Boys buying two sausages each: On the syntax and semantics of distance-distributivity
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This thesis provides an analysis for a number of phenomena concerning the relation between syntax and semantics, or between the structure and the meaning of natural language expressions. In particular, the thesis attempts to provide answers to two central questions of modern day linguistics. How is the syntactic structure of a sentence translated into meaning? And what is the influence of interpretive requirements on the structure of a clause, if any? The first question touches upon the general question of ‘compositionality’, i.e. whether and how the meaning of a complex expression is derived from the meaning of its parts. The second question touches upon the general question of the ‘autonomy of syntax’ (Chomsky 1965). In the thesis, it will be argued that syntactic structure translates into meaning in compositional fashion. The meaning of a clause depends on the meaning of its parts, and the way they are combined. Furthermore, it will be argued that the meaning of a clause is derivable from its surface structure in the default case. The result of treating surface structures as appropriate inputs for semantic interpretation is that a greater part of the burden of interpretation is placed on the semantic component. The prominent role played by semantics is also highlighted by the answer that is given to the second question. It will be argued that interpretive requirements have a certain influence on the grammaticality of syntactic structures. This influence is exerted in two ways. First, the semantic component acts as a filter on the output of the syntactic component. Certain syntactically well-formed structures cannot be interpreted and are consequently ruled out as grammatical structures of a given language. Second, the semantic component is argued to have an even stronger impact on covert syntax in that at least some syntactic operations at this level must be licensed by interpretive requirements. That is, syntax is argued to be not fully autonomous, but to interact with other modules of grammar (here the conceptual-interpretive system), possibly in form of correspondence rules (Jackendoff 1997).

1 Four Puzzles

Regarding the empirical phenomena under discussion, the thesis sets out to find solutions to four puzzles that arise in connection with the German distributive element jeweils ‘each’, ‘each time’, ‘respectively’, and that have a bearing on the syntax-semantics interface. The puzzles are illustrated in (1) – (4).

The first puzzle is the ambiguity puzzle. The distributive element jeweils can occur both in adverbial (1a) and in adnominal position (1b).

(1) a. Peter hat jeweils gewonnen.  
   Peter has each.time won  ‘Peter has won each time.’

b. Die Jungen haben [mit [jeweils zwei Freunden]] gesprochen.  
   the boys have with each two friends talked  
   ‘The boys have talked to two friends each.’
In (1a), jeweils occupies a position typical for adverbs. In (1b), jeweils forms a constituent with a nominal expression embedded inside a prepositional phrase. This naturally raises the question if jeweils is ambiguous in meaning (as suggested by its two English counterparts), or if jeweils has the same reading in both cases, the meaning difference being due to a difference in syntactic position. In chapter IV, the second position is argued to be correct, highlighting the importance of structural factors for interpretation.

The second puzzle is the puzzle of ‘distance-distributivity’. (2a) is synonymous to (2b) even though the position of the distributive element is different. Synonymy is here understood as being true of the same situations.

(2) a. Jeder Junge hat zwei Currywürste gekauft.
    each boy has two curry sausages bought
    ‘Each boy bought two curry sausages.’

b. Die Jungen haben jeweils zwei Currywürste gekauft.
    the boys have each two curry sausages bought
    ‘The boys bought two curry sausages each.’

(2a) instantiates the regular pattern of universal quantification. The distributive element jeder ‘each’ forms a constituent with its NP-restriction Junge ‘boy’, the expression that denotes the range of quantification for jeder ‘each’. In (2b), the distributive element occurs at a distance to its NP-restriction die Jungen ‘the boys’ over the denotation of which it quantifies. It thus appears to exhibit an irregular pattern of quantification at first sight. The major part of the thesis is devoted to showing that the behaviour of adnominal jeweils is not irregular. Jeweils is analysed as a regular quantifying expression both syntactically (chapter III) and semantically (chapter IV). In particular, it is shown that the quantifier combines with its NP-restriction syntactically, and that the expression as a whole denotes a generalised quantifier. Please notice immediately, that the term ‘distance-distributivity’ is restricted to adnominal elements like jeweils, and does not subsume regular floated quantifiers. Arguments to the effect that distance-distributive elements differ from floated quantifiers are forwarded in chapter II.1.10.

The third puzzle concerns the fact that instances of adnominal jeweils sometimes receive an interpretation which resembles that of adverbial jeweils. Jeweils in (3) is interpreted as distributing over events even though it appears to occur adnominally.

(3) Jeweils zwei Jungen standen Wache.
    each two boys kept guard
    ‘Two boys kept watch at a time.’

In chapter V.1, I provide arguments to the effect that jeweils occurs in adnominal position in (3). Chapter V also explores the necessary structural and semantic conditions which an adnominal element must satisfy in order to give rise to – what looks like – an adverbial reading. There, it will also be shown that the adverbial-like reading is a direct result of the semantics of adnominal jeweils and its syntactic position.

Finally, a smaller part of the thesis is devoted to the puzzle of cross-linguistic variation concerning the syntactic distribution of distance-distributive elements. As (3) shows, the distribution of English distance-distributive each is more restricted than that of jeweils. Distance-distributive each cannot occur in subject position with an adverbial-like reading. Another example is given in (4).
(4) Peter kritisierte und lobte Maria aus jeweils zwei Gründen.
   Peter criticised and praised Maria for each two reasons
   *‘Peter criticised and praised Maria for two reasons each.’

(4) shows that English *each* cannot distribute over the plurality of events expressed by the two conjoined verbs. In such cases, English has to use the expression *respectively*. A small survey of languages shows that many other languages (Russian, Bulgarian, Italian, French, Dutch, Icelandic, Norwegian, Korean, Japanese) also have distance-distributive elements, and that these tend to pattern either with English or with German concerning their syntactic distribution. The cross-linguistic puzzle will be addressed repeatedly in the course of this thesis, namely in chapters III, IV, and V. This is because the differences in distribution are partly due to syntactic factors (the feature content of the distance-distributive element) and partly to semantic factors. The result of this investigation will be a unified analysis of distance-distributivity across languages which accounts for the observable differences at the same time. This unified analysis may provide the basis for a more comprehensive typology of distance-distributivity in natural language, which I will leave for future research.

The foregoing considerations have shown that a careful syntactic and semantic analysis of the German distributive element *jeweils* is not a purpose in itself (although a complete description and analysis of the observable phenomena is missing so far). The present work provides an opportunity for a better understanding of distance-distributivity in natural language in particular, and of the syntax-semantics interface in general.

The remainder of the introduction is reserved for laying out the syntactic background (section 2), the semantic background (section 3), and my views on the syntax-semantics interface (section 4). Section 5 presents a brief preview of the things to come.

2 Syntactic Assumptions

2.1 The Framework

The syntactic assumptions of this thesis are embedded in the general framework of generative grammar in its various implementations (cf. Chomsky 1965, 1981, 1986ab, 1995, 1998, 1999). In particular, I adopt some basic assumptions of the Government & Binding (GB) – framework (Chomsky 1981, 1986ab), and of the Minimalist Program (MP) as developed in Chomsky (1995). This may sound as a contradiction at first sight since the Minimalist Program was developed as a replacement for the GB-framework, and designed to overcome certain weaknesses of the latter. However, the main focus of this thesis is on the interface of syntactic and semantic component, thus reaching out of the domain of syntax proper. The thesis is not concerned with finding the optimal model for the syntactic component itself. For this reason, I take the liberty to adopt well-established elements from both frameworks where nothing hinges on it. I take the analysis to be compatible with both frameworks in principle. The basic syntactic assumptions that I adopt are the following.

(5) i. Syntactic structure is built successively out of lexical and functional (possibly covert) elements through the processes of (categorial, semantic, functional) selection and merge. The resulting structures are conform with Jackendoff’s (1977: 34) phrase structure rule schema. A syntactic head X can form a maximal projection by combining with its complement and specifier.
ii. Adjunction of modifiers is possible in principle. In this case, the categorial status of the adjunction site remains unchanged.

iii. Syntactic structures are binary branching: Every syntactic node in a tree has at most two daughters (Kayne 1994).

iv. The structures built are subject to further transformations through the application of movement operations. Movement operations displace an element out of its base position to another position for grammatical (case assignment, feature checking), and discourse reasons (topics appear to the left of clauses in many languages).\(^1\)

v. Movement leaves behind a covert element (either a trace or a silent copy) which marks the origin of the moved element in line with Emonds’ (1976) ‘Structure Preservation Principle’.

vi. Movement operations can apply overtly (visible) or covertly (invisible).

vii. Movement is restricted by independent syntactic principles (e.g. the ‘Empty Category Principle’ (Chomsky 1981, 1986a) or ‘Shortest Move’ (Chomsky 1995).

In addition, I adopt two other well-established concepts from Chomsky’s (1981, 1986b) GB-system. The ‘Binding Principles’, which govern the distribution of pronouns and referential expressions, and the notion of ‘government’ under c-command.\(^2\)

On the other hand, in line with the MP, I take there to be no independent level of deep structure. Instead, merger of lexical elements and movement operations apply in a stepwise procedure in order to form ever larger structures. In the process, grammatical features and properties are checked along the way, and not at certain levels of representation. The resulting derivational model of syntax is shown in (6).

(6)

```
  Lexicon
    \--------
      selection
    \--------
  structure building, movement operations
          \--------
             Surface Structure (“Spell Out“)
                             \--------
                                movement operations
                                \--------
                        Phonological Form (PF) Logical Form (LF)
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Of particular interest here is the “covert” syntactic level of Logical Form (LF), which in the GB and MP-framework is taken to be a covert level of syntactic representation that serves as the input to semantic interpretation. Originally, LF is the syntactic level at which movement for semantic reasons (e.g. scope) takes place (cf. May 1977, 1985). In the MP, LF-movement can also take place for grammatical reasons (case, agreement) if it has not applied overtly. As a result, the structures of analogous sentences in different languages

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\(^1\) I will remain neutral on the question whether discourse requirements trigger syntactic movement directly, or whether discourse-driven movement is mediated by the presence of syntactic discourse features (topic, focus) that need to be checked by overt movement.

\(^2\) Again, the mixture of frameworks presented here is motivated by expository reasons. The decision for a mixed presentation is based on the assumption that primitives and predictions of the GB-framework can be reformulated in MP-terms in principle. Chomsky’s (1998, 1999) recent incorporation of the notions of ‘Agree’ and ‘phase’ into the MP-framework may have been motivated by the need to account for certain generalisations which were formerly captured by the notion of ‘government’.
are more or less identical at the level of LF. Differences in surface order follow simply from arbitrary morphosyntactic properties of lexical items (their feature strength), which do or do not trigger overt movement (Chomsky 1995).

In this thesis, I would like to shift the attention back to surface structure, showing that a lot of interpretations can be derived directly from the level of overt syntax. This change in perspective significantly lessens the importance of LF-movement for semantic reasons. However, this is not to say that other LF-movement operations (e.g. for grammatical reasons) need not apply. I will remain largely agnostic on this point even though I follow Chomsky (1998) in assuming that grammatical properties (such as case or agreement) can be licensed at a distance through a process of ‘Agree’, which is subject to structural conditions. These properties therefore need not be licensed by LF-movement. Finally, the shift from LF-movement is not to say that LF-movement never applies for interpretive reasons, but that such movement is restricted by interpretive requirements as in Fox (2000). This issue is taken up in chapter V.2.4.2, where one instance of LF-movement for interpretive reasons is discussed.

2.2 The Syntax of Clauses

In the wake of Pollock (1989), clauses are assumed to contain a number of functional projections. The heads of these projections are the hosts of grammatical features such as T(ense), Agr(eement), Neg(ation), Asp(ect), Voice. Rizzi (1997) assumes a number of functional projections in the left periphery of the clause, including Foc(us)P, Top(ic)P, Fin(iteness)P. The most elaborate functional architecture of the clause to date is found in Cinque (1999), who assumes a variety of functional projections for different classes of adverbials on top of the functional projections argued for elsewhere.

The clausal structure adopted here contains only two functional projections, namely I(nfl)P and C(omp)P. I is the locus of tense and agreement features and (in some languages) modal auxiliaries, and responsible for assigning nominative case to the subject of the clause in SpecIP. C is the locus of mood (question, declarative) and possibly discourse features (see fn.1). SpecCP is the left-peripheral position for discourse prominent constituents or question words. Elements are usually not base-generated in SpecIP or SpecCP, but move there in order to satisfy some grammatical requirement. Throughout, I assume the VP-internal subject hypothesis (e.g. Koopman & Sportiche 1985), according to which subjects are base-generated inside the maximal projection of the verb from where they move to SpecIP for case reasons. Finally, modifying adverbials (including negation) can freely adjoin to VP or IP. With these assumptions, the syntactic structure of (7a) is as in (7b).

(7)  a. Peter did not meet the girl.
    b.  I    VP
        /      /
       NP1  I'
       |     |
      Peter did not V P
        /       /
       t1  V'
         /     /
        meet the girl_{NP}
The structure of the interrogative clause (8a) is given in (8b). The interrogative wh-pronoun has moved overtly to SpecCP in order to check its [wh]-feature.

(8)  
\[ \begin{align*} 
\text{a. Who did Peter meet?} \\
\text{b. } \\
\text{CP} \\
\text{NP}_3 \quad \text{C'} \\
\quad \text{C} \\
\quad \text{IP} \\
\quad \text{did}_2 \\
\text{NP}_1 \quad \text{I'} \\
\quad \text{Peter} \\
\quad \text{t}_2 \\
\quad \text{VP} \\
\quad \text{meet}_v \\
\quad \text{t}_3 
\end{align*} \]

2.3 The Syntax of German
The German clause structure differs from that of English in (7) and (8) in two respects. First, I take the underlying order of German to be SOV (Bach 1962, Bierwisch 1963). The verb is always base-generated in sentence-final position, after the direct object. The underlying word order shows up regularly in German embedded clauses, such as (9).

(9) ..., weil die Mädchen die Jungen küssten.
    '... because the girls kissed the boys.'

The well known V2-phenomenon of German is the result of movement of the finite verb from its sentence-final base position to I and onwards to C (cf. den Besten 1977/83). The part of the clause between the V2-position of the verb and its sentence-final position is called the ‘middle field’ in traditional grammatical approaches. I will also adopt this term as a descriptive device.

The analysis of German as underlingly SOV conflicts with proposals by Kayne (1994) that all languages are underlingly SVO. Although this position is theoretically attractive, I stick to the more traditional SOV-analysis, which is also found in many recent analyses of German (cf. e.g. Haider 1997, Vikner 2001). A reason for this will emerge in chapter IV.6., where it is argued that a difference in the distribution of distance-distributive jeweils and each follows from the different underlying word orders of German and English.

The second striking difference is that German is more flexible in overt word order than English. Various elements can be moved to SpecCP for discourse needs. (10a) illustrates the topicalisation of a direct object, (10b) that of an adverb. The fronted element has a prominent discourse status in both sentences, showing that the left periphery (= CP) of German declarative clauses is an appropriate landing site for discourse prominent elements, normally topics or (contrastively) focussed elements.

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3 For an introduction to German syntax in the generative tradition, see e.g. Grewendorf (1988), and Haider (1993), for an analysis in GB-terms, and Grewendorf (2002) for an analysis in the framework of the MP.
(10) a. \[CP Einen \text{ Hund}_3 \text{ hat}_2 [IP \text{ Peter}_1 t'_2 [VP t_1 t_3 \text{ gestreichelt} t_2]]. \]
    'A/some dog, Peter petted yesterday.'

    \[a \text{ dog}_\text{ACC} \text{ has}_2 \text{ Peter}_1 \text{ yesterday} \text{ petted}_2 \]

    \[b. \ [CP \text{ Gestern}_3 \text{ hat}_2 [IP \text{ Peter}_1 t'_2 [VP t_1 \text{ einen} \text{ Hund}_3 \text{ gestreichelt} t_2]]. \]
    'Yesterday, Peter petted a dog.'

    \[yesterday \text{ has}_2 \text{ Peter}_1 \text{ a} \text{ dog}_\text{ACC} \text{ petted}_2 \]

The V2-property of German requires that at most one element can be fronted. As a result, (11) is ungrammatical in German.

(11) *Einen Hund gestern habe ich gestreichelt.
    a dog yesterday have I petted
    'A/some dog, I petted yesterday.'

German also exhibits a greater degree of flexibility in the middle field. The well known phenomenon of ‘scrambling’ leads to a reordering of constituents in the middle field. A constituent can raise out of its base-position inside or adjoined to VP, and adjoin to the left of other middle field material. Scrambling derives (12b) from the base order in (12a) (see Lenerz 1977 for arguments that (12a) exhibits the basic, underived word order).

(12) a. ...weil Peter [VP dem Professor die Hausarbeit gegeben hat].
    because Peter the professor the term paper given has

    b. ...weil Peter [VP die Hausarbeit dem Professor gegeben hat].
    because Peter the term paper the professor given has

    '…because Peter has given the homework to the professor.'

Overt reordering via scrambling is accompanied by a change in discourse structure. In the case of (12ab), the scrambled direct object die Hausarbeit changes its status from (information) focussed constituent to topic of the clause, whereas the indirect object changes its status from topic to (information) focussed constituent.4

To conclude, German differs from English in underlying word order (SVO vs SOV) and allows for word order alternation more freely. As shown in (12), a change in word order comes along with a change in the discourse structure of the clause.

2.4  The Syntax of Nominal Arguments

Since a large part of the discussion of adnominal jeweils concerns the internal structure of nominal arguments, it is necessary to lay out the basic assumptions concerning their structure. The syntax of nominal arguments in German has been studied extensively, e.g. by Vater (1986), Haider (1988), Löbel (1989), Olsen (1991), Fortmann (1996), Demske (2001), and others. Vater (1986) adopts Jackendoff’s (1977) X’-framework, which postulates three structural layers inside NP. The later references are inspired by Abney’s (1987) DP-hypothesis. They assume the presence of an additional functional projection DP above the NP, and discuss an abundance of DP-internal phenomena. To keep the discussion of nominal arguments manageable, I will concentrate on two aspects: The categorial status of nominal arguments, and the status of numeral

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4 When an indefinite expression scrambles, it must be interpreted under a specific, a presuppositional, or under a contrastive focus interpretation (see Diesing 1992). This fact can also be stated the other way round. DeHoop (1992) argues that specific or presupposed indefinites in German must leave the VP by overt scrambling for semantic reasons.
phrases such as *zwei Bücher* ‘two books’. Both aspects have a direct bearing on the analysis of adnominal *jeweils* in chapter III. I will adopt the following position concerning the two aspects:

(13) i. All nominal arguments are D(eterminer)Ps, i.e. all nominal arguments contain a functional D-layer, which contains a case-feature as well as the phi-features gender, number, and person. (see e.g. Hellan 1986, Abney 1987, Stowell 1989, 1991, Szabolcsi 1994, Longobardi 1994, and - for German - Felix 1988 and Bhatt 1990; but see Haider 1988)

ii. Numeral and indefinite NPs do not form a DP by themselves, i.e. numerals and indefinites are not quantificational functional heads, but attributive (cardinality) predicates, adjoined to NP (see Lewis 1975, Kamp 1981, Heim 1982, Higginbotham 1987; but see Bhatt 1990, and Pafel 1994).

From (13i) and (13ii) it follows that all numeral NPs in argument position contain a zero D*-head that is the locus of case- and phi-features.

### 2.4.1 Functional Projections in the Nominal Domain

Hellan (1986) and Abney (1987) are among the first proponents of the DP-hypothesis. The DP-hypothesis states that nominal arguments are headed by a functional head D that hosts their grammatical features, that selects for an NP as its complement, projecting a maximal projection DP, and that can be filled by lexical determiners such as *the* or *a(n)*.

In the following, research concentrated mainly on the following questions: (i.) is the DP-level obligatory, and (ii.) are there other functional projections above DP? Stowell (1989, 1991), Szabolcsi (1989, 1994), and Longobardi (1994) answer the first question in the positive. According to them, all nominal arguments are DPs, presumably universally. This is the strong DP-hypothesis. The strong DP-hypothesis makes it possible to view clausal and nominal arguments as parallel in structure as shown in (12).

(14)a. The structure of nominal arguments  
\[ \text{[DP D NP]} \]  

b. The structure of clausal arguments  
\[ \text{[CP C IP]} \]

Longobardi (1994) argues that a D-head is also required for semantic reasons. It hosts an operator whose function is to turn the NP-denotation (a predicate, which cannot serve as an argument) into an individual, which can serve as an argument.

The second question is also answered in the positive by many researchers. A number of functional heads have been suggested as hosts of particular grammatical features and target sites for overt movement of the nominal head: Ritter (1988) proposes a Numeral(P), Abney (1987) additional Kas(e)Ps, and QPs. Let us summarise these analyses under the cover term ‘Multiple FP-analysis’. The development of the multiple-FP-analysis for the nominal domain took place in parallel to the proliferation of functional projections in the clausal domain in the wake of Pollock (1989). The most elaborated forms of multiple FP-

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5 See also the references in Bittner (1994:67)

6 Abney (1987) draws a parallel between D and I(nfl) because the determiner seems to govern possessive agreement in languages like Hungarian.

7 The assumption of a QP seems to be a corollary of the assumption that D is the host of referentiality, given that quantificational categories are inherently non-referential. Proponents of a QP in German are Löbel (1989), Bhatt (1990), and Giusti (1991) among others.
analyses even assume the presence of Agr(eement)Ps within nominal arguments (cf. Coene 1999).

As argued above, I adopt a rather minimalist position, and restrict the number of functional projections in German to one. All nominal arguments are taken to be DPs, irrespective of the fact if they host an overt determiner element, or not. This decision implies that quantifiers are located in D as well. The restriction to one functional layer is motivated by the simple reason that we do not need more for a satisfactory analysis of the phenomena surrounding adnominal jeweils. In chapter III.4, I argue that jeweils occupies the specifier position of a functional projection, namely DP, at surface structure. The decision for DP is motivated by the fact that it seems to be the least controversial of all functional projections in the nominal domain (and in addition motivated by the existence of a closed class of lexical determiner elements).

2.4.2 The Categorial Status of Indefinite and Numeral Phrases

In chapter III, I argue that adnominal jeweils forms a complex nominal constituent with numeral (or more generally: indefinite phrases), such as two books. In order to determine the categorial status and the internal structure of this complex constituent, it is necessary to first establish the categorial status of ‘bare’ numeral phrases. Depending on the outcome, there are different possibilities for the position of jeweils in relation to the numeral phrase. One option is that such phrases are full DPs by themselves. An alternative option is that indefinite and numeral phrases are simply NPs, the numeral being a cardinal adjective adjoined to NP. This position is found in various forms in Kamp (1981), Heim (1982), Higginbotham (1987), and Kamp & Reyle (1993), and this is the position that I will adopt below.

The researchers who locate the numeral in the head of DP (or QP) do so because of the purported quantificational properties of the numeral. According to Bhatt (1990) and Pafel (1994), the structure of ‘bare’ numeral NPs is as in (15).

(15)  [D/Q zwei [NP Bücher]]

two   books

I would like to discuss two empirical arguments against the analysis in (15). One is syntactic in nature and is based on the co-occurrence of numerals with clear cases of lexical determiners, as in (16).

(16)  die zwei Bücher

the two books

If the lexical determiner occupies D, the numeral cannot do so at the same time.8 The second argument is semantic in nature, and concerns the supposed quantificational status of numerals. It follows from the argumentation in Bhatt (1990) and Pafel (1994) that there

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8 Bhatt (1990) and Pafel (1994) neutralise this counterevidence in different ways. Bhatt (1990:77) assumes the existence of a QP below a DP. On her analysis, die ‘the’ in (16) is located in D, while zwei ‘two’ is located in Q. Pafel (1994) treats numerals variously as quantifying adjectives adjoined to NP, or as quantifying adjectives adjoined to an empty D-head. When the numeral is adjoined to the D-head, the entire DP behaves as a quantifying expression. For instance, it exhibits scope interaction with other quantifying expressions or negation. Crucially, both analyses assume that numerals in bare nominal arguments are located under a functional head. I argue against this claim in the main text.
will be no need for locating numerals in D (or Q) if it can be shown that these are not inherently quantificational.

There is a tradition in modern semantics, beginning with Kamp (1981) and Heim (1982), and based on observations by Fodor & Sag (1982), to treat indefinites such as *some*, *a*, and later also numerals (Kamp & Reyle 1993) not as inherently quantifying elements, but as (cardinality) predicates over sets. Syntactically, these elements are realised as attributive adjectives (see e.g. Higginbotham 1987)\(^9\).

The basic observation is that constituents containing these elements differ from other constituents containing quantifiers such as *every*, *each*, or *most* in their scope taking abilities. In particular, numerals and indefinites can take scope out of syntactic islands, as shown in (17) (the example is taken from Reinhart 1995, whose argument I follow).\(^10\)

\[
(17) \text{If we invite three philosophers, Lucy will be offended.}
\]

(17) has two readings. On one reading, (17) is true if Lucy will be offended, if we invite any group of three philosophers. The constituent *three philosophers* takes narrow scope inside the conditional *if*-clause, which is a syntactic island for extraction. On its second reading, (17) is true if there is a specific group of three philosophers such that Lucy will be offended if we invite these three. This reading allows for her being perfectly happy if we invite three other philosophers (or only two of the first three). On this reading, *three philosophers* takes wide scope with respect to the *if*-clause.

In contrast, quantified phrases containing *every* cannot take wide scope out of the *if*-clause as shown by the impossibility of reading (18ii) for (18).

\[
(18) \text{If we invite every philosopher, Lucy will be offended.}
\]

(18) only has the narrow scope reading in (18i). (18) does not have the wide scope reading in (18ii) on which Lucy would be offended even if we invited only a single philosopher. The absence of this wide scope reading can be attributed to the island sensitivity of the syntactic operation of ‘Quantifier Raising (QR)’ (May 1977, 1985), which applies at LF, and which applies only to quantified phrases. The same island sensitivity is exhibited by overt movement operations as shown in (19).

\[
(19) \begin{align*}
    a. & \text{ *Who, if we invite t, Lucy will be offended.}\text{\(11\)} \\
    b. & \text{ *Who, Lucy will be offended, if we invite t.}
\end{align*}
\]

If the absence of a wide scope reading for (18) depends on the syntactic island status of the *if*-clause, which blocks QR, and if QR is the only way to derive wide scope effects with quantifying expressions, it follows either that QR with numerals is subject to different syntactic restrictions, or that numerals are not quantificational at all. In this case, their wide scope must come about in some other way. The first option is a mere restating of the facts, whereas the second option asks for an explanation for the different behaviour

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\(^9\) This class of elements is also defined as the class of ‘weak’ (Barwise & Cooper 1981), or ‘existential’ (Keenan 1987) quantifiers.

\(^10\) The facts are the same for German.

\(^11\) See Reinhart (1997) for arguments to the effect that QR should be subject to standard constraints on movement.
of quantifiers and numerals which lies in the different semantic and categorial nature of the expressions involved.

The discussed empirical difference between genuine quantifiers like *every* on the one hand, and numerals and indefinites on the other, has motivated the analysis of these expressions as inherently non-quantificational expressions. In ‘Discourse Representation Theory’ (DRT) (Heim 1982, Kamp 1981) indefinite expressions, and later also numeral expressions (Kamp & Reyle 1993), are analysed as introducing individual variables into the semantic representation. The quantificational force which is usually associated with the numeral comes about through existential closure of the indefinite’s individual variable by an existential operator ‘∃’ at the level of LF (Heim 1982). This existential operator binds any free variables introduced by indefinite or numeral expressions. In the case of (17), local insertion of the ∃-operator within the *if*-clause yields the narrow scope reading. Insertion at the matrix level yields the wide scope reading.12

The main point of the foregoing discussion is the following: There is semantic evidence that numeral and other indefinite expressions are not inherently quantificational because they behave differently from ‘real’ quantifiers. I conclude on the base of this that there is no need to locate a numeral or an indefinite in the D-head of a nominal argument. Numerical expressions by themselves are NPs. The numeral, being an adjective, is adjoined to NP (see Haider 1988 and Tappe 1989 for the position that prenominal adjectives are adjoined to NP).

2.4.3 Licensing Empty D-heads in German

The conclusions of the two previous sections seem to be contradictory. In 2.4.1, it was argued that all nominal arguments contain a D-head. In 2.4.2, it was argued that the numeral in numeral expressions is not a D-head. The question arises how the two positions can be reconciled when a numeral expression (with or without adnominal *jeweils*) occurs in argument position as in (20).

(20) Zwei Jungen kamen herein.

12 This is an oversimplification of the facts. It turns out that existential closure of the indefinite’s variable by ‘∃’ at the matrix level does not give the correct truth conditions if the numeral or indefinite occurs in the restriction of universal quantifiers, or inside an *if*-clauses as in (17). Heim (1982) points out that the resulting truth-conditions are way too weak (see also Abusch 1994 and Reinhart 1995, 1997 for discussion). In order to see this, consider the semantic representation of (17), with existential closure applying at the matrix level.

(i) \( \exists X \ [ (*philosopher'(X) \& three'(X) \& *invite'(w',X)) \rightarrow \text{offended}'(lucy) ] \)

Since the semantic representation in (i) contains a material implication, it is predicted that Lucy would be offended if we invited any group of individuals that are not philosophers, for this would falsify the premise of the material implication, thus verifying the whole expression. But clearly, (17) does not say that Lucy is offended if we invite any group of non-philosophers. In response to the problem in (i), Heim (1982) assumes that indefinite expressions can raise at LF after all, thus violating syntactic island conditions. Abusch (1994) proposes a semantic ‘storage’ mechanism that allows for a correct interpretation of the indefinite expression in situ. Nevertheless, as pointed out in Reinhart (1997), this storage mechanism is only a reformulation of syntactic LF-movement in semantic terms. Reinhart (1995, 1997) and Winter (1997, 1998) present an empirical argument to the effect that numeral and indefinite expressions need not be moved, not even out of the restriction of universal quantifiers and conditionals. The reader is referred to the references cited for details, but it should be mentioned that the proposed solution (i.) treats numerals and indefinites as inherently non-quantificational, (ii.) assumes no movement of these expressions out of islands, and (iii.) interprets them as denoting variables over choice-functions (functions that select individual elements out of sets), which are bound by existential closure.
In response to the problem posed by (20), I argue that numeral NPs are selected by an empty D-head when they occur in argument position. The structure of the subject expression in (20) is given in (21).

(21) \[ DP \emptyset [NP \text{zwei} [NP \text{Junge-n}]]] \\
\text{two} \hspace{1cm} \text{boy-s}

Postulating empty heads in syntactic analysis carries the danger of leading to more and more abstract structures. Therefore, the presence of empty heads needs to be constrained by theoretical arguments (see section 2.4.1), as well as by empirically verifiable licensing mechanisms. In general, there are at least three ways to license an empty D-head, D\(^0\). First, D\(^0\) can be licensed by lexical government, e.g. by a verb, like other empty categories (cf. Chomsky 1981). Second, D\(^0\) can be licensed by incorporating a lexical N-head (cf. Longobardi 1994, see Baker 1988 on incorporation). Third, D\(^0\) can be licensed by overt morphology on its NP-sister. This overt morphology expresses (part of) the feature content (case, number, gender) of the empty D-head, thereby licensing it (Emonds 1987). Emonds (1987) assumes that empty D-heads in English numeral phrases are licensed by the overt presence of plural morphology on the NP, namely the plural /s/-suffix. Notice that different languages can make use of different licensing mechanisms, depending on their general (morpho-) syntactic properties.

I take the empty D-heads in German numeral phrases also to be licensed by overt morphology on the NP-complement. In German, numeral NPs inflect not only for plural, but also for case, even though the inflectional paradigm is partly impoverished and does not always allow for a proper identification of case. The inflectional (case) paradigm for numeral expressions in three inflectional classes is shown in table 1:

<table>
<thead>
<tr>
<th>Class</th>
<th>I: (e)n-plural</th>
<th>II: ∅-plural</th>
<th>III: er-plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM</td>
<td>zwei/drei Frauen</td>
<td>zwei/drei Engel</td>
<td>zwei/drei Bücher</td>
</tr>
<tr>
<td>GEN</td>
<td>zweier/dreier Frauen</td>
<td>zweier/dreier Engel</td>
<td>zweier/dreier Bücher</td>
</tr>
<tr>
<td>DAT</td>
<td>zwei/drei Frauen</td>
<td>zwei/drei Engel</td>
<td>zwei/drei Bücher</td>
</tr>
<tr>
<td>AKK</td>
<td>zwei/drei Frauen</td>
<td>zwei/drei Engel</td>
<td>zwei/drei Bücher</td>
</tr>
</tbody>
</table>

GEN is marked on the numeral in all inflectional classes. DAT is marked on the noun in class II and class III.\(^{13}\) Structural case is marked by the absence of overt inflection. With numerals higher than three, which never inflect, the bare genitive form is ungrammatical (22ab). In such a case, a prepositional von ‘of’- phrase with dative complement has to be used (22c). In this case, the argument of the preposition is inflected overtly for dative case.

(22) a. *anstelle fünfzehn-er Engel
    in-place-of fifteen-GEN angel\(_{pl}\)
    b. *anstelle fünfzehn-∅ Engel-∅
    c. anstelle von fünfzehn Engel-n
    in-place of fifteen angel-DAT\(_{pl}\)

\(^{13}\) Class I only exhibits a distinction between GEN and the other cases and does not allow for proper identification of case. Nevertheless, the NPs are inflected for plural, and can therefore license the empty D-head.
I conclude that licensing of the case and phi-features of an empty D-head through inflectional morphology on the sister of D\(^0\) is possible in the case of German numeral arguments. In particular, structural case in argument position can be identified by the absence of overt case morphology. Therefore it seems justified to maintain the strong DP-hypothesis for numeral phrases in German. I conclude that numeral phrases in argument position have the structure in (21). They are NPs that are selected by an empty D-head, which hosts case and phi-features. In chapter III, we will return to the licensing of empty heads through movement and/or overt morphology in connection with the analysis of adnominal jeweils. This concludes the discussion of the syntactic background.

3 Semantic Assumptions

The semantics employed in this thesis follow the semantic system presented in Heim & Kratzer (1998). The chief properties of this system are summarised in (23):

(23) Properties of the semantic system:
   i. The semantics are extensional
   ii. The semantics are truth-conditional (Tarski 1935)
   iii. The semantics are mostly static, but incorporate some insights from dynamic theories of meaning, in particular DRT (Kamp 1981, Heim 1982, Kamp & Reyle 1993)
   iv. Natural language expressions are directly interpreted (Montague 1970a)
   v. Interpretation is compositional and type driven.

In what follows, I will briefly comment on each property in turn.

Regarding (23i), the discussion of the semantics of jeweils is only concerned with the denotations of natural language expressions in the ‘real’ or actual world. Since, we are not concerned with the denotations of expressions in other possible worlds, the semantic model does not contain an intensional component. As a result, I will freely use the terms ‘meaning’, ‘denotation’, and ‘semantic value’ as synonyms for the same thing: The referent of a natural language expression.

Regarding (23ii), natural language expressions are evaluated as to their truth with respect to the state of affairs in the actual world. A sentence is interpreted as defining a set of truth-conditions which must be satisfied in the world. If the truth conditions of a sentence are not met by the state of affairs in the actual world, the sentence is judged to be ‘false’. If the truth-conditions are met, the sentence is judged ‘true’ (cf. Tarski 1935).

Regarding (23iii), the semantic analysis of jeweils in chapter IV is for the most part concerned with the interpretation of individual sentences in isolation. Their meaning can be adequately captured by a static semantic model which does not look further than the clause level. Nonetheless, a few discourse phenomena are observable in connection with adverbial jeweils and with adnominal jeweils under adverbial-like interpretations. In these cases, an antecedent for an anaphoric element is provided by the preceding discourse. In order to account for this, it is necessary to incorporate some aspects of dynamic semantic

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Notice that the semantic system does not make use of models in order to evaluate the (in)felicity of natural language expressions. See T. E. Zimmermann (1999) for arguments to the effect that models in semantics are at best redundant, and potentially harmful.
theories. To this end, I will make use of the model of ‘Discourse Representation Theory’ (DRT) as explicated in Kamp & Reyle (1993).

Regarding (23iv), the semantic component interprets natural language expressions directly. This means that they are interpreted without a translation into an intermediate formal language such as simple or higher-order predicate calculus, or λ-calculus, the syntactic and semantic properties of which are well defined. For this reason, formal languages were thought to be interpretable more accurately, avoiding the messy unclarities, ambiguities, and instances of vagueness which are often encountered in natural language. An example in question is (24), which is scopally ambiguous. The intermediate-translation approaches resolve this ambiguity by translating the syntactic structure of (24) into two different logical formulas (25ab).

(24) All men did not lie.
(25a) ∀x [man(x) → ¬lie(x)]
For all men it is the case that they did not lie. ⇔ No man lied.
(25b) ¬∀x [man(x) → lie(x)]
It is not the case that all men lied. ⇔ Some men did not lie.

Prominent proponents of the intermediate translation approach are Frege (1891), Russell (1905), Russell & Whitehead (1910-13) and Quine (1960). Montague (1970a) was the first to show that natural language expressions can be treated like formal languages, and that an intermediate translation into a formal language is therefore unnecessary.15 Montague provided the necessary tools for interpreting natural language expressions directly, while at the same time coping with the ambiguities etc. Heim & Kratzer (1998) take up this idea and interpret natural language expressions directly. In the course of this thesis, I will often make use of formulae from the predicate calculus and λ-calculus as useful abbreviations for the denotations of natural language expressions. This should not divert from the fact that I assume direct translation of natural language expressions throughout. We will come back to the relation of syntactic structure and meaning in the next section.

In general, different classes of natural language expressions have different types of denotations in terms of what they refer to. Natural language expressions can refer to individuals, to sets of individuals, to sets of sets of individuals, to truth-values and so forth. Since any set is definable in terms of its characteristic function (see Heim & Kratzer 1998), it is possible to reduce the number of ontological entities in the semantics to three: individuals (denotations of proper names and definite DPs), truth-values (denotations of sentences), and functions (denotations of all other expressions). The semantics used here include these three entities plus the category of ‘events’ (which are individuals of a different sort, see chapter IV.1). I will also adopt the common practice of representing semantic functions in the λ-calculus, which provides a concise and elegant means of formalising complex denotations. (26) provides a few examples of denotations that will show up in later chapters.

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15 Of course, the objectives of the proponents of an ideal intermediate language differ from Montague’s. The first are interested in creating a precise and unambiguous language to be used in (scientific) reasoning, while Montague is interested in analysing the semantics of English. Montague (1970b) reverts to using intermediate translations in the analysis of the semantics of English. However, he also shows that the intermediate level can always be eliminated as long as the translation procedure is homomorphic, i.e. structure preserving. Thanks to Ede Zimmermann for bringing this to my attention.
(26)  

\begin{align*}
\text{a. } & \text{[[Peter]]} = \text{peter}^{16} \\
\text{b. } & \text{[[man]]} = \lambda x. x \text{ is man} \\
\text{c. } & \text{[[laugh]]} = \lambda x. x \text{ laughs} \\
\text{d. } & \text{[[meet]]} = \lambda x. \lambda y. x \text{ meets } y \\
\text{e. } & \text{[[every man]]} = \lambda P. \text{for every man } x \text{ it is the case that } x \text{ has the property } P \\
& \text{(i.e. the quantified expression } \text{every man} \text{ denotes the set of properties that every man has)} \\
\text{f. } & \text{[[Peter smokes]]} = 1 \text{ iff it is true that Peter smokes.} \\
\end{align*}

Regarding (23v), I adopt the ‘Principle of Compositionality’ as stated in (27).

(27)  

\textit{Principle of Compositionality:}^{17}

The meaning of a complex expression is derivable on the base of the meaning of its immediate constituents, and the way they are combined (i.e. their syntactic structure).

In the course of the thesis, we will frequently encounter the principle of compositionality. It is one of the chief claims of the thesis that compositionality can (and should) be maintained even in difficult cases that – at first sight – suggest otherwise. From (27), it follows that semantic derivations must take syntactic structure seriously. In other words, if some constituent $\alpha$ is the syntactic sister of a constituent $\beta$, it must also compose with $\beta$ semantically, before the derivation can proceed. This way, the semantic interpretation proceeds in parallel with the formation of ever more complex syntactic structures.

Following Heim & Kratzer (1998), I assume that the process of semantic composition is type-driven. This means that two syntactic sisters can only combine if they are of appropriate types. If they are of the wrong type, a type mismatch ensues, and the derivation cannot proceed – unless some sort of rescue mechanism comes to help. We will encounter two such rescue mechanisms in chapter IV.4. Semantic types go back to the Russellian theory of types and – in their present form – to Church (1940). They abstract away from the peculiar lexical content of natural language expressions, and focus on the status of a natural language expression concerning its combinability with other expressions. Frege (1891) shows that there is a fundamental difference between saturated expressions, which denote truth-values or individuals, and unsaturated expressions, which in the present framework denote functions (see also chapter IV.4.2.1 for further discussion).^{18} The semantic type of a truth-value denoting expression is defined as $<t>$ (for ‘truth-value’), and the semantic type of individual-denoting expressions is defined as $<e>$ (for ‘entity’). These are the basic semantic types for saturated expressions. All other semantic types, i.e. the types of all function-denoting expressions are defined recursively.

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$^{16}$ (26a) reads as ‘The meaning of the natural language expression \textit{Peter} is the individual Peter in the actual world.’ Lower case expressions are used to talk about entities in the world, in contrast to the natural language expression itself.

$^{17}$ The ‘Principle of Compositionality’ is frequently attributed to Frege although he never stated it explicitly (see Janssen 1997 for extensive discussion). Szabó (2000:488) presents a quote from Frege (1919:255) that could be interpreted as expressing the idea of compositionality: “corresponding to the whole-part relation of a thought and its parts we have, by and large, the same relation for the sentence and its parts”. In Montague (1970b), compositionality is brought into the semantic analysis of natural language in form of a homomorphism requirement on the translations of natural language expressions. The phrasing of the principle in (27) is close to that found in Partee, Ter Meulen, and Wall (1990:318). (27) explicitly acknowledges the importance of syntactic structure for semantic interpretation.

$^{18}$ I will also make use of the traditional terms ‘predicate’ and ‘relation’.
on the base of these two basic types. For instance, an expression which denotes a function from individuals to truth-values (e.g. intransitive verbs) has the semantic type \(<e,t>\). Expressions which denote functions from individuals into functions from individuals into truth-values (e.g. transitive verbs) are of type \(<e,<e,t>>\), and quantified expressions such as *every man*, which denote functions from individuals into truth-values, are of type \(<<e,t>,t>\). The semantic type-scheme has the advantage that it allows for a quick calculation if a given combination of natural language expressions is interpretable or not. Observe also that semantic types are insensitive to the syntactic category of an expression. Both the common noun *man* and the intransitive verb *laugh* in (26) denote a function from individuals into truth-values. Therefore, both are of semantic type \(<e,t>\).

Finally, I follow Heim & Kratzer (1998) and assume that the meaning of two natural language expressions can be combined by means of two basic semantic mechanisms. The first is ‘Functional Application’ (FA), which involves an unsaturated entity (a function) taking another entity of the right semantic type as its argument, and mapping it onto another entity. A basic instance of FA is found with predication of a verb over its subject, as illustrated in (28a). The second mechanism is ‘Predicate Modification’ (PM), which combines two predicative expressions (of type \(<e,t>\)) into a complex predicative expression. A basic instance of PM is found with attributive modification, as illustrated in (28b).

(28)  
\begin{align*}
a. & \text{Peter smokes.} \Rightarrow \text{the unsaturated predicate smoke functionally applies to the saturated expression Peter, yielding a truth value} \\
b. & \text{gray cat} \Rightarrow \text{the two properties expressed by gray and cat combine to form a complex property expressed by gray cat}
\end{align*}

This concludes the overview over the main semantic assumptions.

### 4 The Syntax-Semantics Interface

An important task of natural language semantics is to account for the scopal ambiguity of sentences. The problem with scopally ambiguous structures such as (24) (*All men did not lie*) is that two interpretations are matched with a single syntactic structure, raising a serious problem for compositionality. The traditional language-philosophical approach (e.g. Russell & Whitehead 1910-13, Quine 1960) to the problem of ambiguity was to translate natural language expressions into an intermediate formal language where the ambiguity was resolved (see section 3). In the direct translation approach adopted here, this is no longer possible.

The literature offers two possible ways of for approaching the ambiguity problem in a direct translation approach. The introduction of a syntactic level of L(ogical) F(orm) in May (1977, 1985) and Chomsky (1981) has made it possible to resolve ambiguities at this level. On this view, a scopally ambiguous sentence such as (29) is disambiguated at LF by means of reconstructing (lowering) the subject DP into its base position. The two LF-structures of (29) are shown in (30ab).

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19 See Heim & Kratzer (1998: 49 and 65) for exact definitions.

20 Ultimately, the concepts of LF and disambiguation at this level go back to Montague’s (1973) rule of ‘Quantifying in’ (Ede Zimmermann, p.c.).
A unicorn seems to be in the garden.  

(30) a. LF1: \[ \text{IP a unicorn, [VP seems [IP t to be in the garden]]} \]  
b. LF2: \[ \text{IP e [VP seems [IP a unicorn to be in the garden]]} \]  

The two LFs in (30) serve as input for semantic interpretation. LF1 is interpreted as ‘There is a (specific) unicorn which seems to be in the garden.’ This reading is also called the ‘surface reading’ because the scope relation between the two scope-bearing expressions a unicorn and seems matches the syntactic prominence relation that is definable in terms of c-command.\(^{21}\) The DP a unicorn takes scope over seems. LF2 is interpreted as ‘It seems to be the case that there is a unicorn in the garden.’ This reading is called the ‘inverse reading’ because the scopal relation inverts the c-command relation that holds at surface structure. It follows that (29) is structurally ambiguous at LF as much as (31) is structurally ambiguous at surface structure:

(31) The girl cut the boy with the knife.  
i. The girl cut [DP the boy [PP with the knife]]  
ii. The girl [VP [VP cut [DP the boy] [PP with the knife]].

Aoun & Li (1993) argue that all scopal ambiguities should be resolved through structural ambiguity at the level of LF. They make heavy use of the syntactic operation of ‘Quantifier Raising (QR)’ which applies to quantifier expressions (of type \(<\text{et},\text{t}>\)), and which can adjoin them to IP. This way, the two readings of (32) are derived from the LFs in (33ab). In (33b), QR has raised the object QP to a position above the subject, giving it scope over the latter.\(^{22}\)

(32) Some man loves every woman.  

(33) a. \[ \text{IP some man_1 [VP every woman_2 [VP t_1 loves t_2]]} \]  
b. \[ \text{IP every woman_2 [IP some man_1 [VP t_1 loves t_2]]} \]  

In recent years, it has been observed, though, that free application of QR leads to unwelcome overgeneralisations. In particular, many more inverse readings are predicted to be possible than are actually attested (cf. Liu 1990, Beghelli 1993, 1995, Stowell & Beghelli 1997). In response to this problem, application of QR was restricted in two ways. Beghelli (1993, 1995) and Stowell & Beghelli (1997) restrict QR to apply to distributive QPs such as each, every, and possibly most. All other DPs, including numeral and indefinite DPs, are not inherently quantificational and therefore cannot be raised by QR. As a result, inverse readings are impossible with them.\(^{23}\) The second restriction directly concerns the licensing conditions of QR. Reinhart (1995) and Fox (2000) propose that LF-movement of a quantified expression is – like any form of movement in the minimalist framework – costly, and should be avoided if possible. The only way for QR to escape the

\[^{21}\] The notion of ‘c-command’ is defined as follows in Reinhart (1976): Node A c (onstituent)-commands node B iff the branching node \(\alpha_1\) most immediately dominating A either dominates B or is immediately dominated by a node \(\alpha_2\) which dominates B, and \(\alpha_2\) is of the same category type as \(\alpha_1\).

\[^{22}\] Notice that it is generally assumed in the LF-framework that quantified objects must LF-move for reasons of interpretability. The object QP is of type \(<\text{et},\text{t}>\) and cannot combine with the transitive verb of type \(<\text{e}<\text{et}>>\). Therefore, it has to raise and adjoin to VP in the unmarked case (cf. May 1985). Or it raises further and adjoins to IP, giving rise to an inverse reading.

\[^{23}\] Beghelli & Stowell (1997) capture the wide scope of specific indefinites, by postulating a separate Ref(P) whose specifier can serve as a landing site for specific (=referring) expressions at LF.
A ban on costly movement is if the resulting structure gives rise to a new interpretation which was not available before movement (cf. Fox 2000). In other words, semantic factors can overrule the syntactic ban on movement at least in covert syntax at LF. The two restrictions taken together give a much more accurate picture of the availability of inverse scope readings in natural language. They adequately capture the fact that inverse readings are the exception rather than the norm.

I summarise the second type of approaches to the ambiguity problem under the label of ‘categorial grammar approaches’ (cf. e.g. Jacobson 1996). These approaches do not assume a syntactic level of LF. The interpreted structures are surface structures (cf. Hendriks 1987, Jacobson 1996). The ambiguity in meaning is attributed to additional processes applying in the semantic component, such as type-shifting, functional composition (Jacobson 1996), and argument lift (Hendriks 1987). It is the trademark of these approaches that they simplify the syntactic component (no LF-movement) at the expense of a more complex semantics.

On the scale between heavily LF-based and extremely “surfacy” approaches to the syntax-semantics interface, this work is inclined towards the latter. The following two principles are adopted as methodological principles:

(M1) Derive the meaning of sentences compositionally. I.e., build up the meaning parallel to syntactic structure in 1:1-fashion.
(M2) If a sensible and compositional interpretation is possible from surface structure, it is to be preferred.

The usefulness of (M1) as a methodological principle is stressed by Janssen (1997). (M2) states that LF-movement for purely interpretive reasons should be avoided, thus reducing the importance of LF for semantic interpretation. As will be shown in the course of the thesis, almost all occurrences of *jeweils*, including occurrences of distance-distributive *jeweils* can be interpreted directly from surface structure. Sometimes, this will involve the assumption of additional semantic processes, but in any event, there is no need for *jeweils* to move at LF for interpretive reasons. To the contrary, in chapter III.4.3 I present empirical evidence to the effect that distance-distributive *jeweils* does not move at LF. Nonetheless, the syntactic structures to be eventually interpreted are LF-structures in the syntactic framework adopted here (see (6) above). In chapter V, this will be shown to be with good reason. There, we encounter a single case where the interpretation of adnominal *jeweils* seems to necessitate LF-movement of another constituent. This shows that LF-syntax is not totally obsolete for reasons of interpretation, but that there is only very little LF-movement for semantic reasons. As a result, looking at surface structures generally provides us with all the information we need for a proper semantic interpretation.

A last point to be raised in connection with the syntax-semantics interface is whether there is a one-way relation between syntax and semantics, or whether the relation is two-ways. Is the only relation between syntactic and semantic structure such that syntax provides the input for interpretation? Or can semantic factors exert an influence on the syntactic component as well? The second position would be denied in classical generative approaches (Chomsky 1965), which maintain that the syntactic component is autonomous. However, the discussion in Reinhart (1995) and Fox (2000) shows that this position has been weakened in recent years. These authors assume that syntactic operations can be triggered (or licensed) by extra-syntactic, namely discoursive or semantic factors. As mentioned above, I adopt the position that syntax is sensitive to semantic factors in principle. In the course of the thesis, we will encounter two areas were syntax is
determined by semantic factors. The first concerned the triggering of LF-movement by semantic (interpretive) needs, which was discussed above. Second, I assume that semantic requirements can have a more indirect influence on the syntactic order of constituent. It can act as a filter on the output of free adjunction, ruling out certain syntactically well-formed structures because they cannot be interpreted. In other words, sometimes the syntax would allow for free variation in the relative order of two constituents which are adjoined to the same constituent, but the semantics rule out one of these orders as ungrammatical because it cannot be interpreted in a meaningful way (cf. Jackendoff 1972:72). In chapter IV, this interpretability requirement is held responsible for the relative order of adverbial (event) quantifiers and adverbial (event) modifiers, both of which are adjoined to VP.

Summing up, the two main positions regarding the syntax-semantics interface are, first, that the semantic interpretation is derivable from surface structures in most cases. Second, semantic factors can have an effect on syntax (i.) by filtering out certain syntactic structures, and (ii.) by restricting the application of QR at LF. This concludes our survey of background assumptions.

5 Preview of Things to Come

The thesis has three objectives. The first objective is to account for the puzzles listed in section 1. The key to solving the problems is a surface-compositional analysis of the German distributive element *jeweils*, and in particular of adnominal *jeweils* with its distance-distributive behaviour. The second objective of this thesis is to provide a unified cross-linguistic analysis of distance-distributivity for a number of related and not so related languages. The third objective is to show that an integrated syntactic and semantic account of the phenomenon is preferable to purely syntactic accounts.

Chapter II introduces the basic facts from German and other languages with distance-distributive elements. The chapter provides evidence for the assumption that *jeweils* occurs both in adverbial and in adnominal position. Second, the chapter shows that distance-distributivity with adnominal elements (as illustrated in (2)) is not restricted to German and English, but that it is attested in a range of languages. This observation makes distance-distributivity a cross-linguistic phenomenon which needs accounting for.

Chapter III presents the syntactic analysis of *jeweils*. The major part of the chapter is devoted to the analysis of adnominal *jeweils*, which is the interesting case due to its – apparent - distance-distributivity. It is argued that adnominal *jeweils* is a regular QP which is base-generated in postnominal position of a complex DP, and moves overtly to DP-initial position. Distance-distributivity is shown to be only a spurious phenomenon. The structure of DPs containing *jeweils* is argued to be identical to that of other German DPs that contain postnominal (quantificational) modifiers. The last part of the chapter extends the analysis to other languages. It is shown that a unified cross-linguistic analysis of distance-distributive constructions is possible, and that most observable differences between languages reduce to principled syntactic differences.

Chapter IV presents the semantic analysis of *jeweils*. It is shown that both adverbial and adnominal *jeweils* can be interpreted as generalised quantifiers. The difference in meaning stems from the difference in syntactic position, thus accounting for the ambiguity puzzle. Second, it is shown that adnominal *jeweils* can be interpreted compositionally in its surface position, thus accounting for the distance-distributivity puzzle. Finally, a
difference between English each and German jeweils is reduced to an interaction of semantic and syntactic factors.

Chapter V is devoted to the analysis of adverbial readings with adnominal jeweils. First, the discussion focusses on general licensing conditions for the availability of adverbial readings with adnominal elements. The discussion proceeds to show that the adverbial reading of adnominal jeweils can be derived from surface structure, using a newly introduced semantic mechanism of crosswise λ-abstraction. In a third step, the analysis is applied cross-linguistically, suggesting that crosswise λ-abstraction is a universal semantic process. Finally the semantic mechanism of crosswise λ-abstraction is shown to be applicable in a range of constructions which are at first sight unrelated to constructions with jeweils.

Chapter VI summarises the main results of the thesis.