek* introduces a past operator.

G2 The scope of a past tense is not fully determined by the verb which introduces the operator.

G3 The number of *perfek* and *imperfek* verbs determines the upper-bound of the number of past operators in a clause, but not the exact number.

G1 In Section 2 we argued for the existence of a past operator in the logical form of finite *perfek* and *imperfek* forms. For sentence (1) we also observed a reading, (2-a), which expresses two past operators. Thus we have positive evidence that each of the two verb forms, which are potential candidates for introducing a past operator, actually does so.

G2 In (14) we will give a sentence with the *imperfek* form of *wil*, followed by an English translation for each of the possible readings.

(14) Jan wou die boek lees.
Jan wanted.IMP the book read
a. Jan wanted to read the book.
b. Jan wants to have read the book.

We may conclude that in both readings there is a past operator. The ambiguity of sentence (14) is, however, a well-established observation in the description of Afrikaans (de Villiers 1971, Ponelis 1979, Donaldson 1993, Kleij 1999). This means that even though the verb *wou* can be assumed to introduce a past operator, the scope of this operator with respect to the constant $\textsf{want}'$ is not fully determined.

The underspecification of the past operator also goes the other way. If there is an infinite *perfek* or *imperfek*, then there is also a past operator in the logical form. Note that in fact this past operator can have scope over the higher *presens* verb. Therefore the sentences in (14) and (15) have the same readings.

(15) Jan wil die boek gelees het.
Jan wants.PRES the book read.PART AUX
a. Jan wants to have read the book.
b. Jan wanted to read the book.

Kleij (1999) gives the following example from her literary corpus. For clarity we will characterize the intended reading with a simple logical form. Note that *moet* (*must*) is the only verb which is not marked for anteriority in this sentence. Nonetheless it is in the scope of the past operator.

(16) Ek moet los kon rondgeloop het.
I must.PRES freely can.IMP around.walked.PART AUX
'I had to be able to run around freely.'
$\textsc{past}(\mathsf{must}'(\hat{}\mathsf{can}'(i, \hat{}\mathsf{run\text{-}around\text{-}freely}'(i))))$

G3 Note also that there cannot be more past operators in the logical form of a clause than there are *perfek* or *imperfek* verb forms. This means, that sentence (14) cannot express the idea *Jan wanted to have read the book*. If we combine two verbs which are marked for anteriority we can have at most two past operators in the logical form — and, according to **G2**, we must have at least one. Here the example in (1) comes into play. The three generalizations predict exactly the three readings given for (1) above. Also the interpretation of (16) can be accounted for: There is an *imperfek* and a *perfek* verb. Nonetheless there is only one past operator in the logical form. This operator has wider scope than the verbs which introduce it.

It should be noted that the generalizations stand in contradiction to standard assumptions on compositionality: If a *perfek* contributes a past tense operator in (15), it is then unexpected that this operator can have scope over the higher verb *wil* in any of the readings. Furthermore, if there are two past operators contributed to the logical form of (1), then traditional semantic systems would only allow us to derive a reading with two past operators, i.e. the reading in (2-a). There would be no means in such a system to "eliminate" one of these operators.

In the next section we will present a different system for combinatorial semantics which can cope with the empirical facts in a natural way.

4 Lexical Resource Semantics

Lexical Resource Semantics (LRS) was developed as a semantic system for Head-Driven Phrase Structure Grammar (HPSG, Pollard and Sag 1994). An introduction to LRS is given in Richter and Sailer (2003). LRS combines the techniques of underspecified semantics (Reyle 1993, Bos 1996, Pinkal 1996) with the properties of an HPSG grammar to yield a new system for phrasal semantics. Richter and Sailer (2003) also compare the architecture of LRS with that of other semantic systems. LRS has been applied to scope ambiguity (Bouma 2003) and to the analysis of various cases of multiple exponency of semantic operators such as multiple wh-questions in German (Richter and Sailer 2001a) and negative concord in Polish (Richter and Sailer 2001b). In this paper we will use an HPSG-independent notation for LRS which is based on a notation used in a joint enterprise for the implementation of LRS, conducted by Gerald Penn, Frank Richter and the present author.

If we assume a given semantic representation language L, then expressions of LRS are taken from a semantic meta language $\mu(L)$. Every expression of L is in $\mu(L)$. In addition, we assume a set *VAR* of meta variables (written as $A, B, \ldots$). For each $V \in VAR$ and for each n-tuple

$\phi_1, \ldots, \phi_n$ of expressions of $\mu(L)$ which no not contain an occurrence of V, $V[\phi_1, \ldots \phi_n]$ is in $\mu(L)$. Furthermore, all logical connectors of L can be used to combine expressions of $\mu(L)$, but note that quantification and lambda abstraction are only possible over variables from L, not over meta variables. For convenience we will write $\vec{\phi}$ for n-tuples of $\mu(L)$ expressions, and V for $V[\,]$.

Since $\mu(L)$ is a meta language, expressions of $\mu(L)$ denote expressions of L. This denotation is defined with respect to a meta variable assignment function *ASS*, which assigns an expression of L to each element of *VAR* . We will write $[\![\phi]\!]^{ASS}$ for this meta denotation. Expressions of the form $V[\phi_1, \ldots, \phi_n]$ are interpreted as $ASS(V)$ if for each ϕ_i, $[\![\phi_i]\!]^{ASS}$ is a subexpression of $ASS(V)$. Otherwise the denotation is undefined. The denotation of syntactically complex expressions is defined recursively. For example, the denotation of $\phi \wedge \psi$ is the L expression $[\![\phi]\!]^{ASS} \wedge [\![\psi]\!]^{ASS}$.

In the following we will indicate expressions of $\mu(L)$ as the logical forms of sentences. Usually these meta expressions can denote more than one expression of L, depending on the meta variable assignment. Thus we may define a *reading* of an expression from $\mu(L)$ as in (17).

(17) For each $\phi \in \mu(L)$, $\phi_{lf} \in L$, ϕ_{lf} *is a reading* of ϕ, iff there is a meta variable assignment function *ASS* such that

(i) $\phi_{lf} = [\![\phi]\!]^{ASS}$, and

(ii) for each ψ which is a subexpression of ϕ_{lf},
if ψ is a variable or a constant, then ψ is a subexpression of ϕ,
if ψ is of the form $\psi_1 \wedge \psi_2$, then there is a ψ' such that
ψ' is a subexpression of ϕ and has the form $\psi'_1 \wedge \psi'_2$,
where $[\![\psi'_1]\!]^{ASS} = \psi_1$ and $[\![\psi'_2]\!]^{ASS} = \psi_2$,
analogously for the other complex expressions of L.

A reading of a $\mu(L)$ expression ϕ is an interpretation of this expression (clause (i)). This condition guarantees that all the L variables, constants and connectors that occur in ϕ will also be present in the reading ϕ_{lf}. In addition, the second clause imposes an exhaustivity condition on this interpretation: every subexpression of ϕ_{lf} must appear in ϕ, possibly in “disguised” form by the presence of meta variables.

For example the $\mu(L)$ expression $A[\mathsf{call}'(e, j)]$ can denote any L expression which contains $\mathsf{call}'(e, j)$ as a subexpression. However, it has only one *reading*, in which *ASS* assigns $\mathsf{call}'(e, j)$ to the meta variable A. The expression $\exists e(\mathsf{call}'(e, j))$ is an interpretation of $A[\mathsf{call}'(e, j)]$, since $ASS(A)$ contains the subexpression $\mathsf{call}'(e, j)$. Nonetheless, it is not a *reading* of $A[\mathsf{call}'(e, j)]$ because the original $\mu(L)$ expression does not have a subexpression of the form $\exists e(\ldots)$.

In LRS the semantic contribution of linguistic signs will be written as expressions of $\mu(L)$. The logical forms of an utterance are the readings of the meta expression associated with the utterance. The combinatorial system specifies principles of how to combine $\mu(L)$ expressions of daughters to form the semantic contribution of a mother node in a syntactic tree.

In order to specify the combinatorial principles of LRS we will define an *lrs* as a triple of $\mu(L)$ expressions $\langle \phi, \phi_-, \phi_\# \rangle$. In accordance with the terminology of Richter and Sailer (2003) we will call ϕ the *parts structure* of the *lrs*, ϕ_- the *internal content* and $\phi_\#$ the *external content*. In an *lrs*, ϕ_- is a subexpression of ϕ, and there is a meta variable assignment *ASS*, such that (i) $[\![\phi_-]\!]^{ASS}$ is a subexpression of $[\![\phi_\#]\!]^{ASS}$, and (ii) $[\![\phi_\#]\!]^{ASS}$ is a subexpression of $[\![\phi]\!]^{ASS}$. For utterances we even require that the external content ($\phi_\#$) be a *reading* of the parts structure.

We will write the semantic contribution of a word as an *lrs*. For example with the Afrikaans verb *bel* (*call*) we will assume the *lrs* in (18-a). For convenience we will use an abbreviated notation in which we prefix the external content with a # sign and underline the internal content.

This notation is illustrated in (18-b).

(18) a. $\left\langle A[s^*, \exists e(\tau(e) \odot T \wedge B[\mathsf{call}'(e,j)])], \mathsf{call}'(e,j), A \right\rangle$
b. $^{\#}A[s^*, \exists e(\tau(e) \odot T \wedge B[\underline{\mathsf{call}'(e,j)}])]$

An L expression is a *reading of an lrs* $\langle \phi, \phi_-, \phi_\# \rangle$ iff it is a reading of ϕ as defined in (17). Note that the *lrs* in (18-a) has exactly one reading, given in (19) together with the meta variable assignment which is responsible for this reading.

(19) a. $\exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e,j))$
b. $T = s^*$
$A = \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e,j))$
$B = \mathsf{call}'(e,j)$

We can show that (19) is indeed a reading of the parts structure of the *lrs* in (18-a). For the sake of convenience we will write ϕ for this parts structure. The logical form in (19) satisfies the first condition of the definition of a reading, since $[\![\phi]\!]^{ASS} = ASS(A)$. $ASS(A)$ is defined, because both $[\![s^*]\!]^{ASS}$ and $[\![\exists e(\tau(e) \odot T \wedge B[\mathsf{call}'(e,j)])]\!]^{ASS}$ are subexpressions of $ASS(A)$. For the second condition we must check the subexpressions of the logical form in (19-a). Let us consider the case of $\psi = \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e,j))$. There is a ψ', $\psi' = \exists e(\tau(e) \odot T \wedge B[\mathsf{call}'(e,j)])$ which is a subexpression of ϕ. ψ contains the two immediate subexpressions $\psi_1 = e$ and $\psi_2 = \tau(e) \odot s^* \wedge \mathsf{call}'(e,j)$. For ψ' the immediate subexpressions are $\psi'_1 = e$ and $\psi'_2 = \tau(e) \odot T \wedge B[\mathsf{call}'(e,j)]$. As can be seen from the meta variable assignment in (19-b), $[\![\phi'_1]\!]^{ASS} = \phi_1$ and $[\![\phi'_2]\!]^{ASS} = \phi_2$. The other subexpressions of (19-a) can be checked analoguously. Thus the meta variable assignment indicated in (19-b) leads to a reading as defined in (17).

At this point it is not obvious why we use the meta variable T in the *lrs* of *bel*. We will see later that this corresponds to our intuition that the base forms do not directly express temporal location with respect to the speech time.

We will also need the notion of a *constraint lrs*. This is a pair $\langle \lambda, \kappa \rangle$, where λ is an *lrs* and κ is a finite set of constraints of one of the forms: (i) $\phi \lhd V$, where $\phi \in \mu(L)$, and $V \in VAR$ both occurring in λ, or (ii) $\phi = \psi$, where ϕ, ψ both occur in λ. Every constraint *lrs* can be rewritten as a normal *lrs* applying the following algorithm: To eliminate a constraint of the form $\phi \lhd V$, replace each $V[\vec{\psi}]$ in λ with $V[\vec{\psi}, \phi]$. For constraints of the form $\phi = \psi$ we will take a meta variable W which does not occur in λ and replace each occurrence of ϕ and ψ with $W[\phi, \psi]$.

We will use the notion of constraint *lrs* in the *Semantics Principle* (SP). The SP specifies how the semantic contributions of daughters are combined depending on the syntactic structure. In this paper we will only refer to parts of the full SP for LRS.

(20) The *Semantics Principle* (SP):

Let $\langle \phi, \phi_-, \phi_\# \rangle$ be the *lrs* of the head daughter, $\langle \psi, \psi_-, \psi_\# \rangle$ the *lrs* of the nonhead daughter, and V a meta variable which does not occur in either *lrs*,
then the *lrs* of the mother results from eliminating the constraints from

$$\left\langle \left\langle V[\phi, \psi], \phi_-, \phi_\# \right\rangle, \kappa \right\rangle,$$

where κ contains exactly the following constraints:

1. $\phi_\#$ is of the form $\beta[\vec{\phi}]$, and $\psi_\# \lhd \beta$ is in κ,
2. • if the non-head is a raised complement of the head, then $\phi_- = \psi_-$,
   • ...

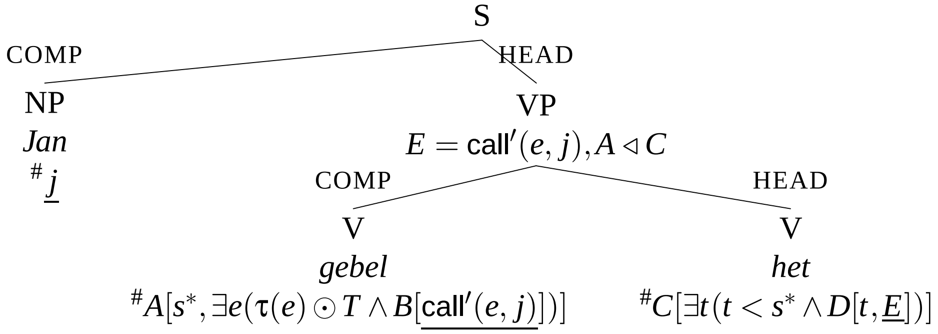


Figure 1: The structure of *(dat) Jan gebel het*

To illustrate the SP we will consider the sentence *(dat) Jan gebel het* (*(that) Jan called*), which is similar to (11-a). Figure 1 shows the syntactic structure.[7] At the leaves we indicate the semantic contribution of the words.[8] Note that we assume that the past participle *gebel* and the base form *bel* have identical meaning contributions.

Given the lexical specifications in Figure 1 we will state the constraint *lrs* which results from applying the SP at the VP level in (21-a). In (b) the constraints are eliminated. The elimination of "$\mathsf{call}'(e,j)=E$" leads to the introduction of a new meta variable, G.

(21) a. $\left\langle F[^{\#}C[\exists t(t<s^*\wedge D[t,\underline{E}])],A[s^*,\exists e(\tau(e)\odot T\wedge B[\mathsf{c}'(e,j)])]],\{A\triangleleft C,\mathsf{c}'(e,j)=E\}\right\rangle$

b. $F[^{\#}C[\exists t(t<s^*\wedge D[t,G[\underline{E},\mathsf{call}'(e.j)]]]),A[s^*,\exists e(\tau(e)\odot T\wedge B[G[\underline{E},\mathsf{call}'(e,j)]]])]],$
$A[s^*,\exists e(\tau(e)\odot T\wedge B[G[\underline{E},\mathsf{call}'(e,j)]]])]]$

At the S node nothing interesting happens semantically because the subject is translated as a semantic constant j. Thus we can continue working with the *lrs* in (21-b). Even though this *lrs* looks rather complicated, there is only one meta assignment, given in (22-a), which provides a reading, the logical form in (b).

(22) a. $T=t$
$A=C=F=\exists t(t<s^*\wedge\exists e(\ldots))$
$B=E=G=\mathsf{call}'(e,j)$
$D=\exists e(\tau(e)\odot t\wedge\mathsf{call}'(e,j))$

b. $\exists t(t<s^*\wedge\exists e(\tau(e)\odot t\wedge\mathsf{call}'(e,j)))$

It can be seen that for the *perfek* sentence the metavariable T is not interpreted as s^* but as t instead, i.e. the event time is located after the speech time. The alternative assignment ($ASS(T)=s^*$) would not result in a reading because under such an assignment $ASS(D)$ could not contain an occurrence of t, thus $ASS(D)$ would be undefined.

A similar analysis applies to the sentence in (23-a). In (b) we indicate the *lrs* of the verb *wil*. As noted in connection with (9-a) the semantic contribution of the base form *bel* is the same in finite and infinite uses.

[7] We will use verb final clauses to avoid issues of V2. We will not discuss details of the Afrikaans verbal complex either (see e.g. Robbers 1993 for an overview), but simply assume a selectional behavior analogous to the standard HPSG analysis of German (Hinrichs and Nakazawa 1994, Kiss 1995, Kathol 2000, Meurers 2000), i.e., that the complements of the auxiliary *het* and the verb *wil* are a verbal word and the complements of this verb.

[8] Note that the constant j already appears in the correct argument position of call' in the semantic contribution of *gebel*. We have adopted the general assumption of HPSG and other lexical grammar formalisms, that the lexical entry of a verb has access to information about the referential indices of its complements (see Halvorsen 1995).

(23) a. (dat) Jan wil bel
that Jan want.PRES call
b. *wil*: $^{\#}F[EXs(s \odot T' \wedge \mathsf{want}'(s, j, \hat{}\exists s^*(s^* \approx s \wedge G[s^*, \underline{H}])))]$

In this paper we are only concerned with verbal complexes. Thus at the phrasal level the SP identifies the internal contents of the head and the nonhead, and places their respective lrs representations within a larger one. Therefore we can ignore the additional meta variables added by the SP, since they will eventually be identical to meta variables which are already present. Taking this into consideration, the meta variable assignment in (24-a) will result in the only possible reading of the sentence, the logical form in (b).

(24) a. $T = s^* \qquad T' = s^*$
$A = G = \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e, j))$
$B = H = \mathsf{call}'(e, j))$
$F = \exists s(s \odot s^* \wedge \mathsf{want}'(s, j, \hat{}\exists s^*(s^* \approx s \wedge \exists e(\ldots))))$
b. $\exists s(s \odot s^* \wedge \mathsf{want}'(s, j, \hat{}\exists s^*(s^* \approx s \wedge \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e, j)))))$

In this section we gave a brief outline of LRS. For clarity we presented a framework neutral version of the theory. In the following section we will address the more complex data of Section 3. We will show that the data follow directly from lexical specifications and from the notion of an LRS reading as defined in (17).

5 Analysis

We will now address the data discussed in Section 3. We will present the lexical LRS specification for the *imperfek* form *wou* and show how the different readings can be derived.

In (25) the LRS specification of the verb *wou* (*want.IMP*) is given. It can be seen that this *lrs* contains both a past operator ($\exists t(t < s^* \wedge \ldots)$) and an intensional operator ($\hat{}\exists s^*(\ldots)$). However, the relative scope of these two operators is not specified. The only information given is that the internal content ($\underline{K}$) must be in the scope of both operators. Due to the semantics principle the internal content of the verb *wou* will be identical to that of its infinite complement.

(25) *wou*: $^{\#}I[\exists t(t < s^* \wedge J[t, \underline{K}]), \exists s(s \odot T' \wedge \mathsf{want}'(s, j, \hat{}\exists s^*(s^* \approx s \wedge L[s^*, \underline{K}])))]$

In (26) we will give a simple sentence which contains the verb *wou*. The syntactic structure is identical to that of sentence (23-a). In (a) and (b) are given the two possible readings of this sentence which correspond to the readings indicated in (14). The respective meta variables assignments follow in (27).

(26) (dat) Jan wou bel
that Jan want.IMP call
a. $\exists t(t < s^* \wedge \exists s(s \odot t \wedge \mathsf{want}'(s, j, \hat{}\exists s^*(s^* \approx s \wedge \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e, j))))))$
b. $\exists s(s \odot s^* \wedge \mathsf{want}'(s, j, \hat{}\exists s^*(s^* \approx s \wedge \exists t(t < s^* \wedge \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e, j))))))$

(27) a. $T = s^* \qquad T' = t$
$A = L = \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e, j))$
$B = K = \mathsf{call}'(e, j)$
$I = \exists t(t < s^* \wedge \exists s(\ldots))$
$J = \exists s(s \odot t \wedge \mathsf{want}'(s, j, \hat{}\exists s^*(\ldots)))$
b. $T = s^* \qquad T' = s^*$

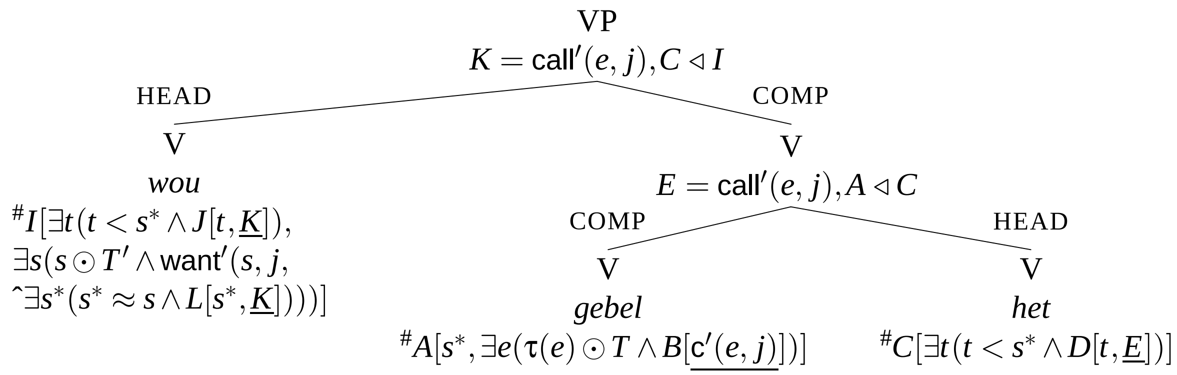


Figure 2: The structure of the verbal complex *wou gebel het*

$A = I = \exists s(s \odot s^* \wedge \text{want}'(s, j, \hat{}\exists s^*(s^* \approx s \wedge \exists t(\ldots))))$
$B = K = \text{call}'(e, j)$
$J = \exists e(\tau(e) \odot t \wedge \text{call}'(e.j))$
$L = \exists t(t < s^* \wedge \exists e(\ldots)$

These meta variable assignments show that we can express generalization **G1** directly in LRS, because we do not need to specify the relative scope of the temporal and the intensional operator in the lexicon.

With the specification of *wou* we can return to the analysis of the data in (1). In (28) a simplified version of the sentence will be given together with the three available readings. Figure 2 shows the syntactic structure of the verbal complex together with the lexical LRS specification at the leaves and the constraints added by the semantics principle. The semantic specifications given for *het* in Figure 1 and for *wou* in (25) both contain a temporal operator. Thus we express the generalization **G2** by lexical specification.

(28) (dat) Jan wou gebel het
that Jan want.IMP call.PART AUX
a. $\exists t(t < s^* \wedge \exists s(s \odot t \wedge \text{w}'(s, j, \hat{}\exists s^*(s^* \approx s \wedge \exists t(t < s^* \wedge \exists e(\tau(e) \odot t \wedge \text{c}'(e, j)))))))$
b. $\exists s(s \odot s^* \wedge \text{w}'(s, j, \hat{}\exists s^*(s^* \approx s \wedge \exists t(t < s^* \wedge \exists e(\tau(e) \odot t \wedge \text{c}'(e, j))))))$
c. $\exists t(t < s^* \wedge \exists s(s \odot t \wedge \text{w}'(s, j, \hat{}\exists s^*(s^* \approx s \wedge \exists e(\tau(e) \odot t \wedge \text{c}'(e, j))))))$

In (29) we indicate the meta variable assignments which determine the respective readings.

(29) a. $T = t \qquad T' = t$
$A = C = L = \exists t(t < s^* \wedge \exists e(\ldots))$
$B = E = K = \text{call}'(e, j)$
$D = \exists e(\tau(e) \odot t \wedge \text{call}'(e, j))$
$I = \exists t(t < s^* \wedge \exists s(\ldots))$
$J = \exists s(s \odot t \wedge \text{want}'(s, j, \hat{}\exists s^*(\ldots)))$
b. $T = t \qquad T' = s^*$
$A = C = L = \exists t(t < s^* \wedge \exists e(\ldots))$
$B = E = K = \text{call}'(e, j)$
$D = J = \exists e(\tau(e) \odot t \wedge \text{call}'(e, j))$
$I = \exists s(s \odot s^* \wedge \text{want}'s, j, \hat{}\exists s^*(\ldots))$
c. $T = s^* \qquad T' = t$
$A = L = \exists e(\tau(e) \odot s^* \wedge \text{call}'(e, j))$
$B = E = K = \text{call}'(e, j)$

$$C = I = \exists t(t < s^* \wedge \exists s(s \odot t \wedge \mathsf{want}'(s, j, \hat{}\exists s^*(\ldots))))$$
$$D = J = \exists s(s \odot t \wedge \mathsf{want}'(s, j, \hat{}\exists s^*(\ldots)))$$

The meta variable assignments in (29) define readings according to the definition in (17). The important property of an LRS reading is that even if a semantic operator appears in the *lrs* of more than one word, it may be that there is only one occurrence of this operator in a given reading. To illustrate this we will consider the past operator in reading (28-b). In the reading, there is a subexpression $\psi = \exists t(t < s^* \wedge \exists e(\tau(e) \odot t \wedge \mathsf{c}'(e, j)))$. In the *lrs* of the sentence, there are two subexpressions which stand in the required relation to ψ: clause (ii) in the definition of a reading is satisfied by both $\psi' = \exists t(t < s^* \wedge J[t, K])$ and $\psi' = \exists t(t < s^* \wedge D[t, E])$. In the definition of a reading in (17) we do not impose a uniqueness requirement on ψ'. This immediately allows for multiple exponency.

It should be noted in addition that it is not possible to derive a reading for (28) which contains three past operators. An LRS reading must consist exclusively of the *L*-subexpressions of a given *lrs*. Since there are only two past operators in the *lrs* of the clause, we cannot construct a reading with three such operators. This shows that the notion of an LRS reading is defined in an adequate way to allow for multiple exponency of semantic operators. This correctly accounts for our generalization **G3**.

Before we can close this section we should reflect on the question of whether we are excluding other non-available readings. In particular logical forms such as outlined in (30), i.e. readings where both past operators have either wide or narrow scope with respect to the intensional operator, would be conceivable.

(30) a. $\textsc{past}(\textsc{past}(\mathsf{want}'(j, \hat{}\mathsf{call}'(j))))$
b. $\mathsf{want}'(j, \hat{}\textsc{past}(\textsc{past}(\mathsf{call}'(j))))$

A “pluperfect” reading of this kind is not available in Afrikaans and correctly excluded by our semantic representations, because the past operator always uses the variable s^* to locate time introduced by the temporal operator.

In this section we demonstrated that the readings of more complex examples follow immediately from the general LRS system and the way in which we specify the lexical contribution of certain verbs.

6 Conclusion

The system of past tense marking in Afrikaans provides empirical evidence for the need for scope underspecification and multiple exponency of semantic operators within the system of compositional semantics. Since LRS has incorporated these two features, it allows for an adequate account of the data.

The Afrikaans data follow directly from the way LRS is constructed together with the lexical specifications for the particular verbs. Interestingly the data considered in this paper did not require further assumptions about the syntax-semantics interface. While we only discussed simple clauses, the present study provides a basis for a more comprehensive account of the Afrikaans temporal system which would include an account of temporal adverbials, and several sequence-of-tense patterns (see de Villiers 1971).

LRS was originally developed as a semantic formalism for HPSG. In the original formulation the notion of an LRS reading followed directly from the HPSG formalization. In contrast to this we had to introduce it explicitly for a framework-independent definition. Nonetheless, we think that defining this notion explicitly is helpful for a better understanding of LRS, and will make the predictions of an LRS theory more transparent.

References

Bos, J.: 1996, Predicate logic unplugged, *in* P. Dekker and M. Stokhof (eds), *Proceedings of the Tenth Amsterdam Colloquium*, ILLC/Department of Philosophy, University of Amsterdam, pp. 133–143.

Bouma, G.: 2003, Verb clusters and the scope of adjuncts in Dutch, *in* P. A. M. Seuren and G. Kempen (eds), *Verb Constructions in German and Dutch*, Benjamins, Amsterdam and Philadelphia.

de Villiers, M.: 1971, *Die grammatika van tyd en modaliteit*, 2nd, revised edn, Balkema, Kaapstad.

Donaldson, B. C.: 1993, *A Grammar of Afrikaans*, Mouton de Gruyter, Berlin and New York.

Halvorsen, P.-K.: 1995, Situation semantics and semantic interpretation in constraint-based grammars, *in* M. Dalrymple, R. M. Kaplan, J. T. I. Maxwell and A. Zaenen (eds), *Formal Issues in Lexical-Functional Grammar*, CSLI and University of Chicago Press, Chicago, pp. 293–309.

Hinrichs, E., Meurers, D. and Nakazawa, T.: 1994, Partial-VP and Split-NP Topicalization in German — An HPSG Analysis and its Implementation, *Arbeitspapiere des SFB 340, Nr. 58*, Universität Stuttgart and Universität Tübingen.

Hinrichs, E. and Nakazawa, T.: 1994, Partial-vp and split-np topicalization in German — an HPSG analysis, In (Hinrichs, Meurers and Nakazawa 1994), pp. 1–46.

Kathol, A.: 2000, *Linear Syntax*, Oxford University Press, Oxford.

Katz, D.: 1987, *Grammar of the Yiddish Language*, Duckworth, London.

Katz, G.: 2001, (A)temporal complements, *in* C. Féry and W. Sternefeld (eds), *Audiatur vox sapientiae: a Festschrift for Arnim von Stechow*, Akademie-Verlag, Berlin, pp. 230–258.

Kiss, T.: 1995, *Merkmale und Representationen. Eine Einführung in die deklarative Grammatikanalyse*, Westdeutscher Verlag, Opladen.

Kleij, S. v. d.: 1999, Tijd en aspect in het werkwoordelijke systeem van het Afrikaans. M.A. thesis, University of Leiden.

Meurers, W. D.: 2000, *Lexical Generalizations in the Syntax of German Non-Finite Constructions*, Phil. dissertation, Eberhard-Karls-Universität Tübingen. Published as: Arbeitspapiere des SFB 340, Nr. 145.
*http://www.sfs.nphil.uni-tuebingen.de/sfb/reports/berichte/145/145-2up.ps

Montague, R.: 1974, English as a formal language, *in* R. H. Thomason (ed.), *Formal Philosophy. Selected Papers of Richard Montague*, Yale University Press, Yale, pp. 188–221.

Partee, B. H.: 1984, 'Compositionality', *in* F. Landman and F. Veltman (eds), *Varieties of Formal Semantics. Proceedings of the Fourth Amsterdam Colloquium, September 1982*, Foris, Dordrecht, pp. 281–311.

Penka, D. and von Stechow, A.: 2001, Negative Indefinta unter Modalverben, *Linguistische Berichte* pp. 263–286.

Pinkal, M.: 1996, Radical underspecification, *in* P. Dekker and M. Stokhof (eds), *Proceedings of the Tenth Amsterdam Colloquium*, ILLC/Department of Philosophy, University of Amsterdam, pp. 587 – 606.

Pollard, C. and Sag, I. A.: 1994, *Head-Driven Phrase Structure Grammar*, University of Chicago Press, Chicago and London.

Ponelis, F. A.: 1979, *Afrikaanse sintaksis*, van Schaik, Johannesburg.

Reyle, U.: 1993, Dealing with ambiguities by underspecification: Construction, representation and deduction, *Journal of Semantics* **10**(2), 123–179.

Richter, F. and Sailer, M.: 2001a, On the left periphery of German finite sentences, *in* W. D. Meurers and T. Kiss (eds), *Constraint-Based Approaches to Germanic Syntax*, CSLI Publications, Stanford, pp. 257–300.

Richter, F. and Sailer, M.: 2001b, Polish negation and Lexical Resource Semantics, *in* G.-J. Kruijff, L. S. Moss and R. T. Oehrle (eds), *Proceedings FG-MOL 2001*, number 53 in *Electronic Notes in Theoretical Computer Science*, Elsevier Science.
*http://www.sfs.uni-tuebingen.de/hpsg/archive/bibliography/papers/rs-polishlrs.ps

Richter, F. and Sailer, M.: 2003, Basic concepts of Lexical Resource Semantics. Lecture notes for the course on *Constraint-based Combinatorial Semantics*, ESSLLI 2003, Vienna.

Robbers, K.: 1993, *Non-finite Verbal Complements in Afrikaans: A Comparative Approach*, number 33 in *HIL Dissertations*, Holland Institute of Generative Linguistics.

Stechow, A. v.: 1993, Die Aufgaben der Syntax, *in* J. Jacobs, A. von Stechow, W. Sternefeld and T. Vennemann (eds), *Syntax. Ein internationales Handbuch zeitgenössischer Forschung*, Vol. 1, Walter de Gruyter, Berlin and New York, pp. 1–88.

Stechow, A. v.: 2002, German *seit* ’since’ and the ambiguity of the German perfect, *in* I. Kaufmann and B. Stiebels (eds), *More than Words. A Festschrift for Dieter Wunderlich*, Akademie-Verlag, Berlin, pp. 393–432.

MANNERS AND CAUSATION

Martin Schäfer,
Universität Leipzig

schaefem@rz.uni-leipzig.de

Abstract

This paper is divided into two parts. In part one I apply a formal method for the establishment of cause-relations between events to cases involving manner modification. In the second part I argue that the status of a manner adverb with regard to its role in a cause-consequence sequent does not play a role for its formal representation at the sentential level. Instead, it influences a sentence's information structure. In turn, this can influence the syntactic position of a manner adverb.

1 Introduction

The manner in which things are done can have a influence on subsequent events. This fact has proofed to be fruitful in the investigation of questions such as event individuation, but it has also been used in investigations into the different readings of sentences containing manner modification as well as the formalization of such sentences. In this paper, I will mainly address this latter issue, especially with respect to the question whether or not causal relations between events can be used in order to gain insight into the correct formal representation of manner adverbs. Questions concerning the metaphysics of events and event individuation will be excluded as much as possible.

In the course of the paper, I will show that causal relations can not be used to gain insight into the formal representation of manner adverbs, though they influence information structure and in turn an adverb's syntactic position.

I will start with a short introduction into the formalization methods used to establish causal relation between events. Secondly, I will turn to the linguistic reflexes of the role a manner adverb plays with respect to causation.

Before starting with the main body of the paper, I would like to clarify what I take to be manner adverbs. Manner adverbs basically fall into two classes, namely Pure Manner Adverbs (PMA) and Agent-Oriented Manner Adverbs (AOMA), cf. (1).

(1) Er hat **laut/schnell/wunderbar** gesungen. [Pure Manner Adverbs]
He sang loudly/quickly/wonderfully.

(2) Er hat sich **intelligent/geschickt** verteidigt. [Agent-Oriented Manner Adverbs]
He defended himself intelligently/cleverly.

They can be identified with the help of the paraphrase text given in (3), taken from Bartsch (1976).

(3) Sentences with manner adverbs can be paraphrased by *How X verbs, that is ADJ*
cf. [s] in Bartsch (1972, p. 150), Bartsch (1976, p. 153)

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference "sub8 – Sinn und Bedeutung". Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany*

2 When does manner matter? Some possible worlds

To illustrate the manner-cause interaction, take for example the situation depicted by the sentences in (4).

(4) Weil der Wecker laut klingelte, ist das Baby aufgewacht.
Because the alarm rang loudly, the baby woke up.

Without further information about the exact circumstances in which this sentence is uttered, it is not clear whether the baby woke up simply because of the ringing of the alarm as such, or whether it was the loudness of the alarm's ringing which was responsible for the waking up of the baby. E.g., the baby usually sleeps on when the alarm rings, but someone has turned its volume up and that woke her up today.

For the purpose of a more formal exposition, I will differentiate between three events, e_1, e_2, and e_{1b}, as in (5).

(5) e_1 = the ringing of the alarm
e_{1b} = the loud ringing of the alarm
e_2 = the waking-up of the baby

The consequence of the occurence of either e_1 or e_{1b} with respect to e_2 can differ in different worlds, cf. 1 which gives the constellations for three different possible worlds A, B, and C.

Occurence of	Consequences in the possible worlds		
	A	B	C
e_{1b}	e_2 does not occur	e_2	e_2
e_1	e_2	e_2	e_2 does not occur

Figure 1: Patterns for cause-consequence relations between two events in three different possible worlds

Before I begin to discuss these three possible worlds in some more detail, it is useful to think about the relationship between e_1 and e_{1b} in (5). In particular, the question is when an explicit modification such as *loudly* is used and when it is not used. Starting from the latter, there can be two reasons for the absence of explicit manner modification. If the action refered to with the help of the verbal predicate is carried out in a default manner there is no need to mention the manner explicitly. If the action is not carried out in a default manner or if in fact no default manner exists (think of *kill*, for example), the exact manner might simply not be important enough to mention, either because it has no influence on the course of events or what influence it has is not important from the point of view of the speaker. Thus, one has to bear in mind that the absense of explicit manner modification does not mean that the event in question was not carried out in some manner, quite on the contrary, in principle the manner in which something was carried out can always be specified, but the factors mentioned above prevent this in practise.

In world A, the chain of events connected to the three events can be expressed with the help of the two conditional sentences in (6).

(6) If the alarm rings, the baby wakes up.
If the alarm rings loudly, the baby does not wake up.

What strikes one as strange in the case of the two conditionals is related to our default assumptions about alarm ringings. Firstly, the ringing of an alarm is, usually, loud. Consequently the explicit mention of the ringing being loud seems to be almost superfluous as far as causal relationships are concerned. Furthermore, the louder it is, the better are its effects as far as the waking up of sleeping persons is concerned. That is, the world described with the help of the two conditional sentences seems highly implausible. However, it is not the constellation as such that is implausible, compare the sentence (7) where *quietly* has been used instead of *loudly*.

(7) Because the alarm rang quietly, the baby did not wake up.

This does make sense, as it is a common experience that people do not wake up if their alarm is too quiet. In addition, *quietness* is not a default attribute of alarm ringings.

The causal relationship expressed in (7) has been called pseudo-causality in Eckardt (1998), who differentiates between REAL-CAUSAL STATEMENTS and PSEUDO-CAUSAL STATEMENTS.[1]

Events referred to in Pseudo-causal sentences do not pass the classical criteria for causal dependence introduced by Lewis (1986). Lewis introduced (8) as a definition of causation between two events *c* and *e*. Or, in other words, if (8) holds, than *c* causes *e*.

(8) $O(c) \mathbin{\Box\!\!\rightarrow} O(e)$
and $\neg\, O(c) \mathbin{\Box\!\!\rightarrow} \neg\, O(e)$
cf. Lewis (1986, pp. 164ff)

O(e) is a proposition which holds in a world *w* when *e* occurs in that world *w*.

The symbol $\Box\!\!\rightarrow$ is defined as given in (9).

(9) $\Box\!\!\rightarrow$=df. A $\Box\!\!\rightarrow$C is true (at a world *w*) iff
(1) there are no possible A-worlds (A $\Box\!\!\rightarrow$C is *vacuous*), or
(2) some A-world where C holds is closer (to *w*) than is any A-world where C does not hold.
cf. Lewis (1986, pp. 164ff)

We can easily apply the definition in (8) to the constellation referred to by (7), cf. (10).

(10) *Baby's not waking up* depends causally on *the alarm ringing quietly* iff
O(*bnw*)$\Box\!\!\rightarrow$ O(*arq*) and
$\neg$O(*arq*)$\Box\!\!\rightarrow$ $\neg$O(*bnw*)

In prose: The event *c* "the alarm ringing quietly" causes the event *e* "Baby's not waking up" in a world *w* if and only if (A) some world *w'* where e and c hold is closer to *w* than any world *w"* where e but not c holds and (B) a world *w'* where e and c do not hold is closer to *w* than any world *w"* where e does not hold but c holds.

These criteria are clearly not met by (7), since the event *e* "the baby not waking up" is very likely to be true in a world where the alarm does not ring at all.

World B can be described with the help of the following conditionals, cf. (11).

(11) If the alarm rings, the baby wakes up.

[1]The discussion in Eckardt (1998) uses mostly sentences containing temporal adverbials, such as *delayed* and *late*, whereas the examples used here exclusively contain manner adverbs. I believe, however, that they are constructed parallel enough to justify this discussion.

If the alarm rings loudly, the baby wakes up.

The notable property of this world is that the presence or absence of the explicit manner modification clearly has no impact on the causal chain of events. In addition, the events e_1 and e_1b can refer to the same event in this world, though this must not necessarily be the case. In the case were both events are identical, the explicit modification given for e_1b corresponds either to some default modification or is deemed irrelevant for the context at hand. Such a case would correspond to Davidson's claim in Davidson (1996) which holds that events are the same if they have the same causes and effects (relative to what we know from just the two sentences alone).

Below I give another example which makes clear that a sentence containing a modification with null-effect on the causal relation can nevertheless be judged as informative, cf. (12).

(12) Weil Peter während der Aufführung leise/heimlich den Saal verlassen hatte, war er beim Empfang nicht mehr da.
Because Peter quietly/secretly left the room during the concert, he was absent at the reception.

Clearly, it is Peter's leaving the room which stands in a causal relation to his absence at the reception, and the manner modification gives just some additional information, inconsequential for the causal relation.

World C is the most interesting for the discussion of manner in interaction with causation, as here manner plays a decisive role. Again, the world can be described with the help of the two conditionals in (13).

(13) If the alarm rings, the baby does not wake up.
If the alarm rings loudly, the baby wakes up.

With the help of the formal framework for the establishment of causal relations between events by Eckardt (1998)[2] (adopting Dowty (1979, p. 108, ex. 128-130) to events case), reproduced here as (14), the event e_b *the loud ringing of the alarm* can be established as the causing event for the waking up of the baby.

(14) i. e depends causally on c iff O(e), O(c) and $\neg$O(c)$\Box\!\!\rightarrow$ $\neg$O(e)
ii. c is a causal factor for e iff there is a series of events, $c, c_1, \ldots, c_n, e$ (for n ≥ 0) such that each member of the series depends causally on the previous member.
iii. c CAUSE e is true iff
-c is a causal factor for e and
- for all other c' such that c' is a causal factor for e: for all worlds w where $\neg(\mathrm{O}(c)\wedge \mathrm{O}(c'))$ is true and $\neg$O(c') in w, there is some world w' which is equally or more similar [to the actual world w_0] among the $\neg(\mathrm{O}(c)\wedge \mathrm{O}(c'))$-worlds than w and $\neg$O(c) is true in w'. As a formula:
$\forall w\,(w \models \neg(\mathrm{O}(c) \wedge \mathrm{O}(c')) \wedge w \models \neg \mathrm{O}(c') \rightarrow$
$\exists w'\,(w' \models \neg(\mathrm{O}(c) \wedge \mathrm{O}(c')) \wedge w' \models \neg \mathrm{O}(c)) \wedge d(w_0, w') \leq d(w_0, w)))$
where d measures the distance ($\approx$ similarity) of worlds to the actual world w_0
= D.II in Eckardt (1998, p. 62)

O(e) stands here for 'e occurs', and the notion of distances between worlds is meant to talk about the similarity of worlds: the closer the distance from a world w to the actual world w_0,

[2] The same argumentation can be found in Eckardt (2000).

the greater the similarity of these two worlds.

The main achievement of this definition is the selection of the cause from a set of causal factors. A simple example will make this clearer. We have three events, e_1, e_2, and e_3, cf. (15), which are situated in time as in (16).

(15) e_1 = a baby is born, little Ann
e_2 = an alarm is ringing in little Ann's bedroom
e_3 = little Ann wakes up

(16) $e_1 < e_2 < e_3$

According to the definition given in (14), e_3 causally depends on e_1 and e_2, and e_1 and e_2 are both causal factors for e_3.

However, it is e_2 (=*alarm*) and not e_1 (=*birth*) which CAUSEs e_3, cf. the true (17) and the false (18).

(17) $\forall w\, (w \models \neg(\mathrm{O}(alarm) \wedge \mathrm{O}(birth)) \wedge w \models \neg \mathrm{O}(birth) \;\rightarrow$
$\exists w'\, (w' \models \neg(\mathrm{O}(alarm) \wedge \mathrm{O}(birth)) \wedge w' \models \neg \mathrm{O}(alarm)) \wedge d(w_0, w') \leq d(w_0, w)))$

(18) $\forall w\, (w \models \neg(\mathrm{O}(alarm) \wedge \mathrm{O}(birth)) \wedge w \models \neg \mathrm{O}(alarm) \;\rightarrow$
$\exists w'\, (w' \models \neg(\mathrm{O}(alarm) \wedge \mathrm{O}(birth)) \wedge w' \models \neg \mathrm{O}(birth)) \wedge d(w_0, w') \leq d(w_0, w)))$

In prose: A world where little Ann is born and the alarm does not ring in her bedroom is more similar to the actual world than the world where although little Ann has not been born at all the alarm is ringing in her bedroom.

Looking at world C with the help of the formal definition of causation just introduced, we arrive at the following result (where: (*arl*)= *the alarm rings loudly* and (*ar*)=*the alarm rings*):

(19) $\forall w\, (w \models \neg(\mathrm{O}(arl) \wedge \mathrm{O}(ar)) \wedge w \models \neg \mathrm{O}(ar) \;\rightarrow$
$\exists w'\, (w' \models \neg(\mathrm{O}(arl) \wedge \mathrm{O}(ar)) \wedge w' \models \neg \mathrm{O}(arl)) \wedge d(w_0, w') \leq d(w_0, w)))$

(20) $\forall w\, (w \models \neg(\mathrm{O}(arl) \wedge \mathrm{O}(ar)) \wedge w \models \neg \mathrm{O}(arl) \;\rightarrow$
$\exists w'\, (w' \models \neg(\mathrm{O}(arl) \wedge \mathrm{O}(ar)) \wedge w' \models \neg \mathrm{O}(ar)) \wedge d(w_0, w') \leq d(w_0, w)))$

That is, (21-a) is true but (21-b) is false.

(21) a. arl CAUSE baby wakes up
b. ar CAUSE baby wakes up

Interestingly, Eckardt, in the discussion of an example containing temporal modification, cf. (22), argues that the results achieved through the application of the formal definition (14)[D.II] are not reliable. Eckardt tries to show this for the scenario given in (22), discussing whether here the event *csl* "cooking spaghetti late" or the event *cs* "cooking spaghetti" cause the event *ncp* "neighbour calling the police".

(22) Pat came home late last night, due to a traffic jam. She started cooking spaghetti at 11pm which caused the neighbour to call the police.
= 3 in Eckardt (1998, p. 63)

According to D.II, *csl* is the cause for the *ncp*, while *cs* is not the cause. While Eckardt agrees that "This in and of itself does not violate against our intuition."Eckardt (1998, p. 63), she argues that it leads to problems when counterfactuals come into play, cf. (23).

(23) If Pat's cooking had occured earlier, it would not have caused the neighbour to call the police.
= 12 in Eckardt (1998, p. 63)

According to Eckardt, the subordinate clause in (23) cannot refer to (*csl*), because "wherever (*csl*) occurs, it occurs late." (Although, strictly speaking, the subordinate clause should then be absolute, e.g. *If Pat's cooking had occured early*). Reference to (*cs*) is, in contrast, easily possible, the second sentence taking up the event with the anaphoric pronoun *it*.

The same argumentation can be carried over to the manner-modified example sentence, compare (24).

(24) If the alarm had rang more quietly, it would not have caused the baby to wake up.

Applying Eckardt's line of argumentation, the subordinate clause in (24) cannot refer to (*arl*), as it specifies that the alarm had rang *more quietly*. Consequently, *it* in the main clause does not refer to (*arl*) but, most likely, to (*ar*). Following Eckardt's line of thought, the fact that (24) counterfactually states that *it* would not have stood in a certain causal relation presupposes that *it* actually does stand in that causal relation in the actual world. "The sentence [her comment on (23)] counterfactually states that '*it*' would not have stood in a certain causal relation. This presupposes that '*it*' actually does stand in that causal relation in the actual world."(Eckardt 1998, p. 63f.). This argument, in my view, is not convincing. Consider eg. (25).

(25) If the alarm had not rang, it would not have caused the baby to wake up.

Here, *it* in the matrix sentence cannot refer to the ringing of the alarm, as this is explicitly negated in the subordinate sentence. However, letting *it* refer to (*ar*) seems to me the most natural interpretation. Similar problems for Eckardt crop up if we look at counterfactuals with multiple modification, cf. (26).

(26) If the alarm had not rang loudly in her room, it would not have caused the baby to wake up.

Applying Eckardt's argumentation, *it* should be taken as refering to (*arl*) but not to (*arlr*), proving that it is (*arl*) which stands in the CAUSE relation to the *waking up of the baby*.

3 Causality and the formal representation of manner adverbs

In the previous section, I argued that activities which are carried out in different manners are best regarded as different events, as the different manner can play a role for the causal conseqences of the actions refered to. In this section, I investigate whether the status of a manner adverb with regard to causality plays a role in its formal description. In particular, I will discuss and refute the proposal from Peterson that this is indeed the case.

Peterson (1997) discusses data with patterns similar to those discussed above; he argues that event nominalization containing adverbs such as (27) are ambigue and "may simply refer to the non-complex event that is a particular ringing **or** it may (evidently on the preferred use) refer to another event- the complex event of the alarm's ringing *being loud*"Peterson (1997, p. 187, his markup). In the latter case, the subject of (27) is co-referential with that of (28).

(27) The alarm's ringing loudly awakened Susan.
=7 in Peterson (1997, p. 187)

(28) The loudness of the alarm's ringing awakened Susan.
=6 in Peterson (1997, p. 187)

Peterson finds further support for the ambiguity of (27) by looking at sentences like (29), where the construction is similar, but arguably no reading corresponding to the one in (28) is available, cf. (30).

(29) The alarm's ringing early awakened Susan.
=8 in Peterson (1997, p. 187)

(30) *The earliness of the alarm's ringing awakened Susan.

While here again a non-manner adverb, *early*, is used, this effect corresponds to the finding for (13), consider also the nominalized variants in (31) vs. (32).

(31) The alarm's ringing quietly awakened Susan.

(32) The quietness of the alarm's ringing awakened Susan.

The difference between the two readings corresponds to readings differences discussed by Peterson later on, where he uses the labels RESTRICTIVE versus NON-RESTRICTIVE readings, in anology to the terminology of relative clauses. I will take over his terminology.

Peterson's representation of the restrictive reading of (27) is given in (33).

(33) *The alarm's ringing loudly* [complex event reading]
$\exists e_2[\text{LOUDLY}(\iota\, e_1[\text{RING}(\text{Alarm}, e_1)], e_2)]$

The formula in (33) makes use of two events, e_1 and e_2. e_1 is a simple event, where the alarm exemplifies the property of RINGING, and e_2 is a complex event, build up from e_1 exemplifying the property LOUD.

Peterson (1997, p. 187) does not offer a solution for the non-restrictive cases, besides saying that the subordinate sentence in those cases does not refer to a complex event.

I believe that Peterson's argumentation for the association of restrictive readings with complex events leads into the wrong direction. Although I agree with Peterson that there is a interpretational difference between the two cases, I think that this is a phenomenon which should be treated exclusively at the superclausal level. That is, the modified event is the same event, regardless of wether the modification is restrictive or not. This is especially so in view of the fact that even for (29) on can construe a situation in which it is the *earliness* of the ringing of the alarm which causes the surprise.

3.1 Causality and syntactic position

Wickboldt (2000) gives data that shows that the presence of manner modification influences the interpretation of *since*-clauses, cf. (34).

(34) a. Since John entered the room, he's been looking for a seat. [=temporal]
b. #Since John entered the room quietly, he's been looking for a seat.
c. Since John entered the room quietly, no one noticed him. [=causal]

= 1-3 in Wickboldt (2000). # marks the sentence as pragmatically anomalous "in the sense that it would not be used in ordinary situations or would be dispreferred."p. 359

While she does not give formal details, her explanation for the observed pattern rans as follows: The effect of the manner adverb is to make subevents of the event refered to by the verbal predicate accessible for further commentary. In a certain sense, the telicity of the event is suspended, cf. also the data in (35).

(35) a. #John died. For hours he struggled for breath.
b. John died slowly. For hours he struggled for breath.
b=23b in Wickboldt (2000)

This suspension of telicity has consequences for the interpretation of *since*: *since* needs a temporal anchor for its temporal interpretation, but there is no such anchor if a manner adverb suspends the telicity.

Shaer (2003) builds on Wickboldt's data, but adds a very important piece of evidence to the data, cf. (36), especially (36-a).

(36) a. Since John quietly entered the room, he's been looking for a seat. [=temporal]
b. #Since John entered the room quietly, he's been looking for a seat.
c. Since John entered the room quietly, no one noticed him. [=causal]
= 48 in Shaer (2003)

What this data shows is that it is not the presence of a manner adverb in the subordinate sentence as such which influences the interpretation of *since*, but also its position.

We find the same pattern in German, cf. (37) and (38).

(37) a. Weil Peter während der Aufführung leise den Saal verlassen hatte, war er beim Empfang nicht mehr da.
Because Peter quietly left the room during the performance, he was absent at the reception.
b. ??Weil Peter während der Aufführung den Saal leise verlassen hatte, war er beim Empfang nicht mehr da.
??Because Peter left the room during the performance quietly, he was absent at the reception.

(38) a. ??Weil Peter während der Aufführung leise den Saal verlassen hatte, hat ihn niemand gehört.
??Because Peter quietly left the room during the performance, nobody noticed him.
b. Weil Peter während der Aufführung den Saal leise verlassen hatte, hat ihn niemand gehört.
Because Peter left the room during the performance quietly, nobody noticed him.

If the difference is not made clear through the syntactic position of the modifier, prosody can be used, cf. (39), where in (39-a) manner is important for the cause-relation, in (39-b) not.

(39) a. Weil der Wecker LAUT geklingelt hat, ist das Baby aufgewacht.
b. Weil der Wecker laut geKLINGELT hat, ist das Baby aufgewacht.

If the manner adverb in question is unable to appear in different syntactic positions, prosody is the only way to indicate its status with regard to causation. This seems to hold for some agent-oriented adverbs, cf. e.g. (40) and (41), where, again, in (40) *intelligent* is decisive for the cause-relation, in (41) it is not.

(40) Weil er das Problem intelliGENT gelöst hat, bekam er einen Sonderpreis.
Because he solved the problem intelligently, he was awarded a special award.

(41) Weil er das Problem intelligent geLÖST hat, konnte ein Zusammenstoß verhindert werden.
Because he solved the problem intelligently, an accident could be avoided.

4 Conclusion

This paper had two aims. In the first part, I showed how the definition from Eckardt (1998) can be applied to cases involving manner modification. As it turned out, the manner in which an event is carried out can be decisive for its consequences. Whenever this is the case and the manner adverb does not describe a default manner, one is likely to find explicit manner modification in a sentence. In the second part of the paper I argued that the status of a manner adverb with respect to causation has no consequences for the formal representation of the manner adverb at the clausal level, but does have influence on the information structure of the sentence and in turn on the syntactic position of the adverb.

References

Bartsch, R.: 1972, *Adverbialsemantik. Die Konstitution logisch-semantischer Repräsentationen von Adverbialkonstruktionen*, Athenäum, Frankfurt(Oder).

Bartsch, R.: 1976, *The grammar of adverbials*, Vol. 16 of *North Holland Linguistic Series*, North-Holland, Amsterdam,New York, Oxford. Improved Translation of (Bartsch 1972).

Casati, R. and Varzi, A. C. (eds): 1996, *Events*, Dartmouth, Aldershot.

Davidson, D.: 1996, The individuation of events, *in* Casati and Varzi (1996), chapter 14, pp. 265–283. Originally published in Rescher, N. et al (eds.), Essays in Honor of Carl G. Hempel, Reidel, Dordrecht, pp. 216-234.

Dowty, D. R.: 1979, *Word Meaning and Montague Grammar. The semantics of Vers and Times in Generative Semantics and in Montague's PTQ*, Vol. 7 of *Synthese Language Library*, D. Reidel, Dordrecht.

Eckardt, R.: 1998, *Events, Adverbs, and Other Things. Issues in the Semantics of Manner Adverbs*, Niemeyer, Tübingen.

Eckardt, R.: 2000, Causation, contexts, and event indivituation, *in* F. Pianesi, A. Varzi and J. Higginbotham (eds), *Speaking of Events*, Oxford University Press, Oxford, pp. 105–123.

Lewis, D.: 1986, Causation, *Philosophical papers*, Vol. 2, Oxford University Press, Oxford, chapter 21, pp. 159–213. Originally published in the Journal of Philosophy 70 (1973):556-67.

Peterson, P. L.: 1997, *Facts Propositions Events*, Kluwer, Dordrecht.

Shaer, B.: 2003, “Manner” adverbs and the “association” theory: Some problems and solutions, *in* E. Lang, C. Fabricius-Hansen and C. Maienborn (eds), *Modifying Adjuncts*, Mouton de Gruyter, Berlin.

Wickboldt, J. M.: 2000, Some effects of manner adverbials on meaning, *in* C. Tenny and J. Pustejovsky (eds), *Events as Grammatical Objects*, CSLI, Stanford, pp. 359–374.

ON THE EVENT STRUCTURE OF GERMAN *BLEIBEN*

Barbara Schlücker

barbara.schluecker@rz.hu-berlin.de

Abstract

The German copular verb *bleiben* („*to remain*") is supposed to denote the continuation of a state. In this paper, I will argue that *bleiben* has next to that reading another reading, too, where it denotes a change of state and which seems to be equivalent to *werden* ("*to become*"). The aim of this paper is to present an event structure for *bleiben* which integrates both readings as well as to examine the event structures of *werden* and *bleiben* and to discuss whether the change-of-state meaning denoted by *bleiben* is equivalent to that of *werden*. I will show that this is not the case and that *bleiben* always denotes a state. An exception to this last point forms *bleiben* when it appears in the context of non-finite posture verbs. These *bleiben*-constructions, which are limited to a small number of posture verbs, denote events, too.

1 The event structure of German copular verbs

The meaning of the three German copular verbs *sein* ("*to be*"), *werden* ("*to become*") and *bleiben* ("*to remain*") seems to represent a well-balanced system: *sein* denotes a state, *werden* denotes a change of state and *bleiben* the continuation of some state:

(1)	a.	Peter ist gesund	[Peter is healthy]
	b.	Peter wird gesund	[Peter becomes healthy]
	c.	Peter bleibt gesund	[Peter remains healthy]

(2) Bei dem Flugzeugunglück blieben die Passagiere unverletzt
[Despite the crash of the plane the passengers remained healthy]

A classical, somehow more precise analysis of the meaning of *bleiben* is that *bleiben* asserts a state P and presupposes another instance of P at an interval preceding the interval of the assertion immediately. So (1)c) asserts that Peter is healthy and presupposes that he has been healthy before.

The following diagram represents these intuitions about the internal structure of *sein*, *werden* and *bleiben*[1].

[1] Note that the representation of *werden* in the diagram is a simplification because obviously the change of state is not necessarily atomic as the diagram indicates but can also cover some time. I will not take this into consideration nor will I talk about other problems concerning the event structure of *sein* and *werden*. I consider

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference "sub8 – Sinn und Bedeutung". Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany*

```
                                    P
(3)   a.    sein:      ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~>
                            ¬P            P
      b.    werden:    ///////////////////////////•~~~~~~~~~~~~~~>
                            P             P
      c.    bleiben:   ~~~~~~~~~~~~~~ •~~~~~~~~~~~~~~>
```

[cf. Lenz 1996]

However, on a closer look it seems that *bleiben* has – in contrast to the above overview - at least two different readings. Next to the "regular" cases like in (1)c) and (2) there are a lot of data where the alleged presupposition of an identical first state doesn't hold. In these cases, *bleiben* denotes a change of state rather than the continuation of a state and it seems to be equivalent to *werden*. This shows, first of all, that an internal structure of *bleiben* like the one suggested above is too restrictive. Second, if the meaning of *bleiben* is at least partly identical to that of *werden*, how can the existence of such an equivalence be motivated within the system of the copular verbs? Accordingly, the aim of this paper is not only to present a solution to the problem of the two readings of *bleiben* but also to consider this solution within the whole system of the copular verbs and to show how they form a well-balanced system in a different way than indicated above.

2 Data

Next to the "regular" occurences where *bleiben* denotes the continuation of a state, there are data where the alleged presupposition doesn't seem to hold, i.e. where there isn't any identical state P at the first interval. This reading is called the BECOME-reading, as in these cases *bleiben* seems to be equivalent to *werden* ("*to become*"), whereas the "regular" reading can be called the REMAIN-reading (cf. Steinitz 1999a). Basically, two groups of BECOME-data can be distinguished: first, constructions where *bleiben* appears in the context of non-finite posture verbs, and second, all other *bleiben*-constructions in the BECOME-reading.

In a null context, constructions where *bleiben* appears in the context of non-finite posture verbs are ambiguous ((4)). In an appropriate context they can be desambiguated ((5), (6)).

(4) a. Peter bleibt stehen [Peter remains/becomes standing]

b. Der Ball bleibt liegen [The ball keeps/becomes lying]

<u>REMAIN-reading</u>

(5) a. Alle setzten sich hin, nur Peter blieb stehen

[Everybody sat down but Peter remained standing]

b. Die Kinder vergaßen den Ball und so blieb er im Garten liegen

[The children left the ball and therefore it remained lying in the garden]

---

sein as denoting a state and *werden* as denoting a change of state, either as accomplishment, achievement or even as a process (cf. Steinitz 1999b, Musan 1999).

BECOME-reading

(6) a. Plötzlich blieb Peter stehen [Suddenly Peter stopped]

b. Der Ball rollte aus und blieb kurz vor dem Tor liegen

[The ball went slowlier and stopped short of the goal]

In (7) there are examples of *bleiben*-constructions other than with non-finite posture verbs where the alleged presupposition doesn't hold either. Therefore, these constructions represent some sort of a BECOME-reading, too.

(7) a. (Talking to somebody who is extremely nervous at the moment:)

Nun bleib mal ganz ruhig! [Please get calm!]

b. Er trommelt eine Weile von innen gegen die Tür, dann bleibt es still

[He beats the door for a while, then it becomes silent]

[Zwerenz 1973, in: Rosenthal 1984]

c. Wo ist das Buch geblieben? [Where did the book go?]

d. Im Dorf mit den niedrigen, weissgetünchten Häusern war eine Gewehrsalve zu hören. Dann blieb es still [In the village with the small whitewashed houses a volley was heard. Then it became quiet]

Apart from these data there are independent general arguments from the historical development of *bleiben* which support the claim that confining *bleiben* to the REMAIN-reading is too restrictive. The first argument concerns the fact that *bleiben* chooses *sein* as auxiliary. Following a general rule, *sein* is chosen as auxiliary by non-transitive eventive verbs whereas *haben* ("*to have*") is chosen by verbs denoting a state or a process. According to the "traditional" view which says that *bleiben* denotes the continuation of a state, one would therefore expect *bleiben* to choose *haben* as auxiliary, but in fact *sein* is chosen. This is a hint that *bleiben* at least originally had a change-of-state meaning rather than that of a durative state. The second argument deals with the oldest predecessor of *bleiben*, Gothic **leiben*, **bileiben* which means something like *remain behind*, *stay behind*. This refers to a change of state rather than to a continuing state, too: if somebody or something remains behind this presupposes that there are other entities which in contrast do not take part in the state asserted but which realize a state contrary to that state. For example, if somebody remains behind at a certain place there must be somebody who left. To make the sentence *Peter remained behind* true, the presupposition of others leaving the place is inevitable, but not the one of Peter having stayed at that place before. So *remain behind* makes reference to the counterstate rather than denoting the continuation of the state asserted.

Given these data, it is too restrictive to assume that *bleiben* denotes the continuation of a state because this includes the presupposition of an identical first state. Besides, there is another conceptual problem about such a structure: if there are two instances of state P following each other immediately, how can we tell at which point the first interval ends and the second starts? What does "continuing" really mean? Continuing over and above which point of time? – With respect to these problems, the remainder of the paper deals with the following questions:

(1) Does *bleiben* in the BECOME-reading really behave like *werden*? And if this is the case, how can the existence of two copular verbs be motivated having partly identical functions?

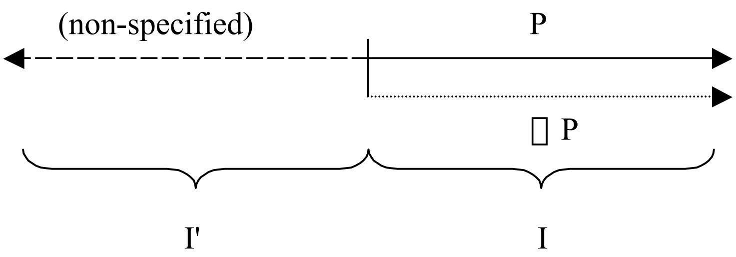
(2) How must an underlying event structure look like that covers both readings of *bleiben* (provided we want to exclude the possibility of two homonym occurences of *bleiben*)?

3 *Bleiben* as state denotation

I assume that there are two main groups of *bleiben*-constructions: First there are "regular" *bleiben*-constructions: state denotations which are obtained compositionally. The state asserted is characterized either as a *continuing state* (see (1)c), (2)) or as a *resultant state* (see (7)). In contrast, *bleiben* in the context of non-finite posture verbs is an event denotation (see (6)). Its meaning can't be obtained compositionally. Due to these basic differences I will restrict the term “BECOME-reading” to the latter group; state denoting “become”-constructions like in (7) are instead referred to as ‘resultant state reading’.

State denoting, compositional *bleiben* consists of three components: the assertion of some state P at an interval I and the presupposition of the existence of an interval I' which precedes I immediately. The assumption of a first presupposed interval whose value is left underspecified allows to achieve the continuing state reading as well as the resultant state reading from the same lexical entry. In section 3.3 we will discuss which kind of eventuality is allowed at that interval and we will see how the two readings are realized in the actual use.

The third component of state denoting *bleiben* is the reference to a counterstate ¬P in a closest possible world at the time of the interval of assertion. The following diagram indicates how assertion, presupposition and reference to a counterstate are related to each other:



In the following sections we will discuss the notion of 'reference to a counterstate' as well as the internal structure as given above. Among other things, we will examine whether it is necessary to assume that the internal structure consists of two intervals if the first interval is underspecified anyway.

3.1 Reference to a counterstate

Bleiben typically appears in a context (or creates such a context) where the counterstate is more likely to exist than the state asserted; it appears in a context where one would typically expect the counterstate to take place instead of what actually happens. In this sense, *bleiben* denotes the absence of the counterstate, and therefore, a sentence like *Peter blieb krank* ("*Peter remained ill*") could be paraphrased as "*Peter didn't become healthy*".

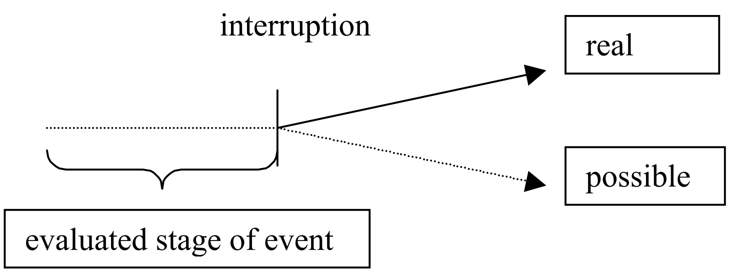
A similar idea about the expectation of a counterstate is found in Landman's (1992) article about the progressive and the imperfective paradox. Landman assumes that the progressive makes reference to one or, if necessary, more possible worlds where everything happens as one would expect if things go their normal way. One example he gives is (8):

(8) Mary was crossing the street when the truck hit her

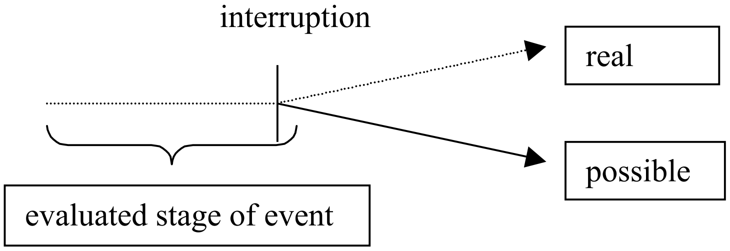
The problem Landman raises is whether it is true to say that Mary is crossing the street because due to the truck she doesn't manage to reach the other side, so there is no actual crossing. Landman argues for the truth of uttering *Mary was crossing the street* in a context like (8) because he assumes that in the case of interruptions (for example the truck hitting Mary), as soon as the interruption takes place the progressive makes reference to the closest possible world where everything is like in the real world up to and except for the interruption. What happens in the possible world is the normal, reasonable continuation of what started in the real world. With respect to (8), this means that given Mary is equipped with average skills of street crossing one can assume that in the closest possible world she will manage to finish the crossing of the street and therefore it is true to say *Mary was crossing the street* in a context like (8).

For *bleiben*, the idea of the reference to a counterstate can be formulated in a similar way. Still, there are differences concerning the interruption: in the case of the progressive, what happens in the possible world is the normal, reasonable continuation of what took place before the interruption. So the interruption itself is not part of the stage of event in the real world which is to be continued in the possible world. In the case of *bleiben* in contrast, this interruption forms a part of the stage of event which is to be continued in the possible world. The evaluation of what is the normal, reasonable continuation takes place on the basis of the interrupted original event. Apart from this, the existence of some kind of interruption forms an obligatory part of the meaning of *bleiben*, but this is not true for the progressive.

(9) Progressive:



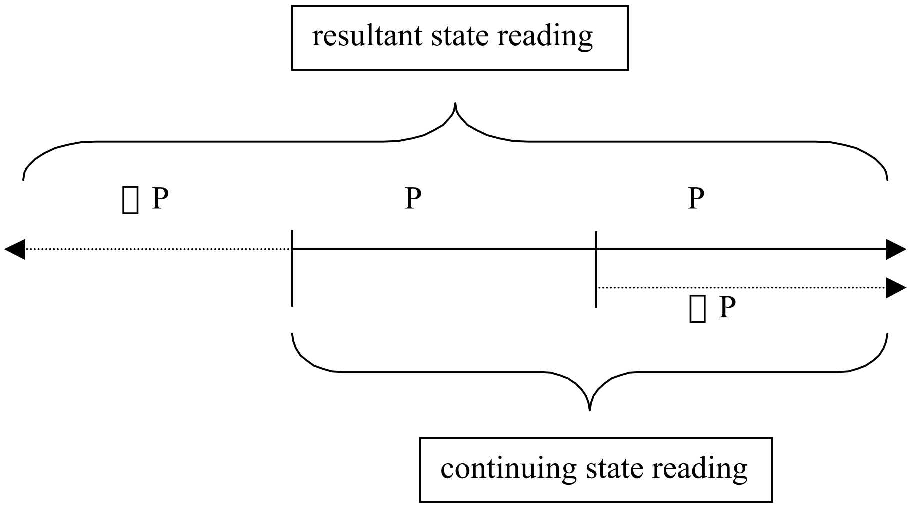
bleiben:



The reference to the counterstate has one important additional function: it helps to identify the two intervals I and I'. If there is some state P which is followed immediately by another state P, and we want to assume that these are somehow two different intervals, they have to be distinguished. This is what the reference to the counterstate does: the second interval is the one for which not only P is asserted, but, at the same time, for which the counterstate is expected to be (or become) true, in contrast to the first interval, where there aren't any expectations about a counterstate.

3.2 Event Structure: One-, two-, or three-piece structure?

Obviously the resultant state reading can't be explained on the supposition that *bleiben* presupposes P at I', the interval preceding the interval of the assertion. However, this problem could be solved (and the presupposition of P at I' kept) if we assume that the resultant state reading adds an interval to the REMAIN-(continuing state)-reading. The resultant state reading could then be paraphrased as "to become and remain P".



Such an analysis would correspond to the intuition that the REMAIN-reading is the regular reading and that the resultant state reading is irregular and derived from the REMAIN-reading and dependent on a special context. According to such a "become and remain"-analysis (10) has the following structure: a first (additional) interval where there is noise, a second interval of silence and a third interval where it is quiet, too, with the additional expectation of noise.

(10) Er trommelt eine Weile von innen gegen die Tür, dann bleibt es still

[He beats the door for a while, then it becomes silent]

It is doubtful whether (10) is interpreted in this way, namely as a continuing state which is marked as the result of a change of state. The problem gets clearer through adding temporal modification:

(11) Er trommelt eine Weile von innen gegen die Tür, dann bleibt es für 5 Minuten still

[He beats the door for a while, then it becomes silent for 5 minutes]

The temporal modifier applies to the interval of assertion which in a tripartite structure is the last one. According to the “become and remain”-analysis, there would be a first (additional) interval where there is noise, a second (presupposed) interval of silence and then a third (asserted) interval where it is quiet, too, and which is temporally modified. With other words, after a change of state there would first be an interval of non-specified length which is followed up by an interval of 5-minute-duration, and this for sure doesn't meet our intuition about the meaning of (11). Instead, the most natural interpretation of (11) is that the temporally modified interval takes place right after the change of state.

So a "become & remain"-analysis doesn’t lead to the correct interpretation. Instead, we must assume that the resultant state reading consists of two intervals, too, but that the first interval has – in contrast to the REMAIN-reading – a value which is contrary to that of the second interval. But if this is true, what exactly does *bleiben* presuppose? On that condition one can't say any more than that *bleiben* presupposes the mere existence of some interval. It is unclear whether this kind of information is sufficient; we will discuss this problem in the remainder of this section and in the next one.

One way to get rid of the presupposition problem just mentioned is to assume that *bleiben* isn’t a presupposition trigger at all. On this supposition the event structure of *bleiben* consists of just one interval. The only difference from *sein* (*be*) then would be that next to the assertion of some state P there is the reference to the counterstate □ P. So is *bleiben* really a presupposition trigger? Such an one-piece-analysis seems possible in cases like:

(12) a. Maria blieb von Peters Reue unbeeindruckt und ließ sich trotzdem scheiden

[Maria remained unimpressed by Peter’s remorses and got divorced nevertheless]

b. Peter blieb drei Tage lang in Spanien [Peter remained in Spain for three days]

The (a)-sentence could be paraphrased as "Maria didn't get impressed by Peters remorses and got divorced (though it was to expect that she would get impressed)" and the (b)-sentence as "Peter was in Spain for three days (and did not leave)". Here, a relation to an interval before the time of the assertion doesn't seem necessary. However, for the following sentences a one-piece-analysis is much more difficult:

(13) a. Bei dem Flugzeugunglück blieben die Passagiere unverletzt

[The passengers remained unhurt despite of the plane crash]

b. Der Bankräuber fuchtelte mit der Pistole herum. Die Kassiererin blieb ruhig

[The bank robber waved the pistol. The cashier remained calm]

Here, the paraphrases would be "The passengers were unhurt despite of the plane crash" and "The bank robber waved with his pistol. The cashier was calm though". This doesn't seem to be sufficient. The context specifies some point of time (namely, the crash respectively the waving of the bank robber) from which on one would expect the counterstate to become true.

But in fact the state continues despite of these interrupting events. In order to interpret this continuation the relation to the interval before is indispensable.

On a closer look it appears that the one-piece-analysis in (12) is only possible because these sentences show special features. Durative temporal modifiers like *drei Tage lang* in (12)b) specify the duration of the interval about which something is said and indicate the left and the right boundary of that interval. What happens before or after is irrelevant. So the denotation of (12)b) is restricted to the second interval I due to the temporal modifier, but not because of the internal event structure of *bleiben*. In (12)a), the one-piece-analysis is possible for a different reason. (12)a) asserts that Maria is unimpressed by Peter's remorses. The beginning of I is marked by Peter's remorses, they form the “interruption”. But strictly speaking, there is no state at all which continues despite an interruption because before Peter's remorses took place, Maria could neither be impressed nor unimpressed by them. So at I' there isn't a state identical nor contrary to the one asserted at I, and we would rather say that here I' isn't interpreted at all. So a one-piece-analysis seems possible but not necessary: if we assume a two-piece-structure for *bleiben*, cases like this show that the first interval may also be underspecified in the actual use and therefore they provide evidence for the flexibility of this analysis.

More evidence for the claim of the existence of a first underspecified interval comes from Late Middel Dutch. These data (legal sources 1250-1600) differ from the data of today in two respects: first, there are much more data with a resultant state reading, and second, there are lots of data which are ambiguous between both stative readings. In these cases the value of the first interval can't be determined, so it remains underspecified in its actual use. Thus, next to explicit continuing or resultant state readings, Late Middel Dutch *bliven* can denote a state despite the fact that the counterstate is more likely to come into existence – and it is left open whether this state did exist before or not.

(14) Niettemin ein jeglich mach in plaetse van ein schutsel ofte bevrijinge op sijnen cost wel ein scheidtzmuer doen maken, ende setten dieselve op gemein erve, sonder metsgateren ofte mit medtsgateren over beyde sijden, ende bie soeverre hie die muer stelt op gemeine erffe, soe blijft de muer altijt gemein, ende moet daernae op gemeine costen onderhalden werden

[Nichtsdestotrotz darf jeder (...) eine Mauer auf Baugrund der Allgemeinheit bauen, (...), und wenn er die Mauer auf allgemeinen Grund setzt, so wird/bleibt/ist die Mauer Allgemeingut, und muß von da an durch die Allgemeinheit in Stand gehalten werden]

[http://www.kulak.ac.be/rechten/Monballyu/Rechtlagelanden/Geldersrecht/gelder1-2.html]

3.3 The condition of a reasonable relation

Assuming that *bleiben* doesn't presuppose an identical state P but just the existence of some first interval I' whose value is underspecified makes it possible to achieve both the continuing state reading and the resultant state reading. What can be said about this first interval? Obviously states being identical as well as contrary to the state asserted occur at that interval. Given there is sufficient contextual information, (15) can have two readings: either one has been calm before and remains calm afterwards, or one is nervous before and becomes calm afterwards.

(15) Nun bleib mal ganz ruhig! [Please remain/get calm!]

The question is whether we also find states or even other eventualites which do not have a relation of identity or contradiction to the state asserted, and, if this is the case, how such constructions are interpreted. In both (16) and (17) the eventualities at I' are neither identical nor contrary to the state asserted at I; still the sentences in (16) are fine whereas the examples in (17) are hardly acceptable. This shows that we need additional restrictions on the eventualities at I'.

(16) a. Peter ging in die Oper. Danach blieb er schick
[Peter went to the opera. Afterwards, he remained chic]
b. Peter spielte Flöte, danach blieb er sitzen
[Peter played the flute, afterwards he remained sitting]
c. Peter spielte Flöte, danach blieb er nicht sitzen
[Peter played the flute, afterwards he didn't remain seated]
b. Peter war jahrelang Radiomoderator, danach blieb er Frühaufsteher
[Peter was a presentor at the radio for years, afterwards he remained an early raiser]

(17) a. Peter ging in die Oper. ??Danach blieb er gut genährt
[Peter went to the opera. ??Afterwards he remained well nourished]
c. Peter spielte Flöte, ??danach blieb er stecken
[Peter played the flute, afterwards ?? he remained sticking]
d. Peter war jahrelang Radiomoderator, ??danach blieb er Metzger
[Peter was a presentor at the radio for years, afterwards ?? he remained a butcher]

In the sentences in (17), the eventuality at I' doesn't relate in any way to the state asserted at I, they don't have anything in common. This is different in (16): we can easily imagine Peter going to the opera and being chic at the same time, as well as his playing the flute and being seated simultaneously or being an early raising radio presentator. What we do here is to interpret the eventuality of the first interval such that we can accommodate for that same interval a state identical to the state asserted at I. In short: we try to interpret the state asserted as a continuing state. (16)b) & (c) are fine because it seems unproblematic to interpret the playing of the flute as being consistent with someone's sitting whereas in (17)b) it seems less easy to interpret the playing of the flute as being consistent with someone's sticking.

The eventualities at I' are restricted to states which are either identical or contrary to the state asserted at the second interval. Eventualities other than these must be able to be interpreted such that they are consistent with the state we want to accommodate, namely with a state identical to the state at I. These restrictions can be summarized by saying that the eventuality of the first interval must relate to the state of the second interval in a reasonable way.

<u>Condition of a reasonable relation:</u>

The eventuality of the presupposed interval must relate to the state asserted in the second interval in a reasonable way.

This means that the default-interpretation of *bleiben* is the REMAIN-reading. In case there is no information about I' like in (1)c), (2), the *bleiben*-state is interpreted as a continuing state, and a state being identical to the state asserted is accommodated for the first interval. The construction also has a continuing state interpretation in case of explicit information about an identical first state. If there is explicit information about another eventuality (event or process) at I' like in (16) and (17), only the REMAIN-reading is available. This is on condition that it is possible to interpret that eventuality such that it is consistent with the state we want accommodate (namely, a state identical to the state asserted at I). The resultant state reading is only available if there is explicit information about a state contrary to the state asserted.

Bleiben presupposes the existence of an interval which precedes the interval of the assertion immediately. It doesn't say what kind of eventuality takes place at that interval. But there is a condition that this eventuality must stand in a reasonable relation to the state asserted and its counterstate, namely: the counterstate is the reasonable continuation of that eventuality as one would expect in the given circumstances. The state asserted on the other hand is contrary to that state and it is that continuation one would not expect under the given circumstances – yet, it is a possible continuation.

4 *Bleiben* as event denotation

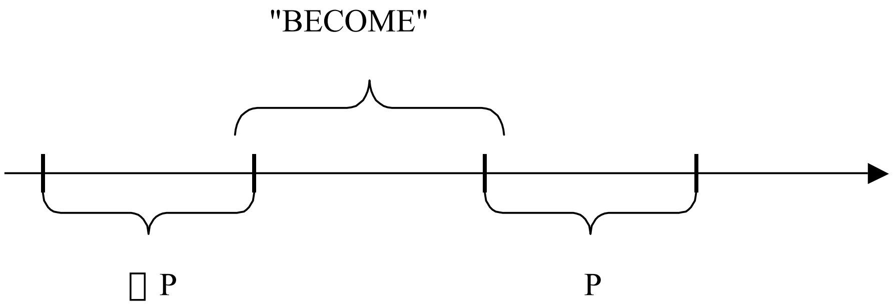
All *bleiben*-constructions mentioned in the previous section are state denotations, also those in the resultant state reading. In these cases, the change of state is only derived secondarily. So the event structure of *bleiben* denoting a resultant state with an implicit change of state is quite different from that of *werden* and from the BECOME-reading in the context of non-finite posture verbs. These differences will be examined more detailed in this section. My claim is that these latter constructions are event denotations and that they represent an irregular, non-compositional construction. The number of verbs which can take part in this construction is limited to a small extent. Temporal modification serves as diagnostics to support this claim and points out the differences between them and the constructions so far mentioned. In this paper, I will restrict myself to the discussion of these properties. I will refrain from examining how this construction comes about and what its relation to “regular” *bleiben*-constructions is (but see Steinitz 1999a, Rosenthal 1984, Krämer 2002).

The data in (4), (5) and (6) show that constructions where *bleiben* appears in the context of non-finite posture verbs are ambiguous in that they can have a REMAIN-reading as well as a BECOME-reading and that they can be desambiguated in an appropriate context. They show properties different from regular state denoting constructions, however this only concerns the BECOME-reading. In the REMAIN-reading they are just an instance of regular state denoting constructions. The two main differences are the following: (a) *bleiben* + non-finite posture verb-constructions (BECOME-reading) denote events, not states, and (b) *bleiben* + non-finite posture verb-constructions (BECOME-reading) don't make reference to a counterstate.

The first difference mentioned, namely that these constructions denote events rather than states, is intuitively clear: in a sentence like

(18) Plötzlich blieb Peter stehen [Suddenly, Peter stopped]

the state of Peter's standing isn't interpreted as being of some duration but rather as being the result of an event of stopping. This stopping-event is over as soon as the resultant state is reached. Therefore for this construction we can assume an event structure which is equivalent to that of *werden*, for example a structure like Dowty (1979) assumes for BECOME:



[Dowty 1979:140; slightly modified]

Considering again sentence (18), the second property is also intuitively clear: the most natural interpretation is that (18) denotes the event of stopping but this interpretation doesn't include any expectations about Peter not stopping. This lack of reference to a counterstate follows naturally from the assumption that these constructions do not denote states but rather events: there is no state which can have a counterstate.

Temporal modification can serve as diagnostics to verify these intuitions. If there is an event, namely a change of state, one would expect event modification to be admissible. On the other hand, if we assume that regular *bleiben*-constructions in the resultant state reading denote states, event modification shoudn't be possible in these cases, and this is exactly what we find:

<u>no event modification with regular *bleiben* (resultant state reading)</u>

(19) a. Er trommelt eine Weile von innen gegen die Tür, dann bleibt es *langsam still
[He beats the door for a while, then it slowly becomes silent]

b. Er trommelt eine Weile von innen gegen die Tür, dann wird es langsam still
[He beats the door for a while, then it slowly becomes silent]

(20) a. Jetzt bleib mal *allmählich ganz ruhig! [Please get calm gradually!]

b. Jetzt werd mal allmählich ganz ruhig! [Please get calm gradually!]

The (a)-sentences show that event modification is not possible in the case of regular *bleiben*-constructions in the resultant state reading. In the (b)-sentences *bleiben* is replaced by *werden*, and here, event modification is admissible. So the ungrammaticality of the (a)-sentences can't be due to some conceptual restriction but must result from the event structure: there is no change-event which can be modified. This is different with *bleiben* in the context of non-finite posture verbs (*bleiben*-NPV-constructions); here, event modification is possible:

event modification with *bleiben*-NPV-constructions

(21) a. Der Ball rollte lange übers Feld, bevor er langsam im Tor liegen blieb

[The ball rolled over the field before it slowly stopped at the goal]

b. Der Trecker fuhr durch den Schlamm und blieb dann langsam stecken

[The tractor drove through the mud and then slowly got stuck]

This different behaviour regarding event modification indicates different underlying event structures. State modification on the other hand is allowed by regular state denoting *bleiben*-constructions:

state modification with regular *bleiben* (resultant state reading)

(22) Er trommelt eine Weile von innen gegen die Tür, dann bleibt es fünf Minuten lang still

[He beats the door for a while, then it becomes silent for five minutes]

Interestingly, we find that state modification is also possible with *bleiben*-NPV-constructions ((23)). This can be explained by the fact that *bleiben* in these constructions has not only an event-denoting function, but can be an instance of regular, state denoting *bleiben*, too.

state modification with *bleiben*-NPV-constructions

(23) a. Der Trecker fuhr durch den Schlamm und blieb dann 3 Stunden lang stecken

[The tractor drove through the mud and then remained stuck for 3 hours]

b. Der Ball rollte lange übers Feld, bevor er für 5 Minuten im Tor liegen blieb

[The ball rolled over the field before it remained lying at the goal for 5 minutes]

If we assume that *bleiben*-NPV-constructions can either be regular *bleiben*-constructions (thus state denoting) or non-compositional event-denoting constructions, it follows naturally, that state modification as well as event modification is possible, but not both at the same time, as we can see in (24):

(24) a. Der Trecker fuhr durch den Schlamm und blieb dann *langsam 3 Stunden lang stecken

[The tractor drove through the mud and then *slowly remained stuck for 3 hours]

b. Der Ball rollte lange übers Feld, bevor er *langsam für 5 Minuten im Tor liegen blieb

[The ball rolled over the field before it *slowly remained lying at the goal for 5 minutes]

Evidence for the claim that *bleiben* + NPV-constructions are structurally ambiguous also comes from Dutch: Dutch *blijven* can take most verbs as a non-finite complement. These constructions are always interpreted in the REMAIN-reading and denote the continuation of the activities denoted by the non-finite verb ((25)). Dutch *blijven* also has an eventive BECOME-reading, however, this reading is restricted to exactly the same posture verbs as in German ((26)):

(25) blijven eten, slapen, werken, wachten, boodschappen doen, ...

[to remain eating, sleeping, working, waiting, shopping, ...]

(26) stehen / sitzen / liegen / hängen / kleben / haften / stecken / schweben bleiben

blijven staan / zitten / liggen / hangen / haken / kleven / plakken / steken / zweven

[to remain/become standing / sitting / lying / hanging / sticking / adhering / floating]

This accounts for the assumption that there is one particular construction with *bleiben* in the context of a limited number of non-finite posture verbs with an eventive BECOME-reading. Still, *bleiben* in the context of non-finite posture verbs, and, for Dutch, with (more or less) all verbs, can take part in the regular, state-denoting construction, either as continuing or as resultant state. This means that these constructions can have three different readings in total:

(27) Ia. (stative *bleiben*, REMAIN-reading):

Die Kinder vergaßen den Ball und so blieb er im Garten liegen

[The children left the ball and therefore it remained lying in the garden]

Ib. (stative *bleiben*, resultant state reading)

Der Ball rollte lange übers Feld, bevor er für 5 Minuten im Tor liegen blieb

[The ball rolled over the field before it remained lying at the goal for 5 minutes]

II. (eventive *bleiben* – BECOME-reading)

Der Ball rollte lange übers Feld, bevor er langsam im Tor liegen blieb

[The ball rolled over the field before it slowly stopped at the goal]

5 Conclusion

One of the questions raised at the beginning was how to motivate the existence of an event denoting BECOME-reading of *bleiben* because such a reading would be equivalent to the meaning of *werden*. We have seen that – except for the construction *bleiben* + non-finite posture verb – there is no eventive BECOME-reading of *bleiben* and therefore no reading where the event structures of *bleiben* and *werden* are equivalent. This difference can clearly be shown by the different behaviour regarding event and state modification. Compositional *bleiben*-constructions denote states and, at the same time, make reference to a counterstate rather than denoting the continuation of some state. Accordingly, the main difference between the meaning of *sein* and *bleiben* isn't that between a state on the one hand and some longer (or continuing) state on the other but that between a state and another which exists despite of the fact that its counterstate is much more likely to come into existence. Furthermore, *bleiben* also presupposes the existence of an interval which precedes the interval of the assertion immediately. At that first interval a state can take place which is either identical or contrary to the state asserted at the second interval, but also other kinds of eventualities given they satisfy the condition of a reasonable continuation.

Taking the arguments from the historical development of *bleiben* into account, too, this leads to the conclusion that the assertion of a state and reference to a counterstate are the most prominent components of *bleiben* which define its meaning in contrast to that of *sein* and *werden* whereas the presupposition of the existence of the first interval can be considered as being less important.

References

Dowty, David R. (1979): Word Meaning and Montague Grammar. The Semantics of Verbs and Times in Generative Semantics and in Montague's PTQ. Dordrecht, Boston, London: Reidel

Krämer, Sabine (2002): Eine Bedeutungsanalyse des Kopulaverbs *bleiben*. Magisterarbeit, Humboldt-Universität zu Berlin

Landman, Fred (1992): "The Progressive". Natural Language Semantics 1, 1-32

Lenz, Barbara (1996): "*Sein*, *bleiben* und *werden* im Negations- und Partizipial-Kontext". Linguistische Berichte 162, 161-182

Musan, Renate (1999): "Zur Semantik von *werden*: Ist prädikatives *werden* transitional?". ZAS Papers in Linguistics 14, 189-208

Rosenthal, Dieter (1984): Studien zur Syntax und Semantik des Verbs *bleiben*. Unter besonderer Berücksichtigung des Niederdeutschen und Niederländischen. Göteborger Germanistische Forschungen 27

Steinitz, Renate (1999a): "Deutsch werden, *bleiben*: Schwedisch bli, förbli". ZAS Papers in Linguistics 14, 1999, 209-226

– (1999b): "Die Kopula *werden* und die Situationstypen". Zeitschrift für Sprachwissenschaft 18.1, 121-151

Causative Constructions and Animacy Configurations

Sang Hwan Seong

sseong@uni-bonn.de

Abstract

This paper investigates the semantics of causative constructions in Korean, German and English with regard to their force dynamic profiles à la Talmy (1988), i.e. distributions over animacy configurations of causer and causee. We investigate how the distributions of types of caused predicates are correlated with the (in)animacy criterion of the causer and the causee. We will be concerned with analytic, syntactic causatives in Korean, German and English in which there are separate predicates expressing the notions of causation and the predicate of the effect. This study reveals that contrary to English, the most directly causing event in Korean is part of the inducive causation (human on human). We also discuss German causative constructions which show relatively tighter argument selectional restrictions compared to English.

1 Introduction[1]

This paper investigates the semantics of causative constructions in Korean, German and English with regard to their force dynamic profiles à la Talmy (1988), i.e. distributions over animacy configurations of causer and causee. We investigate here how the distributions of types of caused predicates are correlated with the (in)animacy criterion of the causer and the causee. Comrie (1981) draws three different types of causative typology: lexical, morphological and analytic (syntactic) causatives. However, we will be concerned only with analytic, syntactic causatives in Korean, German and English in which there are separate predicates expressing the notions of causation and the predicate of the effect (cf. 1).

(1) I *made* John go. I *brought* it *about* that John went.

(2) Na-nun John-ul ka-*key* *hay*-ss-ta (key ha causative)
I-TOP ACC go-AD do-PST-DC
(AD:adverbializer suffix; DC: declarative sentence-type suffix)
'I made John go.'

This causative type is the most productive of all the causative constructions in Korean in that it can combine with any kinds of verbs or adjectives except for the copular adjectives (cf. Sohn 1999).[2] In this paper, we compare the semantic aspects of the English 'make causative' with those of the Korean *key ha* construction and some corresponding German analytic causative constructions.

It is Leonard Talmy who elaborated on "force dynamics" as a semantic category - how entities interact with respect to force. Force dynamics can be understood as a "generalization over the traditional linguistic notion of "causative" (Talmy 1988: 49). Talmy (1976) identifies the following four causation types:

---

[1] The Yale romanization system is used in transcribing Korean language examples in this paper.
[2] For the analysis of *key ha* causative construction in this paper, I exclude examples with *key ha* such as the following , since such *key* has a purely adverbial function:
John-un yonku-lul chungsilha-key ha-ess-ta
John-top research-acc faithful-adv do-pst-decl. 'John conducted research faithfully.'

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference "sub8 – Sinn und Bedeutung". Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany*

Physical causation: physical object acting on physical object;
Volitional causation: volitional entity acting on physical object;
Affective causation: physical object “acting on” entity with mental states;
Inducive causation: volitional entity acting on entity with mental states.

With these four semantic categories Kemmer (2000) analyses the English *make* causative constructions.

2. The analysis of causer and causee in English *make* causative construction (Kemmer 2000)

Based on force dynamics of Talmy (1976, 1988), Kemmer came up with the following distributions from an English database with respect to *make* + NP + V causative construction.

Table 1. Distribution of Causer and Causee over animacy category in *make* + NP + V

	ANIMATE	INANIMATE	Total
CAUSERS	87 (43.3%)	**114 (56.7%)**	201 (100%)
CAUSEES	**147** (73.1%)	54 (26.9%)	201 (100%)

Table 2. Detailed semantics of *make* causatives in various causer-causee configurations

Causer Animate			87	43%
Causee Animate	60	29.9%		
Causee Inanimate	27	13.4%		
Causer Inanimate			**114**	56.7%
Causee Animate	87	**43.3%**		
Causee Inanimate	27	13.4%		
Total		100%	201	100%

The figures on the tables 1 and 2 show that in the English *make* + NP + V causative constructions the inanimate causer constructions (56.7%) are far more productive than the animate causer constructions (43.3%). At the same time we note that the animate causee types occur far more frequently than the inanimate causee types. The predicate types in caused events in English are given as follows (English examples from 3 through 6 are taken from Kemmer 2000).

(3) animate causer on animate causee
a. How do you *make a witch itch*?
b. They *make you feel* they’re trying

(4) inanimate causer on animate causee: physical and mental predicates in caused events
a. The humiliation made me shudder
b. The inconvenience made her chuckle
c. It made me feel an awful lot less isolated

(5) animate causer on inanimate causee: predicates of motion, mechanical function, and appearance
a. we promote each number, make it go higher, right then
b. those states which are committed to making European cooperation work:

The initiator of the event sets causee into motion or operation.

c. I'll probably make the headline look smaller:

External initiator creates a perception in the mind of experiencer relating to the causee. (subjectivized cause)

(6) inanimate causer on inanimate causee
Physiological response, but causee is a body part:
a. I see boys calling the girls fat and it makes my hair stand on end
b. a wide choice of restaurants make your mouth water

Motion (including by chemical reaction) and mechanical function
c. the the um, what do you call it *that made it rise*. Yeast…
d. the effort and planning which had gone into *making the whole program run*

As the semantic distributions of the force dynamics of the English *make* causative examples above show, the category of inanimate causer on animate causee seems to be the most frequently attested one among the four different configurations (cf. examples in [4]). Why is this so? What kind of explanations can we provide to account for these seemingly unbalanced semantic distributions in English *make* causative constructions?

Given the (in)animacy distribution of the causer and causee in the English causative constructions with *make* (56.7% inanimate causers over 43.3% animate causers), Kemmer (2000) argues that there are many inanimate causers attested because "the primary function of *make* is to describe causation events in which things in the world, external to human causes, act on and affect other things, either human or not" (e.g., Inanimate on Animate: *The humiliation made me shudder*; Inanimate on Inanimate: *A wide choice of restaurants makes your mouth water*). According to this version, the most directly causing event is part of the non-human world. On the other hand, she makes a further claim that there are as many animate causers (cf. 44.3%) as there are because i) humans are intrinsically more topical than inanimates, and ii) the use of *make* is construed to indicate compulsion of other animates (e.g. *He said they made him pay back five pounds*).

Despite the insightful observation of Kemmer, a careful study of Korean and German data leads to some contradictory findings in her argument. In section 3, we discuss Korean data primarily with respect to the (in)animacy configurations of causative constructions.

3. The analysis of causer and causee in Korean *key ha* causative construction

This analysis of Korean *key ha* causative construction is based on token frequency attested in four different Korean novels by four different contemporary writers (cf. www.sejong.or.kr for Korean corpora).[3]

Typically, *key ha* causative is used for indirect or distant causation, compared with the direct or immediate causation of suffixal and lexical causatives.[4] This suggests that there is a degree

[3] The four Korean novels are *Inkan mwuncey* (Human problem by K. E. Kang), *Pompom* (Spring, Spring by Y. C. Kim), *Yenghonuy miso* (Smile of Spirit by H. Shim) and *B Sakwan-kwa love letter* (B cadet and love letter by C. K. Hyun).

of causation along a continuum with respect to the different causative constructions. Thus, Comrie (1989: 173) states that "the construction closer to the analytic end is more appropriate for the distant (indirect) causative, while the one closer to the lexical end is more appropriate for the direct causative." Although this seems to hold also true for Korean causative constructions in general, the detailed semantic nature of the Korean analytic causatives is far from clear. Let us consider the semantic distributions of the *key ha* causatives in Korean.

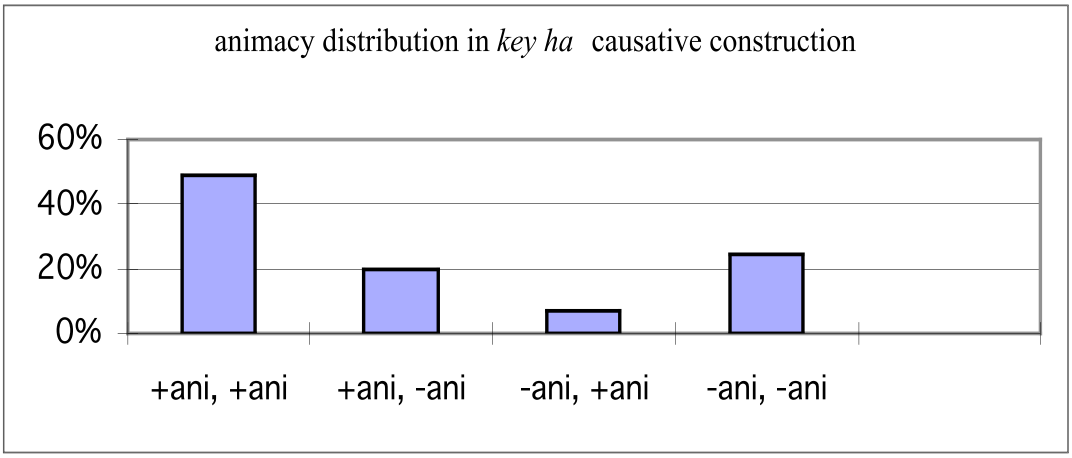
Table 3. Distribution of Causer and Causee over animacy category in Korean ***key ha*** causative construction

	ANIMATE	INANIMATE	TOTAL
CAUSERS	**70** (68.6%)	**32** (31.4%)	102 (100%)
CAUSEES	57 (55.9%)	45 (44.1%)	102 (100%)

Table 4 Distribution of Korean syntactic causative *key ha* in various causer-causee configurations

Causer Animate			**70**	**68.6%**
Causee Animate	50	49%		
Causee Inanimate	20	19.6%		
Causer Inanimate			**32**	**31.4%**
Causee Animate	7	6.9%		
Causee Inanimate	25	24.5%		
Total		100%	102	100%

Table 5. Distribution of Causer and Causee over animacy in Korean *key ha* construction



[4] Song (2002:123) demonstrates that the syntactic *key ha* causative in Korean can potentially be interpreted in such a way that no causation on the part of the subject NP takes place. This discussion goes beyond the scope of the current paper.

As the tables 3-5 on Korean corpus data show, the constructions with the causer animate (68.6%) predominate over those with the causer inanimate (31.4%). This result is shown to be the direct opposite of the English analyses on *make* causative construction. Furthermore, the most preferred construction type among the four different force dynamic configurations adduced from the given Korean database turns out to be the semantic category of causer animate over causee animate. In fact, this category of causer animate over causee animate is analysed as a significantly lower profile in the English corpus as compared to the corresponding Korean one. In the following, we present the detailed predicate types in caused events in Korean *key ha* causative constructions.

3.1. The following predicates are attested for causer animate on causee animate (inducive causation: volitional entity acting on entity with mental states, cf. Talmy 1988, Croft 1991):

cap-a-kata (arrest), mekta (eat), cata (sleep), issta (exist for human), cwuta (give), ota (come), kyelceng-hata (decide), mos-hata (cannot do), omkita (move to another place), phalta (sell), nakata (go out), pwuluta (call someone) cwukta (die), mannata (meet), nulta (age) tephta (cover), mwungchita (gather together), masita (drink or inhale) etc.

Compared to English inducive causation, the kinds of Korean verbs identified in this category include not only intransitive motion verbs but also typical transitive action verbs. The following sentences (7) and (8) are the representative examples for this category.

(7)	chemci-nun	kwanka-ey	kosocang-ul	tulye	i kunche
	old man-top	a district office-goal	a written accusation-acc	file	nearby

nongmin-dul-ul motwu capaka-k**ey ha**y-ss-ta
farmer-pl.-acc all arrest-causative-pst-decl.
Lit. 'An old man, by filing an accusation to a district office, made [police officers] arrest all farmers in the vicinity.' (animate causee is contextually identifiable: police officers)

(8)	senpi-nun	alay-cip	kase	ca ***key ha*** ye la	
	private scholar-top/acc.	lower cabin	go	sleep-causative-imperative	

'Make the private scholar go to the lower cabin and sleep (there).'

3.2. The category of animate causer on inanimate causee (volitional causation: volitional entity acting on physical object): This category signifies motion and change of state. The initiator in causative event possesses and exercises his mental capacity acting on a physical object. Thus, this semantic category inherently blocks the participation of the causee in the effected event :

cakta (be small), kanulta (be thin), aphuta (ache, be sick), tule-ota (enter), ppita (sprain), poita (look like), kwulekata (roll over), phikonhata (be tired), caymi-issta (be interesting):
The predicate types in the caused events of this category involve mostly intransitive and stative verbs.

(9)	Chelsoo-uy	maum-ul	aphu-***key***	***ha***-tu-ni
	Chulsoo-genitive	heart-acc.	ache-causative	do-pret-conjunctive

'You made Chelsoo's heart ache and …'

(10)	senpi-nun	say-mwul-i	tule-o-***key ha***y-ss-go
	private scholar-top/subj.	fresh-water-nom.	enter-come-causative-pret-conjun.

'The private scholar made the fresh water enter and then …'

3.3. The category of inanimate causer on animate causee (affective causation): This category is not productive at all in Korean (6.9%). In one of the four novels investigated, no instance of this type is found. The kinds of caused predicates are non-actional. Cognitive verbs of mental response and processing are attested as in the English instances (cf. examples in [4]). Recall that in table (2) above the English data collected by Kemmer show the highest percentage of occurrence (43.3%) in this semantic configuration. Unlike the category of animate causer on inanimate causee in 3.2., this semantic configuration allows the participation of the causee in the event of causation. The predicates of the effect for this category are given as follows:

silcungnata (get distasteful), salta (live), sayngkaknata (occur to one's mind), ca-a-nayta (evoke [one's feeling]), nolata (be surprised), moluta (do not know).

(11) phyoceng-i Shinchel-lo hayekum tewuk silcungna -***key ha***-yess-ta
countenance-nom Shinchul-agentive more get distasteful-causative-pret-decl.
'The countenance made Shinchel get distasteful all the more.'

(12) ku-uy cwulyang-i na-lul nola-***key ha***-ess-ta
he-gen. drinking capacity-nom I-acc be surprised-causative-pret-decl.
'The alcohol amount he drinks surprised me.'

3.4. The category of inanimate causer on inanimate causee (physical causation: physical object acting on physical object): As in English, physiological responses are attested in Korean. However, this category alone is productive in Korean compared to the category of inanimate on animate type causation. 12 tokens out of 25 cases involve 'affected causee as a body part'. This causation type involves the effected predicates representing the mechanical and metaphorical functions. The effected events are independent of the will or intention of the experiencer or human patients involved. This category also includes appearance and interaction of two non-volitional entities. In (13) and (15) we find that the external stimuli evoke a certain feeling or perception unto experiencer relating to the state of the affairs. The effected predicates are:

palkahta (be red), (ohan-i) nata ([cold] come to exist), ttuupta (be hot), tangkita (appeal to one's appetite), ttwita ([one's heart] beat), pekchata (be beyond one's power or capacity), ca-a-nayta (evoke [one's thought]), koyohata (be quiet).

(13) kwangsen-un ku-uy sonkalak-ul palkah-***key ha***-yess-ta
beam-top/subj. he-gen. finger-acc red –cauative-pret-decl.
'The beam made his finger look red.'

(14) etten kyelsim-i ku-uy censin-ul ttukep-***ke hay***-ss-ta.
a certain decision-nom he-gen. whole body-acc. hot-causative-pret-decl.
'A certain decision made his whole body be hot.'

(15) ku soli-nun koyohan sup-ul te koyoha-***key ha***-yess-ta
the sound-top/subj quiet forest-acc more quiet-causative-pret-decl.
'The sound made the quiet forest be more quiet.' [appearance]

4. The semantic nature of syntactic causative construction: a cross-linguistic view

Judging from the discussions so far, it is clear that the analyses of causer and causee in English *make* causative construction in section 2 provided by Kemmer do not suffice to account for the cross-linguistic differences attested in section 3. The present author finds some logical inconsistencies in her argument, because a cross-linguistic lexical semantics of the causative constructions with *make* does not corroborate its syntactic compatibility with inanimate causers which act upon humans as we have seen in Korean data. We have clearly noticed that in Korean data, the cases of schematic *make* are far more restricted.[5]

Croft (1991: 169) also observes that among the four causation types by Talmy, the most marked type is the inversion of volitional causation, namely, affective causation (inanimate on animate) and that the behavior of the marked causation types is "based on" or "derived from" that of the unmarked types. According to this view and our analyses on Korean data, then, contrary to Kemmer, ***the compulsion make (animate on animate) is shown to be not an extension of schematic make***.

The problems of Kemmer's version on causatives crop up further, when we consider the following observation. Kemmer attempts to provide an answer as to why there are so many animate causees (cf. Kemmer 2000: 5):

(16) animates can have two types of responses to direct external causation, physical or mental, whereas inanimates can have only one; so there are more types of events that will occur with animates (raising their frequency)

The problem with this interpretation is that whereas we can confirm this generalization in the analyses of English *make* force dynamic profiles in section 2, this is not the case in the Korean data in section 3. Recall that in table 2 for English data, in the case of causer inanimate, causee animate (43.3%) has much higher frequency than causee inanimate (13.4%). For the same category, however, Korean shows the opposite proportion (6.9% for causer inanimate on causee animate vs. 24.5% for causer inanimate on causee inanimate). If Kemmer's universal interpretation (16) is right, we would expect the higher frequency rate for the category of causer inanimate on causee animate in Korean. We also need to note that English shows the highest frequency rate for this category among the four different force dynamic profiles.

How do we explain these semantic distribution differences in the analytic causative constructions?

What interests us in an attempt to establish a more convincing and coherent account for these linguistic differences is not the research tradition that seeks to explain away the instances as mere deviations from the central proto-typicality. Rather, in order to provide a better balanced and inviting account for the constructions at issue, we want to establish a coherent relevance among typologically different types of languages that allow or disallow those deviations in a regular fashion.

We argue that the schematic senses of *make* in English are analogical modeling of more inclusive transitive constructions [actor-action-goal model] where inanimate subjects can control the state of affairs, whereas Korean causer in the causing events is subject to an animacy constraint broadly applicable to the transitivity phenomena. In English, it is also the case that, with respect to the subject category, the semantic scope to fill in the subject slot is highly liberal. Thus, we find the following unagent-like entities as grammatical subjects in English.

(17) a. The room seats 500.
b. *De kamer zetelt 500. (Dutch)
c. De kamer heeft 500 zitplaatsen. (Dutch: The room has 500 seats)
d. The fifth day saw our departure.

---

[5] Kemmer (2000: 4) defines the general sense of make (Schematic *make*) as follows:
To affect an entity so as to cause it to be an initiator participant in a caused event: the initiator carries our some action/undergoes some reaction, independently of any will it might have. The most directly causing event is part of the non-human world.

e.*De vijfde dag zag ons vertrek.

In English, the subjecthood has a grammatical status that does not tolerate complete reduction to semantic and pragmatic notions, in the sense that it is grammaticalized to the extent where an expletive grammatical subject is required (cf. Van Oosten 1986, Seong 2001). In this case, the English expletive subjects (e.g., *it* or *there*) contract no semantic relationship with predicates. We can extend this line of reasoning to the analyses and interpretation of the analytic causative constructions at issue.

In Talmy's terms, energy transfer does not take place in the examples in (17), because these subjects actually do nothing to execute the unfolding of the events denoted by the predicates. The fact that these unagent-like noun phrases can appear as syntactic subjects in English does not pose serious problems in cognitive grammar since they are considered mere deviations from the central semantic specification of prototypical transitivity (Taylor 1995: 214). Compared to typical transitive constructions like *John killed a snake*, the semantic relation between subject and each event involved in (17a, 17d) is less intense. In the transitive constructions the relation between the subject that initiates the event and the process it triggers and the relation between this process and the affected entity (object) can have different degrees of intensity. The present author assumes that these relations also hold for the analytic causative constructions that we are investigating.

The following causative constructions also help clarifying our explanation.

(18) a. The terrorist threats close US embassy in Bosnia. (CNN)
b. *De terroristische bedreigingen zorgen voor sluiting van de Amerikaanse ambassade in Bosnië (Dutch).
c. *Die terroristischen Bedrohungen schließen die US Botschaft in Bosnien. (German)
d. Wegen der Terrorbedrohungen wurde die US Botschaft in Bosnien geschlossen.
'Because of the terrorist threats the US embassy in Bosnia was closed'

In the event of closing an embassy we usually expect an agent (*Ger*. Handlungsträger) to appear as a grammatical subject. In this sentence, however, 'threats' as an indirect source or cause can function as subject in the English sentence. The corresponding German and Dutch constructions are ungrammatical. The same kind of grammatical relation holds true for the verb 'buy'.

(19) a. That job bought him a house in Berkeley.
b. *Die baan kocht een huis voor hem in Berkeley.
c. Door die baan kon hij een huis in Berkeley kopen.
d. *Die Arbeit hat ihm ein Haus in Berkeley gekauft.
e. Wegen der Arbeit konnte er in Berkeley ein Haus kaufen.
'Because of the work he could buy a house in Berkeley.'

Money and job in these cases are seen as performing an instrumental function in the act of buying a meal and a house respectively. Even though this function is not directly relevant to the act of purchasing, money and job can indeed appear as subjects in the English constructions. This rule can be applied to a more complex German causative sentence type which shows relatively tighter argument selectional restrictions compared to English:

(20) (Doherty, 1993)
a. The drug encourages the heart to beat more regularly.
b. ?Das Medikament ermutigt das Herz regelmäßiger zu schlagen

In English we find many transitive constructions in which the grammatical differentiations available in overtly case-marking systems such as German and Korean are simply neutralized (G. *Peter braucht eine Frau* 'Peter needs a wife' vs *Peter fehlt eine Frau* 'Peter is lacking a wife'). With respect to these differences in grammatical relations, we can conclude that there is cross-linguistic regularity as regards the semantic intensity between the subject and the verb on the one hand, and between the verb and the object on the other, when it comes to the transitive causative constructions. In this respect, it is also clear that traditional primitive notions of grammatical relations, such as subject and object, do not suffice to adequately describe the grammars of German and Korean as opposed to English. Thus, Korean and German transitive causative constructions show a relatively transparent semantic encoding system of subject and object selection, while in English these constructions are opaque. This comparative perspective provides a better explanation as to why there are cross-linguistic differences of causative constructions with respect to the force dynamic profiles.

References

Comrie, Bernard (1981) *Language Universals and Linguistic Typology*. University of Chicago Press.

Croft, William (1991) *Syntactic categories and grammatical relations*. Chicago: The University of Chicago Press.

Doherty, Monika (1993): Parametrisierte Perspektive. *Zeitschrift f. Sprachwissenschaft* 12.1, 3-38.

Kemmer, Suzanne (2000) ms. Aspects of Causative Constructions. Paper delivered at DGfS, Workshop on Conceptualization, Grammaticalization and Language Production, Marburg, March 1-3, 2000.

Seong, Sang Hwan (2001) Transitivity parameter and prominence typology: a cross-linguistic study. In: *Applied Cognitive Linguistics I: Theory and Language Acquisitition.* Eds. Martin Pütz, Susanne Niemeier and Rene Dirven. *Cognitive Linguistics Research Series 19.1*, Berlin and New York: Mouton de Gruyter (2001), 131-163.

Sohn, Ho-Min (1999) *The Korean Language*. Cambridge: CUP

Song, Jae Jung (2002) The *ke ha* Causative Construction in Korean – Causative or Not?: A Crosslinguistic Perspective. Eoneohag 32: 121-146, *Journal of the Linguistic Society of Korea.*

Talmy, Leonard (1976), Semantic causative types, in Shibatani (ed.), *The grammar of causative constructions, Syntax and Semantics* vol. 6, New York: Academic: 43-116.

Talmy, Leonard (1988) Force dynamics in language and cognition, Cognitive Science 12:49-100

Taylor, John (1995), *Linguistic Categorization: Prototypes in linguistic theory*, Oxford: Clarendon Press.

Taylor, John (1998), Syntactic Constructions as Prototype Categories, in Michael Tomasello (ed.), *The New Psychology of Language*, London: Lawrence Erlbaum Associates: 177-202.

Van Oosten, Jeanne (1986), The nature of subjects, topics and agents: A cognitive explanation, Unpublished Ph.D. Dissertation, University of California, Berkeley.

BECK EFFECTS IN THE COMPARATIVE[1]

Penka Stateva
penka.stateva@rz.hu-berlin.de

Abstract

This paper defends a "classical" quantificational view on the semantics of comparatives. Building on a proposal in Heim (2000), I examine the role of syntax in scope interactions between the comparative operator and other scope bearing elements. I reevaluate Heim's interface constraint, known as *Kennedy's generalization* and propose to reduce it to a more general constraint about intervention effects of quantifiers, independently motivated in Beck (1996a). My proposal also sheds light on long known puzzles in the *than*-clause of comparatives.

1 DegP: a degree quantifier or not?

1.1 Background assumptions

Research on the semantics of comparatives is impressively extensive. Among the various proposals, two major approaches are currently competing: one which treats the comparative construction as a quantificational structure (cf. Seuren (1973), Cresswell (1976), Hoeksema (1983), Hellan (1984), Stechow (1984), Heim (1985), Heim (1998), Heim (2000), Rullmann (1995), Lerner and Pinkal (1995), Beck (1997), Hackl (2000), Schwarzschild and Wilkinson (2002), etc.), and another which treats them as non-quantificational (cf. McConnell-Ginet (1973), Bartsch and Vennemann (1972), Klein (1980), Klein (1982), Kennedy (1999), etc.).

The former approach views the degree word *–er/less* as an operator that binds a degree variable introduced by a scalar predicate: adjective, adverb, or a verb. The ability of the degree operator to bind a variable in its scope, leads one to expect that the operator, being in that sense a quantificational element, can interact with other scope bearing elements. However, evidence for such interactions, as argued by Kennedy (1999), are hard to find. Our main goal here is to offer one such piece of evidence and thus argue for the quantificational theory of comparatives. But before we are able to do that, let us lay out the essentials of that theory.

We specify the basic assumptions of the quantificational theory of comparatives following mostly Heim (2000). Adjectives are assumed to relate individuals and degrees/extents/intervals (depending on different ontological views) on a scale. Therefore, the lexical entries for adjectives like *old* look like (1):

(1) $[[\text{old}]] := [\lambda x \in D_d .[\lambda y \in D_e .\text{old}(d)(y)]]$ where *e* is a type for individuals, and *d* is a type for degrees

The comparative operator quantifies over parts of a scale. It takes two arguments: two sets of degrees. The first one, the restriction on the operator, is the set of those degrees which satisfy the *than*-clause. Consider (2), for example:

(2) a. Scott is taller than Keith is.
b. Scott is taller than Keith.

[1] For generous help and comments on different versions of this paper I am grateful to Željko Bošković, Sigrid Beck, Hans Kamp, Manfred Krifka, Roger Schwarzschild, Yael Sharvit, Arnim von Stechow, Arthur Stepanov and Ede Zimmermann.

The set of degrees that satisfy the *than*-clause are those to which Keith is tall: λd*: tall(d)(Keith)*. This set is not a singleton on the assumption that adjectives are monotone functions in the sense of (3):

(3) A function R of type <d,et> is monotone iff
$\forall x,d,d_1[\ d > d_1\ \&\ R(d)(x) \rightarrow R(d_1)(x)]$ (after Gawron (1995))

There are, however, *than*-clauses like the one in (4) whose reference is a degree, rather than a set of degrees.

(4) Scott is taller than 190cm.

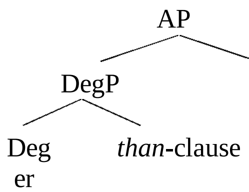
For these cases, it is assumed that there is a comparative operator of the appropriate type: it is a function whose first argument is a degree.

The second argument of the comparative operator is a set of degrees provided by the main clause. In (2), this would be the set of degrees to which Scott is tall: λd*: tall(d)(Scott)*. The denotation of the comparative *–er* applied to its to arguments gives *True* just in case the "biggest" degree that satisfies the main clause is greater than the "biggest" degree satisfying the *than*-clause. With *less*, the relation is reversed. (5) and (6) list the respective lexical entries:

(5) a. $[[er_1]] := \lambda P: P \in D_{<d,t>}.[\lambda R: R \in D_{<d,t>}.[max(\lambda d.P(d)) < max(\lambda d.R(d))]]$
b. $[[er_2]] := \lambda d_1: d_1 \in D_d.[\lambda R: R \in D_{<d,t>}.[d_1 < max(\lambda d.R(d))]]$

(6) a. $[[less_1]] := \lambda P: P \in D_{<d,t>}.[\lambda R: R \in D_{<d,t>}.[max(\lambda d.P(d)) > max(\lambda d.R(d))]]$
b. $[[less_2]] := \lambda d_1.[\lambda R: R \in D_{<d,t>}.[d_1 > max(\lambda d.R(d))]]$
where $max: = \lambda P \in D_{<d,t>}.\ [[the]]\ (\lambda d.\ [P(d)\ \&\ \forall d_1[P(d_1) \rightarrow d_1 \leq d]])$

The theory is dependent on a particular syntactic assumption: that the comparative operator and the *than*-clause form a constituent at LF (see Bresnan (1973), Lechner (1999)).[2] This constituent is what Heim (2000) assumes to be the DegP in comparatives.



The comparative construction comes in two varieties, clausal, as in (2a) and phrasal as in (2b). We do not take a stand here on a long going debate whether these two types of comparatives are transformationally related. For reasons of simplicity, however, we will pretend until *Section 4* that they are. We believe that this assumption, though highly questionable, does not affect the issue about the quantificational status of the comparative morpheme with which we are concerned here.

Let us illustrate the quantificational theory with an example. Consider again (2a), repeated as (7a). (7b) gives the D-structure of the sentence which feeds its LF:[3]

(7) a. Scott is taller than Keith is.

[2] This assumption, though widely followed has been questioned and criticized (see, for example, Lerner and Pinkal (1995), Kennedy (1999)).

[3] The assumption is that the *than*-clause is reconstructed at LF.

b. $[_{IP}$ Scott is $[_{AP}$ $[_{DegP}$ -er than Keith is $\sigma[_{A'}$ tall]]]]

DegP contains the *than*-clause and with it an ellipsis site but ellipsis resolution is impossible in the base position of DegP since the antecedent in the AP includes the ellipsis site. To overcome the difficulty, following a standard solution to the problem of antecedent contained deletion (ACD), DegP is adjoined to IP by Quantifier Raising (QR), leaving behind a trace of type *d*.[4] The movement creates a binder for the trace which is attached on the sister of the moved element (Heim and Kratzer (1998)). Now the antecedent of the elided AP is free of infinite regress and can be copied into the ellipsis site. The trace that is left from the movement of DegP is semantically a variable. It is bound in the main clause but in the *than*-clause the copied degree variable needs a binder, too. The quantificational theory uses a proposal from Chomsky (1977) that there is a *wh*-operator in the CP-domain of the *than*-clause. That operator is assumed to bind the degree variable in the *than*-clause. With these assumptions, we arrive at (8a), as the LF of (7a), which feeds the semantic component. (8b) gives the corresponding semantic derivation:[5]

(8) a. $[_{IP2}[_{DegP}$ -er $[_{CP}$~~than~~ wh_1 Keith is d_1 -tall]]$[_{IP1}2[_{IP}$ Scott is $[_{AP}$ d_2-tall]]]]

b. $[[AP]] = \lambda y{:}y{\in}D.tall(d_2)(y)$
$[[IP_1]] = \lambda d_2{:}d_2{\in}D_d.tall(d_2)(Scott)$
$[[CP]] = \lambda d_1{:}d_1{\in}D_d.tall(d_1)(Keith)$
$[[Deg]] = \lambda P{:}\ P{\in}D_{<d,t>}.[\lambda R{:}\ R{\in}D_{<d,t>}.[max(\lambda d.P(d)) < max(\lambda d.R(d))]]$
$[[DegP]] = \lambda R{:}R{\in}D_{<d,t>}.[max(\lambda d.tall(d)(Keith)) < max(\lambda d.R(d))]$
$[[IP_2]] = 1$ iff $max(\lambda d.tall(d)(Keith) < max(\lambda d.tall(d)(Scott))$

[[Scott is taller than Keith is]] =1 iff The "biggest" degree to which Keith is tall is smaller than the "biggest" degree to which Scott is tall.

The derived interpretation closely reflects the intuitions one has about the meaning of (7a).

As Heim observes, under this view, the comparative operator looks very similar to quantificational elements in DPs. The latter have a restriction which is a function from individuals to truth values and a nuclear scope of the same type. The comparative operator, on the other hand, is restricted by a function from degrees to truth values and takes as a second argument a function of the same type. Individuals and degrees are similar basic types. There's a natural analogy then between the $<et,t>$-type generalized quantifiers and DegP, which is highlighted by the quantificational theory of comparison: $<\alpha t,t>$ is a type of a quantifier (where α = d *or* e).

1.2 Kennedy's observation and the non-reductionist view of Heim (2000)

If *–er/less* has quantificational force, it should interact with other scope bearing elements, as Kennedy (1999) notes. Detecting ambiguities involving a DegP, however, is quite difficult as Heim (2000) shows. Heim (2000) shows that in many cases, the available degree theories, in fact, do not predict truth conditional differences between the comparison operator and a quantified DP, and therefore the lack of ambiguity cannot be taken as an argument against

[4] The proposals for ellipsis resolution in ACD constructions are executed mainly by LF-copying (May (1985), etc.). However, as Lasnik (1993), Lasnik (1999) show, ACD in many cases can also be resolved through PF-deletion.
[5] The preposition *than* is assumed to be semantically vacuous.

them. We have analogous situations with sentences like (9), which certainly involve more than one quantifier:

(9) Every professor interviewed every applicant.

(9) is associated with two possible LFs, but they lead to the same truth conditions. The lack of ambiguity is correctly predicted. (10) is a parallel (in the relevant sense) case involving a comparative:

(10) Every student is taller than Mary is.

If the comparative degree word is a quantificational element, we expect it to take scope either under or over the universally quantified DP. The corresponding LFs are those in (11a) and (11b), respectively. However, they lead to (logically) equivalent truth conditions.

(11) a. [[every student] [1 [[-er than wh_3 Mary is d_3-tall] [2 [t_1 is d_2-tall]]]]]
a'. [[Every student is taller than Mary is]] = 1 iff
$\forall x[\text{student}(x) \rightarrow \max(\lambda d.\text{tall}(d)(\text{Mary})) < \max(\lambda d.\text{tall}(d)(x))]$

b. [[-er than wh_3 Mary is d_3-tall] [2 [[every student] [1 [t_1 is d_2-tall]]]]]
b'. [[Every student is taller than Mary is]] = 1 iff
$\max(\lambda d.\text{tall}(d)(\text{Mary}) < \max(\lambda d \forall x[\text{student}(x) \rightarrow \text{tall}(d)(x)])$

The set of truth conditions in (11a') amounts to requiring that each student is such that she is taller than Mary. The conditions in (11b') require that the shortest of the students be taller than Mary. But the situations in which the conditions from (11a') will be fulfilled are those situations in which the conditions from (11b') will be fulfilled. (10) is judged to be unambiguous, and the degree theories predict that.

A second problem with detecting the scopal properties of comparison operators, which Heim (2000) discusses is that in many cases the truth conditions derived from the compared LFs are not equivalent, but there is an independent reason for one of the LFs to be ill-formed. Again, the empirical facts that we do not detect any ambiguity in such sentences coincide with the prediction of the quantificational theory.

It is then more instructive to look at those examples, for which the quantificational theory predicts an ambiguity. One of them, discussed by Heim, is (12):

(12) Every student is less tall than Mary is.

The sentence is unambiguous. Given the assumptions made so far, we expect to find two readings in (12). We have two well-formed LFs from which we derive two unequivalent sets of truth conditions, as in (13).

(13) a. [[every student] [1 [[less than wh_3 Mary is d_3-tall] [2 [t_1 is d_2-tall]]]]]
a'. [[Every student is taller than Mary is]] = 1 iff
$\forall x[\text{student}(x) \rightarrow \max(\lambda d.\text{tall}(d)(\text{Mary})) > \max(\lambda d.\text{tall}(d)(x))]$

b. [[less than wh_3 Mary is d_3-tall] [2 [[every student] [1 [t_1 is d_2-tall]]]]]
b'. [[Every student is taller than Mary is]] = 1 iff
$\max(\lambda d.\text{tall}(d)(\text{Mary}) > \max(\lambda d \forall x[\text{student}(x) \rightarrow \text{tall}(d)(x)])$

(13a') represents the attested reading of (12), according to which the sentence is true only if it is true of each student that she is shorter than Mary. (13b'), however, allows its truth conditions to be met only if the shortest student is shorter than Mary. But these are inadequate truth conditions: such a reading does not exist.

It looks like some explanation is needed to account for the overgenerated reading of (12) in order to save the quantificational theory. Careful examination of different types of data lead Heim to formulate a syntactic condition on the well-formedness of LFs involving a DegP. This condition rules out (13b) and makes the quantificational theory consistent with the facts. Heim (2000) refers to this condition as the *Kennedy generalization*:

(14) If the scope of a quantificational DP contains the trace of a DegP, it also contains DegP itself.

It follows from the above discussion that if DegPs have significant scopal properties, we should not expect them to be revealed in just any linguistic context in which we find another scope bearing element. On the assumption that scope interaction involves movement, restrictions on DegP movement could prevent us from getting (otherwise expected) well-formed LFs. We need, then, to expand the domain of inquiry and look for configurations that circumvent Kennedy's generalization. This is what we offer in the next section.

2 A puzzle: ambiguity in comparative conditionals

The generalization in (14) accounts for the missing reading of the German sentence (15).

(15) (Frank kommt in unsere Laden einmal pro Woche.) Viele Rentner kommen öfter.
(Frank comes in our shop once a week) many retirees come more-often
'(Frank comes to our shop once a week.) Many retirees show up more often than that.'

(15) contains the comparative quantifier *öfter* and a quantificational DP *viele Rentner*. It is judged to be unambiguous. It can only have the interpretation in (16a) which results from having DegP take narrower scope than the DP. The interpretation in (17a), which reflects the reverse scopal order is unavailable.

(16) a. Many retirees x are such that x shows up more often than once a week.
b.[[many retirees] [1 [[-er than once a week] [2 [t_1 show up d_2-often]]]]]
QP **DegP** $\mathbf{t_{DegP}}$
c. for many retirees x, max(λd.x comes d-often) > once a week

(17) a. #The frequency of having many retirees is greater than once a week.
b. [[er than once a week] [2 [[many retirees] [1 [t_1 show up d_2-often]]]]]
DegP **QP** $\mathbf{t_{DegP}}$
c. max(λd.d-often, many retirees come) > once-a-week

(17a) is created by an illegitimate, from the point of view of Kennedy's generalization, configuration *DegP quantificational DP* t_{DegP}. What this generalization does not explain, however, is why there are two readings in (18), informally represented in (19):

(18) Je mehr Sonderangebote wir haben, umso öfter kommen viele Rentner
the more special-offers we have the more-often come many retirees
'The more special offers we have, the more often many retirees show up.'

(19) a. $\forall t_1,t_2$ [where t_1 and t_2 are relevant periods of time, if we have more special offers at t_2 than we do at t_1, then many retirees show up more often at t_2 than they show up at t_1]
b. $\forall t_1,t_2$ [where t_1 and t_2 are relevant periods of time, if we have more special offers at t_2 than we do at t_1, then we have more often many retirees showing up at t_2 than we have many retirees at t_1]

(19b) results from a LF, which is similar to the illegitimate (17b) in that it utilizes the configuration *DegP quantificational DP* t_{DegP}, as we will show promptly. If indeed we are right in claiming that, two important questions will arise. First, is Kennedy's generalization flexible enough to make a difference between (17b) and (19b)? And second, what is the property that distinguishes the two LFs? That property must be blamed for the different acceptability status of the readings that correspond to the respective LFs.

Before we ask these questions, let us first show how (19a) and (19b), the two readings of the comparative conditional (CC) sentence in (18) are derived. We follow Beck (1997)'s proposal for analyzing comparative conditionals.

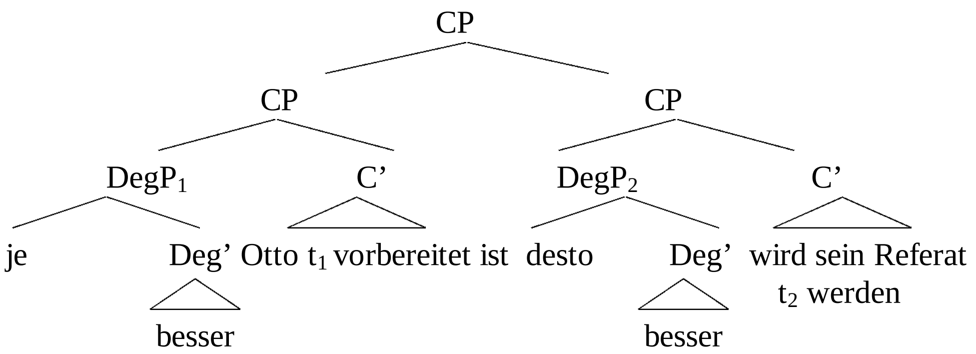
We start with the essentials of her proposal. CCs are genuine conditional sentences. One of the clauses is viewed as an antecedent, the other – as a consequent. Like in other conditional sentences, Beck proposes that there is an implicit adverb of universal quantification. It binds a pair of world/time variables. Let us look at one of her examples:

(20) Je besser Otto vorbereitet ist, desto besser wird sein Referat werden.
The better Otto prepared is the better will his talk become
'The better Otto is prepared, the better his talk will be.'

The intuitive truth conditions of (20), given in (21), involve a universal quantification over a pair of worlds in which Otto has a different degree of preparedness:

(21) $\forall w_1,w_2$ [$w_1 \in$ Acc & $w_2 \in$ Acc & if Otto is better prepared in w_1 than he is prepared in w_2 then Otto's talk is better in w_1 than it is in w_2]

(22) is the proposed syntactic structure underlying (20):

(22)


The DegP in the antecedent and the consequent is fronted to the respective [Spec, CP]. The consequent is the main clause. The antecedent is adjoined to it.

Beck notices that in both the antecedent and the consequent there is a part of the clause that is used twice in the interpretation. Again informally, such are the incomplete clauses *Otto is prepared d-well* and *Otto's talk is d-good*. But then it follows that everything except for *je/umso/desto* and *–er* is used twice. Beck draws two conclusions: (i) either *je/desto* or *-er* must be blamed for using the interpretation of each of these clauses twice. Her proposal is that *je/desto* are defined to do that. This is a case of what Heim (2000) calls semantic ellipsis: an instruction in the semantics of a lexical item that requires an argument to which that item applies to be used more than once in a semantic derivation. (ii), the adverb from each DegP which appears fronted along with the comparative morpheme in its surface position must be reconstructed to its base position at LF in order to create the appropriate incomplete clause which is recycled in the interpretation procedure. *Je/umso/desto* is suggested to occupy the syntactic position of the missing than-clause in the construction and is defined as in (10):

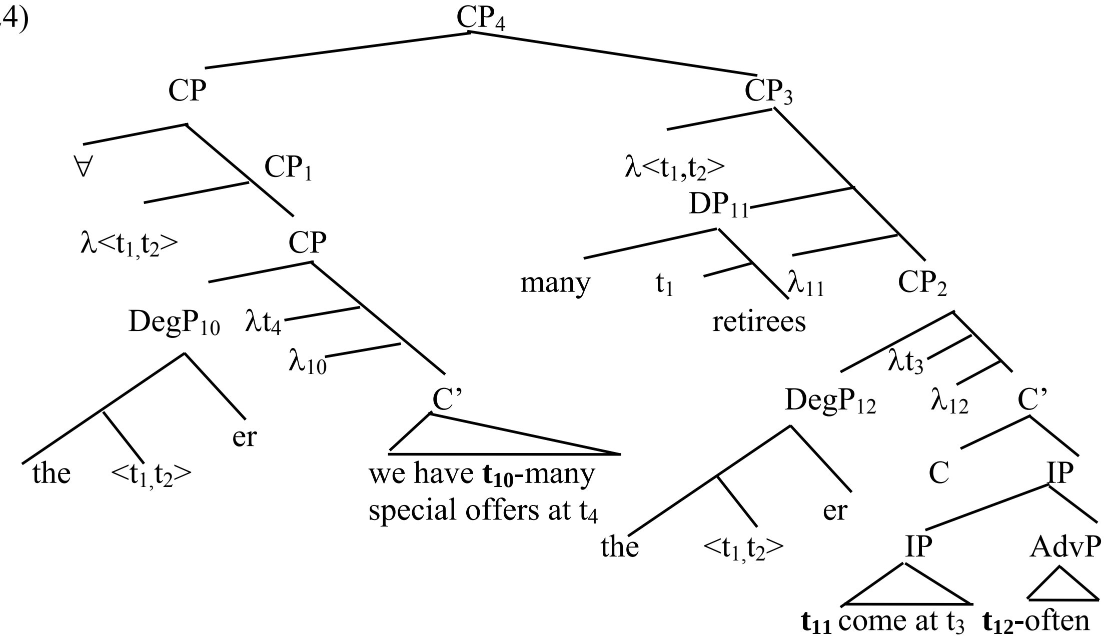
(10) $[[\text{je/umso}]](<w_1,w_2>)([[\text{er}]])(D_{<s,<d,t>>}) = 1$ iff $[[\text{er}]](D(w_2))(D(w_1))$

-*Er* and *je/umso/desto* form a constituent at LF, DegP, whose denotation combines with the denotation of the antecedent/consequent clause, D, (i.e. a set of degrees) after DegP is fronted. These assumptions allow for CCs to be interpreted compositionally. (20) has the interpretation in (23) which correctly represents the intuitive meaning given in (21).

(23) $\forall w_1,w_2,[w_1 \in Acc\ \&\ w_2 \in Acc\ \&\ [\max(\lambda d.[\mathit{well}(d)(\lambda x.\mathit{prepared}(x) \text{ in } w_2)](\mathit{Otto})) < \max(\lambda d.[\mathit{well}(d)(\lambda x.\mathit{prepared}(x) \text{ in } w_1)](\mathit{Otto}))] \Rightarrow [\max(\lambda d.[\mathit{good}(d)(\mathit{Otto's\_talk}) \text{ in } w_2]) < \max(\lambda d.[\mathit{good}(d)(\mathit{Otto's\_talk}) \text{ in } w_1])]]$

Let us now go back to (18) and see how the two intuitively present readings of the sentence can be compositionally derived. Beck's semantics of CCs, coupled with the quantificational theory of comparatives offers the desired account of the ambiguity in CCs. By assumption, the comparative operator is a scope bearing element, so given that there is another scope bearing element in the consequent clause, we can represent that clause by two LFs: one in which the DP *viele Rentner* has the comparative operator in its scope, and another, with the reverse scopal ordering. (24) represents the first option.

(24)



(25) gives the semantic interpretation derived by this LF. Note that the gradable adverb with which the comparative operator is associated is reconstructed to its base position at LF:[6]

[6] $t_{1,\ldots n}$ are variables over periods of time. $\mathbf{t_{1,\ldots n}}$ are traces of moved elements.

(25) antecedent clause CP_1

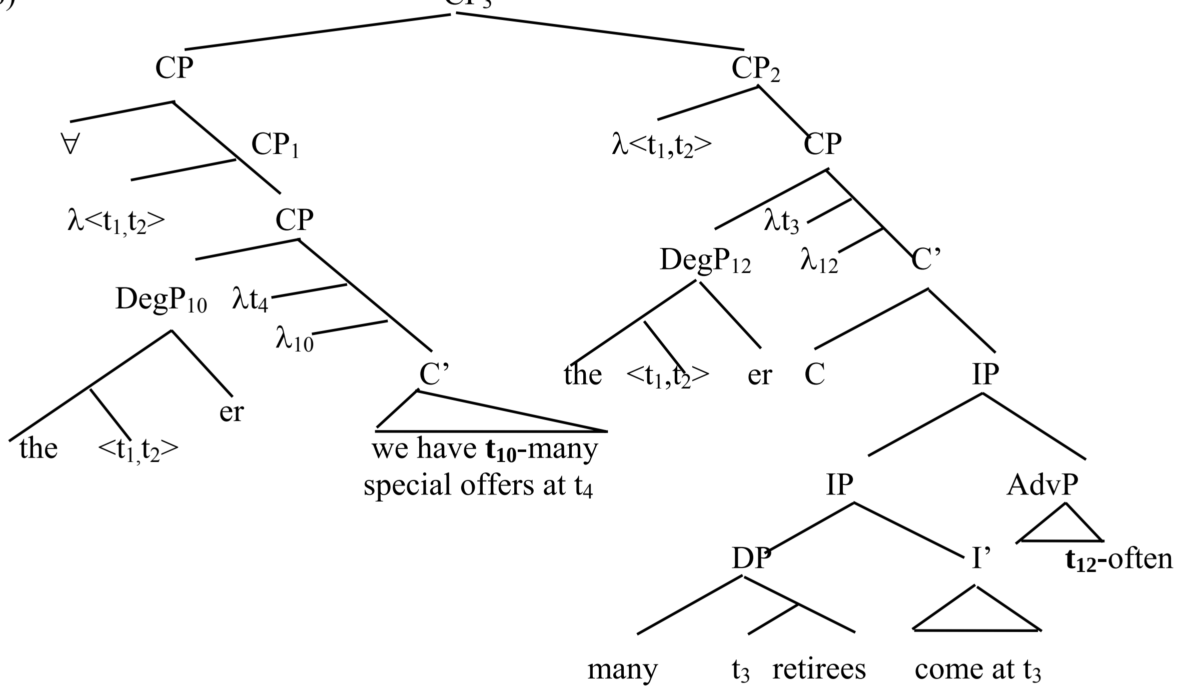
$[[DegP_{10}]] = \lambda D.[max(\lambda d.D(d)(t_1)) < max(\lambda d.D(d)(t_2))]$
$[[CP_1]] = \lambda t_1.\lambda t_2.[max(\lambda d.\text{we have d-many special offers at } t_1) <$
$max(\lambda d.\text{we have d-many special offers at } t_2)]$

consequent clause CP_3
$[[DegP_{12}]] = \lambda D.[max(\lambda d.D(d)(t_1)) < max(\lambda d.D(d)(t_2))]$
$[[CP_2]] = max(\lambda d.\text{d-often, x comes at } t_1) < max(\lambda d.\text{d-often, x comes at } t_2)$
$[[CP_3]] = \lambda t_1.\lambda t_2.\text{for many retirees}(t_1)\text{ x}, max(\lambda d.\text{d-often, x comes at } t_1) <$
$max(\lambda d.\text{d-often, x comes at } t_2)$

CP_4
$[[CP_4]] = 1 \text{ iff } \forall(t_1,t_2)\ [max(\lambda d.\text{we have d-many special offers at } t_1) <$
$max(\lambda d.\text{we have d-many special offers at } t_2)] \Rightarrow$
$\text{for many retirees}(t_1)\text{ x}, max(\lambda d.\text{d-often, x comes at } t_1) <$
$max(\lambda d.\text{d-often, x comes at } t_2)$

The truth conditions that we derived by scoping the quantified DP in the consequent clause above its respective DegP predict (18) to be true when for all pairs of time periods t_1 and t_2, if the number of special offers at t_2 exceeds the number of special offers at t_1 then for many retirees x the number of visits of x (to our shopping center) at t_2 exceeds the number of visits of x at t_1. These truth conditions correspond to one of the intuitive readings we associated (18) with, (19a). It remains to be seen whether the truth conditions derived from the LF representing the reverse scopal configuration involving DegP and the DP will adequately represent the second reading of the sentence, (19b). (26) gives the relevant LF.

(26)



Here are the truth conditions derived by this LF:

(27) antecedent clause CP_1

$[[DegP_{10}]] = \lambda D.[max(\lambda d.D(d)(t_1)) < max(\lambda d.D(d)(t_2))]$

$[[CP_1]] = \lambda t_1.\lambda t_2.[max(\lambda d.\text{we have d-many special offers at } t_1) <$
$max(\lambda d.\text{we have d-many special offers at } t_2)]$

consequent clause CP_3

$[[DegP_{12}]] = \lambda D.[max(\lambda d.D(d)(t_1)) < max(\lambda d.D(d)(t_2))]$

$[[CP_2]] = \lambda t_1.\lambda t_2.max(\lambda d.\text{d-often, many retirees}(t_1) \text{ come at } t_1) <$
$max(\lambda d.\text{d-often, many retirees}(t_2) \text{ come at } t_2)$

CP_3

$[[CP_3]] = 1$ iff $\forall(t_1,t_2)$ $[max(\lambda d.\text{we have d-many special offers at } t_1) <$
$max(\lambda d.\text{we have d-many special offers at } t_2)] \Rightarrow$
$max(\lambda d.\text{d-often, many retirees}(t_1) \text{ come at } t_1) <$
$max(\lambda d.\text{d-often, many retirees}(t_2) \text{ come at } t_2)$

According to these truth conditions, derived from (26), the sentence should be true when for all pairs of time periods t_1 and t_2, if the number of special offers at t_2 exceeds the number of special offers at t_1, then more frequently at t_2 than at t_1 the shop gets many retirees as customers. These are adequate truth conditions for (18) because they represent the intuitive second reading of the sentence.

These new data shed light on the debate about the adequacy of the quantificational theory of comparatives. The observed ambiguity in CCs is easily explained on the assumption that the quantified DP in (18) interacts scopally with DegP, while any non-quantificational theory would stumble here.[7] We conclude then that ambiguity in CCs present an argument for the "classical" quantificational theory.

We are now also ready to face the two questions we posed earlier. The first one is whether Kennedy's generalization is descriptively adequate. Obviously, it is not fine grained as needed to make a difference between (17b) and (19b) and rules the latter out on a par with the former. This calls for a revision. The property that distinguishes (17b) and (19b) is the timing of DegP movement. The observation that we can make on the basis of CCs is that whenever DegP movement is overt, DegP and it trace can be separated by a quantified expression; if DegP movement is covert, quantified expressions that intervene make the LF ill-formed. We thus propose to modify Kennedy's generalization. We suggest the formulation in (28):

(28) If the scope of a quantificational expression contains the **LF** trace of a DegP, it also contains DegP itself.

That formulation raises a question about the status of the constraint related to Kennedy's generalization. Is it an independent principle of grammar? As an interface condition, (28) is

[7] One might be concerned whether we correctly identified the source of ambiguity in (18). Could it be that the sentence is ambiguous not because the quantified DP in the consequent clause interacts with *-er* but because it interacts with the adverb which is part of *öfter*. We have two arguments against such a view. First, if this were true, then the wide scope reading of *viele Rentner* should be derived by raising it above the adverb but lower than the comparative head. The resulting interpretation for (18) would be as in (i):

(i) $\forall t_1,t_2$ [where t_1 and t_2 are relevant periods of time, if we have more special offers at t_2 than we have t_1, then the lowest degree d such that many retirees visit us d-frequently is greater at t_2 than it is at t_1.

This reading is unavailable. So, on the one hand, one of the available readings of (18) cannot be derived at all, and on the other, a non-existing reading is predicted if we assume that the adverb in *öfter*, rather than the comparative operator is responsible for the ambiguity.

Second, (17), recall, is not ambiguous. The "missing" wide scope DegP reading is to be attributed to Kennedy's generalization. That account is unavailable under the alternative hypothesis considered here.

strongly reminiscent of Beck (1996b)'s Minimal Quantified Structure Constraint (MQSC), given in (29):

(29) If an LF trace β is dominated by a Quantifier-Induced Barrier (= the first node that dominates a quantifier, its restriction, and its nuclear scope) α, then the binder of β must also be dominated by α.

MQSC is formulated as a more general interface principle about intervention effects induced by a quantified expression, while (28) covers a smaller empirical domain which falls under it. We propose then, that Kennedy's generalization be reduced to MQSC. In the next section, we briefly review the independent evidence for MQSC.

3 Independent evidence for the constraint on LF-movement

Beck (1996b) discusses four cases from German, related to *wh*-movement, that motivate MQSC. All of them point to the conclusion that LF movement is more constrained than overt movement. A quantified expression intervening between a moved element and its trace leads to ungrammaticality or loss of ambiguity. But this is true only if traces result from LF movement. Let's look at some data. Beck considers the following constructions: scope-marking questions, exemplified in (30a), multiple wh-questions, exemplified in (30b), the *wh-alles* construction in (30c) and a construction in which the restriction of a *wh*-phrase is left behind after overt *wh*-movement, as in (30d):

(30) a. Was glaubt Luise wen Karl gesehen hat?
What believes Luise whom Karl seen has
'Who does Luise believe that Karl saw?'

b. Wen hat Luise wo gesehen?
Who has Luise where seen
'Where did Luise see whom?'

c. Wen hat Luise alles gesehen?
Whom has Luise all seen
'Who-all did Luise see?'

d. Wen hat Luise von den Musikern getroffen
whom has Luise of the musicians met
'Which of the musicians did Luise meet?'

The scope-marking question in (30a), as Beck argues, is interpreted like a regular long-distance question in German. That requires that the *wh*-phrase *wen*, from the embedded clause, is covertly raised to take scope over the whole question. Beck also argues on semantic grounds that each of the underlined expressions in the rest of the examples must raise at LF: the *wh*-phrase in-situ in (30b) must be interpreted in [Spec,CP]; *alles* in (30b) universally quantifies over a question denotation, so it must take scope over the whole question at LF; and finally the restriction of the D-linked *wh*-phrase must be interpreted along with the *wh*-element, so the restriction must also raise to [Spec,CP].

Raising the underlined phrases is possible in each of the examples in (30), since they are acceptable. However, if the proper name, which, being in the subject position c-commands the moved element, is replaced by a quantified expression, the status of the sentences changes: they become unacceptable:

(31) a. ??Was glaubt niemand <u>wen</u> Karl gesehen hat?
What believes nobody whom Karl seen has
'Who does nobody believe that Karl saw?'

b. ??Wen hat niemand <u>wo</u> gesehen?
Who has nobody where seen
'Where did nobody see whom?'

c. ??Wen hat niemand <u>alles</u> gesehen?
Whom has nobody all seen
'Who-all did nobody see?'

d. ??Wen hat keine Studentin <u>von den Musikern</u> getroffen
whom has no student of the musicians met
'Which of the musicians did no student meet?'

The conclusion to be drawn from the contrast between (30) and (31) is that the quantified expressions in (31) intervene between each moved element and its trace. That causes the ungrammaticality in the latter case. However, that conclusion is too strong. As (32) shows, the quantified expressions don't cause a problem if they separate an overtly moved expression and its trace:

(32) a. Wen glaubt niemand daß Karl gesehen hat ?
What believes nobody that Karl seen has
'Who does nobody believe that Karl saw?'

b. Wo hat niemand Karl gesehen?
Where has nobody Karl seen
'Where did nobody see Karl?'

c. Wen alles hat niemand gesehen?
Whom all has nobody seen
'Who-all did nobody see?'

d. Wen von den Musikern hat keine Studentin getroffen
whom of the musicians has no student met
'Which of the musicians did no student meet?'

The contrast between (31) and (32) requires a characterization of intervention effects that makes reference to the type of movement involved in creating the offending configuration in (33):

(33) $*Q_1...Q_2...t_1$

Therefore, MQSC, which Beck proposes, applies only to LF movement.

From a different empirical point, we reached the same conclusion, namely, that LF movement of DegP is more restricted than overt movement. We have also observed that Beck's filter is general enough to cover also the cases related to comparatives.

Finally, it is important to mention that Bošković (1998) and Bošković (2000) reach independently Beck's conclusion that LF movement is more restricted than overt movement. Here is one of Bošković's arguments. French is a language that has overt *wh*-movement but allows a *wh*-phrase to remain in situ in certain well defined contexts. This is illustrated in (34):

(34) a. Tu as vu qui?
you have seen whom
'Who did you see?'
b. Qui as-tu vu

Bošković brings evidence that the *wh*-phrase in-situ in (34a) must undergo movement to C at LF. In long-distance questions, however, *wh*-phrases can't remain in situ. Consider (35) in this respect:

(35) a. *Jean et Pierre croient que Marie a vu qui
Jean and Pierre believe that Marie has seen whom
'Whom do Jean and Pierre believethat Marie saw?'
b. Qui Jean et Pierre croient-ils que Marie a vu

Like in (34a), the *wh*-phrase in the long-distance question (35a) must undergo LF-movement to the matrix C. But the contrast between (34a) and (35a) shows that long distance *wh*-movement is clause-bounded at LF. Crucially, this is not so with overt movement, as we can see from (35b). Therefore, Bošković concludes, LF-movement must be more restricted than overt movement. Bošković offers an account in terms of feature movement. Under Chomsky (1995) Move F hypothesis, LF movement applies to feature bundles, not to whole lexical items. Feature movement is an instance of head movement. Consequently, crossed heads are interveners in the sense of Relativised Minimality. In (35a) the embedded complementizer, an A' head, blocks the LF movement of the *wh*-features to the matrix C, also an A' head. Since overt movement applies to whole categories, no intervention effect is observed in (35b).

We take the fact that Beck (1996b) and Bošković (1998) converge on their view about the relative restrictedness of LF-movement to indicate that the conclusion is on the right track. But, although they make a very similar claim, the empirical basis for each of the accounts is somewhat different and it isn't immediately obvious that either account can be extended to the whole set of data. Beck's account refers to inherently quantified elements as interveners. Also, very importantly, the cases that Beck considers involve phrasal movement. Bošković identifies a different set of interveners. Perhaps it is desirable, on conceptual grounds, that the two sets of data find a common explanation. In the lack of an obvious general proposal, however, we side with Beck's account because our data are, in the relevant respect, very similar to the data for which MQSC was originally proposed.

4 Schwarzschild and Wilkinson's problem and MQSC

In *Section 1* we discussed data like (36) which do not allow one to observe any scope interaction between the quantified DP and the comparative operator:

(36) (Scott is 180cm tall.) Every girl is less tall than that.

Along with Heim (2000), we argued that the lack of ambiguity in (36) does not suggest that *er* has no scopal properties. We gave an argument from CCs defending the quantificational theory of comparatives. Following Heim (2000), we appealed to an interface constraint that disallowed LFs derived by scoping the comparative DegP across a quantified DP in order to account for "missing" readings in sentences with comparatives. We further argued, on the basis of cases involving overt movement of DegP, that Heim's constraint should be reduced to the more general Beck filter on LF-movement. There is a set of data involving the comparative construction, which, in the relevant respect, poses a similar question to the quantificational theory of comparatives. We offer here some speculations about that. These data involve quantifiers in the *than*-clause. The problem has been known for many years, but recently examined in great detail in Schwarzschild and Wilkinson (2002). A few examples are given in (37):

(37) a. Scott is taller than every girl.
b. Scott is taller than every girl is.
c. Scott is taller than most of the others.
d. Scott is taller than most of the others are.
e. Scott is taller than exactly three girls.
f. Scott is taller than exactly three girls are.

Similarly to (36), all of the sentences in (37) are unambiguous. And, again, the quantified DP cannot stay in the scope of the comparative operator. To see that, let us look more carefully at (37b), for example. If *every girl* is interpreted in-situ, we derive counterintuitive truth conditions, as (38b) shows. The LF in (38a) results from resolving ellipsis in the *than*-clause through LF copying:

(38) a. $[[_{DegP}$ er than wh_2 every girl is $\mathbf{t_2}$**-tall**$]$ $[1[_{IP}$ Scott is t_1-tall$]]]$
b. $\max(\lambda d.\mathit{tall}(d)(\text{every girl})) < \max(\lambda d.\mathit{tall}(d)(\mathit{Scott}))$

According to (38b), (37b) is true only if Scott is taller than the shortest girl. To derive the intuitive truth conditions, which make the sentence true only if Scott is taller than each of the girls, i.e. he is taller than the tallest girl, one has to allow the universal quantifier in (37b) to QR above the *than*-clause outside of the scope of the comparative operator. And further, one has to stipulate that QR in this context is obligatory since the reading derived when QR does not apply is unattested, as we saw from (38). So, let us make sure that QR leads to the desirable truth conditions:

(39) a. $[[$every girl$]$ $[3[_{DegP}$ er than wh_2 t_3 is $\mathbf{t_2}$**-tall**$]]$ $[1[_{IP}$ Scott is t_1-tall$]]]$
b. $\forall x[\text{girl}(x) \rightarrow \max(\lambda d.\text{tall}(d)(x)) < \max(\lambda d.\text{tall}(d)(\text{Scott}))$

These are indeed the desired results. But does MQSC, which we argued to be accountable for "missing" readings like those in (36) also extend to quantifiers in the *than*-clause? Since quantifiers behave similarly in the two types of contexts, we expect that their inability to appear in the scope of the comparative operator to have the same explanation. If we are on the right track, then the answer is Yes, MQSC rules out the LF in (38a), and this creates the effect of illusionary obligatoriness of QR. Let us elaborate.

We picked the clausal comparative in (37b), as an exemplary case because it is somewhat easier to see the relevance of MQSC in clausal comparatives. Recall, that the standard quantificational theory assumes that ellipsis in the *than*-clause is resolved similarly to ACD in sentences like *John dated every girl Bill did*. *-er* and its restriction, the *than*-clause with which it forms a constituent, is QR-ed in the covert component, which makes it possible to reconstruct the elided predicate. That predicate contains the trace of the moved DegP. QR itself doesn't violate MQSC, unlike in the wide scope DegP "reading" of (36). DegP in (38a) does not raise across an intervener. What makes (38a) illegitimate is reconstructing the trace of DegP in the *than*-clause and thus creating the configuration *DegP intervener* t_{DegP}. If we are correct in assuming that a violated MQSC accounts for the missing readings in (37), we have an argument that the condition applies representationally. If it applied derivationally, the LF in (38a) could be saved by having MQSC apply before LF-copying.

Some explanation is now in order for the phrasal comparatives in (37a), (37c), and (37e). Recall from *Section 1* that there is no agreement on the question whether these involve ellipsis in the *than*-clause. If they do, then the "missing" wide scope DegP reading must be attributed to MQSC without further discussion: the reconstructed predicate *be d-tall* contains an offending trace which is separated from its binder by an intervener.

The (semantic) alternative to an ellipsis-based analysis of phrasal comparatives is the direct analysis, suggested by Heim (1985). We will briefly review a close relative of that proposal and after that we will consider its implications for the "missing" readings in the phrasal comparatives in (37).[8]

Any comparative construction, be it causal or phrasal, needs two predicates: one to be ascribed of the subject, and another, of the DP-complement of the preposition *than* in the case of phrasal comparatives, or the subject of the *than*-clause in the case of clasal comparatives. The surface representation of comparatives, however, contains only one such predicate. The standard solution for clausal comparatives, as we discussed many times by now, is to assume that the predicate in the *than*-clause is syntactically reconstructed. The alternative, that Heim suggests and exploits in her 1985 paper on comparatives is semantic ellipsis. Recall that semantic ellipsis refers to a phenomenon triggered by an operator that requires using the denotation of an expression twice in the interpretation. The direct analysis gives such semantics to the comparative operator: one of its arguments is a relation between a degree and an individual: it applies once to the individual denoted by the subject and once more to the individual denoted ny the DP in the *than*-clause. For this to be possible, however, DegP must always raise at a minimal distance above the main verb in order to derive the appropriate relation which can be an argument of *-er*. *-er* is specified in the lexicon as in (40):

(40) $[[er]] := \lambda y{:}y \in D.[\lambda R{:}R \in D_{<d,et>}.[\lambda x{:}x \in D.\max(\lambda d.R(d)(x)) > \max(\lambda d.R(d)(y))]]$

As we see from (40), *-er* applies first to the denotation of the *than*-phrase. Since *than* is semantically vacuous, the denotation of the PP is the denotation of the DP, an individual. The second argument of *-er* is a relation. Finally, *-er* takes an individual as an argument to yield

---

[8] In a nutshell, Heim proposes that phrasal comparatives contain a comparative operator with the following semantics: *-er* has two arguments: an ordered pair of individuals, and a scalar predicate - a relation between a degree and individual. It is defined as in (i):

(i) $[[-er]]<x,y>(R_{<d,et>}) = 1$ iff $\max(\lambda d.R(d)(x)) > \max(\lambda d.R(d)(y))$

For example, the LF of (iia), is derived without reconstruction in the *than*-clause. Rather, the DP *Amy* adjoins to the subject of the main clause, and *-er* adjoins to that constituent, as in (iib):

(ii) a. Scott is taller than Amy.

b. $[_{IP}$ [er $[_{DP}$Scott Amy]] [1[2[t_2 is t_1-tall]]]]]

(iib) leads to the interpretation in (iii):

(iii) $\max(\lambda d.\mathit{tall}(d)(\mathit{Scott})) > \max(\lambda d.\mathit{tall}(d)(\mathit{Amy}))$

According to (i), (iiia) is true only if the degree to which Scott is tall is greater than the degree to which Amy is taller. The conditions correspond to speakers' intuitions. However, as Lerner and Pinkal (1995) point out the syntactic status of these two adjunction operations, especially the adjunction of the DP that starts in the *than*-phrase to the subject, is unclear. In addition, we also believe that the semantic interpretation in not, strictly speaking compositional. If it were, [[-er]] would not apply to the pair of individuals denoted by each DP but rather to the denotation of the constituent that dominates the two DPs. But it isn't obvious to us that the denotation of that constituent in an ordered pair of individuals. To avoid these problems, we consider a variant of the original proposal. It is in the spirit of the direct analysis, and is a straightforward extension of Heim (1999)'s proposal about the interpretation of superlatives.

true just in case the maximal degree of the set of degrees related to the individual from the main clause is bigger than the maximal degree of the set of degrees related to the individual from the *than*-phrase. A sample derivation involving phrasal comparatives is given in (41):

(41) a. Scott is taller than Amy.
b. $[_{IP}$ Scott $[_{DegP}$ er than Amy] [1[2[t_2 is t_1-tall]]]]
c. [[er]]([[Amy]])(λd.λx.tall(d)(x))([[Scott]]) =1 iff
max(λd.*tall*(d)(*Scott*)) > max(λd.*tall*(d)(*Amy*))

Now, we are ready to go back to (37a): *Scott is taller than every girl*. Under Heim's proposal, (42) is the LF of (37a):

(42) $[_{IP}$ Scott $[_{DegP}$ er than every girl] [1[2[t_2 is t_1-tall]]]]

In phrasal comparatives, in contrast to clausal comparatives, *-er* must apply directly to the denotation of the DP in the *than*-phrase. However, in (37a) that DP is not of the appropriate type. *-Er*'s first argument is an individual but *every girl* denotes an expression of type <et,t>. To resolve the type mismatch, *every girl* must be QR-ed. And no matter how short than movement is, it will be above the scope of the comparative operator. But this, in turn, explains why in phrasal comparatives like (37a), (37c), and (37e), the only attested reading is the one where DegP scopes below the quantified DP.

To summarize the discussion so far, we addressed the question about missing readings in the comparative construction, involving quantified expressions in the *than*-clause. We extended the MQSC-based explanation to at least clausal comparatives. Crucially, we argued that the disallowed configuration in which a quantified expression intervenes between DegP and its trace is created as a result of the reconstruction process in the *than*-clause. We argued that even if phrasal comparatives do not involve ellipsis, there is an alternative explanation that accounts for the wide scope of a universal quantifier there.

We need to acknowledge, however, that Schwarzschild and Wilkinson (2002) present an argument against QR-ing a quantified expression out of a *than*-clause. And this might be a potential problem for us since we argued that such DPs cannot be interpreted in the scope of DegP, rather they must move out of the c-command domain of DegP in LF. We leave our answer to this challenge for future research. But first, let us present Schwarzschild and Wiskinson's argument. It involves sentences with a quantifier in the *than*-clause buried in the scope of another scope bearing element. (43) is such an example:

(43) Bill did better than John predicted most of his students would do.

Consider (43) in the context where John predicts that most of his students will get a score between 80 and 90 on the exam. If John gets 96 points, (43) can truthfully be uttered in this context. But how is the sentence interpreted? The problem with the quantifier *most of his students* in the *than*-clause resurfaces as it did in (37). If it is interpreted in situ, we get too weak truth conditions for (43). The sentence is predicted to be true if John makes a prediction that the bigger portion of his students will score within a particular range and Bill scores more than the lower limit that John sets but not more than the higher limit. For example, if Bill gets 81 points, (43) will still be true in the context where John predicts that most of his students will get between 80 and 90 points. This type of problem was explained as a violation of MQSC in clausal comparatives in (37) and resolved by QR-ing the quantifier out of the *than*-clause. But, for (43) that solution doesn't work. Suppose we QR that quantifier and give it wider scope than DegP. Then (43) will have the truth conditions in (44):

(44) Most of John's students are x such that: Bill did better than John predicted x would do.

The problem with (44) is that the first argument of the comparative operator, *λd.John predicted x to do d-well*, is the empty set since John made no predictions about the scores of particular students. The *max* operator cannot apply to an empty set of degrees because the maximum of that set is undefined. And consequently, contrary to speakers' intuitions (43) is not predicted to be true in the context we considered. As a solution, Schwarzschild and Wilkinson (2002) develop a new theory of scalar predicates where the degree argument of gradable adjectives/adverbs is in fact an interval, rather than a point on the scale.

This is not to say that the MQSC account of "missing" readings, for which we argued, must be wrong. Rather, the solution relying on QR out of the *than*-clause, is problematic in light of (43). Either, there is an alternative strategy altogether that is used in deriving the interpretation of (43) and the interpretation of the sentences in (37), or such a strategy is available along with QR out of the *than*-clause but for an independent reason, it is the only option when the quantifier is embedded under another scope bearing element in the *than*-clause.

5 Conclusion

To sum up, the ambiguity observed in comparative conditionals supports the view that the comparative construction contains a degree quantifier. Scope interactions in the comparative construction are constrained by a general constraint on LF movement.

References

Bartsch, Renate, and Theo Vennemann. 1972. Relative adjectives and comparison. In *UCLA papers in syntax* 2, 80-107.

Beck, Sigrid. 1996a. Quantified structures as barriers for LF movement. *Natural Language Semantics* 4: 1-56.

Beck, Sigrid. 1996b. *Wh-constructions and transparent Logical Form*. Eberhard-Karls-Universitaet Tuebingen, Tuebingen.

Beck, Sigrid. 1997. On the semantics of comparative conditionals. *Linguistics and Philosophy* 20: 229-271.

Bošković, Željko. 1998. LF movement and the Minimalist Program. In *Proceedings of the North Eastern Linguistic Society* 28, 43-57. GLSA, University of Massachusetts, Amherst.

BoškovićŽ, Željko. 2000. Sometimes in SpecCP, sometimes in-situ. In *Step by step: Essays on minimalism in honor of Howard Lasnik*, ed. Roger Martin et al., 53-88. Cambridge, Mass.: MIT Press.

Bresnan, Joan. 1973. Syntax of the comparative clause construction in English. *Linguistic Inquiry* 4.

Chomsky, Noam. 1977. On *wh*-movement. In *Formal syntax*, ed. Peter Culicover et al., 71-132. New York: Academic Press.

Chomsky, Noam. 1995. Categories and transformations. In *The minimalist program*, 219-394. Cambridge, Mass.: MIT Press.

Cresswell, M. 1976. The semantics of degree. In *Montague grammar*, ed. Barbara Partee, 261-292. New York: Academic Press.

Gawron, J.M. 1995. Comparatives, Superlatives and Resolution. *Linguistics and Philosophy* 18: 333-380.

Hackl, Martin. 2000. *Comparative quantifiers*. PhD thesis, MIT, Cambridge, Mass.

Heim, Irene. 1985. *Notes on comparatives and related matters.* Ms., University of Texas, Austin.

Heim, Irene. 1998. *Negative decomposition and comparatives.* Ms., University of Connecticut colloquium.

Heim, Irene. 1999. *Notes on superlatives.* Ms., MIT, Cambridge.

Heim, Irene. 2000. Degree operators and scope. In *Proceedings of the Semantics and Linguistic Theory* 10, ed. Brandon Jackson and T. Metthews. CLC Publications, Cornell University, Ithaca.

Heim, Irene, and Angelika Kratzer. 1998. *Semantics in generative grammar*. Malden, MA.: Blackwell Publishers.

Hellan, Lars. 1984. Notes on some issues raised by von Stechow. *Journal of semantics* 3: 83-92.

Hoeksema, Jacob. 1983. Negative polarity and comparative. *Natural Language and Linguistic Theory* 1: 403-434.

Kennedy, Christopher. 1999. *Projecting the adjective: The syntax and semantics of gradability and comparison*. New York: Garland. (Ph.D. dissertation, University of California, Santa Cruz, 1997)

Klein, Ewan. 1980. A semantics for positive and comparative adjectives. *Linguistics and Philosophy* 4: 1-45.

Klein, E. 1982. The interpretation of adjectival comparatives. *Journal of Linguistics* 18: 113-136.

Lasnik, Howard. 1993. *Lectures on minimalist syntax* (=UConn Working Papers Occasional Papers in Linguistics 1). University of Connecticut, Storrs.

Lasnik, Howard. 1999. Pseudogapping puzzles. In *Fragments: Studies in ellipsis*, ed. Elabbas Benmamoun and Shalom Lappin, 141-174. Oxford: Oxford University Press.

Lechner, Winfred. 1999. *Comparatives and DP-structure*. PhD thesis, University of Massachusetts, Amherst.

Lerner, Jan, and Manfred Pinkal. 1995. Comparative ellipsis and variable binding. In *Proceedings of SALT V*, 222-236, Ithaca.

May, Robert. 1985. *Logical Form: Its structure and derivation*. Cambridge, Mass.: MIT Press.

McConnell-Ginet, Sally. 1973. *Comparative constructions in English: A synatctic and semantic analysis*. Doctoral dissertation, University of Rochester.

Rullmann, Hotze. 1995. *Maximality in the semantics of wh-constructions*. Doctoral dissertation, University of Massachusetts, Amherst.

Schwarzschild, Roger, and Karina Wilkinson. 2002. Quantifiers in comparatives: A semantics of degree based on intervals. *Natural Language Semantics* 10: 1-41.

Seuren, Peter A.M. 1973. The comparative. In *Generative grammar in Europe*, ed. F. Kiefer and N.Ruwet. Dordrecht: Riedel.

von Stechow, Arnim. 1984. Comparing semantic theories of comparison. *Journal of semantics* 3: 1-77.

CATAPHORIC INDEFINITES

Carla Umbach

carla.umbach@uni-osnabrueck.de

Abstract

In this paper a subclass of specific indefinites called *cataphoric indefinites* is investigated. These indefinites carry an accent on the determiner, are partitives, and occur in topic position. They induce a particular set of alternatives, which represents an implicit, cataphoric, identifying property, and are closely similar to attributive (non-pronominal) definite descriptions. For cataphoric indefinites, the speaker-hearer asymmetry turns out to be a mere side effect of information structure.

1 Introduction

Specific indefinites are commonly characterized as (i) exhibiting exceptional scope behavior, (ii) being existentially presupposed and, (iii) involving a speaker-hearer asymmetry. Specific indefinites exhibit exceptional scope behavior taking wide or intermediate scope with respect to modal operators or additional quantifiers. The referent of a specific indefinite appears to be existentially presupposed, which places specific indefinites near to referentially used definites. The attempt to explain the specific/non-specific distinction by correlating it with the referential/attributive distinction failed, however, because of the existence of intermediate readings. Moreover, while referentially and attributively used definites are symmetric, the speaker and the hearer being able to identify the referent, specific indefinites convey a speaker-hearer asymmetry: The speaker seems to have a particular individual in mind without communicating the individual's identity to the hearer. Specific indefinites have been a topic of continuing interest for the last two decades, cf., e.g., Fodor and Sag (1982), Enc (1991), Farkas (1994), (2002), Abusch (1994), Kratzer (1998), Portner and Yabushita (2001), Schwarzschild (2002), Heusinger (2002). For an overview see section four and five in Heusinger (2002).

The analysis presented in this paper takes the speaker-hearer asymmetry as the starting point: What does it mean for the interpretation of a noun phrase if the speaker has a particular individual in mind, but the hearer is unable to identify the referent? Using a specific indefinite, the speaker informs the hearer that he will not be able to identify the referent the speaker is talking about, which is counterintuitive from a Gricean point of view: Why should it be relevant for the hearer to learn that the speaker withholds information? Why does the speaker not simply use an existential instead of a specific indefinite, if he doesn't want to reveal the referent's identity? If specificity is taken to be a semantic instead of a purely pragmatic phenomenon these questions have to be answered.

It is well-known that the interpretation of noun phrases is influenced by focus, cf., e.g., Bosch (1988), van Deemter (1994), Jäger (1998) and Umbach (2001). For specific indefinites it has been claimed that they tend to carry an accent on the determiner (e.g. Enc 1991). However, the position of the accent is clearly insufficient to distinguish non-specific from specific indefinites. Consider the German examples in (1)(a) and (b):

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference "sub8 – Sinn und Bedeutung". Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany*

(1) (a) (Paulsen, who is the local plumber, has been asked to provide internships for a group of local students:)

Paulsen: /EINEN Schüler würde ich \NEHMEN, (aber zwei sind mir zuviel.)

(I would take one student, but two are too many for me.)

(b) (Grün, the owner of the drugstore, has been asked, too. At first, he is reluctant. But then he says:)

Grün: /EINEN Schüler würde ich \NEHMEN (nämlich den kleinen Otto Pitzke. Die anderen taugen nichts.)

(I would take one (of the) student(s), namely Otto Pitzke. The others are good for nothing.)

The indefinite NP *EINEN Schüler* in (1)(a) requires a non-specific reading whereas in (b) it is clearly specific. Nevertheless in both (a) and (b) the indefinite NP carries an accent on the indefinite determiner, which is in German used as an article and also as a numeral, similar to English *one.* Note, however, that in (a) *EINEN Schüler* contrasts with *zwei [Schüler]* (*two students*), whereas in (1)(b) it contrasts with *die anderen [Schüler]* (*the other students*). This difference will be essential to the analysis presented in this paper. It will be shown that indefinites of the latter type constitute a subclass of specifics for which the speaker-hearer asymmetry turns out to be a mere side-effect of information structure. This subclass will be called "cataphoric indefinites".

The paper is organized as follows: In the next section we will briefly review the account of focus in definite NPs proposed in Umbach (2001) and (2003), providing a suitable background for the representation of cataphoric indefinites and for the comparison of cataphoric indefinites and definites. In section three, Eckardt's (2002) notion of referential and denotational contrastive topics will be presented which account for the difference between (1)(a) and (b). In section four it will be shown how cataphoric indefinites relate to specificity (and why they are cataphoric in the first place). Finally, the scope behavior of cataphoric indefinites will be considered. Although the examples in this paper will mostly be in German, the basic results will also apply to English taking differences with respect to the distribution of the indefinite articles and word order into account.

2 Focus in definite noun phrases

In Umbach (2002), (2003) it is shown that intonation is essential for the interpretation of definite noun phrases. Consider the example in (2): Depending on whether there is an accent or not the interpretation of the definite NP *the shed* is radically different. The NP in (a), which carries an accent, clearly refers to some shed belonging to John's cottage. The NP in (b) is completely deaccented and without further context we will interpret it as referring to the cottage itself, the speaker making a disapproving comment. Obviously, in the accented version in (a) the NP introduces an additional discourse referent related to John's cottage whereas in the deaccented version in (b) it constitutes an identity anaphor.

(2) (John has an old cottage.)

(a) Last summer he reconstructed the SHED.

(b) Last summer he RECONSTRUCTED the shed.

Farkas (2002) suggested viewing definiteness as uniqueness where familiarity is regarded as a special case of uniqueness (for uniqueness accounts of definite NPs see also Hawkins 1991 and Löbner 1985). According to Farkas a definite may achieve uniqueness either because its descriptive content singles out a unique referent or because the referent of the definite can be identified with a previously given referent, which divides the range of definite expressions into two classes: While proper names and pronouns achieve uniqueness via identification with a given referent, full definite descriptions have to provide a singleton by means of their descriptive content (supplemented by a restriction of the relevant domain). This classification, however, is disproved by the example in (2), which demonstrates that even a full definite description may achieve uniqueness either way. For this reason in Umbach (2002) it is proposed to distinguish between two uses of full definite descriptions depending on whether there is an accent on (part of) the descriptive content:

(i) A (use of a) definite description is "given" iff it is completely deaccented. Given definites constitute identity anaphors. Uniqueness is accounted for by the salience hierarchy of accessible discourse referents, i.e. there has to be a most salient discourse referent to be identified with the definite's referent. The descriptive content of the definite merely has to be compatible with the antecedent and may be accommodated. Thus given definites are comparable to pronouns, and can be substituted by a pronoun without affecting the meaning of the sentence. Consider, for example, (2)(b): *John has an old cottage. Last summer he RECONSTRUCTED it.*

(ii) A (use of a) definite description is "non-given" iff at least part of the descriptive content is focussed. Non-given definites introduce novel discourse referents.[1] The uniqueness requirement has to be satisfied by the descriptive content. This is straightforward in the case of semantically unique descriptions (*the pope, the smallest prime number,...*), but may also be achieved by the help of a bridging antecedent. In the latter case the referent will be singled out by the descriptive content together with the bridging relation. In (2)(a), for example, we have to interpret *the shed* as "the unique object related to John's cottage which is a shed" making use of the previously introduced cottage as a bridging antecedent. In introducing novel discourse referents non-given definites are similar to indefinite NPs. Nevertheless they cannot be substituted by the latter because indefinites in general lack the uniqueness requirement. It will, however, be shown in section five that non-given definites may be substituted by cataphoric indefinites without affecting truth conditions.

It is important to note that this approach, although admitting two uses of definite NPs, does not admit two readings of the definite article *the.* Instead, the definite article uniformly indicates uniqueness. The two uses are due to focusing/deaccenting of the descriptive content of the definite NP and result from the interaction of the meaning of the definite article and the semantics of focus. To support this idea, in Umbach (2003) an analysis of focus in complex definite NPs is presented which is based on DRT (Kamp, Reyle 1993) and the presuppositions-as-anaphors theory of van der Sandt (1992). The interpretation of focus follows the general ideas in Rooth (1992) without, however, employing a separate level of alternative meaning. Instead, the alternative set is represented as an anaphor (see the representation in (5)(b) below). This account makes crucial use of the notion of the *focus phrase* as suggested by, e.g., Krifka (ms.), thus accounting for the fact that the alternatives

---

[1] Discourse referents are regarded as novel iff they are no identity anaphors, i.e. they are regarded as novel even if they relate to a bridging antecedent. There are examples challenging the correspondence of deaccented/given and focussed/novel DRs, especially if the NP has occurred in a preceding conjunction (*John has a boy and a girl. The BOY is called Kim*). Note, however, that the use of a (deaccented) pronoun (*he*) would not be appropriate in this example. For a comprehensive discussion of apparent counterexamples cf. Umbach (2001).

induced by a focus need not correspond to the focussed item. In the case of definite NPs the focus phrase is the "highest" NP including the focus. The focus phrase must not be confused with the focus domain: While the focus domain indicates the range within which alternatives vary, the focus phrase indicates the range within which backgrounded information has to be taken into account to yield the appropriate alternatives.[2]

This analysis also accounts for the fact that the set of alternatives induced by a focussed definite NP is restricted by the bridging antecedent (if there is a bridging antecedent involved in the interpretation). Consider the example in (3). Ben is supposed to be a reporter who wants to conduct an interview with the members of a certain research team. The proposition in (3) will be false, if Ben interviewed any member of the research team other than the Dutch one. But it will not be false if he additionally interviewed someone who is not on the team. Hence the set of alternatives relevant for quantification by *only* is limited by the members of the research team. This is intuitively intelligible taking into account that the definite NP *the DUTCH researcher* has to relate to the previously mentioned research team as a bridging antecedent in order to achieve uniqueness, that is, it has to be interpreted as "the unique member of the research team who is Dutch". Evidently, if a (partly) focussed definite NP involves a bridging antecedent (and most of them do because semantically unique descriptions are rare), then the bridging antecedent plays a double role, supporting uniqueness and also restricting the relevant alternatives.

(3) (The research team arrived at the base camp late at night.)

Ben only talked to the DUTCH researcher.

Consider finally the continuation of (3) given in (4). The NP *the OTHERS* refers to the set of non-Dutch members of the research team, which is the set of the proper alternatives induced by the focus in *the DUTCH researcher*.[3]

This is accounted for by assuming that the meaning of *other* consists in the property of being distinct from a co-referent. The NP *the OTHERS* and its co-referent have to relate to the same bridging antecedent, thereby partitioning the common set of alternatives into two complementary sets ("the one" and "the others").[4]

(4) (The research team arrived at the base camp late at night. Ben only talked to the DUTCH researcher.)

The OTHERS were preparing for the next day.

The DRT-based representation requires, in short, a (set valued) discourse referent A representing the set of alternatives along with the following presuppositions: (i) A is constrained by the local background (i.e. the non-focussed part of the focus phrase); (ii) the

---

[2]In (i) the focus domain (or focus) is given by *Denmark* whereas the focus phrase comprises the superordinate NP *the girl from Denmark*. In (ii) focus domain and focus phrase coincide.

(i) Ben only invited [the girl from [DENMARK]$_{\text{Focus Domain}}$]$_{\text{Focus Phrase}}$ (... not the girl from Bulgaria)

(ii) Ben only invited [[the girl from DENMARK]$_{\text{Focus Domain}}$]$_{\text{Focus Phrase}}$ (...not the man with the fancy hat)

[3]The set of "proper" alternatives is defined as the set of alternatives minus the focussed element.

[4]Throughout this paper we will assume that the co-referent is a single individual and *the others* comes as a plural, thereby simplifying the presentation. Moreover, we will ignore backgrounded descriptive material, e.g. *the OTHER geologists.* For a comprehensive discussion cf. Umbach (2003).

focus phrase referent is an element of A; (iii) A includes at least one contrasting element, which is distinct from the focus phrase referent. These conditions match with Rooth's (1992) requirements, the discourse referent A corresponding to Rooth's variable C. Since we will employ a similar representation in the case of cataphoric specific indefinites in section five, we will briefly discuss the representation of the NP *das* BLAUE *Bild* in (5):

– Carrying a focus, the NP constitutes a non-given definite introducing a novel discourse referent x. The focussed part of the description corresponds to the asserted condition, blue(x).
– The presuppositions are partly due to focus and partly due to definiteness. Focus requires a discourse referent A representing the set of alternatives which is constrained by the background part of the description, picture*(A) (star indicating distributivity). The set of alternatives includes the NP referent, $x \in A$, and also the contrasting elements, $\omega \subset A$, $x \notin \omega$. (For convenience, the contrasting element is assumed to be set-valued, cf. previous footnote concerning "the others". It has to be maximal w.r.t. $A \backslash \{x\}$).
– Definiteness, on the other hand, requires a bridging antecedent B and a relation R(x, B). Due to uniqueness x has to be the only blue picture which is R-related to the bridging antecedent, i.e. $\forall z.R(z,B) \& picture(z) \& blue(z) \rightarrow z=x$. The bridging antecedent moreover restricts the set of alternatives, $y \in A$ iff R(y,B).
– On updating, B will be bound to the previously introduced exhibition, and A will be bound to the set of elements R-related to B. When updating the succeeding sentence, the referent of *die* ANDEREN (*the others)* will be bound to the set of contrasting elements ω (for details cf. Umbach 2003).

(5) (a) (...Marek's exhibition is worth seeing.)

Das /BLAUE Bild hat mir \BESONDERS gefallen. (Aber die anderen sind auch gut.)

(I especially liked the blue picture. But the others are interesting, too.)

(b) Das /BLAUE Bild...

<table>
<tr><td colspan="3">x</td></tr>
<tr><td>blue(x)</td><td colspan="2">A, B, ω</td></tr>
<tr><td></td><td>picture*(A)
$x \in A$
"$\forall y.R(y,B) \leftrightarrow y \in A$"

R(x,B)
"$\forall z.R(z,B)$ & picture(z) & blue(z) $\rightarrow z=x$"</td><td>$\omega \subset A$
$x \notin \omega$
"$\forall Z.\ Z \subset A \backslash \{x\} \rightarrow Z \subset \omega$"</td></tr>
</table>

3. Referential vs. denotational readings of contrastive topics

Example (1) in the introduction made clear that the position of the accent is insufficient to distinguish between the non-specific and the specific reading of an indefinite NP. Although the accent is located on the determiner in (a) and (b), the indefinite *EINEN Schüler (ONE student)* has a non-specific reading in (a) and a specific reading in (b). At first sight this seems to be reason enough to cancel the intonation hypothesis. However, it has been pointed out by Eckardt (2002) that quantifiers in topic position with an accent on the determiner exhibit a systematic ambiguity. It will turn out in the next section that this ambiguity perfectly matches the distinction between the non-specific and the specific reading in (1)(a) and (b).

In Eckardt (2002) it is argued that quantifiers in topic position which carry an accent on the determiner are systematically ambiguous between a *referential* and a *denotational* reading. Consider Eckardt's examples in (6) and (7). In the referential reading, in (6), the NPs are partitives referring to subgroups of the previously given plural referent, i.e. the seven dwarfs. The subgroups may have the same cardinality, but they must be disjoint, that is, no dwarf both peels potatoes and roasts sausages. Assuming that (6)(a)-(c) constitute the answer to a question, the appropriate question will be *What did the dwarfs do?*, and the answer has to be exhaustive, mentioning each of the disjoint subgroups. Thus, we learn from (a)-(c) that the overall number of dwarfs is seven. Finally, the complement of the NP referent is defined, that is, the expression *the others* can be felicitously used in a continuing sentence (*THREE dwarfs were peeling potatoes. The others were roasting sausages*).

(6) (The [seven] dwarfs were busy cooking dinner.)

(a) /THREE dwarfs were \PEELING POTATOES.

(b) /TWO dwarfs were \FETCHING BEER, and

(c) /TWO dwarfs were \ROASTING SAUSAGES.

In the denotational reading, as shown in (7), the NPs denote quantifiers of different cardinality. They may, but need not be partitives relating to subgroups of a given group of objects. The quantifiers must be of different cardinality, but the denotations may overlap. The appropriate question to be answered by (7)(a)-(c) will be *How many spots were visible on what day?*, where the answer need not be exhaustive and the cardinalities cannot be added up. From (a)-(c) we cannot infer the overall number of red spots. Finally, in the denotational reading the complement of the NP referent is not defined, that is, the expression *the others* will not be felicitous in a continuation (*At different days of my measles I had increasing numbers of red spots: FOUR spots appeared on Monday. #The others were visible on Tuesday*.)

(7) At different days of my measles, I had increasing numbers of red spots:

(a) /FOUR spots appeared on \MONDAY,

(b) /FIVE spots were visible in \TUESDAY, and

(c) /EIGHT spots shone on my face on \WEDNESDAY.

It follows from the above characterization that the referential and the denotational reading essentially differ with respect to the alternatives triggered by the focus. In the denotational reading the alternatives consist of quantifiers of different cardinality, {four spots, five spots, six spots,....}, where the denotations may overlap. As compared to this, in the referential reading the set of alternatives has to comprise disjoint subsets of a given referent, where the subsets are exhaustive, for example {three of the dwarfs, another two of the dwarfs, the rest of the dwarfs} or {three of the dwarfs, the other dwarfs}. The latter type of alternative sets will be most important in the analysis of cataphoric indefinites in the next section.

In addition to the characteristics given in Eckardt (2002) it can be observed that the referential and the denotational reading of a topicalized quantifier differ with respect to the scope of the negation: Referential topics induce narrow scope, cf. (8)(a), which has to be read as "most...not". Denotational topics, on the other hand, induce wide scope, cf. (8)(b) which is "not...most".

(8) (a) (The seven dwarfs were playing in the garden.)

/MOST dwarfs were \NOT wearing a cap (but two of them did.)

(b) (When I had my measles, the doctor promised that most spots were gone within a week.)

/MOST spots were \NOT gone by Friday (but at least half of them...)

These observations provide evidence that the referential/denotational difference is not just vagueness in the sense that there are different contexts and the referential reading corresponds to one type of context set while the denotational reading corresponds to another. Instead, it seems to be a genuine ambiguity. Actually, similar distinctions have been suggested by other authors, for example, Gyuris (to appear), who points out a referential/quantificational distinction with respect to Hungarian contrastive topics, and Endriss and Ebert (to appear), who discuss the conditions under which a quantifier qualifies as a topic (thereby licensing a specific interpretation). Still, the referential/denotational distinction is far from being settled issue. It is, for example, unclear whether it relates to the other features of quantifiers (monotonicity, weak/strong etc.). Moreover, it might be doubted whether denotational topics are genuine topics in the sense of aboutness topics. The question attributed to (7) appears to be a multiple focus question suggesting that the NP might be part of the comment instead of being a topic. Also, the fact that negation takes wide scope is evidence against a genuine topic. We have to leave these questions open in the present paper.

4 Cataphoric indefinites

Let us reconsider the example in (1) in the introduction, repeated in (9). In (9)(a) and (b) the indefinite NP *EINEN Schüler* carries an accent on *ein*, which is in German used as an indefinite article and also as a numeral, similar to English *one.* (9)(a) and (b) perfectly match the distinction between the denotational and the referential reading discussed in the previous section. In the non-specific reading in (a) the alternatives triggered by *EINEN Schüler* have to be quantifiers of different cardinality {one student, two students, three students,...}. This is evident from the continuation of the sentence. In contrast, in the specific reading in (b) the alternatives triggered by *EINEN Schüler* are subgroups of the student group which are disjoint and exhaustive, {one of the students, the other students}.

(9) (a) (Paulsen, who is the local plumber, has been asked to provide internships for a group of local students:)

Paulsen: /EINEN Schüler würde ich \NEHMEN, (aber zwei sind mir zuviel.)

(I would take one student, but two are too many for me.)

(b) (Grün, the owner of the drugstore, has been asked, too. At first, he is reluctant. But then he says:)

Grün: /EINEN Schüler würde ich \NEHMEN (nämlich den kleinen Otto Pitzke. Die anderen taugen nichts.)

(I would take one (of the) student(s), namely Otto Pitzke. The others are good for nothing.)

The example in (9) demonstrates that indefinites with an accent on the determiner, if they constitute referential topics, qualify as specifics. On the other hand, indefinite NPs which constitute denotational topics are clearly non-specific. The essential difference between the denotational/non-specific reading of the indefinite in (a) and the referential/specific reading in (b) lies in the nature of the alternatives evoked by the focus on the determiner. In the referential/specific reading in (b) the alternatives consist in two disjoint subgroups which exhaust the group antecedent: {one of the students, the other students}. Notice that two disjoint and exhaustive subgroups of a supergroup result in a two-cell partition, and a two-cell partition is equivalent to a property. Thus the set of alternatives in (b) represents a property. In addition, one of the cells has to be a singleton, which is indicated by the stressed determiner *EIN* (*ONE*).[5] Accordingly, in the specific reading the set of alternatives represents a property which is unique with respect to the antecedent group. By using *EINEN Schüler* (*one student*) in contrast to *die anderen Schüler* (*the other students*) the speaker conveys a particular partition of the antecedent student group into a singleton cell and the rest and, by virtue of this partition, she conveys a unique property without explicitly mentioning it.

It has been suggested by, e.g., Zimmermann (2003), Schlenker (2003) that specificity comes with an implicit identifying property. This idea is confirmed by the analysis given here. But in contrast to the above accounts, in the present analysis the identifying property need not be introduced as an additional assumption. Instead, the identifying property turns out to be a side effect of focus, that is, of the particular formation of the alternative set triggered by a referential/specific indefinite. Deducing the identifying property from the alternatives also clarifies the problem of trivial properties: If you simply assume that a specific indefinite implies the existence of an identifying property, then any unique property will do. In contrast, in the present analysis it is not the mere existence of a property which is expressed by the speaker. Recall that *EINEN Schüler* in the referential reading is not a quantifier but an anaphor. Thus when using *EINEN Schüler* in contrast to *die anderen Schüler* the speaker doesn't merely communicate the existence of a partition but instead communicates this particular partition. The property corresponding to this partition might be spelled out as "being distinct from the others", which is tantamount to an anaphoric expression which lacks information for resolution, that is, a cataphoric expression. This is the reason why these indefinites are called "cataphoric indefinites" in this paper. It will be shown below that referential/specific indefinites actually function as cataphors in a discourse.

On this analysis, the core feature of specific indefinites, namely the intuition that the speaker has a particular individual in mind without communicating the individual's identity to the hearer, turns out to result from cataphoricity, which is a well-known phenomenon. Note, however, that on the above analysis the speaker has a particular property in mind, but not (necessarily) a particular individual. Thus examples like *EINEN Läufer* in (10), which are clearly specific although the speaker cannot have a particular individual in mind, don't pose a problem.[6]

---

[5]It is commonly agreed that stress on *EIN (ONE)* implies the interpretation "exactly one". But what has been ignored is the fact that, even if stressed, the determiner *EIN (ONE)* need not contrast with different numbers but may also contrast with *die anderen (the others)*. It is commonly said that *ein* is homonymous being either a determiner or a numeral. However, stressed *EIN* when contrasting with *die anderen* also implies a "numeral" interpretation, since it induces a singleton property. Hence there is no clear-cut distinction between the determiner and the numeral *ein*. A clear determiner reading for stressed *EIN* is given if it contrasts with the definite determiner *DER*: *Er ist nicht EIN Verdächtiger, sondern DER Verdächtige.* This reading corresponds to English stressed *A* which contrasts with *THE (He is not A suspect, he is THE suspect.)*

[6]Many thanks to Cornelia Endriss for this example.

(10) (Berlin Marathon. Before the start of the race the mayor of Berlin informs the head organizer:)

/EINEN Läufer möchte ich nach dem Rennen \PERSÖNLICH beglückwünschen, nämlich den Sieger, (... den anderen lasse ich meine besten Grüße ausrichten.)

(I would like to congratulate one of the runners, namely the winner, and offer my best wishes to the others.)

The major question concerning the speaker-hearer asymmetry of specific indefinites relates to the Gricean maxime of informativity: Why does the speaker not simply use an existential instead of a specific indefinite, if he doesn't want to reveal the referent's identity? Why should it be relevant for the hearer to learn that the speaker withholds information? On a closer look, however, it turns out that the speaker actually doesn't withhold information. Consider the example in (11)(a) and (b) which are slight modifications of (9)(b):

(11) (Grün is asked by the teacher of the graduating class to provide internships for a group of local students:)

(a) Grün: /EINEN Schüler würde ich \NEHMEN (... wie heißt der denn noch? ...na, der Enkel von meinem früheren Nachbarn.)

(I would take one (of the) student(s), ... wait a moment, what's his name? ... well, the grandson of my former neighbor.)

(b) Grün: /EINEN Schüler würde ich \NEHMEN.

(I would take one (of the) student(s))

Teacher: Wen denn? (Who then?)

Grün: Na, den Otto Pitzke,.... (Well, Otto Pitzke.)

In (11) (a) Grün cannot remember the referent's name and therefore he falls back upon a definite description. In (11)(b) Grün stops immediately after the first sentence. In this situation the teacher is prompted to ask for the identity of the referent, and Grün in turn has to answer this question (or else has to give a good reason for not answering the question) Obviously, the speaker-hearer asymmetry is only temporary. The speaker might have forgotten the referent's name, or be in search of a suitable description, or she might simply want to make her utterance more dramatic, but in the end she has to place the hearer in a position to determine the referent. Similarly, when using a cataphoric pronoun the speaker withholds the referent's identity, but only for a short moment. In the case of cataphoric pronouns the referent is missing, in the case of cataphoric indefinites the identifying property is missing. In either case, the missing information constitutes an open question-under-discussion, and the speaker is obliged to answer this question to ensure successful communication.

5 Cataphoric indefinites vs. non-given definites

It is generally agreed that specific indefinites exhibit a close relationship to definite NPs. Taking the given/non-given distinction for definites into account (cf. section two), cataphoric indefinites are in fact strikingly similar to non-given definites. Compare (12)(a) (= (5)(a)) and (12)(b). The examples differ only with respect to the point in time when the identifying property is provided. While in the case of the definite in (a) the identifying property is presented by a prenominal modifier, it is presented by a postponed apposition in the case of the cataphoric indefinite.

(12) (Marek's exhibition is worth seeing ...)

(a) Das /BLAUE Bild hat mir \BESONDERS gefallen, (aber die anderen sind auch gut.)

(I especially liked the blue picture, but the others are interesting, too.)

(b) /EIN Bild hat mir \BESONDERS gefallen, nämlich das \BLAUE, (aber die anderen sind auch gut.)

(I especially liked one picture, namely the blue one, but the others are interesting, too.)

Apart from the position of the modifier, i.e. the point in time the identifying property is named, the non-given definite in (a) and the cataphoric indefinite in (b) are structurally equivalent: First, both NPs introduce a novel discourse referent. Secondly, both NPs relate to a bridging antecedent to achieve uniqueness, which is the previously introduced exhibition. Note that in either case the relation to the antecedent is not simply group membership, but approximately "shown in". Thirdly, the alternatives triggered by the non-given definite and those triggered by the cataphoric indefinite are provided by the bridging antecedent, i.e. the respective sets of alternatives consist of the elements shown in the exhibition that are pictures (due to the backgrounded part of the descriptive content). The only difference between the non-given definite and the cataphoric indefinite concerns the property responsible for uniqueness. In the case of a non-given definite this property is given by the focussed part of the descriptive content and in the case of the cataphoric indefinite it is a cataphor represented by the partition of the alternatives into "the one" and "the others". Let the cataphoric property be denoted by C. Then the non-given definite yields the interpretation "the unique painting shown in Marek's exhibition which is blue" and the set of alternatives is given by {the blue picture shown in the exhibition, the non-blue pictures shown in the exhibition}. Compared to this, the cataphoric indefinite yields the interpretation "the unique painting shown in Marek's exhibition which is C", and the set of alternatives is given by {the C picture shown in the exhibition, the non-C pictures shown in the exhibition}.

Following the representation suggested in section two, the cataphoric indefinite in (12)(b) will be represented as shown in (13):

– Being an indefinite the NP introduces a novel discourse referent x.
– Due to partitivity there has to be a bridging antecedent B and a relation R(x, B).
– Focus requires a presupposed discourse referent A representing the set of alternatives.[7] A is constrained by the background description, picture*(A) and includes the NP referent, $x \in A$, and also the contrasting elements, $\omega \subset A$, $x \notin \omega$. Moreover, A is restricted by the bridging antecedent, $y \in A$ iff R(y,B).
– Due to the focus on *ein* (on the referential interpretation) the alternatives are partitioned into a singleton cell and the rest, i.e. the NP referent is the only element which is R-related to B and a picture and is not included in the contrasting elements, $\forall z.R(z,B) \& picture(z) \& z \notin \omega \rightarrow z=x$. Note, that this entails the existence of a property C such that $\forall z.R(z,B)$ & picture(z) & C(z) $\rightarrow$ z=x, where C(z) iff $z \notin \omega$.
– On updating, B will be bound to the previously introduced exhibition. When updating the succeeding sentence, the referent of *die ANDEREN* (*the others)* will be bound to the set of contrasting elements ω.

[7]As in the case of definite NPs the relevant alternatives are assumed to relate to the focus phrase.

The representation of the cataphoric indefinite in (13) corresponds exactly to the representation of the non-given definite in (5)(b), apart from the fact that in the case of the non-given definite there is an asserted condition, blue(x), whereas in the case of the cataphoric indefinite, there is a presupposed condition C(x) which has to be bound by a succeeding property.[8]

(13) EIN Bild (... die anderen)

x

A, B, ω, *C*

picture*(A)	$\omega \subset A$
$x \in A$	$x \notin \omega$
"$\forall y.R(y,B) \leftrightarrow y \in A$"	"$\forall Z.\ Z \subset A \backslash \{x\} \rightarrow Z \subset \omega$"
R(x,B)	
"$\forall z.R(z,B)$ & picture(z) & $z \notin \omega \rightarrow z=x$"	
" $C(x) \leftrightarrow x \in A$ & $x \notin \omega$"	

It has been discussed in Umbach (2001) whether the distinction between the given and the non-given use of definites corresponds to the distinction between the referential and the attributive use of definite descriptions introduced by Donellan (1966). First of all, there is no one-to-one correspondence, since there are attributive uses which are identity anaphors, e.g. "*Someone murdered Smith. We're all very distressed because Smith was such a nice guy. It must be that Smith's murderer is insane -- that's the only way to explain it.*"[9] The definite *Smith's murderer* is attributive in this example, even though the discourse referent has been introduced before and thus the definite counts as given (and is in fact deaccented). On the other hand, Wilson (1991) suggested distinguishing between pronominal and attributive definite descriptions where Donellan's referential uses constitute a special case of the former. The definite *Smith's murderer* in the above example would be a pronominal one and we might amend the above claim by saying that the given/non-given distinction corresponds to the pronominal/attribute distinction according to Wilson.

In any case, cataphoric indefinites are not identity anaphors. The discourse referent is novel and is determined by a property, even if this property is a cataphor. It is important to recall that due to the cataphoric indefinite analysis the speaker-hearer asymmetry does not pertain to an individual but to a property. Thus it might be the case that the speaker has a particular property in mind and is nevertheless unable to determine the referent. One example of this kind is (10), where the indefinite is uttered before the identifying property (i.e. *winner*) can be evaluated. Note that in (10) it would be perfect to add "*(namely the winner) whoever that is*". Similarly, Donellan's famous Martini example can easily be rephrased by a cataphoric

[8]For convenience, C is included in the list of discourse referents. But keep in mind that it is a property instead of a (group-) individual.

[9]Many thanks to Barbara Abott for pointing out this example to me.

indefinite, cf. (14). But surprisingly it is the attributive version which facilitates a cataphoric indefinite. Contrary to the common assumption that specifics are similar to referentially used definites, cataphoric indefinites pair up with attributive (non-pronominal) definite descriptions.

(14) (After it was revealed to him that someone present at the meeting had a flask in his jacket pocket, the head of the teetotalers announced at the meeting:)

/EIN Mann muss sofort den \RAUM verlassen, ... nämlich der mit dem Flachmann in der Jacke, ... wer immer das ist.

(One man must leave the room immediately,... namely the one who has a flask in his jacket,... whoever that is.)

6 Cataphoric indefinites and scope

It has been shown in the preceding sections that for cataphoric indefinites the core feature of specificity, i.e. the speaker-hearer asymmetry concerning the identification of the referent, is a result of the interpretation of focus. Of course, cataphoric indefinites cover only a small range of the variety of specific indefinites listed in the literature. Classical examples such as the specific reading of *a logician* in *Mary talked to a logician* are not included, and neither are indefinite NPs of the form *a certain N*. Where scope with respect to other operators is concerned wide scope readings of indefinites are, of course, not restricted to cataphoric ones, cf., e.g., (15)(a) which has a de re reading. Still, if we focus on indefinites carrying a rising accent on the determiner, i.e. those qualifying for either a referential or a denotational topic, then there is evidence that wide scope readings require cataphoric indefinites. For example, the indefinite in (15)(b) has wide scope and is a cataphoric one, inducing the set of alternatives {one of the Greek girls, the other Greek girls}.[10]

(15) (a) During his holidays in Greek, Paul has fallen in love:

Anne: Stell dir vor: Paul will eine \GRIECHIN heiraten. (Er hat sie im Urlaub kennengelernt.)

(Have you heard the news: Paul wants to marry a Greek woman. He met her while on vacation.)

(b) During his holidays in Greek, Paul met a Greek girl group and is full of enthusiasm.

Anne: Stell dir vor: Paul will /EINE Griechin tatsächlich \HEIRATEN. Ich glaube, es ist die Schlagzeugerin.)

(Believe it or not: Paul wants to marry one of the Greek girls. I think it's the drummer.)

In (16) the interaction with another quantifier is demonstrated. In each of the examples the focus in the indefinite is on the determiner, *EINEN Vortrag* (*one talk*). In (a) the indefinite has wide scope and is at the same time cataphoric, one of the talks being contrasted with the other talks. In (b) the indefinite has narrow scope and is not cataphoric, the alternatives being {one

---

[10]Note that in (15)(b) the cataphoric indefinite has to precede the sentence adverb, which is a prerequisite for a topic to occur in the German middlefield (cf. Frey, to appear). Shifting the adverb seems to induce the reading where *EINE Griechin* contrasts with two Greeks, three Greeks etc. which is hard to interpret because it contradicts world knowledge: *Paul will offenbar /EINE Griechin \HEIRATEN.*

talk, at least three talks}.[11] In (c) the indefinite has narrow scope. Still, the alternatives consist of {one of talks, the other talks} indicating that the indefinite is a cataphoric one. Examples of this type were presented in Farkas (2002) and in Heusinger (2002) to point out that specific indefinites need not have wide scope (Farkas refers to these cases as *co-variation*, Heusinger call them *subject-specific*).

(16) (After the workshop...)

(a) Alle Teilnehmer fanden /EINEN Vortrag offenbar /BESONDERS interessant. (Die /ANDEREN waren eher /SCHLECHT besucht.)

(Every participant found one talk especially interesting. The other talks were less popular.)

(b) Jeder Teilnehmer fand offenbar /EINEN Vortrag \BESONDERS interessant (...aber mindestens DREI durchaus lohnenswert.*)*

(Every participant found one talk especially interesting and at least three talks worth hearing.)

(c) Jeder Teilnehmer fand /EINEN Vortrag offenbar \BESONDERS wichtig*,* (... nämlich seinen eigenen, und die anderen mäßig interessant.)

(Every participant found one talk especially important,... namely his own one,... and the others slightly interesting.)

Let us finally have a brief look at the examples in (17). In (a) the intermediate scope reading is the most natural one. *EINE Aufführung* (*one production*) must be contrasted with *the other productions* due to world knowledge (since the theater festival has to present more than one production). Thus the indefinite is a cataphoric one. In (b) the indefinite is slightly varied, thereby licensing a denotational topic interpretation where one Marthaler production is compared to two and the indefinite has narrow scope with respect to *drei Argumente.*

(17) (The jury of the Berlin theater festival provided the reviewers with the following instructions:)

(a) Jeder Kritiker soll drei Argumente bringen, die zeigen dass /EINE Aufführung ins \PROGRAMM genommen werden muss, (während die anderen verzichtbar sind.)

(Each reviewer has to come up with three arguments that show that one production must be put on the program whereas the others are dispensable.)

(b) Jeder Kritiker soll drei Argumente bringen, die zeigen dass /EINE Marthaler-Aufführung ins \PROGRAMM genommen werden sollte, (aber zwei zuviel wären.)

(Each reviewer has to come up with three arguments that show that one Marthaler production should be put on the program, but two would be too many.)

Although these examples are not sufficient for definite conclusions, they provide evidence that exceptional scope behavior is allowed for cataphoric indefinites but not for denotational topic indefinites. Cataphoric indefinites in German are not restricted to the sentence initial position, but may also occur in the topic position of the German middle field (cf. Frey, to appear). Denotational topic indefinites are excluded from this position, which is evidence that they do not constitute genuine topics, in spite of the rising accent. Cataphoric indefinites may have wide scope with respect to preceding operators, as in (15)(b) and (16)(a), which is not

[11]Note again that the sentence adverb has to precede the indefinite in this reading.

possible for denotational topic indefinites. But cataphoric indefinites may also have narrow scope inducing a co-variation reading, cf. (16)(c). Finally, cataphoric indefinites can take intermediate scope whereas denotational topic indefinites cannot.

7 Conclusions

In this paper it has been argued that cataphoric indefinites constitute a subclass of specific indefinites which is distinguished by a particular type of alternative set. Cataphoric indefinites (i) carry a focus on the determiner, (ii) are partitives, (iii) are topics, and (iv) induce a defined complement. Thus they trigger a set of alternatives of the form {one of the N, the other N}. For cataphoric indefinites, the speaker-hearer asymmetry with respect to the identity of the referent has been shown to result from the particular form of the alternative set: Inducing a partition into a singleton subgroup and the rest, the alternative set is equivalent to a unique property which is a cataphor to be specified in the subsequent discourse. On this analysis the core feature of specificity, i.e. the intuition that the speaker has a particular referent in mind without communicating its identity to the hearer, turns out to be a mere side effect of the interpretation of focus in topic constituents.

This analysis confirms the claim of Portner and Yabushita (2001) that specifics have to be partitive and topical. If we accept the evidence from German in the previous section, then denotational topics are no genuine topics and thus the combination of partitivity and topicality yields a sufficient characterization. Yet, the discussion in this paper has been limited to indefinites with an accent on the determiner and the results do not straightforwardly carry over to different accent positions. For example, shifting the accent from *EIN Bild* to *ein BILD* the alternatives no longer consists of one picture as compared to the other ones. For a specific reading of *ein BILD*, specificity effects have to be explained in some other way.

The present analysis also confirms the idea of an implicit identifying property pertaining to specific indefinites, as suggested by Schlenker (2003) and Zimmermann (2003). In contrast to their account, the present analysis need not pose the identifying property as an additional feature because it is a consequence of the particular alternative set. Moreover, the cataphoric indefinite analysis appears reminiscent of Schwarzschild's (2002) singleton indefinite analysis. However, on a closer look the accounts differ fundamentally. Schwarzschild argues that specific indefinites result from an implicit domain restriction. Different from other quantifiers, in the case of specifics the domain is restricted to a singleton. Implicit domain restrictions are given by the context and are familiar to the speaker and the hearer. Since this contradicts the observed speaker-hearer asymmetry, Schwarzschild has to pose an ad hoc privacy principle for specific indefinites. According to the cataphoric indefinites analysis the domain restriction is given by the backgrounded descriptive content and may be supplemented with implicit restrictions. For example, *EIN Bild* in (12)(b) has as its domain "pictures shown in Marek's exhibition". In contrast to Schwarzschild's account (and in accordance with the usual assumptions in focus semantics), the domain restriction is supposed to apply to all of the alternatives, whereas the singleton restriction is due to the cataphoric property induced by the particular alternative set.

Finally, cataphoric indefinites confirm the common idea that specific indefinites are close to definites. Taking the difference between given and non-given definites into account, a cataphoric indefinite is like a non-given definite apart from the fact that for non-given definites the identifying property is given by the focussed part of the descriptive content, while for cataphoric indefinites it is given by the particular alternative set and has to be specified afterwards. The similarity between cataphoric indefinites and non-given definites has a surprising consequence: If we accept that the difference between given and non-given definites correlates with the difference between referentially (or pronominally) used and attributively used definites, then cataphoric indefinites are on the side of the attributive ones.

References

Abusch, D. (1994) The scope of indefinites. *Natural Language Semantics* 2, 83-135

Bosch, P. (1988) Representing and Accessing Focussed referents. *Language and Cognitive Processes*, 3, 207-231.

van Deemter, K. (1994) What's New? A Semantic Perspective on Sentence Accent. *Journal of Semantics* 11.

Donellan, K. (1966) Reference and Definite Descriptions. *Philosophical Review* 75, 281-304.

Eckardt, R. (2002) Referential and denotational topics. Talk given at the Conference on Contrast at the Institute of Linguistics, University of Leipzig, February 2002.

Enç, M. (1991) The Semantics of Specificity. *Linguistic Inquiry*, Vol. 22, No 1, 1-25.

Endriss, C. & Ch. Ebert (to appear) Wide Scope Indefinites as Aboutness Topics. Proceedings of SuB 8, *Konstanz Linguistics Working papers*.

Farkas, D. (1994) Specificity and Scope. In L. Nash & G. Tsoulas (eds.) *Langues et Grammaires* 1. 119-137.

Farkas, D. (2002) Specificity Distinctions. *Journal of Semantics* 19, 1-31.

Fodor, J. & I. Sag (1982) Referential and Quantificational Indefinites. *Linguistics and Philosophy* 5, 355-398.

Frey, W. (to appear) A Medial Topic Position for German. *Linguistische Berichte*.

Gyuris, B. (to appear) Specificity and Information Structure. Proceedings of SuB 8, *Konstanz Linguistics Working papers*.

Hawkins, J. (1991) On (in)definite articles: implicatures and (un)grammaticality prediction. Journal of Linguistics 27, 405-442.

von Heusinger, K. (2002) Specificity and Definiteness in Sentence and Discourse Structure. *Journal of Semantics* 19, 245-274.

Jäger, G. (1998) Topic, Focus and Weak Quantifiers. In Bosch, P., van der Sandt, R. (eds.) *Focus and Natural Language Processing*. Cambridge University Press.

Krifka, M. (ms.) Association with Focus Phrases.

Löbner, S. (1985) Definites. Journal of Semantics 4, 279-326.

Ludlow, P., & S. Neale (1991) Indefinite Descriptions: In Defense of Russel. *Linguistics and Philosophy* 14, 171-202.

Portner, P. & K. Yabushita (2001) Specific Indefinites and the Information Structure Theory of Topics. *Journal of Semantics*, Volume 18, Issue 3, pp. 271-297.

Schlenker, Ph. (2003) Island-Escaping Indefinites and Scopal Independence. Talk in the Workshop on Direct Reference and Specificity, ESSLLI, Vienna.

Schwarzschild, R. (2002) Singleton Indefinites. *Journal of Semantics*, 19.

Umbach, C. (2001) (De)accenting Definite Descriptions. *Theoretical Linguistics* Vol. 27.

Umbach, C. (2003) Anaphoric Restriction of Alternative Sets: On the Role of Bridging Antecedents. Proceedings of SuB 7, *Konstanz Linguistics Working papers*.

Wilson, G. (1991) Reference and Pronominal Descriptions. *Journal of Philosophy*, 88, 359-87

Zimmermann, E. (2003) Bare Plurals and Specificity. Talk in the Workshop on Direct Reference and Specificity, ESSLLI, Vienna.

USING FOCUS TO IMPROVE DEFINITION: WHAT COUNTS IN HUNGARIAN QUANTIFICATION*

Daniel Wedgwood,
University of Edinburgh

dan@ling.ed.ac.uk

Abstract

Szabolcsi (1997a) proposes that some left-peripheral syntactic positions encode not compositional semantic information, but different *procedures* for the assessment of truth conditions. These procedures are said to be reflected in the range of quantified noun phrases that may appear in certain positions in the pre-verbal field in Hungarian. While one of Szabolcsi's proposed procedures correctly predicts a monotonicity-based constraint on the quantifiers appearing in certain positions, her other procedure is too vaguely defined to produce useful predictions. I argue that the appropriate procedure in this latter case is the same as the one that produces 'narrow focus' interpretations and that the related position that Szabolcsi proposes for quantificational processes is nothing other than the well-known 'focus position' of Hungarian. Apparent interpretive differences between the relevant quantificational phrases and other uses of syntactic focus follow naturally from an inferential pragmatic approach to this position. This has important theoretical implications: an inferential analysis of syntactic focus requires (1) a 'dynamic', parsing-based view of the relationship between syntax and semantics and (2) a re-alignment of the burden of explanation between linguistically encoded semantics and inferential pragmatics. An analysis of this nature proves to explain the quantifier distribution facts and a number of other syntactic phenomena in an extremely parsimonious fashion.

1 Background

The structure of the Hungarian sentence, as viewed by Szabolcsi (1997a), can be summarised as in the template in (1) (where an asterisk is the Kleene star, signifying the possibility of iteration). This article concentrates on the pre-verbal field, in particular on contrasts between TopP and QP, on the one hand, and PredOp and Focus, on the other[1]. In (2)–(5), an example of the use of each putative syntactic position is given.

(1) (Top[ic]P*) (Q[uantifier]P*) (PredOp) (Focus) V (XP*)

(2) **TopP:** [*Kati*] ***meg****ijedt.*
Kati VM-feared
'Kati was frightened.'

(3) **QP:** [*Minden gyerek*] ***meg****ijedt.*
every child VM-feared
'Every child was frightened.'

*The ideas presented in this article first appeared in Wedgwood (2003), where more detailed argumentation may be found. The further development of this work is supported by an ESRC Postdoctoral Fellowship.

[1] Szabolcsi (1997a) in fact refers to TopP and QP as 'RefP' and 'DistP', respectively. I employ the better known and more transparent terminology of É. Kiss (1987) for essentially the same positions. For the distinction between TopP and QP, which is beyond the scope of this article, see the above-cited works and É. Kiss (2002).

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference "sub8 – Sinn und Bedeutung". Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany*

(4) **PredOp:** [*Kevés gyerek*] *ijedt* ***meg***.
few child feared VM
'Few children were frightened.'

(5) **Focus:** [*Kati*] *ijedt* ***meg***.
Kati feared VM
'It's KATI that was frightened.'

It is immediately obvious that the four positions split into two groups, according to the position of any 'verbal modifier' (VM), such as the aspectual particle *meg*, shown in boldface in (2)–(5)[2]. VMs appear left-adjacent to the tensed verb except in the presence of a PredOp quantifier or a syntactically focused expression, when the VM appears post-verbally. This is line with the fact that foci and PredOp quantifiers are themselves strictly left-adjacent to the tensed verb[3]. Alongside strict adjacency and some prosodic cues, the position of any VM therefore provides a diagnostic for the use of PredOp or Focus. Below, in section 2, I argue that this structural indicator has a unique significance: PredOp and Focus are the same position.

Szabolcsi (1997a), discussing only quantificational issues, argues that the effect of moving a quantified noun phrase (QNP) to TopP/QP is to cause it to undergo a certain kind of semantic assessment procedure; moving a QNP to PredOp causes it to be interpreted by a different procedure (the procedures themselves are outlined below). Hence, Szabolcsi's proposal contrasts with the more common approach to semantics, which assumes that the lexical and syntactic elements of natural languages declaratively encode pieces of compositional semantic information. I believe that Szabolcsi's use of procedural encoding represents a very valuable insight, but one which she applies at an inappropriate level: the quantificational phenomena that she discusses are actually mere manifestations of much more fundamental procedures.

Szabolcsi's primary aim is to explain the existence of a number of restrictions on the kinds of QNP that can appear grammatically in the different syntactic positions in (2)–(5). Encoded semantic procedures potentially provide an explanation, because some QNPs are incompatible with semantic assessment by certain procedures. Szabolcsi is able to define some such incompatibilities by reference to standard Generalised Quantifier (GQ) theory. However, the set of QNPs appearing grammatically in the PredOp position appears to defy categorisation in terms of GQ theory and Szabolcsi resorts to classifying these as 'counting quantifiers', a classification that lacks any clear definition. Below, I argue that restrictions on appearance in PredOp can be defined in terms of GQ theory, as long as the structural properties of QNPs are also taken into account, and that this reflects a basic procedure which applies to *all* expressions that are left-adjacent to tense in Hungarian, including foci.

The nature of the Hungarian pre-verbal field is of interest far beyond the study of this one language. Beghelli and Stowell (1997) assume rich LF structure for languages like English (with associated covert QNP movement) partly on the basis of Szabolcsi's analysis of Hungarian. Meanwhile, the widespread analysis of the 'focus position' as a dedicated FocusP projection has led to highly influential theories of 'the fine structure of the left periphery' (e.g. Rizzi 1997, citing Hungarian as the primary evidence for such projections in universal grammar). Therefore, if the pre-verbal positions of Hungarian prove to require a quite different kind of analysis, significant elements of current approaches to the syntax-semantics interface must be called into question—indeed, my proposals point to a need for fundamental changes of perspective.

[2]In addition to a class of directional/aspectual particles, VMs include resultative secondary predicates, determinerless object nominals and certain adverbial phrases.

[3]More accurately, there are only two entities that can intervene between such expressions and the tensed verb: the negative particle *nem* and a clitic-like particle, *is*. These exceptions are explained in Wedgwood (2003).

2 Restrictions on QNP distribution and Szabolcsi's procedures

2.1 QNPs in TopP/QP

Szabolcsi (1997a) observes that only QNPs with monotone increasing (upward entailing) quantifiers are found in TopP and QP; QNPs with monotone decreasing (downward entailing) or non-monotonic quantifiers are ungrammatical in these positions. Some illustrative examples are given in (6) and (7).

(6) *Több, mint hat diákunk* ***félre****értette* *a* *kérdést.*
more than six student-1PL aside(VM)-understood the question-ACC
'More than six of our students misunderstood the question.'

(7) **Kevesebb, mint* / **Pontosan hat diákunk* ***félre****értette* *a* *kérdést.*
fewer than precisely six student-1PL aside(VM)-understood the question-ACC
Intended: 'Fewer than six / Precisely six of our students misunderstood the question.'

Some QNPs can occur in either QP or PredOp. These have a distinct interpretation in each position. The difference seems to be based on whether or not the QNP is used to refer to a closed set of entities. This is demonstrated by Szabolcsi's 'others' test, as in (8) (I give speaker B's contributions only in English, as the meaning alone is at issue here).

(8) a. **A:** *Több, mint hat diákunk* ***félre****értette* *a* *kérdést.*
more than six student-1PL aside(VM)-understood the question-ACC
'[$_{\text{QP}}$ More than six of our students] misunderstood the question.'
B: . . . "Maybe you'll find others too."

b. **A:** *Több, mint hat diákunk* *értette* ***félre*** *a* *kérdést.*
more than six student-1PL understood aside(VM) the question-ACC
'[$_{\text{PREDOP}}$ More than six of our students] misunderstood the question.'
B: # . . . "Maybe you'll find others too."

Szabolcsi concludes from this evidence that the QNP contributes its semantics to the sentence in different ways, according to its syntactic position. A QNP in TopP or QP appears to introduce a set referent, with the rest of the sentence predicating something of this set. A PredOp QNP, on the other hand, seems merely to specify the cardinality of some set denoted by the rest of the sentence. It follows that if the quantifier, like *more than six*, has no upper bound, then no closed set is invoked in PredOp and reference to 'others' will be infelicitous, as in (8-b). The different positions thus encode two procedures, described in Szabolcsi's own words as follows:

(9) **TopP/QP**: "start out with a set determined by the quantifier and check its members for some property" (1997a, 125)
PredOp: "[perform] a counting operation on the property denoted by the rest of the sentence" (1997a, 122)

In more technical terms, the TopP/QP procedure involves predicating over a *witness* of the QNP. That is, in contrast to standard representations of GQs, the value of the quantifying determiner is not assessed with respect to the composite semantic contribution of the rest of the sentence. Rather, the QNP as a whole contributes a set as a logical subject of predication. In terms of the tripartite structure of quantification, this means that the quantifier combines with its restrictor to produce a witness set and the nuclear scope then predicates over this set.

As Szabolcsi notes, this explains the monotonicity-based constraint on appearance in TopP or QP, for the following reasons. With upward entailing quantifiers, predicating over a witness set produces the correct truth conditions, irrespective of the cardinality of the intersection of the restrictor and nuclear scope. With other quantifiers, however, the truth conditions of the sentence depend upon the cardinality of this intersection.

For example, the upward entailing QNP *at least two students* may have as a witness the set $\{kenny', henry'\}$, assuming that both Kenny and Henry are students. To assess the truth of the proposition 'At least two students smoke' with respect to this set one may simply check the set of smokers for Kenny and Henry. In contrast, the truth of the proposition 'Exactly two students smoke' cannot be established in this way, even though the set $\{kenny', henry'\}$ fulfils the criteria for a witness of the non-monotonic QNP *exactly two students*. In this case it also matters whether or not there exist other student smokers—that is, the cardinality of the intersection of the restrictor and the nuclear scope must be established—so the sentence cannot be assessed simply by predicating over a closed set.

Though Szabolcsi (1997a) concentrates on the formal properties of witness sets, there is a clear intuitive connection between predicating over a witness set presented as the denotation of a QNP and the notion of that QNP being the 'topic' of the sentence. This mode of semantic assessment amounts to investigating the properties of some identifiable set without regard to the rest of the model. The various characteristics of topics—'aboutness', 'discourse-linked' status, specificity—are all to some extent implied by some part of this description. As my primary aim is to explain the nature of PredOp/Focus, rather than TopP/QP, I shall not pursue this subject, beyond noting that the connection between the witness set mode of interpretation and the notion of topichood seems fairly direct[4]. It may well therefore be unnecessary to posit the encoding of any more detailed semantic information in TopP and QP in order to derive the essential properties of topics (especially given the likely addition of further information in use by inferential pragmatic means).

2.2 QNPs in PredOp/Focus

There is no monotonicity-based constraint on QNPs in PredOp (which I show below to be identical to Focus). Among the expressions that appear unproblematically in this position are QNPs with monotone increasing quantifiers, as seen already in (8-b), and with monotone decreasing and non-monotonic quantifiers, as shown in (10).

(10) *Kati kevesebb, mint öt / pontosan száz szavakat írt le.*
Kati fewer than five exactly hundred words-ACC wrote down(VM)
'Kati wrote down fewer than five / exactly a hundred words.'

QNPs that cannot appear in PredOp/Focus include those with universal quantifiers and *a legtöbb N* 'most N'. Such QNPs provide initial evidence in favour of treating PredOp and Focus as a single position: they are unable to appear in the immediately pre-verbal, VM-inverting position even under an explicitly contrastive focus reading, as shown in (11)—so the same constraints seem to apply to Focus and the putative PredOp.

(11) *Minden gyerek megijedt / #ijedt meg.*
every child VM-feared feared VM
For: 'EVERY child got frightened (e.g. not just the girls).'

[4] See Ebert and Endriss (this volume) for a technical development of the use of witness sets to capture the notion of topichood.

Universal quantifiers and 'most' belong to a well-known class within GQ theory: proportional (i.e. non-intersective) quantifiers. However, Szabolcsi (1997a) points out a number of examples which show that proportional QNPs are not barred from PredOp/Focus. For example, *kevés N* 'few N' may be found in this position. Szabolcsi also notes examples like (12).

(12) *A fiúknak több, mint 50 százaléka értette félre a kérdést.*
the boys-DAT more than 50 percent-3PL understood aside(VM) the question-ACC
'More than 50% of the boys misunderstood the question.'

The QNP here is not only proportional but also, by most definitions, denotationally equivalent to a QNP that cannot appear in PredOp/Focus: *a legtöbb N* 'most (of the) N'. This kind of example prompts Szabolcsi to conclude that we must look beyond denotational semantics in order to define the class of QNPs that may appear in PredOp (and thereby reveal the encoded procedure that, by hypothesis, underlies this class).

Szabolcsi in fact claims that only 'counting quantifiers' are permitted in PredOp. It is not clear how this category might be defined. It is difficult to see how any definition of 'counting' could distinguish between *kevés N* 'few N', which occurs grammatically in PredOp/Focus and *a legtöbb N* 'most (of the) N', which cannot. In any case, given the evidence presented below for the unification of Szabolcsi's PredOp and Focus, the nature of the position cannot be defined in purely quantificational terms.

3 PredOp and Focus unified as a procedure

In order to understand the class of QNPs that appear in Szabolcsi's putative PredOp position, it is instructive to take Szabolcsi's descriptions of her proposed procedures, (9), remove unhelpful references to 'counting' and re-phrase them so that they are expressed in a truly parallel fashion. This yields something like (13).

(13) **TopP/QP**: "start out with a set determined by the quantifier and check its members for some property"
PredOp: "start out with the rest of the sentence and evaluate the quantifier in terms of this"

Connections to the information-structural readings of the respective positions now begin to look quite direct. Just as there is an intuitive link between the procedure of predicating over a witness set and a simple 'topic-comment' reading, so the idea of 'starting out with the rest of the sentence' is suggestive of taking a 'focus frame' from the context.

This reduces Szabolcsi's PredOp position to a special use of Focus: narrow focus on a quantifier. Of course, two putative syntactic positions cannot be reduced to one on the basis of such intuitive reasoning alone. As Wedgwood (2002, 2003) shows, there is also clear syntactic evidence for identifying PredOp with Focus. In brief, there are certain phenomena in Hungarian that are generally recognised to be licensed only in a sentence that contains a pre-verbal focus; these include the post-verbal appearance of monotone decreasing QNPs, as in (14) and the use of a definite internal argument NP with so-called 'Definiteness Effect' verbs like *hoz* 'bring', as in (15)[5]. As (14-c) and (15-c) show, such phenomena are licensed straightforwardly by 'PredOp' QNPs (i.e. with the kind of relatively unmarked readings that Szabolcsi associates with PredOp; not requiring any special cleft-like reading).

[5]It is beyond the scope of this article to explain these phenomena; see Bende-Farkas 2002 for valuable discussion.

(14) a. **Jánosnak visszaadott legfeljebb három könyvet.*
János-DAT back(VM)-gave at.most three book-ACC
For: 'To János were given back at most three books.'
b. *Jánosnak MARI adott vissza legfeljebb három könyvet.*
János-DAT Mari gave back(VM) at.most three book-ACC
'It's Mari who gave at most three books back to János.'
c. *Jánosnak kevesebb, mint hat lány adott vissza legfeljebb három könyvet.*
János-DAT fewer than six girls gave back(VM) at.most three book-ACC
'To János, fewer than six girls gave back at most three books.'

(15) a. *#János hozta a székeket.*
János brought the chairs-ACC
For: 'János brought the chairs.'
b. *JÁNOS hozta a székeket.*
János brought the chairs-ACC
'It's János who brought the chairs.'
c. *Kevesebb, mint hat lány hozta a székeket.*
Fewer than three girl brought the chairs-ACC
'Fewer than three girls brought the chairs.'

PredOp being a special use of Focus, the second half of (13) should be generalised by replacing the phrase "the quantifier" with the "the pre-verbal expression" or "the focused expression". This 'procedure' is, as it stands, no more than a *post hoc* description of the effect a certain syntactic configuration produces (the reasons *why* the pre-verbal position relates to this form of interpretation are outlined below), but is sufficient to indicate the basis of an approach to Hungarian focus that differs significantly from current mainstream analyses.

Given the assumption of a procedure that always yields a broad 'focus frame' and a narrow focus, many of the properties associated with syntactic focus in Hungarian are explained without further stipulation. The commonly 'identificational' nature of pre-verbal foci (Kenesei 1986, É. Kiss 1998) follows for purely pragmatic reasons from their narrowness: a richly specified 'focus frame' sets up the expectation of a particular kind of expression playing a particular role in the eventuality in question, so that the item in focus appears simply to identify who or what fulfils this role. Relatedly, the well-known 'exhaustivity' (sometimes termed 'exclusivity' or 'contrast') of Hungarian pre-verbal foci follows by purely pragmatic reasoning: when one individual (or group, value, etc.) is asserted as fulfilling a particular role within a known eventuality, other hitherto contextually possible alternatives to the asserted item are implicitly excluded, by the kind of pragmatic reasoning known in the Gricean tradition as 'quantity implicature'[6].

There is therefore no reason to assume that exhaustivity as such is part of the encoded semantics of the Hungarian pre-verbal focus position. The commonly accepted analysis of this position, as put forward by the likes of Szabolcsi (1981, 1994) and É. Kiss (1998), is that it corresponds to a semantic 'exhaustivity operator'. However, the availability of an inferential pragmatic explanation of exhaustive/identificational readings suggests that this kind of detail need not be actually encoded in the grammar.

Indeed, the arguments present above, to the effect that Szabolcsi's PredOp and Focus are demonstrably the same position, provide evidence in favour of the pragmatic approach. As noted above, there is generally perceived to be a certain difference in the readings of pre-verbal

[6]The fact that the exhaustivity of pre-verbal foci may affect truth-conditions, as identified by Szabolcsi (1981), does not preclude an inferential pragmatic account of this nature. As well-founded pragmatic approaches like Relevance Theory emphasise (Sperber and Wilson 1986, Carston 2002), there is no principled reason to restrict inferential pragmatic processes to operating only over the output of truth-conditional semantics.

QNPs, compared to individual-denoting pre-verbal foci: the latter are typically associated with a strongly exhaustive cleft-like reading, while pre-verbal QNPs usually are not. This difference in interpretation appears to be one of the main motivations for Szabolcsi's distinction between PredOp and Focus—and indeed this distinction must be made, if an encoded exhaustivity operator is taken to provide the semantics of Focus. Szabolcsi (1994) argues that the correct form of any such operator must have the form in (16), to allow for appropriate entailments.

(16) $\lambda z \lambda P[z = \iota x[P(x) \,\&\, \forall y[P(y) \rightarrow y \subseteq x]]]$

As Szabolcsi (1997a, 149) notes, this definition of exhaustivity only works with set (singular or plural individual) denoting expressions. As tests like (8) show, immediately pre-verbal QNPs are not set-denoters, but part of a truly quantificational structure. It follows that if (16) is the semantic contribution made by the Focus position, such QNPs must be in a different position where they undergo a different kind of interpretation. However, this conclusion contradicts the syntactic evidence, as shown above. Encoding the semantics of exhaustivity into the Focus position therefore forces the adoption of an empirically unsustainable analysis.

In contrast, the pragmatic approach to exhaustive identificational focus predicts that narrow focus on a quantifier will tend to have a different impact to narrow focus on an individual-denoting expression. In Wedgwood (2002, 2003), I discuss at length how the nature of contextual alternatives to individual-denoters contrasts with the alternatives to asserted quantificational values (which are generally context-independent and, in the case of numerals, often open-ended) and how this tends to create different perceptions of exhaustivity. In essence, it is pragmatically predictable that the inferred exclusion of well-defined and contextually evoked alternatives will produce a stronger sense of an intentionally contrastive reading than will the exclusion of the other members of an infinite and 'ever-present' scale of values like the natural numbers[7]. Moreover, in many cases the narrowly focused item is not the whole QNP, but some sub-part of it, for reasons expounded below. In these cases, the majority of the QNP is not asserted material at all, but rather background material that is 'pied-piped' into the pre-verbal position[8]. The QNP as a whole is therefore often not expected to bear any kind of contrastive reading, under a pragmatic account of the origins of such readings.

Even besides the issue of QNPs, there are good reasons to reject the idea that Focus encodes an exhaustivity operator. First, narrow foci without markedly exhaustive readings (i.e. those naturally translated with English sentences of unmarked word order, rather than *it*-clefts) may appear in the immediately pre-verbal position—for example, the unmarked answer to a *Wh*-question like (17) appears there. Because all 'given' material is generally elided in such contexts, the answer to (17) would normally be simply *Jánost*, but native speakers confirm that the only possible full sentence answer would involve the use of the 'Focus' position, as shown (the example is taken from Horvath 2000). The idea that the Focus construction is only used in strongly exhaustive/contrastive contexts thus springs from its independently determined 'invisibility' in unmarked contexts.

(17)	*Kit*	*hívtak*	*meg?*	*Jánost*	*hívták*	*meg.*
	who-ACC	invited-3PL	VM	János-ACC	invited-3PL	VM
	'Who did they invite?'			'They invited János.'		

[7]It is of course possible for a restricted, context-specific sets of numeral values to be salient—and in this case a strong sense of exhaustivity/contrast is felt (e.g. *FIVE students [not four]*). Note that this depends only on the nature of the (psychological) context; no special grammatical encoding is required to 'add' the exhaustive reading.

[8]Despite the name, this 'pied-piping' need not entail a syntactic theory involving movement. See Kempson, Meyer-Viol and Gabbay (2001, 113) for technical ways of encapsulating pied-piping effects within Dynamic Syntax—a framework with which my analysis shares fundamental assumptions.

Furthermore, as in English, special indicators are required to convey the idea that a narrow focus is *non*-exhaustive: Horvath comments that explicit phrases such as *többek között* 'among others' are necessary to create a non-exhaustive answer to a question like (17); rising intonation also appears to be obligatory. This confirms that exhaustivity is the pragmatically unmarked reading of narrow foci, making a grammatically encoded operator superfluous.

Further evidence that the Focus position cannot encode an exhaustivity operator comes from applying a test due to Horn (1981). Horn shows that the English *it*-cleft construction cannot directly encode exhaustivity, since an exhaustive reading of the clefted constituent fails to appear in a sentence like (18-a), even though the addition of exhaustive semantics (akin to '*only* a pizza') is precisely what is required to make the meaning of the sentence coherent. As (18-b), the translation of Horn's example, shows, the same is true of the Hungarian Focus construction, demonstrating that the exhaustive meaning is not provided by the grammar and must instead be inferred from the way in which the item in Focus is asserted.

(18) a. ?? I know Mary ate a pizza but I've just discovered that it was a pizza that she ate.
b. ?? *Azt tudtam, hogy Mari megevett egy pizzát, de most vettem*
that knew.1SG that Mari VM-ate.3SG a pizza-ACC but now take
észre, hogy egy pizzát evett meg.
mind-to(VM) that a pizza-ACC ate VM

Let us summarise the argument so far. The true counterpart of Szabolcsi (1997a) successful procedural analysis of TopP and QP is not the 'counting' operation that she proposes, but rather something reminiscent of a procedural approach to 'focus frame + narrow focus' sentences. The idea that such a procedure somehow underlies the interpretation of the 'PredOp' QNPs is consistent with strong syntactic and interpretive evidence that the putative PredOp position is identical to the position known as Focus. A procedural approach to this position seems appropriate, given the existence of significant problems for the commonly-held idea that this position contributes an exhaustive focus operator. In the remainder of this paper, I present a proposal regarding the precise nature of the procedure associated with this position and show how this explains both its information-structural reading and the nature of the QNPs that can appear there.

4 The 'Focus' position as a predicative position

My proposals regarding the information-structural and quantificational significance of the position left-adjacent to the tensed verb in Hungarian rely on a radical new analysis of this position. Rather than positing a specialised Focus projection, I concentrate on the linear relationship of left-adjacency to the tensed verb. Considering the range of items that can enter into this relationship and the range of resulting interpretations, its significance is clearly more general and underspecified than any available definition of 'the semantics of focus'. I propose that the linear adjacency relationship acts as a signal to the hearer to pursue a particular interpretive procedure involving the expression to the left of the tensed verb. Depending on the nature of this expression, the procedure is predicted to trigger different inferential processes, which lead to the appropriate information-structural readings. Constraints on the distribution of QNPs also follow from the nature of this procedure.

If Focus is to be subsumed in a more general phenomenon, a new name is required for the relevant syntactic position. Furthermore, the involvement of the *tensed* verb in particular will be shown to be crucial, so descriptions such as 'the pre-verbal position' will not suffice. Instead, I shall use the abbreviation 'PT' (for 'pre-tense') to refer to the relevant position (which continues to contrast with TopP and QP).

4.1 Pre-tense, not pre-verbal

Concentration in the literature on present and past time sentences (such as (2)–(5)), in which the main verb is inflected for tense, has led to the common perception that the position of syntactically focused expressions in Hungarian is related to the position of the main verb. Examples containing tensed auxiliary verbs and infinitival main verbs tell a different story. In these examples, the main verb is independent of the expression of tense, revealing the true nature of the PT position. Consider (19): here tense is carried by the auxiliary *fog*, which, rather like English *will*, acts in such sentences simply to convey temporal information.

(19) a. *Mari látni fogja Jánost.*
Mari see-INF will-PRES.3SG János-ACC
'Mari will see János.'

b. *Mari Jánost fogja látni.*
Mari János-ACC will-PRES.3SG see-INF
'It's János that Mari will see.'

The sentence in (19-a) has what is known as a 'neutral' reading; that is, it appears to contain no syntactically focused expression and hence is essentially read as 'topic + broad focus'. Every neutral sentence has the same basic linear structure: the main verb immediately precedes the expression of tense, whether as [verb stem + tense affix] or as infinitival verb followed by tensed auxiliary. Sentences containing auxiliaries diverge from those with tensed main verbs in clear examples of syntactic focus, like (19-b). Here the main verb appears to the right of the tensed element, effectively 'vacating' the immediately pre-tense position, which is occupied by the focused item. What these examples show is that in a neutral sentence the verb itself is in PT: the same position occupied by a focused expression when there is one. Tensed main verbs confuse the picture, inevitably appearing to the left of tense, for morphological reasons. In this position, they can be interpreted as being left-adjacent to tense, but can alternatively be viewed as *being* the tensed element themselves. In terms of semantic significance, the contribution of a main verb stem may be itself subjected to the procedure encoded by PT, or, as the tensed element, it may simply indicate that another expression is to be interpreted in terms of PT. The former situation results in neutral sentences; the latter in the identification of a syntactic focus.

The observation that PT, the position of foci, is occupied by the main verb in neutral sentences precludes any direct encoding of the semantics of focus (appropriately, given that the problems with encoded exhaustivity noted above leave us with nothing but a vague notion of 'narrow focus') and supports the idea of underspecified procedural encoding. Further evidence for this approach comes from the behaviour of verbs when there is both a tensed auxiliary and a VM. As shown in (20-a), in this case the infinitival main verb does not appear before tense even in a neutral sentence; instead, the VM does—though still postposing in the presence of a focused expression, as in (20-b).

(20) a. *Mari meg fogja hívni Jánost.*
Mari VM will-PRES.3SG call-INF János-ACC
'Mari will invite János.'

b. *Mari Jánost fogja meghívni.*
Mari János-ACC will-PRES.3SG VM-call-INF
'It's János that Mari will invite.'

The conclusion from sentences with tensed auxiliaries is that VMs, main verbs or other expressions may appear in PT, with different interpretive consequences: a neutral reading in the case of VMs and verbs and a narrow focus interpretation with other expressions. These differences follow from the ways in which each is able to fulfil the procedure that is encoded in PT[9].

4.2 PT and predication

The analysis pursued here suggests that PT encodes a fundamental semantic procedure that is highly underspecified with regard to the eventual interpretive effects it may produce. Observed interpretations arise via chains of inferential reasoning, on the basis of the kind of expression that is actually encountered in the PT position. It follows that the path from syntactic structure to observed interpretations must take account of what occurs during the processing of utterances; attempting to 'interface' a static representation of syntactic structure with semantics could at best result in a highly underspecified semantic representation. Indeed, I argue below that a crucial part of the chain of inference from PT to its eventual semantic interpretation involves the time-linear processing of utterances: the explanation of the observed information-structural readings depends on the fact that material 'to the right of' PT is processed after the PT procedure has been completed. My analysis is therefore inherently 'dynamic', in the sense of Kempson et al.'s (2001) Dynamic Syntax. This allows for forms of explanation that are not possible under more conventional approaches, with the particular advantage of allowing for a reasoned shifting of the burden of explanation from encoded semantics to inferential pragmatic processes.

The nature of the underlying interpretation of PT is suggested by the fact that it is the unmarked position of main verbs (a situation mirrored in the verb-initial focus position found in many otherwise strictly V-initial or Aux-initial languages; see Paul 2001). This indicates that the idea of predication may in some way be important in the interpretation of PT. This is consistent with the use of PT as a 'focus position'—there is a long tradition of relating background and focus to the notions of 'logical subject' and 'logical predicate', respectively (see von Heusinger 2002 for a historical overview). Note also how this connects to the basic procedures suggested in (13). The first procedure is evidently concerned with predication; if, as seems likely, the second is in some sense the inverse of the first, it too is essentially predicative.

A further indication of the underlying interpretation of PT is to be found in the following generalisation (which has been hitherto overlooked in the literature on the 'focus position'). Whatever expression appears in PT is usually the beginning of the 'new' (or 'comment') part of the utterance. This is accounted for if the PT position somehow encapsulates the idea of focus-as-logical-predicate. However, while any material following a verb or VM is typically further 'new' material, anything that follows a non-verbal expression in PT is necessarily background, leaving the expression in PT as the whole of the 'new' material by itself. To be all of the new material in the sentence is to be a narrow focus; therefore, explaining the different information-structural readings of Hungarian sentences can be reduced to explaining how different occupants of PT determine the focus/background status of *subsequent* material.

The different effects of verbal and non-verbal expressions can be accounted for if the following is assumed to be the procedure encoded in PT: the expression left-adjacent to tense contributes a

[9]For reasons of space, I do not address here why it is VMs, not verbs, that appear in PT in a neutral sentence with a tensed auxiliary; see Wedgwood (2003, Chapter 7).

predicate, the application of which must create a full, if skeletal, propositional form (apart from the temporal anchor contributed by tense), *at the point at which PT is parsed*.

The appropriate effects on subsequent material follow from this because of a key semantic difference between verbs and non-verbal expressions: the degree to which each contributes the structure of a proposition. Verbs provide rich information such as argument structure, which allows the verb alone to give the bare bones of an eventuality. In combination with tense (providing a temporal anchor point), a verb can therefore create the skeletal structure of a proposition. This is reflected in the fact that in a fully 'pro-drop' language a tensed verb alone can be a full sentence, corresponding to a full proposition. For example, the Hungarian verb *Látta* can convey the entire meaning 'S/he saw him/her'.

The fact that a verb contributes skeletal semantic structure also means that this structure can be 'filled out' by subsequent assertions, adding information without changing the propositional form that has been created. This creates the impression of a 'broad focus' reading (i.e. as part of a so-called neutral sentence). Thus, in a sentence like (19-a), the main verb in PT fulfils the procedure outlined above, a full propositional form (minus temporal anchor) being created at the appropriate point thanks to the richly structured semantics of the verb. The subsequent accusative NP *Jánost* is asserted material, elaborating on a part of the propositional form already created by the verb. The verb is therefore just the beginning of the newly asserted material in the sentence, but simultaneously also constitutes the whole of the 'logical predicate' of the sentence on its own[10].

The case of VMs is somewhat more complicated (see Wedgwood 2003, Chapter 7), but essentially similar to main verbs, in that VMs too bring abstract structure to a proposition (many VMs affect aspectual structure, for example, and in general VMs contribute to complex predicates, in ways that can be analysed as effectively 'selecting for' a main verb). Again, this structure can be 'filled out' by subsequent assertions within the same sentence, creating the effect of 'broad focus', but without changing the fundamental structure of the proposition.

A non-verbal expression, such as an argument NP, has no such internal structure. How could such an expression fulfil the proposed procedure associated with PT and create a propositional form before the rest of the utterance is parsed? On its own, it clearly cannot. All of the necessary elements of a proposition must therefore be available 'in advance', outwith the sentence itself. In practice, this means that the whole of the relevant proposition apart from the contribution of the PT expression must be 'given' in the context. This brings us back to the procedures outlined in (13): everything other than the expression in PT must be taken to be something akin to a 'complex topic', in the sense that all of this material must be treated as the logical subject over which the PT item can predicate[11]. Thus, the proposed procedure obligatorily yields a 'focus frame + narrow focus' interpretation just when the occupant of PT is non-verbal[12].

A number of other important facts about the 'focus position' are also predicted by this account of PT, without any *ad hoc* syntactic machinery or semantic operators. Notably, the apparent postposing of VMs in the presence of a focused expression is explained: if a VM intervenes between some expression and the tense-carrying element, that expression simply will not be interpreted as the proposition-creating predicate, since it will not be recognised as being in PT—and there-

[10]For a compatible view of how adjuncts relate to verbal semantics in a dynamic approach, see Marten 2002.

[11]One way to achieve this technically is to turn to neo-Davidsonian event-based semantics (Parsons 1990), within which expressions like NPs correspond to predicates over eventuality variables, giving a close parallel to the semantic contribution of verbs. An approach of this kind is taken in Wedgwood (2003), where a means of formally representing the dynamic aspects of the contribution of PT is developed.

[12]Note that, correctly, there is nothing in this analysis that prevents a verbal element from receiving a narrow focus interpretation, just in case there is a suitable 'focus frame' available in the context. The point is that this is not necessarily the reading with verbal elements—indeed, it is clearly the more marked possibility.

fore it will not be interpreted as a narrow focus. At the same time, the unmarked appearance of VMs before auxiliary verbs does not rely on any *ad hoc* operation of 'VM climbing', such as is required in many purely syntactic accounts. As shown in Wedgwood (2003, to appear), the PT analysis also explains without further the stipulation the nature of two apparently aspectual constructions that interact with focusing and, with minimal further assumptions, the positions and associated interpretations of the Hungarian negative particle.

5 PT and QNP distribution

The key to explaining the class of QNPs that appears in PT is the fact that this structural position necessarily relates to a single act of predication. In order to fulfil this function, the occupant of PT must contribute a predicate that is independent of the rest of the proposition. This must be so because the rest of the proposition is background material when the occupant of PT is a non-verbal expression, the PT predicate itself being the only asserted material in the sentence.

There is a well-known class of quantifiers within GQ theory that, in effect, contribute no predicate that is independent of the rest of the proposition in which they appear: the proportional (non-intersective) quantifiers. This is clear from basic representations of GQ semantics, viewed in terms of tripartite quantificational structure. As can be seen in (21-a), the contribution of an intersective quantifier like *four* is a predicate—it assigns to the intersection of its restrictor and nuclear scope sets the property of having the cardinality '4'. This intersection is therefore unproblematically available as a 'focus frame' for a quantifier in narrow focus. In contrast, a proportional quantifier imposes the condition that the intersection of its restrictor and nuclear scope is a certain proportion *of the restrictor*, as shown in (21-b). The contribution of *every* may be alternatively expressed as a relation between the restrictor and the nuclear scope, as in (21-c). Either way, there is no predicate over the intersection of restrictor and nuclear scope that can be identified as the property of the quantifier alone, so the quantifier cannot fulfil the predicative procedure encoded in PT.

(21) a. $|\{x : R(x)\} \cap \{y : N(y)\}| \ = \ 4$
b. $|\{x : R(x)\} \cap \{y : N(y)\}| \ = \ \frac{1}{2}|\{x : R(x)\}|$
c. $\{x : R(x)\} \subseteq \{y : N(y)\}$

Universal quantifiers and 'most' are unable to appear as the asserted item in PT (as shown in (11)), so appear to corroborate the idea that the need for an independent predicate is involved in defining the class of PT QNPs, as predicted by the analysis outlined in section 4.2. However, as noted in section 2.2, it is not the case that proportional quantifiers never appear in PT, so PT cannot be simply restricted to QNPs with intersective quantifiers. Recall that 'few (of the) N' and 'more than 50% of the N' may appear in PT, despite their proportional quantifiers (see section 2.2). Another of Szabolcsi's examples is (22).

(22) *A fiúk közül több/kevesebb, mint hat emelte fel az asztalt.*
the boys among more/fewer than six lifted up(VM) the table-ACC
'More/fewer than six among the boys lifted up the table.'

Given Szabolcsi's assumptions, whereby what appears in her PredOp position must be defined in terms of quantifier semantics, such examples mean that one must abandon the idea that the proportional/intersective distinction may be relevant to characterising this position. But given the PT analysis outlined above, these QNPs merit further analysis. Under the latter approach, the significant factor is not intersectivity as such, but a necessary consequence of intersectivity:

the ability to provide a predicate that is independent of the rest of the proposition. As outlined below, this property is in fact consistent with certain proportional quantifiers, including those listed above, though not through the semantic contribution of the quantifier as a whole. The ability to recognise and account for this depends upon a unified procedural account of PredOp and Focus.

In a syntactically complex quantifying determiner like those in (12) and (22), certain lexical sub-parts of the quantifier are potential contrastive foci. That is, one of these sub-parts may provide the predicate demanded by PT. In this case, the appearance of the whole QNP in PT represents a kind of pied-piping—something that is independently attested in Hungarian focusing (see (24) below). Furthermore, it is intuitively clear that focus on certain sub-parts of QNPs like (12) is pragmatically highly likely. The proportion '50% of N' may easily form part of the background in addressing whether more than, fewer than, or exactly this proportion of some set is involved in some eventuality. Alternatively, the value '50' may be asserted contrastively against the background assumption that, say, 'more than 30% of' some set is involved in some eventuality. The case of (22) is similar, but with more marked phrase-internal information structure. Native speaker informants report that the 'fronted' PP ('among the boys') has a 'topical feel' and requires corresponding intonation, and that contrastive focus must fall after this (on *több*/*kevesebb*, on the numeral *hat* or on the head noun). Thus, the quantifier as a whole *cannot* be taken to be the item in focus, making it unsurprising that the proportionality of the quantifier has no bearing on the syntactic distribution of the QNP.

The possibility of contrastive focus on a lexical sub-constituent explains the appearance of proportional QNPs with syntactically complex quantifiers in PT. The emerging descriptive generalisation is that *single-lexeme* proportional quantifiers cannot be focused and therefore appear to be banned from the PT position. The case of *kevés* 'few' appears to be a counter-example even to this, however, and as such might seem to be a problem for the whole PT analysis.

In fact, this apparent problem only arises through confusion over the precise application of the term 'proportional'; *kevés* does not exhibit the kind of proportionality that is relevant to PT. The meaning 'few' clearly expresses a proportion in some sense, but, unlike with 'every' or 'most', this need not be taken to be a proportion of the quantifier's restrictor set. Rather, the meaning here relates to a proportion of some contextually determined 'standard' or 'expected' amount. The number of students to fail an exam in a given year may be considered 'few' even when it is the majority of the class—for example, if most years at least three-quarters fail but this year only 60% do so. The point is still clearer with the monotone increasing counterpart of 'few', 'many' (Hungarian *sok*). Five students out of a group of 30 taken ill in a single day might be considered many, but in other contexts this could be considered a very small number. This analysis is well enshrined in semantic practice; consider the following rough semantics for *few* taken from Heim and Kratzer's (1998) textbook:

(23) $|\{x : P(x)\} \cap \{y : R(y)\}|$ **is small**

Given that *kevés* and *sok* are thus proportional to some contextual value and not to their restrictor sets as such, the intersection of the restrictor and the nuclear scope can straightforwardly act as the background against which the fully independent meaning of the quantifier is asserted as a narrow focus, as the representation in (23) implies. The generalisation therefore holds that single-lexeme quantifiers that are semantically proportional to their restrictor sets are unable to appear as the focused element in PT. This is precisely what is predicted by the analysis of section 4.2, based on PT as a special predicative position.

The hypothesis that a QNP's ability to appear in PT is determined by whether it makes a semantically independent predicate available creates another prediction that distinguishes this approach from one based in quantifier semantics alone. If the current approach is correct, then even a QNP with the structure *minden N* ‘every N’ should be able to appear in PT if the head noun is taken to be contrastively focused and the rest of the QNP pied-piped, since in this case the noun itself may supply the required semantically independent predicate (presupposing a logical subject that contains the value of the quantifier and abstracts over the contribution of the noun). This prediction is fulfilled, examples like (24) being grammatical (in contrast to (11)).

(24) *Minden FIÚ ijedt meg* (*nem minden LÁNY*).
every boy feared VM not every girl
‘It’s every BOY that got frightened (not every GIRL).’

6 Conclusions

The denotational semantics of quantifiers helps to account for the hitherto mysterious class of quantifiers that may appear in the Hungarian ‘focus position’ (or Szabolcsi’s PredOp) just insofar as GQ theory explains why some quantifying determiners can’t contribute any predicate that makes no reference to the rest of the tripartite quantification structure. Understanding why the availability of such a predicate is crucial depends on recognising that the interpretation of QNPs in Szabolcsi’s PredOp position and the apparently strictly exhaustive foci in her Focus position are manifestations of a single underlying procedure. To do so, and to identify the nature of this procedure, depends in turn on identifying what may be inferred in performance, on the basis of general pragmatic principles, and on the possibility of significant underspecification at the level of what is actually encoded in the grammar.

This analysis of Hungarian therefore carries an important lesson regarding the assumptions we bring to the analysis of linguistic data. It illustrates two major reasons why we cannot apply a strong assumption of compositionality, whereby observed semantic effects are reflected homomorphically in syntactic structure, to the study of natural languages. The first reason is that the structural details of natural languages may encode procedures rather than declarative compositional semantic material. Where this is the case, there may be apparent associations between denotational semantic generalisations and syntactic forms, but these are epiphenomenal (as in the connection between proportional quantifiers in PT). The second reason is that what is systematically encoded in the grammar of a language may be significantly underspecified. What we understand to be the semantics of a sentence is the output not only of interpreting lexico-syntactic forms but also of inferential processes, carried out in context according to general pragmatic principles (Carston 2002). For these reasons, elements of semantic representations cannot simply be attributed to those elements of linguistic structure that appear to produce them. To do so is to risk missing key generalisations, while complicating the grammar with machinery that only duplicates the work of independently necessary extra-grammatical processes.

References

Beghelli, F. and Stowell, T.: 1997, Distributivity and negation: The syntax of *Each* and *Every*, *in* Szabolcsi (1997b), pp. 71–107.

Bende-Farkas, A.: 2002, Verb-object dependencies in Hungarian and English: A DRT-based account. Ph.D. thesis, IMS, Stuttgart University.

Carston, R.: 2002, *Thoughts and Utterances: The Pragmatics of Explicit Communication*, Blackwell, Oxford.

É. Kiss, K.: 1987, *Configurationality in Hungarian*, D. Reidel, Dordrecht.

É. Kiss, K.: 1998, Identificational focus versus information focus, *Language* **74**(2), 245–273.

É. Kiss, K.: 2002, *The Syntax of Hungarian*, Cambridge University Press, Cambridge.

Ebert, C. and Endriss, C.: 2004, Wide scope indefinites as aboutness topics. This volume.

Heim, I. and Kratzer, A.: 1998, *Semantics in Generative Grammar*, Blackwell, Malden, Mass. and Oxford.

Horn, L.: 1981, Exhaustiveness and the semantics of clefts, *Proceedings of NELS 11*, pp. 125–142.

Horvath, J.: 2000, Interfaces vs. the computational system in the syntax of focus, *in* H. Bennis, M. Everaert and E. Reuland (eds), *Interface Strategies*, Royal Netherlands Academy of Arts and Sciences, Amsterdam, pp. 183–206. Proceedings of the Colloquium, Amsterdam, 24–26 September 1997.

Kempson, R., Meyer-Viol, W. and Gabbay, D.: 2001, *Dynamic Syntax: The Flow of Language Understanding*, Blackwell, Oxford.

Kenesei, I.: 1986, On the logic of word order in Hungarian, *in* W. Abraham and S. de Meij (eds), *Topic, Focus and Configurationality: Papers from the 6th Groningen Grammar Talks, Groningen, 1984*, John Benjamins, Amsterdam, pp. 143–159.

Marten, L.: 2002, *At the Syntax-Pragmatics Interface: Verbal Underspecification and Concept Formation in Dynamic Syntax*, Oxford University Press, Oxford.

Parsons, T.: 1990, *Events in the Semantics of English: A Study in Subatomic Semantics*, M.I.T. Press, Cambridge, Mass.

Paul, I.: 2001, Concealed pseudo-clefts, *Lingua* **111**(10), 707–727.

Rizzi, L.: 1997, The fine structure of the left periphery, *in* L. Haegeman (ed.), *Elements of Grammar*, Kluwer, Dordrecht, pp. 281–337.

Sperber, D. and Wilson, D.: 1986, *Relevance: Communication and Cognition*, Blackwell, Oxford. (Second Edition: 1995).

Szabolcsi, A.: 1981, Compositionality in focus, *Folia Linguistica Societatis Linguisticae Europaeae* **15**, 141–162.

Szabolcsi, A.: 1994, All quantifiers are not equal: the case of focus, *Acta Linguistica Hungarica* **42**, 171–187.

Szabolcsi, A.: 1997a, Strategies for scope taking, in *Ways of Scope Taking* (Szabolcsi 1997b), pp. 109–154.

Szabolcsi, A. (ed.): 1997b, *Ways of Scope Taking*, Kluwer, Dordrecht.

von Heusinger, K.: 2002, Information structure and the partition of sentence meaning, *in* E. Hajičová, P. Sgall, J. Hana and T. Hoskovec (eds), *Travaux du Cercle Linguistique de Prague / Prague Linguistic Circle Papers*, Vol. 4, John Benjamins, Amsterdam amd Philadelphia, pp. 275–305.

Wedgwood, D.: 2002, ‘Focus position’ and quantification: The relevance of pragmatic theory, *in* I. Kenesei and P. Siptár (eds), *Approaches to Hungarian, Volume 8: Papers from the Budapest Conference*, Akadémiai Kiadó, Budapest, pp. 241–260.

Wedgwood, D.: 2003, Predication and information structure: A dynamic account of Hungarian pre-verbal syntax. Ph.D. thesis, University of Edinburgh.

Wedgwood, D.: to appear, Predication, focus and the positions of negation in Hungarian, *Lingua*.

SYNTACTIC VS. SEMANTIC NEGATION

Hedde Zeijlstra, University of Amsterdam (ACLC / ILLC)
H.H.Zeijlstra@uva.nl

Abstract

In this paper I investigate the relation between Negative Concord (NC) and the syntactic status of negative markers. I will show that (basing myself on three different empirical domains) Jespersen's original bidirectional generalization between these two phenomena should be replaced by a unidirectional one: whenever a language has a negative marker that is a syntactic head, the language exhibits NC; languages that only exhibit Double Negation lack a negative head. I will analyze NC as a form of syntactic agreement. This means that only NC languages have a functional projection NegP. Moreover, this means that n-words in Negative Concord languages cannot be regarded as semantically negative and that not in every language the negative marker itself is the phonological realization of a negative operator. I will conclude my paper by showing that this analysis predicts the correct readings of multiple negative expressions, including those that formed problems for previous analyses of NC.

1 Introduction

Negative Concord (NC) has been a problem for compositionality for a long time. In this paper I will show that the solution for NC can be found in the syntactic status of negative markers that participate in NC relations. The analysis of the status of negative markers provides a framework in which NC naturally falls out as a form of syntactic agreement. I will also argue that n-words in NC languages are semantically non-negative, and the combinations of these two assumptions predicts the correct readings of multiple negative expressions, including those that formed problems for previous analyses of NC.

In section 2 I will discuss four different instances of Negative Concord, and I will argue that one particular instance (Emphatic Negation) does not count as 'true Negative Concord.'

In section 3, I will discuss the correspondence between Negative Concord and the syntactic status of the negative marker in three different empirical domains: Dutch diachronic variation, Dutch dialectological variation and cross-linguistic variation. I will argue that Jespersen's (1917) original bidirectional generalization should be replaced by a unidirectional one.

In 4.1 I will present a syntactic analysis for negative markers and argue that only negative heads require the presence of a functional projection NegP, whereas negative adverbs are base-generated in a lower position in the clause and do not necessarily require the presence of a NegP. The result of this analysis is that it is possible to connect NC to he presence of a NegP. In 4.2 I will argue that n-words are semantically non-negative, but that they are semantically marked for negation and that this also may hold for negative markers in several NC languages. In 4.3 I will show that NC can be analyzed as agreement between a negative operator and negative elements that are only marked for negation in the syntax.

2 Negative Concord

In this section I will introduce one of the two topics in this study of negation: Negative Concord. Negative Concord (NC) is the name for the phenomenon that multiple negative

In: Cécile Meier, Matthias Weisgerber (ed.) 2004: *Proceedings of the Conference "sub8 – Sinn und Bedeutung".*
Arbeitspapier Nr. 177, FB Sprachwissenschaft, Universität Konstanz, Germany

elements in the syntax only yield one negation in the semantics[1]. Although many different subclasses of Negative Concord have been defined in the literature (cf. Den Besten 1989, Van der Wouden 1994, Giannakidou 2000 a .o.) I will restrict myself to four different instances of NC.

(1) a. **Strict Negative Concord**: N-words are not allowed to occur by themselves, but have to be accompanied by a single negative marker.
b. **Non-strict Negative Concord**: N-words are not allowed to occur by themselves, but should be accompanied by a single negative marker, except when the n-word is a preverbal position. Then it never co-occurs with a negative marker.
c. **Paratactic Negation**: a verb or preposition with a negative connotation in a main clause selects an n-word in its complement (clause), that does not contribute any negation of its own.
d. **Emphatic Negation**: One negative element enforces another negative element.

Whereby the following definitions hold:

(2) a. **Negative markers**: elements that denote that a sentence (or constituent) is under the scope of negation. Examples are French *ne* and *pas*, Italian *non*, Czech *ne*- and Dutch *niet*.
b. **N-words**: elements that are only under well-defined conditions equivalent to a negative quantifier. Examples are French *rien* or *personne*, Italian *nessuno* or Czech *nikoho* (after Laka 1990).
c. **Negative elements**: the set of negative markers, n-words and negative quantifiers

Examples of these four instances in (1) are in (3)-(6).

(3) a. Milan *nikomu ne*volá. Czech
Milan n-body neg-call
'Milan doesn't call anybody'
b. Dnes *ne*volá *nikdo*.
Today neg-calls n-body
'Today nobody is calling'
c. Dnes *nikdo ne*volá.
Today n-body neg-calls
'Today nobody is calling'

(4) a. Gianni *(*non*) ha telefonato a *nessuno* Italian
Gianni neg has called to n-body
'Gianni didn't call anybody'
b. *(*Non*) ha telefonato *nessuno*
Neg has called n-body
'Nobody called'
c. *Nessuno* (**non*) ha telefonato
N-body neg has called
'Nobody called'

(5) a. J'ai *peur* qu'il *ne* vient French
I am afraid that he neg comes
'I am afraid that he comes'
b. Il est *autre que* je *ne* croyais
He is different than I neg believed.SUBJ
'He is different than I thought'

[1] Cf Van der Wouden (1994) and Giannakidou (1997, 2000) for their definitions that are only slightly different.

c. Il vient *sans personne*
He comes without n-body
'He comes without anybody'

(6) a. Hij heeft nergens geen zin in — Dutch
He has n-where no lust in
'He doesn't feel like anything at all'
b. Hij gaat nooit niet naar school
He goes n-ever neg to school
'He never ever goes to school'
c. Ik vind dat niks niet leuk
I find that n-thing neg nice
'I don't like it at all'

In (3) we see that the negative marker *ne* is prefixed to the finite verb in all examples. In (4) the negative marker (which is not a prefix but a separate word), is only allowed in negative sentences, if it is not preceded by an n-word in subject position. Given that the negative marker can co-occur with a negative subject in a lower position, it is not due to the fact that the *nessuno* is a subject, but due to the position of *nessuno* in the clause in (4) that the occurrence of the negative marker is forbidden.

Whereas (3) and (4) are examples that denote the traditional notion of Negative Concord, the phenomenon in (5) is different, because the concord relation is not clause-internal, and the first element in the concord relation, is not a negative element. It is known from the literature (Van der Wouden 1994) that Paratactic Negation only takes place in three different kinds of environments: after verbs with a negative connotation (such as *fear, doubt, forbid*), after prepositional operators with a negative connotation (such as *unless, before, without*) and comparative environments. These are contexts that also allow for licensing Negative Polarity Items (NPI's). Paratactic Negation is a subcategory of Negative Concord since it is only possible in languages that exhibit Strict or Non-strict NC[2].

Emphatic Negation is a special subclass of NC. It shows similarities with other classes of NC, due to the fact that the cancellation of two negatives does not take place, but it is far more restricted in its distribution than the other kinds. First, the reading is idiomatic in the sense that the semantic negation is strengthened, whereas standard NC yields an unstrengthened negation. Secondly, Emphatic Negation is subject to very strict locality conditions: Emphatic Negation can only occur if the two negative elements are (almost) adjacent.

(7) a. Hij gaat *nooit niet* naar school — Dutch
He goes n-ever neg to school
'He never ever goes to school'
b. NOOIT gaat hij NIET naar school
N-ever goes he neg to school
'He always goes to school'

(8) *Niemand* vertelde mij (*gisteren) *niks*[3] — Dutch
N-body told me (yesterday) n-thing
'Nobody told me anything at all (yesterday)'

[2] For a more fine-grained classification of environments in which Paratact Negation may occur, cf. Van der Wouden 1994

[3] The sentence with *gisteren* ('yesterday') included is not ungrammatical, but cannot yield the emphatic negative reading anymore. This sentence gets a Double Negation reading.

Moreover emphatic negations are forbidden when the negative marker precedes an n-word, or when the negative marker gets additional stress. Those constructions only yield a Double Negation reading.

(9) a. Hij gaat *nooit NIET* naar school Dutch
He goes n-ever neg to school
'He does never NOT go to school'
b. Hij gaat *niet nooit* naar school
He goes neg n-ever to school
'He sometimes (=not never) goes to school'

Finally, Emphatic Negation is different from the other subclasses of Negative Concord, because it only occurs in languages that do not exhibit any other Negative Concord (like Dutch or German varieties). Languages that standardly use negative concord lack Emphatic Negation.

From the fact that Emphatic Negation does not occur in any standard Negative Concord language it follows that an explanation for Emphatic Negation is different from an account that explains any of the other NC instances[4]. In the rest of this paper I will provide an analysis that accounts for Strict and Non-strict Negative Concords and for Paratactic Negation. I argue that Emphatic Negation should be treated as idiomatic expressions that are lexically stored.

3 The syntactic status of Negative Markers

I will argue that the key to a solution for the puzzle of NC lays in another phenomenon: the syntactic status of the negative marker (i.e. the marker that expresses sentential negation). Languages vary with respect to syntactic status of negative markers. Some languages express sentential negation by means of a negative affix on the finite verb; other languages express negation by means of a negative particle in that is the head of its own functional projection and other languages use a negative adverb in order to express sentential negation.

In this section I investigate the relation between the syntactic status of the negative marker (in informal terms) in three different empirical domains: Dutch diachronic variation, Dutch dialect variation, and typological variation. I will show that the Dutch diachronic development of negation reflects the general development of negation as first described by Jespersen 1917. For every different phase in this development, I will investigate whether this variety of Dutch exhibits NC or not. On the basis of the diachronic development of negation and its correspondence to NC Jespersen (1917) drew a generalization that has been adopted by Haegeman & Zanuttini (1996) and Rowlett (1998). After that I will investigate whether this generalization holds for different Dutch dialects (based on an investigation of 267 Dutch dialects) and for a set of 30 mostly Indo-European languages. I will show that Jespersen's original bidirectional generalization between NC and the status of the negative marker does not hold and should be replaced by a unidirectional relation. This unidirectional generalization will form the input for my syntactic and semantic analysis.

3.1 Dutch diachronic variation

Jespersen (1917) describes the development of negation as follows:

> The history of negative expressions in various languages makes us witness the following curious fluctuation; the original negative adverb is first weakened, then found insufficient and therefore strengthened, generally through some additional word, and in its turn may be felt as the negative

[4] Emphatic Negation is also widely spread under English varieties. However, their distribution is freer and its occurrence is more frequent. I will take English as a language that substandardly allows for Negative Concord.

> proper and may then in course of time be subject to the same development as the original word. [Jespersen 1917]

This development has been known as 'the Jespersen Cycle' and can be formalized as in (10). In (10) the diachronic development of the negation is described as a process that takes place in several phases. Dutch negation underwent the Jespersen starting from Phase I or II (given the small amount absence of fragments of Old Dutch this is hard to say) until Phase V, which is the way that Standard Dutch expresses sentential negation.

(10) *The Jespersen Cycle*

PHASE I	Negation is only expressed by an obligatory negative marker attached to $V_{fin.}$
PHASE II	Negation is expressed by an obligatory negative marker attached to V_{fin} and an optional negative adverb.
PHASE III	Negation is obligatory expressed by both a negative adverb and a negative marker attached to $V_{fin.}$
PHASE IV	Negation is obligatory expressed by a negative adverb and an optional extra negative marker attached to $V_{fin.}$
PHASE V	Negation is only expressed by an obligatory negative adverb.
PHASE VI	The negative adverb becomes also available as a negative marker attached to $V_{fin.}$ Negation is expressed by either one of them.
PHASE VII=I	Negation is only expressed by an obligatory negative marker attached to $V_{fin.}$

Only few fragments are left over from Old Dutch. The only fragment form the 9th century that is still present is a translation of Latin psalm texts. This fragment, the Wachtendock Psalm texts, has met much scepsis throughout the years, as the translation is very literal and thus it could not provide any proper insight in the Grammar of Old Dutch (Hoeksema 1997). However, close observation of the texts shows that the translator added negative markers that were absent in the original Latin texts (11). Moreover, through this adding of negative markers, the translation in Old Dutch shows NC, whereas Vulgate Latin is not a negative Concord language (12). Thus, this is in fact proper evidence that Old Dutch is a Negative Concord language.

(11) *Ne* reslag thu sia[5] Old Dutch
Neg kill you them
'You don't kill them'

(12) *nequando* obliviscantur populi mei Vulgate Latin
that *nohuuanne ne* fargetin folk mîn Old Dutch
that n-ever neg forget.FUT my people
'that they will never forget my people'

Middle Dutch has been well investigated and proven to be a Phase III language. Most negative expressions in Middle Dutch have both a preverbal negative marker and a negative adverb (13). Moreover Middle Dutch exhibits NC (14).

(13) a. Maer dat *en* mach *niet* sijn[6] Middle Dutch
But that neg may not be
'But that may not be (the case)'

---

[5] Wachtendock Psalms 58.12
[6] Cf. Burridge 1993.

b. dat sie *niet en* predicten
that they not neg-preach
'that they didn't preach'

(14) a. *Nyemant en* moet upten kerchoeve hout zaghen — Middle Dutch
No-one neg must on-the churchyard wood saw
'No one should saw wood on the churchyard'
b. *Niemen en* had mi *niet* gesien
No-one neg had me neg seen
'Nobody has seen me'

During the 17th Century, the Dutch preverbal negative marker became only optionally available (15). Therefore 17th Century Dutch counts as a Phase IV language. 17th Century Dutch still exhibits NC (16).

(15) Ghy (*en*) sult *niet* dooden[7] — 1653 Dutch
You (neg-)shall not kill
'You shall not kill'

(16) Hy vreesde Herkles knods *noch* Samsons vuisten *niet*[8] — 1637 Dutch
He feared Hercules' truncheon nor Samson's fists neg
'He feared neither Hercules' truncheon nor Samson's fists'

Finally the Dutch preverbal negative marker completely disappeared and Modern Dutch, being Phase V, expresses sentential negation by means of only a negative adverb. Note that Modern Dutch, contrary to previous stages of the language, lacks NC. Two negations in one proposition cancel each other out and yield an affirmative.

(17) a. Jan loopt *niet* — Standard Dutch
John walks neg
'John doesn't walk'
b. dat Jan *niet* loopt
that John neg walks
'that John doesn't walk'

(18) a. dat Jan *niet* met *niets* tevreden was — Standard Dutch
that John neg with n-thing content was
'that John was not pleased with nothing'
b. dat Jan *niemand niets* geeft
that John n-body n-thing gives
'that John gives nobody nothing'

This development of Dutch in line with Jespersen's observation of other languages. Jespersen noticed a relation between the status of the negative markers and the occurrence of NC (19).

(19) Every language that has a negative marker that is attached to the finite verb is a NC language. Every language that lacks a negative marker that is attached to the finite verb is not a NC language

This bidirectional relation is known as Jespersen's generalization. In the following paragraphs I will show that this generalization is too strong however and should be replaced.

[7] Grammatica Leupenius 1653
[8] Vondel: Gysbrecht (Act V)

3.2 Dutch dialectal variation.

In this paragraph I will evaluate Jespersen's generalization against the observation of 267 different dialects that have been investigated for the Syntactic Atlas of Dutch Dialects (SAND)[9]. Dutch dialects also vary with respect to the expression of sentential negation. West Flemish e.g. is known to be a language that still optionally allows an extra preverbal negative marker. Therefore West Flemish counts as a Phase IV language. West Flemish is also known to be a NC language (Haegeman 1995). In (21) all negative elements yield only one (sentential) negation.

(20) a. Valère (*en*) meet *nie* 's oavens — West Flemish[10]
V. (neg) eats neg in the evening
'V. doesn't eat in the evening'
b. da Valère 's oavens *nie* (*en*) eet
that V. in the evening neg (neg) eats
'that V. doesn't eat in the evening'

(21) a. da Valère me *niets* ketent *(en)* was — West Flemish
that V. with n-thing content (en) was
'that V. was not pleased with anything'
b. da Valère *niemand niets (en)* geeft
that V. n-body n-thing (neg) gives
'that V. does not give anyone anything'
c. da Valère *nooit* van *niemand nie* ketent *(en)* was
that V. n-ever of n-body neg content (neg) was
'that V. was never pleased with anyone'

However, West Flemish does not always yield NC. In cases in which the n-word appears to the right of the negative marker *nie*, a DN reading is yielded. The occurrence of two possible negative markers allows West Flemish, depending on the configuration of negative elements, to yield both NC and DN readings. This cannot be the result of different registers of West Flemish, as one sentence may contain both NC and DN relations. The sentence in (22)b contains three negative elements, but its semantics has only two negations. This is unexpected from Jespersen's generalization: the first clause appears to be too strong.

(22) a. da Valère *nie* van *niemand* tevreden (*en*-)was[11] — West Flemish
that V. neg of n-body content (neg-)was
'That V. wasn't pleased with nobody'
b. da Valère *nooit nie* van *niemand* tevreden was
that V. n-ever neg of n-body content was
'hat V. was never pleased with nobody'

Jespersen's prediction that all phase IV dialects of Dutch exhibit NC is born out. The following table shows that from all 20 dialects that still have a preverbal negative marker, 18 dialects clearly exhibit NC, and the results are unclear for the other two cases.

(23) *Results from SAND-project*:

Dialects with en/ne	NC	No NC	Unclear
20	18	0	2

[9] Syntactic Atlas Dutch Dialects (cf. Barbiers 2000): Current project investigating 250 different Dutch dialects at Universities of Amsterdam, Leiden, Ghent, Antwerps and the Free University Brussels and Meertens Institute.
[10] Data from Haegeman 1995
[11] Cf. Haegeman 1995, 1998

A second observation that is not in line with Jespersen's generalization is the fact that there exist several dialects, especially in the southern parts of the Netherlands and Flanders, that lack a preverbal negative marker, but still exhibit NC. This is a crucial counter example against the second clause of Jespersen's generalization.

(24) Jan loopt *niet* Southern dialects
John walks neg
'John doesn't walk'

(25) Er wil *niemand niet* dansen Southern dialects
There wants n-body neg dance
'Nobody wants to dance'

Before drawing a new generalization, I will first discuss the data from the typological empirical domain.

3.3 Cross-linguistic variation

The distinction between the different Jespersen Phases forms a proper tool to classify languages with respect to their way of expressing negation. This makes it possible to evaluate Jespersen's generalization for languages that can be classified in different Phases of the Jespersen Cycle. The following table shows the relation between the Jespersen Phase of language and the question whether the language exhibits NC, DN, or both.

(26) *Jespersen Cycle, Negative Concord and Double Negation*

Variety/language	*Jespersen Phase*	*NC*	*DN*
Italian	I	+	-
Spanish	I	+	-
Portuguese	I	+	-
Romanian	I	+	-
Polish	I	+	-
Czech	I	+	-
Slovenian	I	+	-
Bulgarian	I	+	-
Russian	I	+	-
Serbo-Croatian	I	+	-
Greek	I	+	-
Hungarian	I	+	-
Hebrew	I	+	-
Turkish	I	+	-
Berber	I	+	-
Catalan	II	+	-
Standard French	III	+	+
West Flemish	IV	+	+
Colloquial French	IV	+	+
Quebecois	V	+	?
Yiddish	V	+	+
Bavarian	V	+	+
Standard English	V	?	+
Standard Dutch	V	-	+
German	V	-	+
Swedish	V	-	+
Danish	V	-	+

Norwegian	V	-	+
Icelandic	V	-	+
Colloquial English	VI	+	+

Based on this large set of data, one cane safely conclude that Jespersen's generalization should be replaced by the following generalization:

(27) Whenever a language has a preverbal negative marker that is attached on V_{fin}, it exhibits NC. Whenever a language exhibits DN, it is has an adverb as negative marker.

4 Analysis

The generalization in (27) forms the input for a syntactic and semantic analysis. The following two questions will be answered in this section: (*i*) What is the syntax status and position of negative markers in Jespersen Phase I-VI? (*ii*) What is the semantic status of n-words and negative operators in NC and DN languages?

4.1 The syntax status of negative markers

It has been argued that negative markers that attach to V_{fin} are synactic heads (X°) (Haegeman 1995, Hageman & Zanuttini 1996, Rowlett 1998): e.g. preverbal negative markers block movement of prepositions or clitics. From the Head Movement Constraint (Travis 1984) it directly follows that these preverbal markers are negative heads.

(28) a. Jean *la* fait manger à Paul[12] French
John it makes eat to Paul
'John makes Paul eat it'
b. *Jean *la* fait *ne* pas manger à Paul
John it makes neg neg eat to Paul
'John makes Paul not eat it'

(29) a. Gianni *li* vuole vedere Italian
John him wants see
'John wants to see him'
b. *Gianni *li* vuole *non* vedere
John him wants neg see
'John wants not to see him'

Another argument is presented by Merchant (2001), who shows that negative heads cannot form adjunctions with XP's like *why*.

(30) a. *Giati dhen? Greek[13]
b. *Perque non? Italian
c. *Pochemune? Russian
Why neg

Application of these tests to the negative markers that are attached to V_{fin} proves that all these markers are syntactic heads X°. Likewise, negative markers that do not block movement of

[12] The example is from Richard Kayne.
[13] This test and these data are from Merchant (2001). The test shows that whenever the word for 'no' (as opposed to yes) is phonologically distinct from the negative marker, the 'why not' test distinguishes x° markers from XP markers. The XP may adjoin to another XP, not to an X°. The way of saying 'why not' in languages with a negative head marker is by using the respective word for 'no' (as in yes/no).

other heads and that allow for *why* adjunction are not X° and therefore should be XP's. This is the case for all negative adverbs:

(31) a. dat Jan *niet* naar huis gaat — Dutch
that John neg to home goes
'that John doesn't go home'
b Jan gaat *niet* naar huis
John goes neg to home
'John doesn't go home'

(32) a. om Jan *inte* köpte boken — Swedish
that John neg bought books
'that John didn't buy books'
b. Jan köpte *inte* boken
John bought neg books
'John didn't buy books'

(33) a. Why *not*? — English
b. Warum *nicht*? — German
c. Hvervor *ekki*? — Icelandic
d. Pourquoi *pas*? — French
Why neg?

Now the new generalization can be reformulated in syntactic terms:

(34) Whenever a language has a negative marker X°, it exhibits NC. Whenever a language exhibits DN, a negative adverb XP is required.

Ever since Pollock (1989) it has been assumed that the negative head corresponds to the head Neg° of a functional projection NegP (either it is base-generated in Neg° or ot forms an agreement relation with this projection). This projection is dominated by TP and dominates vP (following from the fact Negative Polarity Items (NPI's) are not allowed in subject position). Negative adverbs are base-generated in a vP adjunct position (cf. Zanutinni 2001). This follows e.g. from heavy pronoun imperatives in French in which *ne* is not allowed, but *pas* is. This would be impossible if *pas* was not base-generated in a lower position than NegP.

(35) (**Ne*) regarde moi *pas* — French
Neg watch me neg
'Don't watch me'

Thus languages without a negative head do not require a NegP (but may have one), languages with a negative head do. This leads to the following hypothesis about the connection of NC with the presence of a NegP.

(36) Every language that exhibits NC expresses negation by means of a functional projection NegP. Languages without NC lack a functional projection NegP.

It is known that functional projections are only required to establish syntactic agreement relations. Hence, if NC is the result of the presence of a NegP (or vice versa), NC must be a form of (multiple) negative agreement. This means that NC is the results of multiple elements carrying uninterpretable [uNEG] features (cf. Ura 1996, Chomsky 1999) that check these feature against a single negative operator hosted in NegP.

4.2 Semantics of n-words and negative markers

The semantic status of n-words has been subject of long debate throughout the '90's. Basically, two approaches have been formulated. According to one approach (Zanuttini 1991, Haegeman & Zanuttini 1996,) n-words are inherently (i.e. semantically) monadic negative quantifiers that through some process of factorisation and absorption melt together in one polyadic quantifier. De Swart & Sag (2002) provide a semantic framework for this proposal. This approach however has problems analysing the Paratactic Negation sentences as in which non-negative verbs or prepositions (with a negative connotation) license the presence of n-words in their complement.

(37) a. En lugar de intendar *nada* Spanish[14]
In stead of trying n-thing
'In stead of trying anything'
b. Prohibieron que saliera *nadie*
Forbade.3PL that went.out n-body
'They forbade that anybody went out'

Examples like these, and the fact that even under polyadic quantification the loss of negation has not been explained from a compositional point of view, led to another approach that takes n-words to be non-negative NPI's that are licensed by some abstract negation that is triggered by their own presence (Laka 1990, Ladusaw 1992, Giannakidou 1997, 2000). However such an analysis fails to account for the occurrence of fragmentarian answers, which are allowed for n-words, but are not allowed for fragmentarian answers (38). Moreover, n-words cannot be licensed by a negation in a higher clause, whereas NPI's can be licensed clause boundary (39). Finally contrary to NPI's n-words are allowed to occur in subject position, whereas this is not allowed for NPI's (40).

(38) A quién viste? A *nadie* / *A un alma Spanish
To whom saw.2SG? To n-body / to a single soul (NPI)
'Who did you see? Nobody / a single soul'

(39) *Dhen* lipame [$_{CP}$ pu piglosa **KANENAN/*$^{\surd}$*kanenan*] Greek
Neg regret.1SG that hurt.1SG n-body/anybody
'I don't regret that I hurt anybody'

(40) a. *Nikdo ne*prisel na vecirek Czech
N-body neg-came to party
'Nobody came to the party'
b. *Petnik by za to nebyl dan
A.nickel.NPI would for it neg.be given
'A nickel wouldn't be paid for it'

Since the dichotomy between inherently negative and NPI like non-negative n-words seems too strong and the act that NC is a form of syntactic agreement, I argue that n-words are semantically non-negative, but syntactically negative. This means that words can be seen as semantically non-negative Heimian indefinites or existential generalized quantifiers, that carry an uninterpretable [NEG] feature that has to be eliminated throughout the syntactic derivation (41) (cf. Ladusaw 1992, Giannakidou 1997 for similar proposals).

(41) $[[\text{n-P}]] \sim\sim> P'(x)_{[uNEG]}$ or $[[\text{n-P}]] \sim\sim> \lambda Q.\exists x[P'(x)\ \&\ Q(x)]_{[uNEG]}$

One question remains open: what is the semantic status of negative markers? Are they also non-negative markers of negation, or are they the phonological realization of negative operators. Given that all operators have to roof n-words, I argue that in languages in which n-words cannot precede the negative marker, the negative marker is the negative operator. These languages are the so-called Non-strict NC languages, like Italian. In languages like

[14] Data from Herburger 2001

Czech, in which n-words are allowed to occur in a position in front of the negative marker, the negative marker cannot be the negative operator itself and has to be semantically non-negative. The negative marker in these languages is nothing but the phonological realization of the [uNEG] feature.

4.3 Interpreting negative structures

Now we can explain NC from a syntactic point of view: NC is a form af agreement between a negative operator and non-negative elements such as n-words and in strict NC languages also negative markers. This checking of [uNEG] features can only take place if a NegP is present that contains a negative operator. In those languages that lack NC, there are no n-words, but only true negative quantifiers, and since in those languages that negative marker is never roofed by an n-word (since n-words only exist in NC languages) the negative marker in a DN language is a negative operator itself. Since there are no [uNEG] features to eliminate, there is no NegP required to do so. Therefore NegP does not exist in DN languages. This explains why all languages with a negative head Neg° are NC languages.

Hence there are two ways of expressing negation in natural language: semantic negation, whereby all negative elements are semantically negative; or syntactic negation, whereby negative elements are syntacically marked for negation, and these elements all check there [uNEG] feature against a single negative (c)overt operator.

Now I will explain how this analysis predicts the correct readings of negative sentences in the different languages. As all negative elements are [uNEG] in Czech, negation is realized by a covert negative operator *Op*¬, hosted in Spec,NegP (42a). All negative elements check their [uNEG] feature against this operator that is an interpretable [iNEG] feature (42b). In case of n-words in preverbal subject position, *Op*¬ forms a compound with the n-word and this compound is a negative quantifier (42c).

(42) a. Milan *ne*vidi Czech[15]
Milan neg-sees
Milan does not see
[$_{\text{NegP}}$ *Op*¬ Neg° [$_{v\text{P}}$ Milan nevidi$_{[\text{u}\cancel{\text{NEG}}]}$]]
b. Milan *ne*vidi *ni*koho
Milan not-sees n-body
'Milan does not see anyone'
[$_{\text{NegP}}$ *Op*¬ Neg° [$_{v\text{P}}$ Milan *ni*koho$_{[\text{u}\cancel{\text{NEG}}]}$ nevidi$_{[\text{u}\cancel{\text{NEG}}]}$]]
c. *Nikdo ne*prisel na vecirek
N-body neg-came to party
'Nobody came to the party'
[$_{\text{NegP}}$ [*Op*$_{\neg}$+Nikdo$_{[\text{u}\cancel{\text{NEG}}]}$] ne$_{[\text{u}\cancel{\text{NEG}}]}$ prisel na vecirek]

In Italian, all n-words are licensed by the [iNEG] of *non*, which is the negative operator (43a-b). In the case of movement of an n-word to a subject position, *non* can no longer license these n-words. Therefore an abstract operator is introduced that forms a compound with the highest n-word. Obviously *non* cannot be included in this sentence, since then the sentence would contain two negative operators (43c).

(43) a. Gianni *non* ha telefonato Italian
G. neg has called
'G. has not called'
[$_{\text{Neg°}}$ non$_{[\text{iNEG}]}$ [$_{v\text{P}}$ Gianni ha telefonato]]

[15] For typographic reasons diacritics have been left out in all Czech examples.

b. Gianni *non* telefonato a *nessuno*
G. neg calls with nobody
'G. doesn't call with anybody'
[$_{\text{Neg°}}$ non$_{\text{[iNEG]}}$ [$_{vP}$ a nessuno$_{\text{[u}\cancel{\text{NEG}}\text{]}}$ Gianni telefonato]]

c. *Nessuno* (**non*) ha telefonato a *nessuno*
N-body has called to n-body
'Nobody called anybody'
[NegP [$Op_{\neg}$ + Nessuno $_{\text{[u}\cancel{\text{NEG}}\text{]}}$] [$_{vP}$ ha telefonato a nessuno$_{\text{[u}\cancel{\text{NEG}}\text{]}}$]]

French expresses negation by means of an [iNEG] *pas* that raises to Spec,NegP, from which it takes scope (44a). In the case that another n-word is involved the negation comes from an abstract operator that forms a compound with the raised n-word (44b). However, if *pas* and *rien* co occur in the sentence the trace of *pas* precedes *rien* and therefore blocks the agreement relation between NegP and *rien*. Hence a second operator is needed to eliminate *rie*n's [uNEG] feature and a DN reading is yielded (44c).

(44) a. Jean *ne* mange *pas* French
John neg eats neg
'John doesn't eat'
[$_{\text{NegP}}$ pas$_{\text{[iNEG]i}}$ Neg° [$_{\text{vP}}$ t_i Jean ne-mange$_{\text{[u}\cancel{\text{NEG}}\text{]}}$]]

b. Jean *ne* mange *rien*
John neg eats nothing
'John doesn't eat anything'
[$_{\text{NegP}}$ [$Op_{\neg}$+rien$_{\text{[u}\cancel{\text{NEG}}\text{]i}}$] Neg° [$_{\text{vP}}$ t_i Jean ne-mange$_{\text{[u}\cancel{\text{NEG}}\text{]}}$ t_i]]

c. Jean *ne* mange *pas rien*
John neg eats neg nothing
'John doesn't eat nothing' = 'John eats something'
[$_{\text{NegP}}$ pas$_{\text{[iNEG]i}}$ Neg° [$_{\text{vP}}$ t_i Jean ne-mange$_{\text{[u}\cancel{\text{NEG}}\text{]}}$ [$_{\text{NegP}}$ $Op_{\neg}$ Neg° [$_{\text{VP}}$ rien$_{\text{[u}\cancel{\text{NEG}}\text{]}}$]]]]

West Flemish is similar to French, except that the negative marker *nie* is [uNEG]. Hence negation is expressed by an abstract negative operator, that checks all [uNEG] features (45a-b). However, if *nie* intervenes between NegP and an n-word, locality constrictions (Chomsky 1999) block the NC relation between the negative operator and the n-word (45c). The only way to escape this is to move over *nie* to a position that falls within the same phase. Then the NC relation is allowed (45d).

(45) a. (da) Valère *nie en*-eet West Flemish
(that) V. neg neg-eats
'(that) V. doesn't eat'
[$_{\text{NegP}}$ $Op_{\neg}$ Neg° [$_{\text{vP}}$ nie$_{\text{[u}\cancel{\text{NEG}}\text{]}}$ Valère en-eet$_{\text{[u}\cancel{\text{NEG}}\text{]}}$]]

b. (da) Valère niets en-eet
(that) V. n-thing neg-eats
'(that) V. doesn't eat anything'
[$_{\text{NegP}}$ $Op_{\neg}$ Neg° [$_{\text{vP}}$ niets$_{\text{[u}\cancel{\text{NEG}}\text{]}}$ Valère en-eet$_{\text{[u}\cancel{\text{NEG}}\text{]}}$]]

c. (da) Valère nie niets en-eet
(that) V. neg n-thing neg-eats
'(that) V. doesn't eat nothing'
[$_{\text{NegP}}$ $Op_{\neg}$ Neg° [$_{\text{vP}}$ nie$_{\text{[u}\cancel{\text{NEG}}\text{]}}$ Valère [$_{\text{NegP}}$ $Op_{\neg}$ Neg° [$_{\text{VP}}$ niets$_{\text{[u}\cancel{\text{NEG}}\text{]}}$ en-eet$_{\text{[u}\cancel{\text{NEG}}\text{]}}$]]]]

d. (da) Valère niets nie en-eet
(that) V. n-thing neg neg-eats
'(that) V. doesn't eat anything'
[$_{\text{NegP}}$ $Op_{\neg}$ Neg° [$_{\text{vP}}$ niets$_{\text{[u}\cancel{\text{NEG}}\text{]}}$ nie$_{\text{[u}\cancel{\text{NEG}}\text{]}}$ Valère en-eet$_{\text{[u}\cancel{\text{NEG}}\text{]}}$]]

In Bavarian, negation is also expressed by means of an abstract negative operator and n-words are [uNEG] and therefore they need to be in an checking relation with NegP. In this respect Bavarian is similar to West Flemish (only there is no optional negative head marker.)

(46) a. S’Maral woid an Hans ned hairadn — Bavarian
The’Mary wanted the Hans neg marry
‘Mary didn’t want to marry Hans’
$[_{NegP}$ *Op*$_{\neg}$ woid [an Hans $[_{vP}$ ned$_{[\cancel{NEG}]}$ S’Maral hairadn]]]
b. daβ’ma koana ned furtgehd
that’me n-body neg leaves
‘that nobody is leaving’
$[_{NegP}$ *Op*$_{\neg}$ koana$_{[u\cancel{NEG}]}$ ma $[_{vP}$ ned$_{[u\cancel{NEG}]}$ furtgehd]]

Finally, in Dutch there is no NegP and negation is expressed semantically: every negative element corresponds to a negation in the semantics and in the case of two negative elements a DN reading is yielded.

(47) a. (dat) Jan *niet* eet — Standard Dutch
(that) John neg eats
'(that) John doesn't eat'
[Jan $[_{vP}$ niet$_{[iNEG]}$ eet]]
$\neg$eat(**j**)
b. (dat) Jan *niets* eet
(that) John not eats
'(that) John eats nothing'
[Jan $[_{vP}$ $[_{QP}$ niets$_{[iNEG]}$] eet]]
$\neg\exists$x.[eat(**j**,x)]
c. (dat) Jan *niet niets* eet
(that) John neg nothing eats
'(that) John doesn't eat nothing'
[Jan $[_{vP}$ niet$_{[iNEG]}$ $[_{QP}$ niets$_{[iNEG]}$] eet]]
$\neg\neg\exists$x.[eat(**j**,x)] $\leftrightarrow$ $\exists$x.[eat(**j**,x)]

Apart from these correct predictions, this analysis also accounts for the problems that have been raised with the other approaches of NC (37)-(40). Paratactic Negation can be analyzed as feature checking against a negative operator that is lexically decomposed into a negative operator (carrying [iNEG]) and a postive counter part.

(48) *Prohibieron* que saliera *nadie* — Spanish
Forbade.3SG that went.out n-body
'They forbade that anybody went out'
[vP prohieberon$_{[i\cancel{NEG}]}$ [CP C°$_{[u\cancel{NEG}]}$ [saliera $[_{vP}$ nadie$_{[u\cancel{NEG}]}$]]]]

Fragmentarian answers are accounted for by PF movement of the n-word after ellipsis of the entire sentence, containing a negation that checks the n-words [uNEG] feature. Since NPI’s have to be licensed at surface structure, PF movement of NPI’s is not allowed.

(49) A quién viste? A *nadie* — Spanish
To whom saw-you? To n-body
'Who did you see? Nobody'
$[_{FocP}$ nadie$_{i[u\cancel{NEG}]}$ $[_{NegP}$ <~~no$_{[iNEG]}$ vió a t_i~~>]][16]

[16] This account is similar to the account presented Giannakidou (2000) and in Merchant (to appear).

Finally, the fact that NPI's can be licensed by a negation in a higher clause and n-words cannot follows immediately from the clause-bounded conditions on feature checking (C counts as a phase boundary, cf. Chomsky 1999).

(50) *[$_{\text{NegP}}$ *Op*$_{\neg}$ Dhen$_{[\cancel{\text{n\\uNEG}}]}$ lipame [$_{v\text{P}}$ [$_{\textbf{CP}}$ pu piglosa *KANENAN*$_{[\text{uNEG}]}$]]] Greek
Neg regret.1sg that hurt.1sg n-body

5 Conclusions

This analysis predicts correctly the interpretation of negative sentences in a large set of languages. Moreover it solves several problems that have been raised by former approaches of Negative Concord and it accounts for the differences between Strict and Non-strict NC languages. The relation between the syntactic status of negative markers and the occurrence of NC is explained, and replaces the incorrect bidirectional relation that has been proposed by Jespersen (1917) and adopted by Haegeman & Zanuttini (1996) and Rowlett (1998).

References

Barbiers, S. 2000. *Variation in Negation: Questions for the Syntactic Atlas of the Netherlands Dialects,* Ms. Meertens Instituut.

Burridge, K. 1993. *Syntactic change in Germanic. Aspects of language change in germanic,* John Benjamins, Amsterdam.

Chomsky, N. 1999. *Derivation by Phase*, The MIT Press, Cambridge, MA.

Giannakidou, A. (1997). *The landscape of Polarity Items*, PhD dissertation, Rijksuniversiteit Groningen.

Giannakidou, A. (2000). 'Negative ... Concord?', *Natural Language and Linguistic Theory* **18,** 457-523.

Haegeman, L. 1995. *The syntax of negation*, Cambridge Studies in Linguistics 75. Cambridge University Press, Cambridge.

Haegeman, L. & Zanuttini, R. 1996. 'Negative Concord in West Flemish', in: Belletti, A. & Rizzi, L. 1996 (eds), *Parameters and Functional Heads. Essays in Comparative Syntax.* Oxford University Press, Oxford, pp. 117-179.

Herburger, E. 2001. 'The negative concord puzzle revisited', in: *Natural Language Semantics* **9**: 289-333.

Hoeksema, J. 1997. 'Negation and Negative Concord in Middle Dutch', in: Forget, D. et al. (eds.) *Negation and Polarity. Syntax and Semantics*, Current Issues in Linguistic Theory 155, John Benjamins, Amsterdam/Philadelphia: pp. 139-156.

Jespersen, O. 1917. *Negation in English and other Languages*, A.F. Høst, Copenhagen.

Laka, I. 1990. *Negation in Syntax: on the Nature of Functional Categories and Projections*, PhD dissertation, MIT.

Ladusaw, W. A. 1992. 'Expressing negation', in: Barker, C. & Dowty D. (eds.) 1992, *SALT II*, Cornell Linguistic Circle, Ithaca.

Leupenius, P. 1653. *Aanmerkingen op de nederduitsche taale en Naaberecht.* annotated by W.J. Caron 1958, Wolters, Groningen.

Merchant, J. 2001. *Why no(t)?*, Ms. University of Chicago.

Pollock, J.-Y. 1989. 'Verb movement, Universal Grammar, and the structure of IP', *Linguistic Inquiry* **20**, pp. 365-424.

Rowlett, P. 1998. *Sentential Negation in French,* Oxford University Press, New York/Oxford.

Travis, L. 1984. *Parameters and effects of word order variation,* PhD dissertation, MIT.

Ura, H. 1996. *Multiple Feature Checking*, PhD dissertation MIT.

Van der Wouden, T. 1994. *Negative Contexts*, PhD dissertation, Rijksuniversiteit Groningen.

Zanuttini, R. 2001. 'Sentential Negation', in: Baltin, M. & C. Collins (eds.). 2001, *The Handbook of Contemporary Syntactic Theory*, Blackwell, pp. 511-535.

Competition between Word Meanings: The Polysemy of *(A)Round*[1]

Joost Zwarts

Joost.Zwarts@let.uu.nl

Abstract

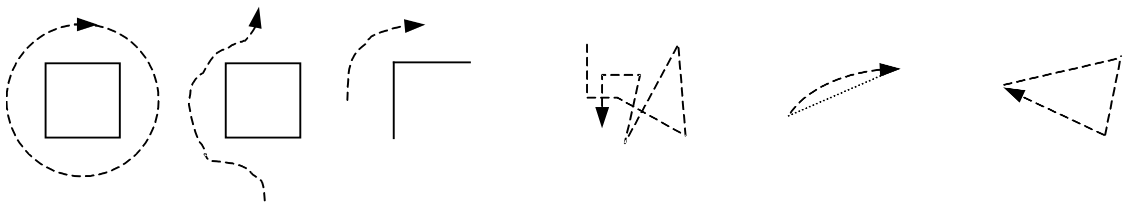
The preposition *(a)round* can be used to describe a wide variety of spatial paths, ranging from perfectly circular to slightly curved. This polysemy is approached from a formal semantic perspective, building on the descriptive work of cognitive semanticists. The different uses are defined in model-theoretic terms, using a vector-based model, and shown to be entailments, i.e. weaker versions or supersets, of the prototypical circle meaning of *round*. The different spatial senses of *round* can then be ordered according to strength. The interpretation that is chosen in a particular context is determined in an optimality-theoretic fashion from the interaction of a small number of general principles: **Strength**, **Fit** and **Vagueness**, of which the last two are more important than the first. The strongest sense of *round* is chosen that fits the linguistic context. If the context does not favour a weaker meaning, a weaker meaning still results because of a preference for vagueness.

1 Introduction

The polysemy of spatial prepositions is a phenomenon that has hardly drawn any attention from formal semanticists. They seem to be happy to leave it to the cognitive semanticists, for whom spatial polysemy is indeed a focal concern, combining as it does the major themes of space and categorization. In the wake of Lakoff's (1987) work on *over* the polysemy of many spatial prepositions and adverbs has been described in terms of networks of image-schematic meanings, typically represented by informal little pictures. For example, Hawkins (1984), Schulze (1991, 1993), Taylor (1995) and Lindstromberg (1998) have done this for *(a)round*, covering such diverse readings as in (1), illustrated in:

(1) a. The postman ran round the block
  b. The burglar drove round the barrier
  c. The steeplechaser ran round the corner
  d. The tourist drove round
  e. The driver took the long way round
  f. The woman came round again

[1] I gratefully acknowledge the audience of Sinn and Bedeutung and the members of the Cognition project (of which this research is part) for useful discussion, and the Netherlands Organisation for Scientific Research (NWO) for financial support (grant 051-02-070 for the Cognition project *Conflicts in Interpretation*).



a b c d e f

Figure 1: Paths corresponding to *round*

In this paper I want to approach the polysemy of *(a)round* from a more formal perspective. In doing that I hope to demonstrate that more precise definitions of the meanings of polysemous spatial prepositions are possible and, more importantly, essential for a better understanding of their semantic structure and use in context. Since a full treatment of the meanings of *round* would require far more space than available here, I will restrict myself to a core of spatial uses of this item.

I will take as my point of departure a strong ‘prototype’ meaning for *round* based on a circle (section 1). Section 2 will show that this prototype meaning implies a range of properties that are characteristic for non-prototypical meanings of *round*. Then in section 3 I will suggest a way to select the right meaning of *round* in a particular context, using an Optimality Theoretic approach to interpretation Blutner (2000), Hendriks and de Hoop (2001), de Hoop and de Swart (2000), Zeevat (2000) that incorporates the Strongest Meaning Hypothesis of Dalrymple et al. (1994) and Winter (2000).[2]

2 The prototype of *round*

Dictionary entries of *round*, its etymology (from Latin *rota* ‘wheel’) and speakers’ intuitions all suggest that the core meaning of *round* corresponds to a *circle*, a circular shape or movement (Hawkins 1984, Schulze 1993). This is what we could call the prototypical meaning of *round*.

I will model this meaning in terms of the set of *paths* that describe exactly one perfect circle, with different radii.[3] I will use the label CIRCLE for this set. There are many ways to model a path, but Zwarts and Winter (2000) and Zwarts (2003) give good arguments to define a path as a sequence of *vectors* located with their starting point in one common origin. This notion of path can be formalized as a function **p** from the real interval [0,1] to **V**, a three-dimensional vector space. I will require this function to be *continuous* and *dynamic*. A path function is continuous in the standard sense of elementary calculus, i.e. when its graph is an unbroken curve.[4] A path function is dynamic if it is not a constant function on any subinterval of its domain. This does not mean that an object traversing a path is not allowed to stand still, but this possibility is not part of the definition of path, because a path is intended as an a-temporal, purely spatial entity. It is part of the continuous function that maps a time interval $[t_0,t_1]$ onto the domain [0,1] of a path in a homomorphic fashion, representing motion along

[2] See Wunderlich (1993) for a somewhat different approach to similar phenomena.

[3] How the two-dimensional path of *round* can apply to three-dimension configurations (e.g. *the skin round the apple*) is something I will not discuss here. See Wunderlich (1993) for discussion of such ‘dimensionality effects’.

[4] A function **p** from [0,1] to **V** is continuous iff for each $i \in [0,1]$, $\text{limit}_{k \to i}\, \mathbf{p}(k) = \mathbf{p}(i)$. See any calculus textbook for a further explication of the notion of limit.

the path. In other words, stationariness should be part of the representation of motion, not of the representation of paths.

The following figure illustrates what a prototypical path for *round* will look like (in five snapshots):

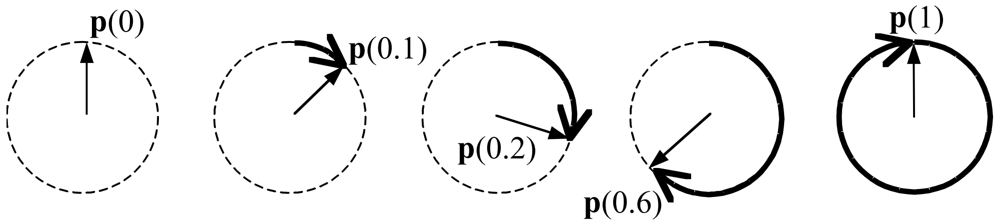


Figure 2: Vectors from a prototypical *round* path

Notice that the direction of a path is not defined by the vectors but by the ordering of the domain [0,1]. The vectors serve to locate the positions of the path in terms of their distance and direction relative to an origin. This origin is determined by the reference object of the preposition (2a), by a central point in that reference object (2b) or by an implicitly given reference point (2c):

(2) a. The car drove round the barrier
 b. Beatrice walked round the hall
 c. They wandered round

The path in Figure 2 is not only used to represent motion, but also extension and rotation:

(3) a. Mary has a necklace round her neck
 b. John turned the wine glass round in his fingers

In (3a) the necklace does not move in a circular path round Mary's neck; it is distributed along that path (a case of fictive motion in Talmy's (1996) terms). For (3b) the path describes the rotation of the wine glass around a vertical axis, with the vector representing one arbitrarily fixed side of the glass relative to the axis (see Zwarts 2003 for more details).

3 Properties of the prototype

What are the properties of a circular path? We can first of all note that a prototypical *round* path has a vector pointing in every direction in a plane, that is, a two-dimensional vector space. This is what I call COMPLETENESS:

(4) COMPLETENESS

A path **p** in a plane **P** is complete iff for every direction $\mathbf{D} \subseteq \mathbf{P}$, there is an $i \in \mathrm{dom}(\mathbf{p})$ such that $\mathbf{p}(i) \in \mathbf{D}$.

where a direction is the set of vectors pointing in one direction, i.e. a half line, dom(**p**) is the domain of function **p**, i.e. [0,1], and **p**(i) is the vector of path **p** at index i.[5]

All paths in the set CIRCLE have COMPLETENESS (i.e. CIRCLE $\subseteq$ COMPLETENESS), but not all paths with COMPLETENESS are circles. Spirals and ellipses are complete, but they are not circles. What distinguishes circular paths from spiralling paths and elliptical paths is that all the vectors of a circular path are of the same length. This is what the property CONSTANCY formulates:

(5) CONSTANCY

A path **p** is constant iff for every $i, j \in$ dom(**p**), |**p**(i)| = |**p**(j)|.

In this definition | | is a function that assigns to a vector its length. Notice that an arc has CONSTANCY but not COMPLETENESS. Only perfectly circular paths have both COMPLETENESS and CONSTANCY:

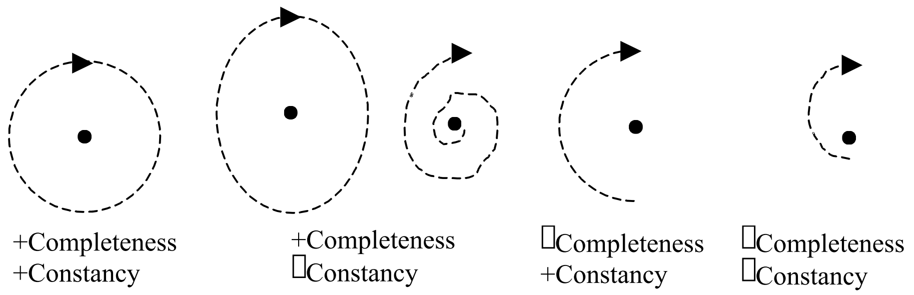


Figure 3: Completeness and constancy in paths

The following property states that a path describes a circle in the most economical way, without passing any direction twice:

(6) UNIQUENESS

A path **p** in a plane **P** has uniqueness iff for every $i, j \in$ dom(**p**)/{0,1} and every direction **D**, **p**(i) $\in$ **D** and **p**(j) $\in$ **D** iff $i = j$.

Because of UNIQUENESS a path does not change direction (from clockwise to anticlockwise or vice versa) and it does not continue beyond one full cycle. Notice that the definition allows **p**(0) and **p**(1) to point in the same direction, because i and j are taken from the open interval (0,1). Unlike COMPLETENESS and CONSTANCY, UNIQUENESS is a not specific to *round*, but it

[5] Because vectors are taken as primitives here, directions are higher order properties, i.e. equivalence classes of vectors. Simpler definitions of direction and completeness might be possible when vectors are analyzed in terms of (polar) coordinates.

characterizes the prototypical meanings of all directional prepositions. The rough intuition behind this is that normal paths do not touch a place more than once.

In many uses of the word *round* the path involved will not describe one perfect circle, but something that has some but not all of the properties of the prototype. The property of UNIQUENESS is not satisfied by uses that express a repeated circling or rotating, ‘round and round’:

(7) a. John keeps running round in circles
   b. The earth turns round its axis
   c. The rope is coiled round a pole

CONSTANCY is absent in the following examples:

(8) a. The earth goes round the sun in one year (elliptical path)
   b. There is a wall round the garden (rectangular path)
   c. The planet spirals round towards its sun (spiral path)

In the crisscross or aimless path meaning that we saw in *The tourist drove round*, both UNIQUENESS and CONSTANCY are missing. Only COMPLETENESS characterizes this reading. This can be seen as follows: from a central point in the city we can find a point in every direction where the tourist has been in his tour through the city centre. These points are not all at the same distance from that central point and they are not ordered in a clockwise or anticlockwise direction.

Circular paths also satisfy the following two properties, weaker versions of COMPLETENESS:[6]

(9) INVERSION

There are $i, j \in \mathrm{dom}(\mathbf{p})$ such that $\mathbf{p}(i) = -s\mathbf{p}(j)$ with $s \geq 0$.

(Two of **p**’s vectors point in *opposite* directions, **p** is at least a half-circle)

ORTHOGONALITY

There are $i, j \in \mathrm{dom}(\mathbf{p})$ such that $\mathbf{p}(i) \perp \mathbf{p}(j)$.

(Two of **p**’s vectors point in *perpendicular* directions, **p** at least a quarter-circle.)

The following examples illustrate INVERSION:

[6] There might be a continuous range of such properties, corresponding to smaller or bigger parts of the circle, but these two are singled out because they correspond to prominent meanings in dictionaries and semantic descriptions and because they correspond to geometrically salient operations.

(10) a. The burglar drove round the barrier

b. The children sat round the television

c. The car turned right round

In each of these examples the underlying path is semicircular: the path that the burglar takes in (10a), the arrangement of the children in front of the television in (10b) and the rotation of the car in (10c). Examples that illustrate the property ORTHOGONALITY are given in (11):

(11) a. The steeplechaser ran round the corner

b. A man put his head round the door

c. John turned round to the woman sitting next to him

In each of the sentences in (11) there is a change of position or direction from one side to an orthogonal side, not the opposite side.

Note that INVERSION and ORTHOGONALITY only require two vectors in the path to be opposite or perpendicular, without specifying what the vectors in between are like. A path that passes through an object from one side to another in a straight line would also have INVERSION. Hence, if INVERSION were the only condition, then (10a) would even be true if the burglar drove right through the barrier. The reason that *round* does not have this use, is because it is blocked by the more specific directional preposition *through*. In other words, *round* means ‘not through’ because of a pragmatic implicature, not because this ‘not through’ element is part of a lexical semantic property of *round*.

Schulze (1993) distinguishes a class of uses of round that he calls DETOUR and that can be defined here as follows:

(12) DETOUR

$|\mathbf{p}(0) - \mathbf{p}(1)| <$ the length of $\mathbf{p}$

A path **p** has DETOUR when the direct distance between its starting point and end point is smaller than the length of **p** measured along the path.[7] This is true of a prototypical circular path, but, in fact, every path that does not form a straight line between its starting point and end point has the property DETOUR. Some uses of *round* clearly have this property (example from Schulze 1991):

(13) The bridge is damaged, so you will have to go round by the lower one

[7] The notion of the length of a path is intuitively clear and working out that notion would involve to much vector calculus here.

This sentence can be true in a situation where the normal route would be a straight line from A to B, and the alternative route by the lower bridge somewhat longer. There is no requirement for the alternative path to be a half-circle or an arc.

Another property is LOOP, a property that paths have when their starting point and end point are identical:

(14) LOOP

$\mathbf{p}(0) = \mathbf{p}(1)$

A path can have LOOP even when all its vectors point in one and the same direction, as in the following example:

(15) The woman came round again

when she had been visiting a friend down the road and came back. The same LOOP meaning can be seen in compounds like *a round trip* 'to a place and back again'.

The prototypical meaning of *round* satisfies all the properties defined above. However, as we already suggested above, some properties are weaker or implied by others. The properties can be partially ordered according to strength in a graph as in Figure 4. I have left UNIQUENESS out of the picture, because it is not characteristic for *round* and I have included the set of all paths (PATH) at the bottom because theoretically, the weakest possible meaning of *round* is 'any path', the dual of the prototype in the poset of strength.

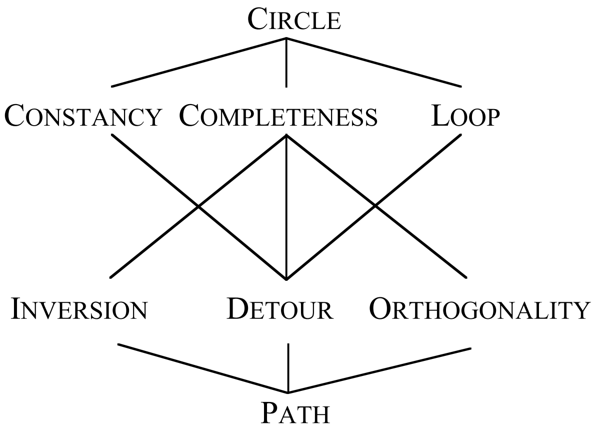


Figure 4: Strength of *round* properties

When we would only consider paths with CONSTANCY, then the ordering between the other five properties of *round* is as follows, from stricter to weaker, or, from longer to shorter paths along a circle:

(16) LOOP > COMPLETENESS > INVERSION > ORTHOGONALITY > DETOUR

When we assume CONSTANCY *and* UNIQUENESS the difference between LOOP and COMPLETENESS disappears and the following ordering results:

(17) LOOP = COMPLETENESS > INVERSION > ORTHOGONALITY > DETOUR

This ordering gives us a scale from a complete circle via a half and a quarter circle to an arc.

4 Optimizing the meaning of *round*

The strictest, prototypical meaning of *round* can be defined by a conjunction of properties, including UNIQUENESS, CONSTANCY and either COMPLETENESS or LOOP. As we saw, there are non-prototypical meanings that are weaker than this, because they correspond to a wider set of paths. These meanings are characterized by a conjunction of less or weaker properties. If *round* is associated with a range of meanings like this, is there any way of telling which meaning will be chosen in a particular context? An answer to this question can be found in the interaction of three principles:

- **STRENGTH**: stronger interpretations are better than weaker interpretations
- **FIT**: interpretations should not conflict with the (linguistic) context
- **VAGUENESS**: the strongest interpretation should be avoided

Both **FIT** and **VAGUENESS** conflict with **STRENGTH**. I will show how this conflict is resolved, first for **STRENGTH** and **FIT**, then for **STRENGTH** and **VAGUENESS**.

4.1 The role of the context

We have seen the *internal* restrictions on the polysemy of *round* (stemming from its prototypical meaning), we also want to know the *external* restrictions, imposed by conceptual, pragmatic and contextual considerations. Here I will restrict myself to considering some restrictions that come from neighbouring words.

I would like to suggest that the meaning of *round* that is chosen is often preferably the strongest meaning that is compatible with the context in which it is used (following the proposals of Dalrymple et al. (1994) for the interpretation of reciprocals and Winter (2000)). This idea can be made more concrete using Optimality Theory (OT). OT is a theory in which linguistic objects (pronunciations, syntactic structures, interpretations) can compete with each other in how good they satisfy a system of ranked constraints (Prince & Smolensky 1997). The object that best satisfies the constraints wins the competition and is the optimal outcome. This optimal outcome is not the outcome that satisfies all the constraints, but that incurs less violations than alternatives. In OT Semantics the competitors are interpretations of a word, sentence or discourse and the constraints formulate general requirements on semantic interpretation.

For my limited purposes only two constraints will be relevant: **STRENGTH**, a constraint that favours stronger interpretations over weaker interpretations (Blutner 2000, Zeevat 2000), and **FIT**, a constraint that favours interpretations that do not give rise to a contradictory or unnatural reading (similar constraints to **FIT** are **AVOID CONTRADICTION** in Hendriks & de

Hoop (2001) and **CONSISTENCY** in Zeevat (2000)).[8] **FIT** is ranked over **STRENGTH**, which means that a weaker non-contradictory meaning wins over a stronger contradictory meaning. In this way the conflict between **FIT** and **STRENGTH** is resolved.

The following example, in the form of a so-called *tableau*, will make clearer how this works:

	round the door	**FIT**	**STRENGTH**
	COMPLETENESS or LOOP	*	
☞	INVERSION		*
	ORTHOGONALITY		**
	DETOUR		***

Table 1: An OT tableau for the interpretation of *round the door*

The upper left corner of the table gives the input, the prepositional phrase *round the door*. Underneath this input four possible interpretations are given of that phrase that are relevant for the discussion (assuming only paths with CONSTANCY and UNIQUENESS). The two columns to the right show the two constraints on the interpretation of *round the corner* in their ranking and to what extent the candidate interpretations satisfy these constraints. The COMPLETENESS interpretation violates **FIT**, as indicated by the asterisk under **FIT**, because the fact that a door is usually connected to a wall makes it impossible to have a complete path round it (see Figure 5). **STRENGTH** is violated to different degrees by the four candidate interpretations: less asterisks under **STRENGTH** means a stronger interpretation. It is the relative number of asterisks that counts, not the absolute number.

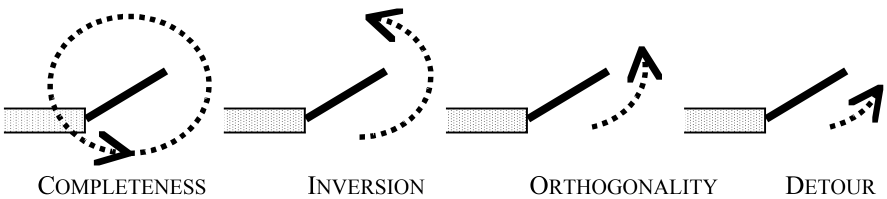


Figure 5: Four of the possible interpretations of *round the door*

The optimal interpretation of *round the door* is, as indicated by the pointing finger in the tableau, the interpretation that best satisfies the two constraints **FIT** and **STRENGTH**, namely INVERSION, the strongest interpretation that still fits. INVERSION is just as good as ORTHOGONALITY and DETOUR as far as **FIT** is concerned (no violations), but it wins because it has less violations on **STRENGTH**.

The optimum can change if more linguistic context is taken into account, as in the sentence *A man put his head round the door*. Now the type of path that we choose for *round* also has to

[8] **STRENGTH** could also be seen as a *faithfulness* constraint on the relation between the underlying lexical meaning and the contextual meaning. Stronger meanings are meanings that reflect the prototypical meaning more faithfully.

fit information about the kind of object that moves or extends along the path, a head in this example. Usually, if someone puts his head round the door he will remain standing on one side of it. The length and flexibility of his human neck does not allow him to move his head all the way to the other side of the door. He will just be able to put his head to the side of the door so that he can see what is outside or speak with someone standing on the other side. ORTHOGONALITY will then be the strongest interpretation still fitting the sentence meaning as a whole, because INVERSION gives a violation asterisk under **FIT**.

A sentence will often contain enough information to show how the strong *round* prototype has to be weakened to fit. This information can come from geometric, functional and other properties of the reference object of *round*. Words like *corner* and *bend* are compatible with paths that have at most ORTHOGONALITY. A barrier is typically used to block a road, so cars driving round the barrier will typically be understood not to describe a circular (COMPLETENESS) but a half circular (INVERSION) path. Children sitting round a television will also form a half circle, given the fact that the screen is only visible on one side. The shape of gardens and blocks of houses makes it unlikely that paths round these objects have CONSTANCY. The wall round a garden or a walk round a block will typically follow the contours of those objects and therefore the strongest interpretation does not satisfy CONSTANCY. Similarly, driving round the city centre is not possible in a perfect circle because the path has to follow the streets of the centre.

The located object (figure) and the verb can also provide information that leads to a weakening of the prototypes of *round*. A necklace hanging round a neck satisfies COMPLETENESS, because any weaker path would not allow the necklace to stay where it is. Many verbs have a meaning that is incompatible with the UNIQUENESS of the prototype of *round*, like *wander*, *spiral*, *coil*. Such verbs force the path to pass a particular side of an object more than once. Adverbs and other more peripheral elements in the sentence can also contribute to determining the interpretation of *round* that is possible or required. The adverb *again* strongly suggests LOOP (as in *to come round again*), *the long way* points in the direction of a DETOUR interpretation and *next to him* in example (11c) to an ORTHOGONALITY interpretation.

FIT can be formulated as a ban against empty sets: interpreting *round* as COMPLETENESS leads to an empty set when the reference object is a door in its normal position. In order to evaluate **FIT** we need to derive from the linguistic and non-linguistic context relevant constraints on paths and intersect these with the candidate constraints derived from the prototype of *round* to see if an empty set results. For example:

(18) **FIT**(*round the door*,COMPLETENESS)=*

iff CONSTR(*round the door*) ∩ COMPLETENESS = ∅

Some of the contextual constraints are specific to particular lexical items, others might be based on general elements of our knowledge of the world. Unfortunately, at this point it is too early to formalize the few things that we understand about how context restricts our interpretation of lexical items.

4.2 The role of vagueness

Even though clues from within the sentence and from the non-linguistic context will often help to determine a unique interpretation, still ambiguity or vagueness is possible. Take the following example:

(19) Scrooge walked round his room for hours

The interpretation that we get here is one that involves a path with COMPLETENESS inside the reference object, but we do not know whether Scrooge walked round in circles or in rectangles or crisscross. Even though the circular shape is part of the prototype of *round*, it does not seem to matter here. There is a convenient kind of vagueness about the use of *round* here. This suggests that another important constraint is at work to explain the use of the preposition *round* in context: **VAGUENESS**.

Krifka (2002) argues that for another type of expressions, numerals, that they are preferrably interpreted in a vague way. *One thousand kilometers* is not interpreted as referring to exactly 1000 km but to a range of values around 1000 km and the width of that range depends on the level of precision needed in a particular context. He formulates this preference as a constraint on interpretation in an Optimality Theoretic framework that favours vague interpretations over precise interpretations. I would like to suggest that a similar preference is at work in the interpretation of the spatial preposition *round* and that it mainly affects the CONSTANCY and UNIQUENESS aspects of the basic meaning.[9] Even if the context would allow us to interpret an occurrence of *round* in the strongest possible way, then the principle of **VAGUENESS**, ranked above **STRENGTH**, would still force us to choose a weaker meaning (without CONSTANCY or UNIQUENESS or with weaker versions of those properties). **VAGUENESS** and **STRENGTH** are opposite forces in determining how far the interpretation of *round* can depart from its prototype. This is the kind of interaction of conflicting principles that we also see in other domains in which Optimality Theory has been applied.

5 Conclusions

In order to give a (partial) account for the polysemy of the preposition *round* I have brought together three lines of research: the empirical lexical semantic work done within the cognitive semantic framework, model-theoretic approaches to spatial semantics and Optimality Theoretic Semantics.[10] Even though only a fragment of the range of meanings of *round* has been discussed and the OT treatment of the interaction between lexical meaning, context and preferred vagueness is still rather sketchy, I believe the general direction is promising. Formal tools help us to define more precisely what the meanings of a polysemous spatial item are and Optimality Theory gives us a general framework to study how these meanings compete with each other and which meaning is optimal given a ranked set of general constraints.

References

Blutner, R. (2000). Some aspects of optimality in natural language interpretation. *Journal of Semantics* 17.3, 189-216.

Dalrymple, M., M. Kanazawa, S. Mchombo & S. Peters (1994). What do reciprocals mean? *Proceedings of SALT 4*.

[9] See also Lasersohn (1999) for a discussion of vagueness in the interpretation of the adjective *round*.

[10] There are also important connections with the two-level semantics that Wunderlich (1993) applied to the interpretation of German *um* ‘round’.

Hawkins, B. (1984). *The Semantics of English Spatial Prepositions*. Ph.D. University of California at San Diego.

Hendriks, P. & H. de Hoop (2001) Optimality Theoretic Semantics, *Linguistics and Philosophy* 24, 1-32.

Hoop, H. de & H. de Swart (2000). Temporal adjunct clauses in Optimality Theory. *Rivista di Linguistica* 12.1, 107-127.

Krifka, M. (2002). Be brief and vague! And how bidirectional optimality theory allows for verbosity and precision. In D. Restle & D. Zaefferer, eds., *Sounds and Systems: Studies in Structure and Change. A Festschrift for Theo Vennemann*. Berlin: Mouton de Gruyter. 439-458.

Lakoff, G. (1987). *Women, Fire, and Dangerous Things*. Chicago: Chicago University Press.

Lasersohn, P. (1999). Pragmatic halos. *Language* 75.3, 522-551.

Lindstromberg, S. (1998). *English Prepositions Explained*. Amsterdam/Philadelphia: John Benjamins Publishing Company.

Prince, A. & P. Smolensky (1997). Optimality: From neural networks to universal grammar. *Science* 275, 1604-1610.

Schulze, R. (1991). Getting round to *(a)round*: Towards a description and analysis of a spatial predicate. In G. Rauh, ed., *Approaches to Prepositions*. Tübingen: Gunter Narr Verlag. 251-274.

Schulze, R. (1993). The meaning of *(a)round*: A study of an English preposition. In R.A. Geiger & B. Rudzka-Ostyn, eds., *Conceptualizations and Mental Processing in Language*. Berlin/New York: Mouton de Gruyter. 399-431.

Talmy, L. (1996). Fictive motion in language and "ception". In P. Bloom et al. eds., *Language and Space*. Cambridge, Massachusetts: MIT Press. 211-276.

Taylor, J.R. (1995). *Linguistic Categorization: Prototypes in Linguistic Theory*. Oxford: Clarendon Press. [Second edition]

Winter, Y. (2000). *Flexible Boolean Semantics: Coordination, Plurality and Scope in Natural Language*. Ph.D. dissertation, Utrecht University.

Wunderlich, D. (1993). On German *um*: Semantic and Conceptual Aspects. *Linguistics* 31, 111-133.

Zeevat, H. (2000). The asymmetry of Optimality Theoretic syntax and semantics. *Journal of Semantics* 17.3, 243-262.

Zwarts, J. (2003). Vectors across spatial domains: From place to size, orientation, shape and parts. In E. van der Zee & J. Slack, eds., *Representing Direction in Language and Space*. Oxford: Oxford University Press.

Zwarts, J. & Y. Winter (2000). Vector Space Semantics: A model-theoretic analysis of locative prepositions. *Journal of Logic, Language and Information* 9, 169-211.

Sekretariat des Fachbereichs Sprachwissenschaft
Frau Gabriele Fahmy,
Fach D 185, D-78457 Konstanz, Tel. 07531/88-2465, Email: Gabriele.Fahmy@uni-konstanz.de.

Hefte mit einem Stern * sind vergriffen. Einige Arbeitspapiere sind elektronisch verfügbar. Sie liegen als Dateien im PDF-Format vor und können per ftp bezogen werden. Zum Betrachten und Ausdrucken wird ein Acrobat Reader benötigt. Eine Liste der bis 1995 erschienen Arbeitspapiere ist ebenfalls elektronisch verfügbar:

http://ling.uni-konstanz.de/pages/publ/arbeitspapiere.html

75. *Susanne Günthner:* From Subordination to Coordination? Verb-second position in German causal and concessive constructions. Februar 1996. DM 5,–.
76.* *Christoph Schwarze:* Lexikalisch-funktionale Grammatik. Eine Einführung in 10 Lektionen mit französischen Beispielen. April 1996. DM 6.–.
77. *Zvi Penner:* From Empty to Doubly-Filled Complementizers. A Case Study in the Acquisition of Subordination in Bernese Swiss German. Oktober 1996. DM 10,–.
78. *Klaus von Heusinger:* Turkish Relative Participles. A Reanalysis in Categorial Grammar. Oktober 1996. DM 5,–.
79.* *Klaus von Heusinger und Urs Egli (Hrsg.):* Proceedings of the Konstanz Workshop „Reference and Anaphorical Relations“. November 1996. DM 13,–.
80.* *Vieri Samek-Lodovici:* A Unified Analysis of Noun- and Verb-based Italian Nominalizations in -ata. Februar 1997. DM 3,50.
81. *Holger Bückemeyer:* Zur Implementierung lexikalischer Übersetzungsbeziehungen. April 1997. DM 3,50.
82. *Bruce Mayo:* Die Konstanzer LFG-Umgebung. Mai 1997. DM 6,50.
83. *Björn Wiemer:* Displaced speech - systematic account and acquisitional background (illustrated by Polish and German). Oktober 1996 / Februar 1997. DM 7,-.
84. *Klaus von Heusinger & Urs Egli (Hrsg.):* Proceedings of the Konstanz Workshop „Reference and Anaphorical Relations“ Vol 2. November 1997. DM 10,–.
85. *Christoph Schwarze:* Repräsentation und Variation. Zur Entwicklung der romanischen Auxiliarsyntax. November 1997. DM 3,–.
86. *Bruce Mayo:* Derivational Morphology in the Konstanz LFG-Workbench. Dezember, 1997. DM 7,–.
87.* *Peter E. Pause:* Lokativalternation bei deutschen Partikelverben und ihren französischen Entsprechungen. Dezember 1997. DM 2,–.

88.* *Christoph Schwarze & Aditi Lahiri:* Einführung in die französische Phonologie. April 1998. DM 10,-.
89.* *Zvi Penner and Karin Wymann (eds.):* Normal and Impaired Language Acquisition. Studies in Lexical, Syntactic, and Phonological Development. Juni 1998. DM 13,-.
90. *Ingrid Langer:* Lexikalisch-funktionale Analyse des französischen Adjektivs. Juli 1998. DM 6,-.
91. *Katrin Mutz:* I suffissi alterativi dell´italiano: prospettive sincroniche e diacroniche. November 1998. DM 4,–.
92. *Regine Eckardt:* Formale diachrone Semantik/Formal Diachronic Semantics. November 1998. DM 6, –.
93. *Klaus Hölker:* Lexikalische Variation der Zeitschemata bei einwertigen Verben im Französischen. Dezember 1998. DM 6,50.
94. *Klaus von Heusinger:* Abstraktnominalisierungen im Deutschen. Eine Bildungsgeschichte. Dezember 1998. DM 5,–.
95.* *Peter Pause & Daniel Heitz:* Verbale Polysemie: Das Verb öffnen. Dezember 1998. DM 4,–.
96.* *Susanne Günthner:* Entwickelt sich der Konzessivmarker "obwohl" zum Diskursmarker? Grammatikalisierungstendenzen im gesprochenen Deutsch. 1999. DM 4,-.
97.* *Christine Gohl & Susanne Günthner:* Grammatikalisierung von weil als Diskursmarker in der gesprochenen Sprache. 1999. DM 4,-.
98. *Mohamed Badawi:* A propos des aspects lexicaux du passif analytique en arabe moderne. März 1999. DM 5,–.
99.* *Aditi Lahiri, Alexander Patschovsky, Christoph Schwarze (eds.):* Issues in Interdisciplinary Research on the Lexicon, März 1999, DM 10,-.
100.* *Veronika Knüppel:* Two lexical-functional analyses of French, Mai 1999, DM 4,00.
101.* *Milena Vegnaduzzo:* I verbi italiani in -sc: morfologia e semantica in prospettiva diacronica, Juni 1999, DM 3,50.
102.* *Vieri Samek-Lodovici:* The Internal Structure of Arguments: Evidence from Italian Nominalization-based Complex Predicates, August 1999, DM 3,50
103. *Matthias Weisgerber:* "Öffnen" und "aufmachen". Eine empirische Studie zum Gebrauch zweier Verben, Oktober 1999. DM 4,50.
104. *Regine Eckardt:* On the underlying mechanics of certain types of meaning change. November 1999, DM 4,50.
105. *Zvi Penner, Petra Schulz and Karin Wymann:* Normal and Impaired Language Acquisition II. Studies in Lexical, Syntactic, and Phonological Development. November 1999, DM 10,–.
106. *Regine Eckardt & Klaus von Heusinger (eds.):* Meaning Change – Meaning Variation. Workshop held at Konstanz, Feb. 1999, Vol. I, Feb. 2000, DM 7,–.
107. *Christoph Schwarze:* Aspetti semantici della formazione delle parole, April 2001, DM 2,–.

108.* *Nikolaus Schpak-Dolt:* Bibliographische Materialien zur romanischen Morphologie 1875–1950, Oktober 2001, DM 5,–.
109. *Klaus von Heusinger:* Italian Nominalization of -*ata*: Derivation and the Structure of the Lexicon. Januar 2002, € 1,–.
110. *Klaus von Heusinger & Ruth Kempson & Wilfried Meyer-Viol (eds.)*: Proceedings of the Workshop "Choice Functions and Natural Language Semantics". Januar 2002, € 3,50.
111. *Klaus von Heusinger & Christoph Schwarze:* Underspecification in the semantics of word-formation. The case of denominal verbs of removal in Italian Oktober 2002, € 1,–.
112. *Götz Wienold & Christoph Schwarze:* The Lexicalization of Movement Concepts in French, Italian, Japanese and Korean: Towards a Realistic Typology; Oktober 2002, € 1,-
113. *Klaus von Heusinger & Georg A. Kaiser (eds.):* Proceedings of the Workshop "Semantic and Syntactic Aspects of Specificity in Romance Languages"; April 2003, € 3,50
114. *Matthias Weisgerber (ed.):* Proceedings of the Conference "SuB7 – Sinn und Bedeutung"; September 2003, € 5,-
115. *Katrin Henk:* Stammalternanz und Stammausgleich im Mittelfranzösischen; August 2004, € 3,50
116. *Marc-Olivier Hinzelin & Georg A. Kaiser:* Das neutrale Pronomen *ello* im dominikanischen Spanisch und die Nullsubjekteigenschaft. Anhang: Korpus und Bibliographie zu *ello* und unpersönlichen Konstruktionen (mit Subjekt) im Spanischen; Oktober 2004, € 1,-
117. *Cécile Meier & Matthias Weisgerber (ed.):* Proceedings of the Conference "sub8 – Sinn und Bedeutung"; Oktober 2004, € 6,-