

On the distribution of quantifiers and their logical properties

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September 23, 2005

Abstract

The paper presents a *constructional* treatment of quantification and argues that quantification essentially is an agreement phenomena. The distribution of quantifiers and related adverb classes almost falls directly out of this treatment (linking is a lexical hypothesis or inferred). Some remaining observations about the distribution of quantifiers are explained on logical and non-grammatical grounds. In effect, no additional constructions or lexical redundancies are needed to explain the empirical facts.

1 Empirical data

1.1 Danish

In Linguistics 101, we were taught there exists four open word classes: nouns, verbs, adjectives – and the rest, which is sometimes lumped together and called *adverbs*. This paper is concerned with a subset of adverbs at the locus of quantifiers, agent-oriented adverbs and manner adverbs. The quantifiers we are concerned with are often called *float*ed quantifiers, but for neutrality they are here referred to as adverbial quantifiers; the agent-oriented adverbs are usually called subject-oriented adverbs, but it is evident from the data presented here that they are in fact agent-oriented. The adverbial quantifiers are either *light* or *heavy*, i.e. either they reflect atomic lexemes, or they are somehow compounded or phrasal. A distinction is made later on between intersective and scopal adverbs, but for now this preliminary terminology suffices. The data presented here concerns representatives of four different adverbial subclasses in Danish:

light adverbial quantifiers	<i>alle</i> ('all')
heavy adverbial quantifiers	<i>allesammen</i> ('altogether')
manner adverbs	<i>sammen</i> ('together')
agent-oriented adverbs	<i>gladeligt</i> ('happily')

In Danish, adverbs occur in both the *Mittelfeld* and the *Nachfeld*. In this section, we test the distribution of the four adverbial classes. In addition, it is investigated if constituents of those classes in certain positions link to agents, subjects or objects. Finally, it is relevant to test if they are event-modifying. Distribution is easily tested, whereas the orientation of adverbs is tested by the entailments of appropriate passive constructions, and whether adverbs are event-modifying is tested by entailments of conjunctions. Consider first the distributional data:

- (1) *pingvinerne spiller alle badminton om eftermiddagen*
 penguins.the play all badminton in afternoon.the
 'all the penguins play badminton in the afternoon'
- (2) **pingvinerne spiller badminton om eftermiddagen alle*
 penguins.the play badminton in afternoon.the all
 'all the penguins play badminton in the afternoon'
- (3) *pingvinerne spiller allesammen badminton om eftermiddagen*
 penguins.the play altogether badminton in afternoon.the
 'the penguins play badminton in the afternoon altogether'
- (4) *pingvinerne spiller badminton om eftermiddagen allesammen*
 penguins.the play badminton in afternoon.the altogether
 'the penguins play badminton in the afternoon altogether'
- (5) *pingvinerne spiller sammen badminton om eftermiddagen*
 penguins.the play together badminton in afternoon.the
 'the penguins play badminton together in the afternoon'
- (6) *pingvinerne spiller badminton om eftermiddagen sammen*
 penguins.the play badminton in afternoon.the together
 'the penguins play badminton together in the afternoon'
- (7) *pingvinerne spiller gladeligt badminton om eftermiddagen*
 penguins.the play happily badminton in afternoon.the
 'the penguins happily play badminton in the afternoon'
- (8) *pingvinerne spiller badminton om eftermiddagen gladeligt*
 penguins.the play badminton in afternoon.the happily
 'the penguins happily play badminton in the afternoon'

The adverbs which are grammatical in the *Nachfeld* can also precede the temporal adverb. Secondly, it is tested if the adverbs can be coindexed (in a loose sense) with the subject in a passive to test, if the adverbs are subject-oriented or agent-oriented.

- (9) *pingvinerne_i blev alle_i fodret*
 penguins.the became all fed
 'all the penguins were fed'

- (10) *pingvinerne_i blev allesammen_i fodret*
 penguins.the became altogether fed
 'the penguins were fed altogether'
- (11) *pingvinerne_i blev sammen_i fodret*
 penguins.the became together fed
 'the penguins were fed together'
- (12) **pingvinerne_i blev gladeligt_i fodret*
 penguins.the became happily fed
 'the penguins were happily fed'

In the *Nachfeld* position, some adverbs can orient toward the object too:

- (13) **pingvinerne så isbjørnene_i allesammen_i*
 penguins.the saw polar-bears.the altogether
 'the penguins saw the polar bears altogether'
- (14) *pingvinerne så isbjørnene_i sammen_i*
 penguins.the saw polar-bears.the together
 'the penguins saw the polar bears together'
- (15) *pingvinerne så isbjørnene_i gladeligt_i*
 penguins.the saw polar-bears.the happily
 'the penguins saw the polar bears happy'

If the object is pronominal, however, both light and heavy quantifiers can orient towards the object:

- (16) *pingvinerne så dem_i alle_i*
 penguins.the saw them all
 'the penguins saw all of them'
- (17) *pingvinerne så isbjørnene_i allesammen_i*
 penguins.the saw polar-bears.the altogether
 'the penguins saw them altogether'

Conjunctions are used to tell if an adverb is event-modifying.

- (18) *pingvinerne går alle og synger*
 penguins.the walk all and sing
 'all the penguins walk and sing' → 'all the penguins sing'
- (19) *pingvinerne går allesammen og synger*
 penguins.the walk all and sing
 'the penguins walk altogether and sing' → 'the penguins sing altogether'
- (20) *pingvinerne går sammen og synger*
 penguins.the walk together and sing
 'the penguins walk together and sing' ↗ 'the penguins sing together'

- (21) *pingvinerne går gladeligt og synger*
 penguins.the walk happily and sing
 'all the penguins walk happily and sing' ↗ 'the penguins happily sing'

The inference in (21) is licensed if the adverb is substituted with a predicative adjective, since predicatives only modify sets of individuals. The results are summarized (pronominal object readings aside):

	pronominal	<i>Mittelfeld</i>	<i>Nachfeld</i>	agent	subject	object	event
<i>alle</i>	✓	✓			✓		
<i>allesammen</i>	✓	✓	✓		✓		
<i>sammen</i>		✓	✓		✓	✓	✓
<i>gladeligt</i>		✓	✓	✓		✓	✓

1.2 Cross-linguistic data

In the cross-linguistic section, only the results are displayed, not the actual data. Native speakers were of course consulted. Only light and heavy quantifiers are included.

1.2.1 English

	pronominal	<i>Mittelfeld</i>	<i>Nachfeld</i>	agent	subject	object	event
<i>all</i>	✓	✓			✓		
<i>alltogether</i>			✓	✓	✓	✓	

1.2.2 German

	pronominal	<i>Mittelfeld</i>	<i>Nachfeld</i>	agent	subject	object	event
<i>alle</i>	✓	✓			✓		
<i>alle zusammen</i>	✓	✓	✓		✓	✓	

1.2.3 Swedish

	pronominal	<i>Mittelfeld</i>	<i>Nachfeld</i>	agent	subject	object	event
<i>alle</i>	✓	✓			✓		
<i>allesamman</i>		✓	✓		✓		

1.2.4 Other languages

Light quantifiers behave in similar ways across the language set. It is interesting that with respect to strong quantifiers the European languages seem to bundle into three classes, exemplified by English, German and Swedish. French behaves like Swedish, while Bulgarian, Danish, Norwegian Bokmål behaves like German (object readings aside). In fact, these two classes can be lumped together if a blocking effect is assumed to prevent the heavy quantifiers in Swedish and French to appear as pronouns, e.g. *allihopa* is the pronominal equivalent of *allesamman* in Swedish. English seems to be the odd one out. Are there exceptions to this behavior in the European language families? Consider the following data from Romanian. Only the SVO fragment is considered here.¹

¹See Herdan (2003) for the relevant VSO and VOS data. Interestingly, the VOS fragment contains no adverbial quantifiers.

- (22) *copiii_i au rezolvat tocti_i problema*
 children.the have solved all problem.the
 'all the children have solved the problem'
- (23) *copiii_i au rezolvat problema tocti_i*
 children.the have solved problem.the all
 'all the children have solved the problem'
- (24) *copiii au rezolvat problemele_i toate_i*
 children.the have solved problems.the all
 'the children have solved all the problems'

The quantifiers and the coindexed noun phrases agree in gender and number. In sum, Romanian has a light quantifier that appears in both the *Mittelfeld* and the *Nachfeld*, and orients toward both the subject and the object.

How is the situation outside the European language families? The observations presented here were found in Donohue (2003).

One observation is that quantifiers seem to be syntactically bound, not semantically. Palu'e has two adverbial quantifiers, for instance. One is a sentence-final quantifier which orients toward the subject or the object (core arguments). The second construction involves duplication of the head noun in question and insertion of a quantificational clitic. The quantifier then orients toward non-subjects (obliques or object).

Consider then the data from Tagalog. AV is "active voice", while PV is "patient voice".

- (25) *humuling lahat ng mga bata ang mga ina*
 catch.AV all GEN PL child NOM PL mother
 'all the mothers caught the children'
- (26) *hinuling lahat ng mga bata ang mga bata*
 catch.PV all GEN PL mother NOM PL child
 'the mothers caught all the children'

In Tagalog, the quantifier always orients toward the nominative (subject) argument. In Mandarin, the adverbial quantifiers also orient toward the subject, not the agent, but in addition, a topicalized noun phrase can also be in the restriction of the quantifier:

- (27) *nà-bian de shítáng lǎoshī dōu=[_{VP} qù-guo]*
 there-side GEN cafeteria teacher all=go
 'the cafeterias over there, the teachers have been to all of them'

1.2.5 Summary

A relatively consistent pattern was observed in the European data set (the pronominal status of heavy quantifiers aside). Our solution to the English data is simple. The word *altogether* is not really a quantifier, but a predicative adverb. It has all the properties of standard predicative verbs.

It is evident from the data of Donohue (2003) that the linking of adverbial quantifiers is syntactically specified (at a level where there is access to grammatical functions). On our analysis, this is different from the agent-oriented adverbs.

2 Related work

Sportiche (1988) famously claims that adverbial quantifiers are in fact not adverbial, but are no different from prenominal quantifiers. They only appear adverbial because the noun phrase in question has moved. The quantifier is stranded with the original subject position, so to speak. Unfortunately, Sportiche does not formally define the principles of extraction that govern the stranding effect, but see Shlonsky (1991) for a supplementary account.

Dowty and ...

Some other analyses exist in the literature. Tsoulas (2002) analyzes adverbial quantifiers as some sort of scope markers. This view is partially adopted on our analysis. Rochman (2005) explains the distribution of adverbial quantifiers in terms of focus and prosody. Focus and prosody seem to be important aspects of the nature of adverbial quantifiers, but they will not be addressed here; in part for clarity of exposition, in part because our analysis is meant to have applications in natural language parsing.

2.1 Objections to stranding

- (i) No explanation for the limitations on the set of quantifiers that can occur adverbially is given.
- (ii) Adverbial quantifiers do not strand with the original subject position in passives, accusatives and transitives with overt accusative case checking.
- (iii) Stranding does not explain *wh*-trace restrictions.

The three objections are illustrated by corresponding data, respectively:

- (28) **pingvinerne blev mange fodret*
penguins.the were many fed
'many of the penguins were fed'
- (29) **pingvinerne blev fodret alle*
penguins.the became fed all
'the penguins were all fed'
- (30) **hvor sulten tror du pingvinerne alle var?*
how hungry think you penguins.the all were
'how hungry do you think all the penguins were?'

Generally, the analyses which rely on movement seem to be motivated, implicitly or explicitly (e.g. Sportiche, 1988), by the adjunct projection principle.

If some semantic type α modifies some semantic type β , and α and β are syntactically realized as a and b , a is projected as adjacent either to b or to the head of b .

Unfortunately, this principle seems invalid in the case of adverbs. Consider, for instance, (52), discussed at the end of this paper. This adverb is non-adjacent to the noun phrase in its restriction, it is clearly not stranded (it is a prototypical adverb), and it does not refer to the event, as is evident from:

- (31) *pingvinerne går uden undtagelse og synger*
 penguins.the walk without exception and sing
 'the penguins walk without exception and sing' → 'the penguins sing
 without exception'

2.2 Objections to adverbial analyses

Various researchers suggest to analyze adverbial quantifiers as proper subject-oriented adverbs. Unfortunately, the analogy is incomplete, as is evidenced by the data above. Subject-oriented adverbs are in fact agent-oriented, but adverbial quantifiers are truly subject-oriented.² Further evidence comes from impersonal passives (32-35) and *there*-sentences (36-37).

- (32) *der danses gladeligt*
 there is.danced happily
 'some dance happily'
- (33) **der danses alle*
 there is.danced all
 'everyone dances'
- (34) *der gives gladeligt gaver til pingvinerne*
 there is.given happily presents to penguins.the
 'some are happy to give presents to the penguins'
- (35) **der gives alle gaver til pingvinerne*
 there is.given all presents to penguins.the
 'everyone gives presents to the penguins'
- (36) *der løber gladeligt pingviner rundt på isen*
 there run happily penguins round on ice.the
 'penguins run happily around on the ice'
- (37) **der løber alle pingviner rundt på isen*
 there run all penguins round on ice.the
 'all penguins run happily around on the ice'

A second difference between quantifiers and adverbs is that quantifiers in some languages agree with the head noun in question, incl. Icelandic, Romanian and Tagalog. In addition, Sportiche (1988; and references cited therein) points out that there exists languages in which the distributions of adverbial quantifiers and adverbs do not overlap. In Moore, for instance, an adverbial quantifier may appear "between I and VP", but no adverb may.

Sag and Fodor (1994) argue that adverbial analyses more elegantly account for the ungrammaticality of (38):

- (38) How satisfied do you think they were all?

²This strictly holds for Danish. In English, subject-oriented adverbs seem to be ambiguous in the passive (Wyner, 1998).

On stranding analyses, this is explained by a rather complex interaction of various constraints, e.g. surface filters and traces. On an adverbial analysis, the ungrammaticality of (38) is the simple result of the fact that the quantifier has no constituents to its right to attach to. Certain dialects of English behave differently, though, e.g. West Ulster English (McCloskey, 2000):

(39) I can't remember what I said all.

The arguments against adverbial analyses are first summarized:

- Adverbial quantifiers tend to be subject-oriented, whereas “subject-oriented” adverbs are really agent-oriented.
- Adverbial quantifiers agree with the head nouns in their restrictions. Adverbs don't.
- In certain languages, adverbial quantifiers and true adverbs have split distributions.
- How is the adverbial analyses to account for the West Ulster English data?

3 Distribution

3.1 Word order

The word order of the Danish main clause can be pictorially represented (Diderichsen, 1957):

word order	$\left\{ \begin{array}{c} N \\ A \end{array} \right\}$	v	n	a*	V ^{1,2}	N ^{1,2}	A*
example	så	har	pingvinerne	vist	spillet	badminton	igen
translation	then	have	penguins.the	apparently	played	badminton	again

“a*” corresponds to our *Mittelfeld* position, and “A*” corresponds to our *Nachfeld* position. The two positions constitute ordered sublists of adverbial classes (Nimb, 2004):

a*	sent./free adv.	neg. adv.	manner adv.
A*	manner/free adv.	pred. adv.	bound adv. free adv.

The adverbial quantifiers precede the manner adverbs in the *Mittelfeld* position, but they cannot precede the predicative adverbs in the *Nachfeld* position:

(40) *så har pingvinerne alligevel ikke alle velvilligt*
 then have penguins.the unexpectedly not all willingly
vist igloerne ordentligt frem for nogen
 presented iglos.the properly forward to anyone
 'unexpectedly, the penguins have then not all willingly presented the iglos properly to anyone'

- (41) **så har pingvinerne alligevel ikke velvilligt alle*
 then have penguins.the unexpectedly not willingly all
vist igloerne ordentligt frem for nogen
 presented iglos.the properly forward to anyone
 'unexpectedly, the penguins have then not all willingly presented the
 iglos properly to anyone'
- (42) *så har pingvinerne alligevel ikke velvilligt vist*
 then have penguins.the unexpectedly not willingly presented
igloerne ordentligt frem for nogen begge to
 iglos.the properly forward to anyone both two
 'unexpectedly, the penguins have then not both willingly presented the
 iglos properly to anyone'
- (43) **så har pingvinerne alligevel ikke velvilligt vist*
 then have penguins.the unexpectedly not willingly presented
igloerne ordentligt begge to frem for nogen
 iglos.the properly both two forward to anyone
 'unexpectedly, the penguins have then not both willingly presented the
 iglos properly to anyone'

This has the important consequence that the scope of adverbial quantifiers can interact with negation in the *Mittelfeld*.

3.2 Logical properties

The quantifiers below roughly cover the fragment of quantifiers discussed in Barwise and Cooper (1981) and their translations in Danish:

quantifier	translation	logical	strenght	monotonic	weight
nogen/en	some/a	yes	w	↑	l
alle	all	yes	+s	↑	l
hver	each	yes	+s	↑	l
ingen	no	yes	w	↓	l
(mindst) 1,2,3,...	(at least) 1,2,3,...	yes	w	↑	h
de(n) 1,2,3,...	the 1,2,3,...	yes	+s	↑	h
begge	both	yes	+s	↑	l
de fleste	most	no	+s	↑	l
mange/adskillige	many/several	no	+s	↑	l
få	few	no	w	↓	l
denne/dette	this/that	no	+s	↑	l
præcis 1,2,3,...	exactly 1,2,3,...	yes	w	-	h
højest 1,2,3,...	at most 1,2,3,...	yes	w	↓	h
mere end halvdelen	more than half	no	+s	↑	h
mindst halvdelen	at least half	no	+s	↑	h
uendeligt mange	infinitely many	yes	w	↓	h
endeligt mange	finitely many	yes	w	↑	h

Floated quantifiers occur in two positions in Danish, as already mentioned, the *Mittelfeld* position and the *Nachfeld* position. The *Mittelfeld* position is restricted to the set of light logical and (positive) strong quantifiers. This makes

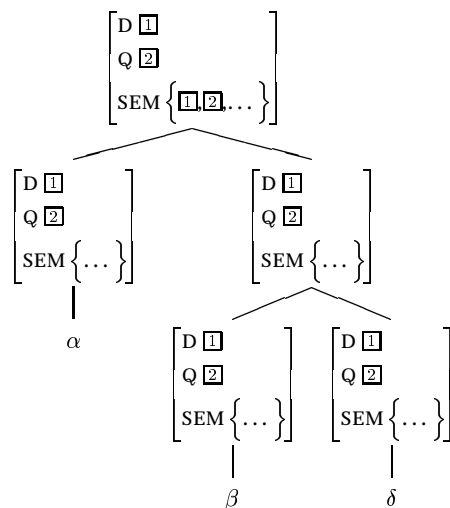
perfect sense. In fact, the distribution can be explained on entirely (onto-)logical grounds. Consider the standard test for quantifier strength (Barwise and Cooper, 1981). If

(44) D N is a N/are Ns

is valid or contradictory for any noun N, D is a strong quantifier, but if the truth of (44) is contingent on the interpretation, then D is weak. This contingency is important in the processing of adverbial quantifiers. If postponed quantifiers suddenly make the interpretation of their coindexed noun phrases contingent on a specific interpretation, the parser and model generator is forced to backtrack. Consequently, the quantifiers in the *Mittelfeld* are restricted for logical and computational reasons.

4 Semantics

This section introduces a grammatical theory of the distribution of adverbial quantifiers and their compositional effects. Our claim is that all the relevant observations fall out as consequences of the theory. The major factor in our explanation is *agreement*. In part, this is based on earlier work. In Søgaard and Haugereid (2005; and references therein), determination and quantificational force are treated as agreement phenomena, i.e. the constituents of the prenominal field collectively determine the determination and quantification of the entire noun phrase, and the actual operator is then inserted at the maximal projection:



The second factor is the distinction between intersective and scopal modification.

4.1 Quantification as agreement

For a theory of determination, the revision of the so-called “givenness hierarchy”, presented in Borthen and Haugereid (to appear), is adopted. Crucially,

the theory makes reference to any connected span of this list of determination values possible:

in focus (*it*) × activated (*this*) × familiar (*that*) × uniquely identified (*the*) ×
identified as type (*a*)

The domain of values of quantificational force is unimportant for our present purposes. The crucial idea for how we employ agreement of determination now is illustrated:

word order		$\left\{ \begin{array}{c} N \\ A \end{array} \right\}$	v	n	a*	V ^{1,2}	N ^{1,2}	A* _{OBJ}	A* _{SUBJ}
light q.		∅		underspec.	underspec.		underspec.	in focus	∅
heavy q.		∅		in focus	underspec.		in focus	in focus	underspec.

Our data tells us that adverbial quantifiers can only appear in nominal and adverbial positions, but cannot be topicalized.³ The more detailed annotations of determination values ensure, for instance, that light quantifiers combine with pronominal objects. Consequently, the ungrammaticality of (13) falls out of disagreement.

Unfortunately, different determination values must be ascribed to the same adverbial classes for different positions. The apparent consequence is lexical enumeration of different adverb forms, a *Mittelfeld* form and a *Nachfeld* form, for instance. This is not necessary, however, if the lexicon is hierarchically organized. Such organization is possible in various frameworks, incl. Head-Driven Phrase Structure Grammar (Flickinger, 1987) and Combinatory Categorical Grammar (McConville, 2005).

The intuition is then that the prenominal, the *Mittelfeld* and the two *Nachfeld* positions constrain the type of quantifiers which can appear in them. The quantifiers are lexically underspecified, except for specification of quantifier weight, but the context of the positions enforce the quantifiers to inherit the features of the greatest lower bound of the contextual constraints and its own lexical specification.

$$\begin{array}{c}
 \left[\begin{array}{c} \textit{prenominal} \\ \text{Q-PROP} \left[\begin{array}{c} \text{WEIGHT light} \\ \text{DET underspec} \end{array} \right] \vee \left[\begin{array}{c} \text{WEIGHT heavy} \\ \text{DET in-focus} \end{array} \right] \right] \left[\begin{array}{c} \textit{mittelfeld} \\ \text{Q-PROP} \left[\begin{array}{c} \text{WEIGHT underspec} \\ \text{DET underspec} \end{array} \right] \right] \\
 \left[\begin{array}{c} \textit{nachf-obj} \\ \text{Q-PROP} \left[\begin{array}{c} \text{WEIGHT underspec} \\ \text{DET in-focus} \end{array} \right] \right] \left[\begin{array}{c} \textit{nachf-subj} \\ \text{Q-PROP} \left[\begin{array}{c} \text{WEIGHT heavy} \\ \text{DET underspec} \end{array} \right] \right]
 \end{array}$$

If the reader cares about logical complexity, the disjunctions are unnecessary; everything can be enforced by type inference.

³The $\left\{ \begin{array}{c} N \\ A \end{array} \right\}$ position is also used for subjects. Of course the “∅” is not intended to exclude quantifiers in subject noun phrases.

4.2 Quantification, intersection and scopal modification

4.2.1 Semantic index

The majority of adverbial quantifiers is oriented toward the subject. The co-indexing is possible, if external arguments percolate to every branch of the tree. Such percolation is motivated by a large set of linguistic phenomena, incl. raising and binding. It is therefore a common feature in recent versions of Head-Driven Phrase Structure Grammar, e.g. Flickinger (2001). The use of the external argument for the compositional semantics of adverbial quantifiers is advocated by Yoo (2001:11):

The subject-oriented property of floating quantifiers is accounted for, since the index of the quantifier is related to that of the VP or AP subject.

The index of the *Mittelfeld* quantifier can uniformly be co-indexed with the external argument. How is the ambiguity of the *Nachfeld* then accounted for? In the cross-linguistic section, it was seen that, in certain languages the object noun phrase can be the restriction of a *Nachfeld* quantifier, incl. German and Norwegian, while in others, incl. Bulgarian and Danish, only subject noun phrases can do this.

One obvious solution is to identify two positions, one for subject-oriented quantifiers and another for object-oriented quantifiers. This of course seems cumbersome. It is motivated, however. (42-43) demonstrate how *Nachfeld* quantifiers apparently cannot precede predicative adverbs. In fact, this is only true for subject-oriented quantifiers. The converse holds for object-oriented ones.

- (45) *så har pingvinerne vist dem begge to frem for*
then have penguins.the presented them both two forward to
nogen
someone
'the penguins have then presented them both to someone'

This of course allows a direct encoding of the proper determination restrictions.

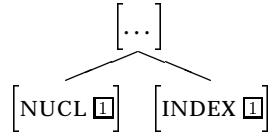
4.2.2 Nuclear scope

The *Mittelfeld* quantifiers interact with the scope of negation and modals, e.g.:

- (46) The penguins (all) can (all) play badminton?
(47) The penguins (all) do not (all) play badminton?

The quantifiers seem to outscope all operators introduced to its right. Consequently, a right branching analysis can be adopted, and the scope relation will correspond to c-command. The nuclear scope of the quantifier is simply its c-command domain.

If this is implemented in a unification-based theory, similar in feature geometry to the one introduced earlier, this is, roughly, what we get:



4.2.3 Genericity and referentiality

Adverbial quantifiers usually enforce a referential reading. This is evident from (48-49).

(48) all penguins fly

(49) the penguins all fly

Adverbial quantifiers license a *second order* generic over conjunctions, however. Consider (50). The relevant reading is that on which penguins are said to generically fly, and similarly for badminton players and birds.

(50) penguins, badminton players and birds all fly

The second order generic of course depends on your theory of coordination, and its exact semantics is left for further research. The disambiguation of referential status is simple on the design of Søgaard and Haugereid (2005). A determiner such as *alle* is said to be ambiguous between a referential (universal quantifier) and generic reading. The quantificational force value is simply further constrained by the position types introduced above.

4.2.4 Intersective and scopal adverbs

Consider the German example in (51) (adopted from Schäfer, 2004):

(51) *Hans hat geschickt die Frage dumm beantwortet*
 Hans has skilfully the question stupidly answered
 'Hans skilfully answered the question stupidly'

In this example, one adverb clearly takes scope over the other. In other words, the proper reading is not one where the event referred to is in the intersection of the denotations of the two adverbs, but a scopal one. On our view, this is important. Some adverbs are intersective while others are scopal.

The distinction is used to explain agent- and subject-orientedness. Agent-orientedness falls out of being scopal. A scopal adverb has no access to the external argument, but is only resolved by inference, when all grammatical information is lost. Some manner adverbs are scopal, others are intersective, while all quantifiers are of course non-modificational. An important distinction must be drawn among intersective adverbs. Our data shows us that some adverbs refer to events, while others do not. Consequently, adverbs come at least in three logical types, namely,

$$\lambda x.P(x), \lambda x, e.P(e, x) \text{ and } \lambda Q.P(Q).$$

5 Conclusions

- Adverbial quantifiers are not stranded, nor adverbs, but they are simply base generated quantifiers which appear in the adverbial field to disambiguate content.
- The restricted set of adverbial quantifiers is explained on logical grounds. The only alternative explanation in the literature is that this is simply a lexical coincidence (see Yoo, 2001).
- The distinction between light and strong quantifiers and their determination properties explain the distributional differences between quantifiers such as *alle* and *allesammen* in Danish.
- The semantic properties of adverbial quantifiers and related adverbs fall out of the division into intersective and scopal ones.
- The adverbial quantifiers usually enforce a referential reading and bind their nuclear scope. Only a second order generic is also licensed.
- Adverbial quantifiers have three distinct positions in most languages, incl. Danish. A *Mittelfeld* position for subject-oriented quantifiers and two *Nachfeld* positions, one for subject-oriented quantifiers and one for object-oriented ones.

5.1 Complications

5.1.1 The puzzle of *every*

Kobuchi-Philip (2004), for instance, reminds us that *every* and *all* not only differ in their ability to function as entire noun phrases, but also in their distribution. The quantifier *every* has no adverbial appearances. The natural question to ask is if there is some connection here?

5.1.2 Borderline adverbs

Consider:

- (52) *pingvinerne spiller badminton uden undtagelse*
 penguins.the play badminton without exception
 'the penguins play badminton without exception'

The adverb *uden undtagelse* has strange properties:

	pronominal	<i>Mittelfeld</i>	<i>Nachfeld</i>	agent	subject	object	event
<i>uden undtagelse</i>		✓	✓	✓	✓	✓	

On our analysis, *uden undtagelse* is somehow ambiguous or underspecified wrt. begin intersective or scopal.

5.1.3 West Ulster English

The adverbial quantifier cannot appear to the right of adjuncts in West Ulster English:

(53) what did she buy (all) in Derry (*all) yesterday (*all)?

In Danish, the situation was very different. Consider again (40-43). The *Nachfeld* quantifier *has* to precede the predicative adverb, but for both positions, there is some degree of flexibility. Our tentative conclusion is that the order of the *Nachfeld* adverbial field is a language-specific linearization effect, partially constrained by performance effects. It is speculated that the order of the *Mittelfeld* is also constrained by scope considerations.

5.1.4 Other complications

Certain languages seem to have no restrictions on the set of quantifiers that appear adverbially. The logical explanation that was given here for the restrictions in English should apply universally because of their logical nature, right? It is left for future research to see if our explanation is simply wrong, or if the problems we identified do not occur in Japanese because of additional facts about sentence structure and interpretation in that language.

5.2 Consequences for locality

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6 References

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