APPOSITION AND THE STRUCTURE OF DISCOURSE

by

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ABSTRACT OF THE DISSERTATION

Apposition and the Structure of Discourse

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The current dissertation focuses on two interpretational properties of APPOSITIVE CON-STRUCTIONS: (i) their (often) NOT-AT-ISSUE status, i.e. the fact that they can be perceived as secondary to the main point of the utterance, and (ii) their PROJECTION behavior, i.e. the fact that they typically escape the scope of external operators (e.g. Chierchia & McConnell-Ginet 2000, Potts 2005).

I analyze appositive constructions as adjuncts (e.g. Jackendoff 1977, Potts 2005) which are interpreted as in-situ conjuncts. Root clauses, appositive relative clauses, and possibly all appositive constructions are assumed to form FORCE PHRASES (see Rizzi 1997, Krifka 2001). Force heads are operators which introduce a fresh variable for the proposition of their scope. Since lexical expressions (operators or predicates) are relativized to propositional variables, Force heads can bind into the lexical expressions in their syntactic scope (cf. Stone 1999, Stone & Hardt 1999). This mechanism keeps apart appositive content from main clause content and is key to explaining the exceptional properties of appositives mentioned above. First, propositional variables introduced by Force heads express proposals to update the context set. The fact that appositive proposals are usually introduced *before* main clause proposals explains why appositives are often not at-issue: all proposals associated with a sentence are silently accepted except the one introduced *last*, which is at-issue. Second, similarly to Force heads, lexical operators introduce propositional variables for the

content of their scope, but, unlike Force heads, can be bound and thus interact with higher operators. Since appositives form separate ForcePs, their interpretation does not depend on whether or not they appear in the syntactic scope of higher operators such as negation or modals. In other words, appositive content necessarily projects.

The proposed analysis is embedded into a discourse model in which SPEECH CONTEXTS keep track of individual speech participants, their discourse commitments, and the context set (see Stalnaker 1978, Kaplan 1989, Farkas & Bruce 2010). The analysis is fleshed out in UPDATE WITH SPEECH CONTEXTS, an update logic in which the formal mechanisms of interpreting formulas and restricting the context set are kept separate (see also AnderBois et al. 2010, Murray 2010, Bittner 2011).

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Maria Bittner is the person whose non-standard way of approaching linguistic phenomena was possibly the biggest inspiration of my graduate career. I am indebted to Maria for teaching me so much about dynamic semantics, emphasizing the importance of taking a crosslinguistic perspective, and keeping my feet to the fire when it came to how the formal system captures the language data.

Kristen Syrett was a godsend. She appeared in exactly the right time to offer her expertise in experimental data collection in semantics-pragmatics and forward my research. I would like to express my gratitude to Kristen for teaching me how to do experimental research in linguistics, her fine intuitions about language examples, her criticism of the broader claims of the dissertation, and, most of all, her untamable optimism despite some bumps on the road.

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Chapter 1

Introduction

APPOSITIVE CONSTRUCTIONS are non-selected constituents that are set off from the rest of the sentence by intonation breaks. Appositives are felt not to be fully integrated into the sentence and indeed, they exhibit a range of notable properties that in many ways challenge standard assumptions about linguistic form and meaning. The current dissertation focuses on two of their interpretational properties: (i) their (often) NOT-AT-ISSUE status, i.e. the fact that they can be perceived as secondary to the main point of the utterance, and (ii) their PROJECTION behavior, i.e. the fact that they typically escape the scope of external operators.

The properties of not-at-issueness and projection appear even more puzzling when evaluated in conjunction with other semantic properties exhibited by appositives. The major goal of the current dissertation is to reconcile two pairs of apparently incompatible properties of appositives. The first pair of properties concerns truth-conditional import and not-at-issue status. It is largely accepted in the literature that appositives make a purely truth-conditional contribution to the sentence in which they appear (see Frege 1892/1980, Böer & Lycan 1976, Rodman 1976, Sells 1985, Kamp & Reyle 1993, Chierchia & McConnell-Ginet 2000, Schlenker 2009, ms, AnderBois et al. 2010, Koev 2012, Syrett et al. ms, a.o.). For example, the sentence in (1) is judged neither true (by means of ignoring the false

information contributed by the appositive) nor lacking a truth value (by means of stating something true and something false) but is rather judged false.[1]

(1)   Rutgers, <u>a maximum security prison</u>, is located in New Jersey.

Having truth-conditional status is a fairly unexciting-looking property that barely needs any mentioning. However, it becomes significant when noticing that appositives are often (though not always: see Chapter 2) not at-issue (see Chierchia & McConnell-Ginet 2000, Potts 2005, Schlenker 2009, ms, AnderBois et al. 2010, Koev 2012, Syrett et al. ms). That is, the content expressed by the appositive is often perceived as disjoint from the main point of the utterance, the latter being typically associated with the root sentence. For example, the direct rejection in (2) can only pick up on the main clause, not the appositive: the rejection can be understood to mean "Edna has not started the descent" but not "Edna is not a fearless leader".

(2)   A: Edna, <u>a fearless leader</u>, started the descent.
        B: No, that's not true.

Since truth-conditional status is standardly identified with at-issue content, any satisfactory semantic account of appositives has to provide an explanation for why such constructions can express truth-conditional content that is not at-issue.

The second pair of surprising properties involves in-situ interpretation and projection. Potts (2005), Arnold (2007), and AnderBois et al. (2010) notice that appositives are interpreted in surface position, as demonstrated by their participation in order-dependent phenomena such as discourse anaphora, presupposition, and ellipsis. For example, the anaphoric dependences in (3) observe linear order, i.e. the anaphors (indicated by subscripts) follow their antecedents (indicated by superscripts), and the sentence is felicitous.

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[1]For ease of readability, appositives and other parenthetical constructions will be underlined in linguistic examples.

The anaphoric links are broken if the appositive is processed as entirely preceding (as in (3a)) or entirely following (as in (3b)) the rest of the sentence.[2]

(3) John^u, <u>who$_u$ nearly killed a^v woman with his$_u$ car</u>, visited her$_v$ in the hospital.

<div align="right">(AnderBois et al. 2010)</div>

    a.   ?? He$_u$ nearly killed a^v woman with his$_u$ car and John^u visited her$_v$ in the hospital.

    b.   # John^u visited her$_v$ in the hospital and he$_u$ nearly killed a^v woman with his$_u$ car.

Although these data argue against interpreting appositives as separate from the rest of the sentence, in-situ interpretation appears insignificant in and of itself. However, it is not immediately clear how this property can be reconciled with the observation that appositives typically project (see Keenan 1971, Böer & Lycan 1976, Cornilescu 1981, Demirdache 1991, Chierchia & McConnell-Ginet 2000, Dever 2001, Del Gobbo 2003, Potts 2005, Koev to appear; see also Thompson 1971, Wang et al. 2006, Amaral et al. 2007, Harris & Potts 2009, Schlenker 2009, ms, Sæbø 2011, Nouwen to appear for potential exceptions to appositive projection). If embedded under an operator, the implication triggered by the appositive in (3) is not affected and survives.[3]

(4) It's **not** true that John, <u>who nearly killed a woman with his car</u>, visited her in the hospital.

A good semantic account of appositives has then to come to terms with the fact that appositives are interpreted as integrated into the sentence with respect to order-dependent phenomena but nevertheless the implications they trigger project.[4]

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[2]Linguistic examples were typically tested on several native speakers and the judgments obtained were approximated as acceptable (no marking), marginally acceptable (?), severely degraded (??), or syntactically or pragmatically unacceptable (* or #, respectively).

[3]Throughout the dissertation, important parts in linguistic examples will be highlighted in bold face.

[4]Roger Schwarzschild notes that the combination of in-situ interpretation and projection is already exhibited by *presupposed* material (cf. 'Michael^u admitted that he$_u$ cheated on Rebecca^v, but I don't think she$_v$'ll forgive him'). However, appositive content is typically discourse-new (see Chapter 2) and has a more robust projection pattern (see Chapter 4), and thus it merits an independent treatment.

The proposal defended in this dissertation views appositive constructions as adjuncts which receive a conjunctive interpretation (cf. Jackendoff 1977, Kayne 1994, de Vries 2002, 2006, Potts 2005, Citko 2008). From this assumption, the truth-conditional status and in-situ interpretation follow directly. What about their not-at-issue status and projection behavior? At the heart of the explanation of those two properties lies the single assumption that root clauses, appositive relative clauses (ARCs), and possibly all appositive construc- tions are FORCE PHRASES (ForcePs; see Rizzi 1997, 2004, Cinque 1999, Krifka 2001, to appear). ForcePs mark constituents for the type of speech act performed when they are uttered. A sentence with an ARC will then contain two ForcePs, as (5) below illustrates.

(5)   a.   Abigail, <u>who stole some money</u>, ran away.
       b.
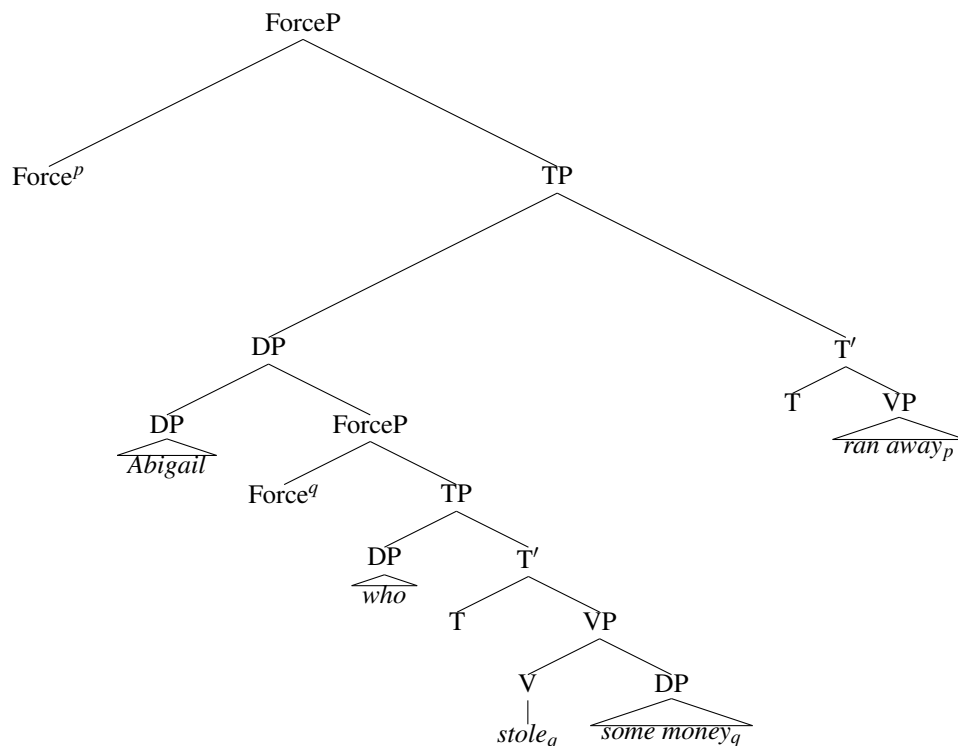
Crucially, an (assertively specified) Force head is treated as an operator which introduces a *fresh* propositional variable for the content of the constituent in its scope (cf. Stone 1999, Stone & Hardt 1999). Force heads bind into the lexical expressions (operators such as nega- tion or predicates such as 'rich') in their syntactic scope. This is possible because lexical expressions are relativized to propositional variables: in (5), lexical predicates found in the

main clause are relativized to *p* and lexical predicates found in the appositive are relativized to *q*. This mechanism keeps apart appositive content from main clause content and points towards an explanation of the exceptional properties appositives have. First, propositional variables introduced by Force heads are associated with proposals to update the context set. The fact that appositive proposals are usually decided *before* main clause proposals is used to explain why appositives are typically not at-issue (see Chapter 2). Second, lexical operators introduce propositional variables on their own for the content of their scope but, in addition, can be bound by higher operators, including Force. Since appositives form separate ForcePs, their content cannot be bound from outside and necessarily projects (see Chapter 4).

Beyond the empirical focus on appositives constructions, this dissertation adopts a discourse model which takes as a cornerstone Stalnaker's view of discourse development. According to Stalnaker (1974, 1978, 1999, 2002), an act of assertion proposes to reduce the CONTEXT SET, i.e. the set of possible worlds representing the shared assumptions among speech participants, to the worlds in which the asserted proposition holds. In order to formally capture the notion of a proposal, I add to Stalnaker's view the notion of individual DISCOURSE COMMITMENTS, modeled as sets of worlds and expressing the public commitments of speech participants (see Gunlogson 2001, Farkas & Bruce 2010, Farkas & Roelofsen ms). But once individual discourse commitments are added to the discourse model, the notions of the speaker and the hearer (as understood in Kaplan 1989) become unavoidable, for both theoretical and empirical reasons.

Theoretically, individual discourse commitments can be regarded as bridging between the Stalnakerian context set and the parameters of the Kaplanian speech context. Since speech participants are usually committed to more information than is recorded by the context set, their discourse commitments need to be included in the context set at any point of the conversation. At the same time, it is not possible to talk about individual discourse commitments without making reference to their agents, i.e. the speaker and the hearer. There

are also empirical cues that languages treat individual discourse commitments and speech participants as connected. In Chapter 5, I argue that perspective shift of English appositives (see Thompson 1971, Amaral et al. 2007, Harris & Potts 2009) and perspective shift of indexical pronouns in some languages (see Rice 1986, Speas 1999, Schlenker 2003, Anand & Nevins 2004, Anand 2006) are only possible in environments in which the existence of a reported speech context can be implied (typically in the presence of verbs of saying). Since shifted appositives attribute discourse commitments to agents not present in the utterance context and shifted indexical pronouns refer to those agents, the two phenomena can be treated in parallel if individual discourse commitments and speech participants are part of the same formal object. These theoretical and empirical considerations call for a unified notion of a SPEECH CONTEXT which includes both Kaplanian and Stalnakerian coordinates. For the purposes of this dissertation, I define it as a quintuple consisting of the speaker and the hearer, their individual discourse commitments, and the context set.

(6) $c = \langle \underbrace{c_{SP}, c_{HR}}_{\text{Kaplanian coordinates}}, \underbrace{c_{DC.of.SP}, c_{DC.of.HR}, c_{CS}}_{\text{Stalnakerian coordinates}} \rangle$ (speech context)

The presence of individual discourse commitments enables us to define the notion of a PROPOSAL, mentioned above, as a public commitment that has been made by a speech participant. The related notions of an acceptance, a rejection, and a counterproposal are defined on its basis. Given that, the central term AT-ISSUE CONTENT is defined as content that has been proposed to restrict the context set but has not yet been accepted or rejected. At-issue status is short-lived: it only holds at a given point in discourse. After a proposal has been accepted or rejected, it is no longer at-issue. The fact that the same semantic content can be at-issue and not at-issue at different points in discourse turns out to obviate the need to postulate not-at-issue content or related concepts as a separate level of meaning (contra Potts 2005, AnderBois et al. 2010, Murray 2010). As far as theory goes, "not-at-issue content" has no role to play, at least for the case of appositives. The fact that asserted content can be not at-issue falls out from the interaction between at-issue content

and discourse structure.

This discourse model affords us enough flexibility to explain the sensitivity of ARCs to linear position. In (2) above we demonstrated that such clauses cannot be a target of direct responses in discourse and thus behave like content that is not at-issue. This only seems true for sentence-medial ARCs, though. Sentence-final ARCs are open to direct responses and thus behave like at-issue content (see AnderBois et al. 2010, Koev 2012, Syrett et al. ms).

(7)   A: Jack invited Edna, <u>who is a fearless leader</u>.
         B: That's not true. (She is a coward.)

The fact that final ARCs can acquire at-issue status is explained by the assumption that only the proposal that has been introduced *last* in discourse is at-issue. Since proposals associated with final ARCs can be introduced after the proposal associated with the main clause, they become at-issue.

The current discourse model is fleshed out in an update logic called UPDATE WITH SPEECH CONTEXTS (USC). In contrast to the standard view that dynamic interpretation amounts to narrowing down the context set with the content introduced, in USC formulas can be interpreted *without* affecting the context set (see also AnderBois et al. 2010, Murray 2010, Bittner 2011). Restricting the context set by semantic content requires a special update which is effected only if the hearer does not object to what has been uttered. Such updates need not be morphologically manifested and could be triggered by the discourse constraints on deciding proposals. Logical representations can thus be augmented in a systematic way with automatic updates which ensure that certain discourse constraints are met.

The current work informs our understanding of appositive constructions and discourse structure in various ways. It demonstrates that not-at-issue status and projection behavior is not a random combination of properties in appositives. Rather, the combination is expected, given the claim that appositives form ForcePs. The current work also implies that those

two properties need not be independently postulated: they are explained out in terms of the grammatical status of appositives and some general principles of discourse dynamics.

The structure of the dissertation is as follows. Chapter 2 discusses the truth-conditional and information status of ARCs. It also motivates the discourse model sketched above and introduces the USC logic. Chapter 3 summarizes two experiments of Syrett et al. (ms) and brings in robust evidence for the empirical claims made in Chapter 2. Chapter 4 is devoted to the projection properties of ARCs. Exceptions to appositive projection, including perspective shift in ARCs, are discussed in Chapter 5. Chapter 6 briefly discusses the syntactic assumptions made about ARCs and offers a short compositional fragment of English. This chapter also develops Compositional USC. Chapter 7 goes beyond ARCs: it offers a quick look into the semantic properties of nominal appositives and slifting parentheticals and evaluates the theoretical account against this broader empirical view.

Chapter 2

Discourse and not-at-issueness: The information status of appositive relative clauses

1 Introduction

Existing semantic accounts assume that APPOSITIVE RELATIVE CLAUSES (ARCs) express content that is asserted while at the same time is perceived as "deemphasized", "backgrounded", or "secondary" (see Böer & Lycan 1976, Bach 1999, Chierchia & McConnell-Ginet 2000, Potts 2005, AnderBois et al. 2010, Murray 2010, Schlenker ms). Such secondary semantic content is often called NOT-AT-ISSUE and is distinguished from the AT-ISSUE assertion of the utterance, typically expressed by the main clause.

The major goal of this chapter is to explain the supposed not-at-issue information status of ARCs. The discussion starts off with the observation, previously noted in AnderBois et al. (2010), that the information status of ARCs depends on their linear position in the sentence. That is, when the ARC occurs SENTENCE-MEDIALLY, as in (1), it is not at-issue whereas when it occurs in a SENTENCE-FINAL position, as in (2), it can be at-issue.

(1) Messi, who once scored a goal with his hand, won the Ballon d'Or.

(2) Everybody admires Messi, who once scored a goal with his hand.

The account is built around the idea that the information status of ARCs is contingent upon the order in which asserted information is put forward and assessed in discourse. The point of departure is Stalnaker's famous model of discourse development. In a series of papers (see Stalnaker 1974, 1978, 1999, 2002) Stalnaker develops the idea that an act of assertion reduces the context set, i.e. the set of worlds representing the shared assumptions among discourse participants, to the worlds in which the asserted proposition holds. In his own words:

> "[...] To make an assertion is to reduce the context set in a particular way, provided that there are no objections from the other participants in the conversation. The particular way in which the context set is reduced is that all of the possible situations incompatible with what is said are eliminated." (Stalnaker 1978:323)

The escape clause, "provided that there are no objections from the other participants in the conversation", is further elaborated on in his 1999 paper. From this later paper it is clear that Stalnaker views the act of assertion as a *proposal* on part of the speaker to reduce the context set. This proposal can be accepted or rejected by the hearer and only in the former case will the context set be affected. Stalnaker writes:

> "An assertion can then be understood as a proposal to alter the context by adding the information that is the content of the assertion to the body of information that defines the context, or equivalently, by eliminating from the context set—the set of possible worlds available for speakers to distinguish between—those possible worlds in which the proposition expressed in the assertion is false." (Stalnaker 1999:99)
>
> "[...] the addressee accepts or rejects the proposal either adding the content of the assertion to the contextual information, or leaving the context as it was [...]." (Stalnaker 1999:102)

Various scholars have further explored the consequences of the view that the act of assertion is a two-stage process which consists of a proposal and an acceptance (see Groenendijk & Roelofsen 2009, AnderBois et al. 2010, Farkas & Bruce 2010, Murray 2010,

Koev 2012, Farkas & Roelofsen ms). The current account, which elaborates on Koev (2012), is one such attempt. According to it, both main clauses and ARCs express asserted content that introduces proposals to narrow down the context set in a specific way. However, the ARC content often appears not at-issue because of the discourse rules governing the timing of introducing and accepting proposals. In particular, after the sentence has been uttered, a medial ARC is not at-issue, because the proposal associated with it must—according to the discourse rules—already have been decided. In contrast, a sentence-final ARC can become at-issue if the proposal introduced by the main clause has been (silently) accepted.

The discourse model outlined above allows us to offer a definition of at-issue content. According to the view defended in this dissertation, at-issue content is a proposal that has been introduced but has not yet been accepted or rejected at the given stage of the conversation. This definition has two important consequences. First, at-issue content is not an absolute notion but is *relative* to the given stage of the conversation. For example, a previously uttered sentence might be not at-issue from the current point of discourse even though it had been at-issue immediately after it was uttered. Second, the definition of at-issue content gives us a clue about the way not-at-issue content could arise. Content could be not at-issue at a given stage just because it is *no more* at-issue at that stage, not because it is marked as "not-at-issue" in the grammar.

The current chapter is structured as follows. Section 2 argues that ARCs make a purely truth-conditional contribution to the sentence in which they appear. In Section 3 I motivate the difference in information status between medial and final ARCs on basis of one standard empirical test for information status: the DIRECT RESPONSE TEST. I also discuss other tests that have been proposed in the literature: the ANSWERABILITY TEST, the QUESTION FORMATION TEST, and the 'THEN'-TEST. I argue that those tests are either subspecies of the Direct Response Test or they do not reliably distinguish between at-issue and not-at-issue content. Section 4 introduces the formal account. It presents UP-

DATE WITH SPEECH CONTEXTS (USC), a typed dynamic logic, and offers an explanation of why and under what conditions ARCs are not at-issue. The discussion on the information status of ARCs naturally leads to a precise definition of at-issue content. Finally, in Section 5 three previous approaches to not-at-issue content are critically examined: the DISCOURSE TOPIC APPROACH of Roberts et al. (2009) and Simons et al. (2010), the DIRECT UPDATE APPROACH of AnderBois et al. (2010) (see also Murray 2010), and the ANAPHORIC APPROACH of Jayez & Rossari (2004) and Murray (2010).

2 The truth-conditional contribution of ARCs

In this section I argue that ARCs express truth-conditional content. This claim is supported by data already present in the literature as well as the experimental findings in Syrett et al. (ms).

The overall consensus in the literature is that ARCs (or appositive constructions in general) make a purely truth-conditional contribution to the sentence in which they appear. This view is defended, in one form or another, in Frege (1892/1980), Böer & Lycan (1976), Rodman (1976), Sells (1985), Kamp & Reyle (1993), Chierchia & McConnell-Ginet (2000), Potts (2005), Schlenker (2009, ms), AnderBois et al. (2010), a.o. Following the lead of these authors, I will claim that (declarative) ARCs are regular assertions and thus express truth-conditional content.[1]

The assertive nature of ARCs is somewhat obscured by the fact that they also possess several semantic properties that are not usually associated with asserted content, including the fact that ARCs are often (though not always) not at-issue and the fact that ARCs typically project out of external operators. The bulk of the current chapter is devoted to explaining the former property and Chapter 4 takes up the latter property. The general point

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[1]ARCs expressing other speech acts are discussed in Section 3.3 and Section 4.6 of the current chapter.

is that not-at-issue status and projection behavior do not preclude the possibility that ARCs express asserted content.

A first hint at the assertive nature of ARCs is the fact that those constructions can introduce new information. Chierchia & McConnell-Ginet (2000) illustrate the point by the following short discourse.

(3) Let me tell you about Jill Jensen,a woman I met while flying from Ithaca to NY last week.
     Jill, who lost something on the flight from Ithaca to NY, likes to travel by train.
                                                  (Chierchia & McConnell-Ginet 2000)

Here it is clear that Jill Jensen is introduced for the first time in discourse, so the ARC in the second sentence can only express new information. Potts (2005) makes an even stronger claim. He argues that ARCs *must* express new information, which he generalizes as the ANTIBACKGROUNDING REQUIREMENT. For example, in (4) the semantic contribution of the ARC is discourse-old and the entire discourse is infelicitous.

(4) Lance Armstrong survived cancer.
     # When reporters interview Lance, who is a cancer survivor, he often talks about the disease.   (Potts 2005, slightly modified)

Yet, this requirement is not parochial to ARCs but rather governs the use of asserted content in general. The discourse in (4) can easily be transformed into a discourse in which the appositive content is expressed by a main clause with an equally infelicitous result.

(5) Lance Armstrong survived cancer.
     # Lance is a cancer survivor, so when reporters interview him, he often talks about the disease.

In fact, an antibackgrounding requirement which prohibits that asserted context is entailed by the context set has already been proposed in Stalnaker (1973, 1978) as a regulatory principle on asserted content.[2] Thus, in obeying such a requirement ARCs behave just like asserted content.

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[2]Stalnaker's formulations go as follows:

Also, if ARCs are asserted, we expect that a false ARC would render the entire sentence false. Frege (1892/1980) was the first to claim that a sentence as in (6) is false as soon as either the main clause or the ARC is false.

(6)   Napoleon, who recognized the danger to his right flank, himself led his guards against the enemy position.   (Frege 1892/1980)

The intuition that the sentence above is false is pervasive. Yet, truth-value intuitions are notoriously difficult to distinguish from other forms of unacceptability. Fortunately, there is experimental data to bolster the claim that ARCs are truth-conditional (see Syrett et al. ms, summarized in Chapter 3).

3 Diagnosing not-at-issue content

In this section I discuss four potential empirical diagnostics for not-at-issue content: the Direct Response Test, the Answerability Test, the Question Formation Test, and the 'then'-Test. The upshot of the discussion is that only the Direct Response Test constitutes a genuine diagnostic for not-at-issue content. The Answerability Test is a weak diagnostic for not-at-issue content, at best: it distinguishes between at-issue and not-at-issue content for reasons that seem independent of the nature of the test. The Question Formation Test will be regarded as a special case of the Direct Response Test. Finally, the 'then'-Test will be found to lack a solid empirical foundation. The proposed diagnostics demonstrate that the information status of ARCs considerably differs depending on their surface position: in sentence-medial position ARCs are invariably not at-issue while in sentence-final position they can be at-issue.

"Obviously, by asserting something, a person acts as if he does *not* take it for granted." (Stalnaker 1973:454)
"A proposition asserted is always true in some but not all of the possible worlds in the context set." (Stalnaker 1978:325)

3.1 The Direct Response Test

The most widely used diagnostic for detecting information status relies on the relative availability of semantic content for direct responses. If the primary assertion of the sentence excludes content that is not-at-issue, one would expect that the latter is not directly accessible for agreement or disagreement in subsequent discourse. I call this the DIRECT RESPONSE TEST and define it as follows.

(7)   DIRECT RESPONSE TEST
      Only at-issue content can be directly targeted in subsequent discourse.

In order to be able to work with this test, we need to explicate the notion of a direct target. Direct targeting occurs when the addressee responds to what has been said without disrupting the natural flow of conversation. Direct responses signal straightforward agreement or disagreement and are typically expressed in English by 'I agree', 'That's not true', etc. Direct responses are often flagged by polarity particles like 'Yes', 'No', 'Maybe', etc.

The Direct Response Test is known under different names in the literature, such as the CHALLENGEABILITY TEST (see Faller 2002) or the ASSENT/DISSENT TEST (see Papafragou 2006). This test has previously been applied to various empirical domains as a diagnostic for whether the semantic import of a given element is part of the main assertion of the sentence. Those elements include presuppositions (see Strawson 1950, Shanon 1976, Karttunen & Peters 1979, Chierchia & McConnell-Ginet 2000), epistemic modals (see Lyons 1977, Papafragou 2000, 2006, von Fintel & Gillies 2007), evidential markers (see Faller 2002, Matthewson et al. 2007, Murray 2010, Koev 2011), and appositive constructions (see Amaral et al. 2007, AnderBois et al. 2010, Koev 2012, Tonhauser 2012).

One should draw a clear line between direct and *indirect* responses. To be sure, it is possible for the addressee to also target not-at-issue content, though only indirectly. The mechanism of indirect targeting has a more severe conversational effect: it disrupts the natural flow of discourse, giving rise to the intuition that information that has already been accepted needs to be withdrawn. It also involves different grammatical tools: indirect re-

sponses are flagged by hedges like 'Actually, ...', 'Well, ...', etc.

Some authors add to the list of indirect responses the 'Hey, wait a minute' hedge (e.g. Amaral et al. 2007, Roberts et al. 2009). This response (or variations thereof) was originally introduced as a means of distinguishing asserted from presupposed content (see Shanon 1976, von Fintel 2004).[3] The claim is that by uttering 'Hey, wait a minute' the hearer cannot address the main assertion of the sentence but can felicitously target its presuppositions. This is illustrated in (8), where the response can only target the presupposition of the sentence (i.e. that some mathematician proved the Goldbach's Conjecture) but not its assertion (i.e. that this mathematician was a woman).

(8)   A: The mathematician who proved Goldbach's Conjecture is a woman.
       B: Hey, wait a minute. I had no idea that someone proved Goldbach's Conjecture.
       B′: # Hey, wait a minute. I had no idea that that was a woman.

(von Fintel 2004)

Since presuppositions typically express content that is not at-issue, one might conjecture that the 'Hey, wait a minute' response uniquely identifies not-at-issue content of any type. However, there is experimental evidence that seems to argue against this broader claim. In their Experiment 1 Syrett et al. (ms) presented participants with sets of sentences representing a brief dialogue between two interlocuters in which the speaker delivered an utterance of a sentence with appositives and the hearer rejected part of the content. For any given test item, the hearer rejected either the appositive content or the main clause content. Participants were given a forced choice between two forms of a rejection: either a direct rejection, introduced by 'That's not true', or an indirect rejection, introduced by 'Hey, wait a minute'. Expectedly, participants overwhelmingly choose indirect rejections when targeting appositives. However, and more importantly for our purposes, participants

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[3]To be precise, Shanon's (1976) claim was that this response identifies pragmatic presuppositions but is infelicitous with semantic presuppositions and assertions. See also Pearson (2010).

choose this same response approximately half of the time to reject the main clause.[4] These findings suggest that rejections prefixed with 'Hey, wait a minute' do not uniquely identify not-at-issue content but are largely felicitous when targeting at-issue content.

Why would that be? One potential explanation is that 'Hey, wait a minute' bears an element of surprise signaling that the speaker expectations had not been met. Surprise can be triggered more easily by presupposed content, since such content is conventionally flagged as discourse-old. This would explain the data in (8). Yet surprise could potentially be also triggered by asserted content. Whatever the exact appropriateness conditions for the use of 'Hey, wait a minute' might be, this response does not seem to tap into the at-issue/not-at-issue distinction. More broadly, this raises the question about the extent to which other alleged indirect response markers (such as 'Actually...', 'Well...', etc.) are compatible with targeting at-issue content.

Let us now see how the Direct Response Test can be applied to sentences with ARCs and what results it delivers. Tonhauser (2012) distinguishes between three different versions of the test which depend on the shape of the response. Here I focus on the first two.[5] The first version involves simple direct responses (e.g. 'Not really'), and the second version involves responses which make it explicit which part of the sentence is targeted (e.g. 'No, he is not a thief'). Starting with sentences in which the ARC occurs medially, let us apply the first version of the test. In (9), the rejection can only target the main clause content. That is, the hearer rejects the information that Edna started the descent, not the information that Edna is a fearless leader.

(9)   A: Edna, <u>who is a fearless leader</u>, started the descent.
        B: That's not true.   (cf. Amaral et al. 2007)

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[4]See Syrett et al. (ms) for more details.

[5]Tonhauser's third version of the test, previously discussed in Karttunen & Peters (1979), involves responses consisting of a simple direct response followed by an adversative clause, e.g. 'That's true, but he is not my brother'. It seems to me that such responses combine direct responses (the 'That's true' part) with indirect responses (the 'but'-clause). Since the Direct Response Test, as defined in (7), says nothing about *indirect* responses, I will ignore this last version of the test.

Applying the second version of the test to the same opening sentence leads to the same result. From the data in (10) it is clear that explicit direct replies can only target the main clause and not the appositive.

(10)   A: Edna, <u>who is a fearless leader</u>, started the descent.

            B: # No, she isn't. (She is a coward.)

            B′: No, she didn't. (Someone else did.)   (cf. Amaral et al. 2007)

In short, medial ARCs disallow direct responses throughout. According to the Direct Reply Test, they are not at-issue.

Next, I apply the two versions of the test to sentences with final ARCs. In (11), there is a slight preference for B's response to target the main clause content, i.e. the information that Jack invited Edna. However, B's response can also felicitously target the appositive content, i.e. the information that Edna is a fearless leader.

(11)   A: Jack invited Edna, <u>who is a fearless leader</u>.

            B: That's not true.

Those intuitions are confirmed by the second version of the test, one that includes explicit replies. As (12) shows, explicit direct replies can target either the main clause or the appositive.

(12)   A: Jack invited Edna, <u>who is a fearless leader</u>.

            B: No, he didn't. (Jack invited someone else.)

            B′: No, she isn't. (She is a coward.)

Given the Direct Response Test, we conclude that final ARCs can readily assume at-issue status. This is consistent with the findings in Syrett et al. (ms), summarized in Chapter 3.

In this section, we have used the Direct Response Test to demonstrate that main clauses appear to be invariably at-issue. The status of ARCs varies depending on their linear position: while medial ARCs are not at-issue, final ARCs can be at-issue.

3.2 The Answerability Test

Another diagnostic for information status is based on the claimed inability of not-at-issue content to address and resolve questions (see AnderBois et al. 2010, Simons et al. 2010, Tonhauser 2012). I call this test the ANSWERABILITY TEST and define it as follows.

(13) ANSWERABILITY TEST
Only at-issue content can be employed by interlocutors to decide between question alternatives.

Since questions await answers and thus explicitly set conversation topics, this test is sometimes framed more generally as the inability of not-at-issue content to address the main topic of the conversation, also known as the QUESTION UNDER DISCUSSION (QUD; see Ginzburg 1996, Roberts 1996, Büring 2003, Farkas & Bruce 2010, Simons et al. 2010). However, in the absence of independent ways for determining what the QUD is at a given point of the conversation, I prefer to formulate the test in the more specific terms of explicit questions.[6]

At first blush, it appears that ARCs fail the Answerability Test and thus behave like not-at-issue content. When a singleton question is asked, neither medial nor final ARCs can felicitously answer it.[7]

(14)   A: What disease did Tammy's husband have?
        B: ?? Tammy's husband, who had prostate cancer, was treated at the Dominican Hospital.
        B′: ?? The doctors of the Dominican Hospital treated Tammy's husband, who had prostate cancer.

Such findings are surprising for at least two reasons. First, it is unclear why appositives, which typically add new information to the common ground, should not be able to decide between question alternatives. Second, we would need to explain why final ARCs can be

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[6]See Section 5.1 below for a review of theoretical accounts that try to explain information status in terms of the QUD.

[7]The two examples below are based on similar examples in AnderBois et al. (2010).

at-issue with respect to the Direct Response Test (see Section 3.1) but are not at-issue with respect to the Answerability Test.

One common property of the answers in (14) is that they provide more information than is required by the question: the information provided by the main clause seems superfluous. A way around this problem is to frame the dialogue in such a way that it involves two questions. When a conjoined question is asked such that the main clause answers one part and the appositive answers the other, the problem of too much information is eliminated and the judgments improve dramatically.[8]

(15) A: What did Paula bring and when did she leave the party?
      B: ? Paula, who brought cookies, left after midnight.[9]

(16) A: Who did you meet at the party and what did she bring?
      B: I met Paula, who brought cookies.

The generalization that seems to emerge is that ARCs can in general answer questions, although this appears to be slightly more difficult for medial ARCs than for final ARCs. The additional examples cited below confirm this generalization.

(17) A: What books did Jack and Jill buy and how much did they pay?
      B: ? Jack, who bought The Lord of the Rings, paid $8, and Jill, who bought A Game Of Thrones, paid $12.

(18) A: What kind of linguist married Susan?
      B: ? Ryan, who does semantics, married her.   (Katy McKinney-Bock, p.c.)

(19) Q: Who's coming to the dinner tonight?
      A: Well, I haven't talked to Charles, who probably won't be able to come, but I did talk to Sally, who is coming.   (Simons et al. 2010)

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[8]I owe the idea of using conjoined questions in this context to Veneeta Dayal.
[9]This sentence was marked as '??' in Koev (2012). However, after consulting with more informants, I found out that such responses are marginally acceptable.

In order to explain these data, I would like to claim that appositive content can in general answer questions.[10] However, there are independent factors that could mask this fact. For example, we already noticed that medial ARCs are somewhat degraded when addressing questions. Why should that be? I will assume that there exists a (weak) pragmatic requirement that answers to questions be left open for discussion. Since medial ARCs are not at-issue and thus not open for discussion (see Section 3.1 above for motivation and Section 4.4 below for an account), they are expected to represent not entirely natural linguistic means for answering questions. In contrast, final ARCs can be at-issue and thus are correctly predicted to be able to address questions.

This line of reasoning suggests that the Answerability Test is not a very reliable tool for diagnosing information status. In general, appositives can felicitously answer questions. However, for the reasons discussed above, appositives expressing not-at-issue content are less suitable for achieving this task. Although the Answerability Test offers a working (though not very sharp) diagnostic for not-at-issueness, it does so for reasons that have little to do with the nature of the test, which is deciding between question alternatives. This is why I will maintain the test as an empirical diagnostic but it will play no role in the theoretical account presented below.

3.3 The Question Formation Test

Amaral et al. (2007) and Tonhauser (2012) propose yet another diagnostic for not-at-issue content. They notice that when an interrogative sentence with appositives is uttered, it is only the main clause content that determines the relevant set of alternatives while the appositive content does not become part of the question. I call this the QUESTION FORMATION TEST and formulate it as follows.

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[10]The same is true about nominal appositives, as shown in Section 2.1 of Chapter 7.

(20) QUESTION FORMATION TEST
      In questions, only at-issue content determines the set of alternative answers.

The workings of the Question Formation Test are illustrated in the example below.

(21)   A: Has Edna, <u>who is a fearless leader</u>, started the descent?
         B: No, she hasn't started.
         B′: # No, she's not fearless.   (after Amaral et al. 2007)

In (21), the answer can only address the issue raised by the main clause, i.e. whether Edna has started the descent, not the additional issue of whether she is a fearless leader. According to the Question Formation Test, the main clause is at-issue while the ARC is not.

The Question Formation Test brings up the more general point of the illocutionary force associated with ARCs. According to some authors, ARCs accomplish a speech act that is independent of the speech act accomplished by the main clause (see Thorne 1972, McCawley 1988, Peterson 2004, Arnold 2007). For example, the main clause in (22) is interrogative and performs a question act, while the main clause in (23) is imperative and performs a request. Yet, in both cases the ARC is declarative and performs a different speech act, i.e. a statement.

(22) Has John, <u>who was talking to Mary a minute ago</u>, gone home? (McCawley 1988)

(23) Put the turkey, <u>which is in the refrigerator</u>, into the oven.   (McCawley 1988)

It seems plausible to assume that in such examples the primary speech act is performed by the main clause while the speech act performed by the ARC is in some sense secondary.

I would like to suggest that the Question Formation Test is really a subspecies of the Direct Response Test. This is despite the fact that the formulations of the two tests look fairly different. To see that, let us ask the following: For a given question, how can we determine the set of alternative answers that the Question Formation Test talks about? Of course by checking what answers can directly and naturally address that question. This achieves a shift in focus from a given question to its answers. Thus, if we extend the notion

of "direct target", mentioned in the formulation of the Direct Response Test, to include not only assertions but also questions, the Question Formation Test can be subsumed under the Direct Response Test. Direct responses can now be instantiated as rejections that target previous statements or answers that target previous questions.[11] The net effect of construing the Direct Response Test this broadly is that if a question can be directly answered, it is at-issue.

The Direct Response Test can now be applied to HYBRID SENTENCES, e.g. sentences in which the ARC performs a different speech act from that performed by the main clause, where a speech act is instantiated as either an assertion or a question.[12] The following examples illustrate the four basic cases for ARCs in different positions.[13]

(24)   A: Has Jack, <u>who was talking to Marcia a minute ago</u>, gone home?
                                                        (MC = Q, ARC = A)

  B: No, he hasn't.   (target = MC)
  B′:   # No, he wasn't.   (target = ARC)

(25)   A: Marcia, <u>whom Jack wanted to meet, didn't he?</u>, has just arrived.
                                                        (MC = A, ARC = Q)

  B: No, she hasn't.   (target = MC)
  B′:   ? No, he didn't.   (target = ARC)

(26)   A: Did you see Jack, <u>who was talking to Marcia a minute ago</u>?
                                                        (MC = Q, ARC = A)

  B: No, I didn't.   (target = MC)
  B′:   # No, he wasn't.   (target = ARC)

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[11]This is supported by the partial overlap of reactions to assertions and polar questions that exists in English, Romanian, and other languages (see Farkas & Bruce 2010).

[12]In Section 4.2 hybrid sentences are defined as being both informative and interrogative (cf. Groenendijk & Roelofsen 2009). As discussed in Section 4.6, not all combinations of declaratives and interrogatives meet the formal definition of hybrid sentences. But for now it would come in handy to think of such combinations as hybrid sentences.

[13]Below, MC abbreviates "main clause", A abbreviates "assertion", Q abbreviates "question", and a question mark at the end of a phrase indicates a rising boundary tone.

(27)　　A:　I invited Marcia, <u>whom Jack wanted to meet, didn't he?</u>

$\qquad$ (MC = A, ARC = Q)

　　　　B:　No, you didn't. $\qquad$ (target = MC)

　　　　B′:　No, he didn't. $\qquad$ (target = ARC)

Although some of the judgments are not easy, the overall pattern seems clear enough. One can make intuitive sense of this paradigm as follows. Medial ARCs, whether declarative or interrogative, are not easy targets of direct responses, as (24)-(25) demonstrate.[14] According to the Direct Response Test then, such ARCs are not-at-issue. Final ARCs can be at-issue only when they are interrogative, as in (27), but not when they are declarative and the host is interrogative, as in (26). Why would that be? I would like to suggest that this might be for syntactic reasons: the attachment possibilities in interrogative sentences are more limited than those in declarative sentences. The basic idea, to be made explicit in Section 4.6 below, is that in (26) the ARC can only be attached to its anchor and is thus not at-issue.

Notice that the ARCs in (25) and (27) are interrogative due to the presence of a question tag. Tag questions are known to carry a bias towards the proposition expressed by the host clause. It has been claimed that the bias is weaker when the tag is pronounced with a final rise as compared to cases in which the tag is pronounced with a final fall (see e.g. Reese 2007, Reese & Asher 2007). This is also true for interrogative appositives, which can be associated with two different boundary tones. When the question tag is pronounced with a final rise, as in (25) and (27) above, the bias towards the appositive content is weaker than when the question tag is pronounced with a final fall, as in (28) and (29) below. In this latter case, the appositive content is not open to direct responses independently of surface position and gives rise to assertion-type readings.

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[14]It still remains to be explained why interrogative medial ARCs are much better targets of direct responses than declarative medial ARCs are.

(28)   A: Marcia, <u>whom Jack wanted to meet, didn't he</u>, has just arrived.

(MC = A, ARC = Q)

        B: No, she hasn't.   (target = MC)

        B′: ?? No, he didn't.   (target = ARC)

(29)   A: I invited Marcia, <u>whom Jack wanted to meet, didn't he</u>.

(MC = A, ARC = Q)

        B: No, you didn't.   (target = MC)

        B′: ?? No, he didn't.   (target = ARC)

How does the assertion-type interpretation of interrogative ARCs arise? I will assume that in such cases appositive questions are automatically assigned an *implicit* positive answer, which could also explain their stronger bias (see above). When this happens, they are marked with a falling boundary tone and are roughly interpreted as question-answer pairs. Thus, (28A), repeated below as (30a), is equivalent in meaning to (30b), which roughly means the same as (30c).

(30)   a.   Marcia, <u>whom Jack wanted to meet, didn't he</u>, has just arrived.

        b.   Marcia, <u>whom Jack wanted to meet, didn't he?</u> (Yes), has just arrived.

        c.   Marcia, <u>whom Jack wanted to meet</u>, has just arrived.

The semantic effect of interrogative ARCs with a final fall is thus very similar to that of their declarative counterparts.

This default-answer strategy seems to only work with polar questions. ARCs expressing content questions typically trigger several alternatives and no default answer can be chosen. As a result, such ARCs cannot be pronounced with a final fall, as demonstrated in (31). They are generally felicitous with a final rise, as in (32), in which case they express genuine questions.

(31)   a.   ?? The invited speaker, <u>who recently visited which country</u>, has just arrived.

        b.   ?? Teresa met with the invited speaker, <u>who recently visited which country</u>.

(32)   a.   ? The invited speaker, <u>who recently visited which country?</u>, has just arrived.

        b.   Teresa met with the invited speaker, <u>who recently visited which country?</u>

In conclusion: In this section we found additional evidence for the claimed asymmetry between medial and final ARCs. Whether it performs an assertion or a question, an ARC is only accessible for direct responses if located at the end of the sentence.

3.4 The 'then'-Test and temporal progression in ARCs

The goal of this section is a negative one. I will investigate the hypothesis that the asymmetry between medial and final ARCs is reflected in their temporal properties as well (cf. Jespersen 1964, Cornilescu 1981, Depraetere 1996, Holler 2005, Loock 2007, AnderBois et al. 2010). I will find no good evidence in support of this hypothesis and will tentatively reject it. Despite the negative result, the findings of the section are important because they inform our understanding of the theory of temporal progression.

AnderBois et al. (2010) allege another, this time temporal diagnostic that could potentially distinguish between at-issue and not-at-issue content. They claim that in medial ARCs the temporal adverbial 'then' can only receive a cotemporal interpretation (roughly paraphrasable as "at that time") whereas in final ARCs 'then' most readily admits a sequential interpretation (roughly meaning "subsequently"). As empirical support, the authors cite the following two examples, both from COCA (see Davies 2008–).

(33) In fact, while she was filming Fresh Prince, her mother, <u>who **then** worked as a librarian</u>, would call her with Black history stories.

<div align="right">(medial ARC ⇒ cotemporal 'then')</div>

(34) Every springtime they migrate out of the sea and swim upriver to reproduce by giving birth to live young, <u>who **then** spend an undetermined amount of time living on land as what we call zucchini slugs.</u> (final ARC ⇒ sequential 'then')

Since sequential 'then' signals time advancement, AnderBois et al.'s claim could be generalized to the statement that the reference time can advance in final but not in medial

ARCs.[15] I formulate this as the following hypothesis.[16]

(35) POSITION-PROGRESSION DEPENDENCY (PPD)
ARCs can participate in temporal progression only if they occur in a sentence-final position.

The PPD hypothesis is in line with the older observation that final ARCs have adopted a special temporal use, often indicated by the presence of temporal adverbials. ARCs with such uses are traditionally referred to as CONTINUATIVE RELATIVE CLAUSES (see Jespersen 1964, Cornilescu 1981, Depraetere 1996, Holler 2005, Loock 2007).

The claim that the reference time can be advanced in final ARCs only is theoretically significant because it could teach us a great deal about the nature of temporal progression and the way this phenomenon taps into the at-issue/not-at-issue divide. After an extensive discussion of various potential arguments, I will be forced to conclude that there is not enough empirical evidence in support of the PPD hypothesis. As it turns out, ARCs in general seem to be able to put events on the main story line. But before going into the discussion, let me introduce the phenomenon of temporal progression and briefly review existing accounts of it.

3.4.1 The phenomenon of temporal progression

Jespersen (1924) noticed that aspectual distinctions play a crucial role in the temporal structure of discourse. He wrote:

> "The aorist carries the narrative on, it tells us what happened next, while the imperfect lingers over the conditions as they were at that time and expatiates on them with more or less of prolixity. One tense gives movement, the other a pause." (Jespersen 1924:276)

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[15]There are various notions of REFERENCE TIME and its grammatical and discourse dimensions (see Kamp & Reyle 1993, Kamp et al. 2011, Altshuler 2012). Here I follow Reichenbach (1947) and Klein (1994), a.o., in assuming that the reference time is the time to which the claim of the sentence is limited.

[16]Even more generally, one could state that only at-issue content can participate in temporal progression. The implications of this latter claim are immense and will not be explored here.

More recently, the same distinction has been taken up both in the discourse analysis literature (e.g. Hopper 1979, Dry 1981, Aristar Dry 1983, Reinhart 1984, Tomlin 1985, Depraetere 1996) and the formal semantics literature (see Kamp 1979, Kamp & Rohrer 1983, Kamp & Reyle 1993, Kamp et al. 2011, Partee 1984, Dowty 1986, Hinrichs 1986, Webber 1988, Lascarides & Asher 1993, Kehler 2002, Parsons 2002, Bittner 2008, Altshuler 2012). The strong intuition, already articulated by Jespersen, is that eventive sentences move the reference time forward whereas stative sentences describe a situation that holds at the current reference time. I will refer to cases in which the reference time moves forward as discourse progresses as cases of TEMPORAL PROGRESSION.[17]

An example of temporal progression and its dependence on the event-state aspectual distinction is provided in (36).

(36) A man entered the White Hart.   (initial event)
He was wearing a black jacket.   (following state ⇒ no temporal progression)
Bill served him a beer.   (following event ⇒ temporal progression)
(Kamp & Reyle 1993)

The first sentence introduces the initial event of a man entering the White Hart. The second sentence describes a state of him wearing a black jacket that holds at the time of the previously introduced event. Here we do not get the intuition that time progresses. The third sentence describes the event of Bill serving that man a beer. This event must follow the initial entering event, so here, in contrast to the previous sentence, we get the intuition that time has moved forward.

More than resting on linguistic intuitions, it is also important to ask what the defining characteristics of temporal progression are. The literature on temporal progression (see the beginning of this section) seems to agree that events in a temporal progression line exhibit the following properties: (i) the events are introduced *in chronological order*, i.e. in the

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[17]The term TEMPORAL ANAPHORA is often used in the literature to describe the same phenomenon. However, I prefer not to use this term since it implies a particular analysis of the empirical phenomenon at hand. (See below for a brief overview of the different accounts of temporal progression.)

order of their natural occurrence; (ii) the events are *punctual*, i.e. are temporally bounded; (iii) the events are *new*, i.e. have not previously been mentioned in discourse. Note that those characteristics say little about the grammatical forms that can introduce such events. However, some authors assume that it is primarily *non-dependent* clauses that trigger temporal progression (e.g. Tomlin 1985, Depraetere 1996). Since ARCs share properties with both main and dependent clauses, it is not clear what predictions this assumption makes with respect to their temporal properties. In particular, this assumption does not distinguish between medial and final ARCs. Thus, if confirmed, the claim that ARCs exhibit different temporal characteristics depending on their surface position can potentially uncover some novel facts about the grammar of temporal progression.

There are three main theoretical approaches to the phenomenon of temporal progression. According to the ANAPHORIC APPROACH temporal progression is a species of discourse anaphora (see Kamp 1979, Kamp & Rohrer 1983, Kamp & Reyle 1993, Kamp et al. 2011, Partee 1984, Hinrichs 1986, Webber 1988, a.o.; see also Dowty 1986). Although the different instantiations of this approach differ in detail, the basic idea is that in a narrative discourse the temporal location of the current event depends on the temporal location of the previously mentioned event. The fact that the current event typically follows the previously mentioned event is derived through anaphora to an element that is closely related to that previous event. To illustrate, according to Partee (1984) and Hinrichs (1986) events are temporally included in the current reference time and introduce a new reference time that (immediately) follows the time of that event. States simply include the current reference time. Going back to the data in (36), we get the following temporal structure.[18]

(36′) A man entered$_{r_1}^{e_1 r_2}$ the White Hart. $(e_1 \subseteq r_1, e_1 < r_2)$
       He was wearing$_{r_2}^{s}$ a black jacket. $(r_2 \subseteq s)$
       Bill served$_{r_2}^{e_2 r_3}$ him a beer. $(e_2 \subseteq r_2, e_2 < r_3)$

---

[18]Here, e is an event, s is a state, r is a reference time, $\subseteq$ denotes temporal inclusion, and $<$ denotes temporal subsequence. I indicate an anaphorically dependent element by a subscript and an antecedent by a superscript.

Given that the second event is included in the reference time introduced by the first clause ($e_2 \subseteq r_2$) and that this reference time temporally follows the first event ($e_1 < r_2$), we correctly derive the fact that the second event is interpreted as having occurred after the first event. Other authors derive the same data by linking the second event to a different element, for example the consequent state of the previous event (see Webber 1988, who builds on Moens & Steedman 1988) or the previously mentioned event directly (see Kamp & Reyle 1993).

The second main approach to temporal progression is the DISCOURSE COHERENCE APPROACH (see Lascarides & Asher 1993, Asher & Lascarides 2003). The main idea is that the temporal order between events is determined by the rhetorical relation that holds between the sentences associated with those events. As empirical support, Lascarides & Asher (1993) point out that nothing in the grammar of English distinguishes between the short discourses in (37) and (38), as they both contain sentences in the Simple Past tense. And yet, in (37) the event associated with the second sentence is interpreted as temporally following the event associated with the first sentence, whereas in (38) the order of events is reversed.

(37)   Max stood up^{e_1}.
       John greeted^{e_2} him.   (temporal order: $e_1 < e_2$; Lascarides & Asher 1993)

(38)   Max fell^{e_1}.
       John pushed^{e_2} him.   (temporal order: $e_2 < e_1$; Lascarides & Asher 1993)

The authors claim that such data can be explained by the intuitive assumption that there is a different rhetorical relation that relates the two sentences in either case: NARRATION in (37) vs. EXPLANATION in (38). In general, each rhetorical relation between two clauses (monotonically or defeasibly) implies a particular temporal ordering between the events associated with them. Since Narration implies that the event of the second clause follows the event of the first clause whereas Explanation implies that the reverse temporal ordering holds, we derive the correct temporal relations for (37)-(38).

Finally, there are also MIXED APPROACHES that integrate ideas from the anaphoric approach and the discourse coherence approach. Kehler (2002) offers a mixed account according to which both temporal anaphora and rhetorical relations play a role. In his view, simple tenses (e.g. the Simple Past) order the described event merely with respect to the time of speech but are further restricted by rhetorical relations. In contrast, complex tenses (e.g. the Past Perfect) introduce reference times that are anaphorically resolved-typically, to the event of the previous sentence.

The claim that only final ARCs can participate in temporal progression imposes different burdens on the different approaches discussed above. The anaphoric approach would need to explain what blocks the temporal anaphora between a medial ARC and the surrounding discourse. In turn, the discourse coherence approach would have to account for the fact that medial ARCs are more restricted than final ARCs when participating in rhetorical relations.

3.4.2 Arguments for a uniform temporal treatment of ARCs

In this section I demonstrate that there is not enough empirical evidence for drawing a distinction between the temporal properties of ARCs in different surface positions. What the discussion below suggests is that both medial and final ARCs can participate in temporal progression.

Chronologically-ordered events   The first and most basic observation that goes against the claim that only final ARCs can participate in temporal progression is that both medial and final ARCs can contribute events that meet all the characteristics for temporal progression listed in Section 3.4.1 above. Consider the following two discourses.

(39)   Nick stuck out^{e_1} his tongue at Jamie.
Jamie, <u>who hit^{e_2} him</u>, left^{e_3} in a huff.   (temporal order: $e_1 < e_2 < e_3$)

(40)   Nick stuck out^{e_1} his tongue at Jamie, <u>who hit^{e_2} him</u>.
She left^{e_3} in a huff.   (temporal order: $e_1 < e_2 < e_3$)

The events described in the appositives above are introduced in chronological order, they are punctual, and they are new (assuming that (39)-(40) are embedded in the right type of larger discourse). Thus, if we want to maintain a distinction in temporal reference between medial and final ARCs, we could do either of two things. First, we could assume that, despite appearances, the event introduced by the medial ARC in (39) "does not count" for temporal progression and impose some additional requirement on temporal progression that (40) does, but (39) does not, meet. However, it is not clear what such new requirement could be. Second, we could simply give up on the idea that ARCs differ in their ability to participate in temporal progression. AnderBois et al.'s (2010) claim would then be taken literally, i.e. as just being about the different interpretations of the temporal adverbial 'then' in medial and final ARCs. Yet, as we will see in the next section, even this weaker claim is problematic.

The 'then'-Test   It has been observed in the literature that the temporal adverbial 'then' has two different uses: a SEQUENTIAL USE indicating that the reference time has moved forward and a COTEMPORAL USE indicating that the reference time is retained (see Jespersen 1924, Schiffrin 1992, Glasbey 1993, Spejewski & Carlson 1993, Thompson 1999, Rossdeutscher 2005). It has also been claimed that those two uses are strongly correlated with the linear position of 'then' within the clause: a clause-initial (or clause-medial) position is typically related to the sequential use and a clause-final position is usually tied to the cotemporal use. The examples in (41)-(42) illustrate the two different uses of 'then'.

(41)   Ken filled a bucket with water.
       Then he poured it on his sister.   (sequential use; Spejewski & Carlson 1993)

(42)   Daniel climbed Ben Nevis in July.
       Gareth climbed Snowdon then.   (cotemporal use; Glasbey 1993)

Given those two uses of 'then', the claim of AnderBois et al. (2010) that medial ARCs do not allow for sequential uses of 'then' can be generalized to the following potential test

for the ability of a clause to participate in temporal progression.

(43) 'THEN'-TEST
      A clause can participate in temporal progression only if it allows for sequential
      uses of the temporal adverbial 'then'.

To illustrate the workings of the 'then'-Test, let us repeat the discourses in (39)-(40)

from above but with the temporal adverbial 'then' added to the appositives.

(44) Nick stuck out his tongue at Jamie.
      Jamie, who **then** hit him, left in a huff.

(45) Nick stuck out his tongue at Jamie, who **then** hit him.
      She left in a huff.

If medial ARCs did not allow for sequential interpretations of the temporal adverbial 'then',

we would expect the second sentence in (44) to either support a cotemporal reading of

'then' or else be ruled out. Instead, we find that in both (44) and (45) 'then' is read sequen-

tially. According to the 'then'-Test, the ARC in (44)-(45) is part of the temporal progres-

sion. We find no difference between the temporal properties of medial and final ARCs with

respect to 'then'.

Sequential readings of 'then' in medial ARCs are rare but still attested in naturally

occurring discourses. A COCA search for the collocation ', who then' delivered the fol-

lowing example, presented with my indexing.[19]

(46) It was later that evening, when she had put away the Monopoly board and told En-
      rique to go to bed, that the telephone rang^{e1}. At first she almost hung up^{e2} on the
      caller, a man, whose voice she didn't recognize and who asked for her. Something
      in the cultivated and stricken tone of the voice made her hesitate.
      "This is she," she said^{e3}, and then, the pain in her leg piercing again, she thought^{e4}
      of her daughter, her darling girl, her pet, of the long flight, which was to bring her
      back to the States the next day. She remembered^{e5} her standing on the stairs in her
      long gray skirt and waving to her mother through the window. What if something
      had happened to her, the love of her life?

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[19]The example is from Kohler, Sheila (2004). "Violence". *The Antioch Review* 62(3): 401–415.

But the caller, <u>who **then** identified[e6] himself</u>, was the head of the history department where the grandmother taught. "I'm afraid I have very bad news for you," he said[e7].

It is thus worth taking a second look at the example on whose basis AnderBois et al.'s (2010) putative generalization was based.

(33)   In fact, while she was filming Fresh Prince, her mother, <u>who **then** worked as a librarian</u>, would call her with Black history stories.   (COCA)

In (33), repeated from above, a sequential reading of 'then' might seem unavailable for several independent reasons. First, the main predicate of the ARC, i.e. 'work', is or can be interpreted as a habitual state, not an event, which possibly blocks a sequential reading of 'then'. Second, the preceding 'while'-clause is subordinate and as such might not be part of the temporal progression itself. In order to check whether such a reading is possible, we need a preceding sentence, e.g. 'She started working as a camerawoman'. Finally, it is not even clear that a sequential reading for 'then' is entirely excluded in (33). In particular, when the pitch accent goes at the end of the ARC, i.e. on the second syllable of 'librarian', and not on 'then', a sequential reading seems accessible. This would be a reading under which the mother started working as a librarian *after* the filming had stopped.[20]

Temporally displaced events   If the temporal properties of medial and final ARCs differed, we might expect this contrast to be reflected in their ability to describe temporally displaced events, i.e. events that are not introduced in chronological order. More specifically, if events described in medial ARCs "do not count" for temporal progression, we would expect that temporally displaced events are described more easily in medial ARCs than in final ARCs.

However, this expectation is not met. This is true for both backward-shifted and forward-shifted events. Starting with backward-shifted events, ARCs can only marginally well de-

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[20]I owe this last observation to Kristen Syrett.

scribe actions that happened before the current reference time. The relevant examples are given in (47)-(48).

(47) Teresa arrived^{e_1} at the party at 7.
      ? Aaron, <u>who arrived^{e_2} one hour earlier</u>, greeted^{e_3} her.

      (intended order: $e_2 < e_1 < e_3$)

(48) Teresa arrived^{e_1} at the party at 7.
      ? She talked^{e_2} to Aaron, <u>who arrived^{e_3} one hour earlier</u>.

      (intended order: $e_3 < e_1 < e_2$)

What is important here is that there is no difference in judgment between the backward-shifted ARCs in (47) and (48).

Roughly the same data can be replicated for forward-shifted events. From (49)-(50) it is clear that neither medial nor final ARCs can easily describe such events.

(49) Jessica moved^{e_1} to Boston.
      ?? Simon, <u>who left^{e_2} the city a few months later</u>, started^{e_3} dating her.

      (intended order: $e_1 < e_3 < e_2$)

(50) In Boston Jessica met^{e_1} Simon, <u>who left^{e_2} the city a few months later</u>.
      ?? He started^{e_3} dating her.   (intended order: $e_1 < e_3 < e_2$)

To summarize: medial and final ARCs seem once again alike with respect to their temporal properties.

Temporal progression within and across ARCs   The somewhat surprising fact that medial ARCs can entirely naturally contribute to the main story line in narrative discourses is complemented by the observation that we also find temporal progression *within* such ARCs. (51) below illustrates a case in which the two events described in the appositive are interpreted as happening one after another.

(51) Jimmy, <u>who got^{e_1} a job and bought^{e_2} a new house</u>, felt so happy with his life.

      (temporal order: $e_1 < e_2$)

The empirical facts involving temporal progression *across* ARCs, i.e. between two adjacent ARCs, are more complicated. One can distinguish between two types of adjacent ARCs: STACKED ARCS and CHAINED ARCS. Appositives are stacked when they modify the same anchor. An example of two stacked appositives is given in (52a), where both ARCs modify 'this man'. Appositives are chained when the anchor of a following appositive is part of the preceding appositive. This is illustrated in (21b), where the first ARC modifies 'my roommate' and the second appositive modifies 'the Dish Café'.

(52)   a.   STACKED ARCS
             ... this man, <u>who came to dinner late</u>, <u>about whom nobody knew anything</u>,
             ...   (de Vries 2002)

        b.   CHAINED ARCS
             ... my roommate, <u>who likes the Dish Café</u>, <u>which is located on Raritan Ave</u>,
             ...

As shown below, it does not seem possible to build a temporal progression line across stacked ARCs, whether those ARCs appear in a medial or final position.

(53)   a.   ?? Jack, <u>who met^{e_1} Marcia</u>, <u>who invited^{e_2} her for coffee</u>, was in a good
             mood.   (intended order: $e_1 < e_2$)

        b.   ?? I talked to Trisha, <u>who arrived^{e_1} at 7</u>, <u>who left^{e_2} at 10</u>.
                                                                   (intended order: $e_1 < e_2$)

On the other hand, temporal progression across chained ARCs seems to be sensitive to linear position. In particular, temporal progression lines are harder to build between two medial ARCs but appear entirely natural between two final ARCs.

(54)   a.   ? Jack, <u>who met^{e_1} Marcia</u>, <u>who invited^{e_2} him for coffee</u>, was in a good
             mood.   (intended order: $e_1 < e_2$)

        b.   I informed Jack, <u>who told^{e_1} Marcia</u>, <u>who told^{e_2} my sister</u>.
                                                                   (temporal order: $e_1 < e_2$)

The contrast between (54a) and (54b) is intriguing and calls for an explanation. Yet, it does not seem reason enough to accept the claim that only sentence-final ARCs can advance the reference time.

3.4.3 Conclusion

I have argued against the Position-Progression Dependency hypothesis according to which ARCs differ in temporal properties depending on their linear position in the sentence. As a consequence, this hypothesis cannot be taken as another diagnostic for distinguishing between at-issue and not-at-issue content, at least not when applied to ARCs.

Still, the discussion above has several theoretically significant implications. As already mentioned, uses of ARCs that participate in temporal progression have been described as involving a subclass of ARCs called continuative relative clauses (CRCs; see references cited above). It is typically assumed that CRCs occur sentence-finally (or maybe *clause*-finally). What we have found, though, is that CRCs are not tied to a particular position in the sentence and can freely occur sentence-medially.

Let us now go back to the theories of temporal progression outlined above. The fact that ARCs can in general participate in temporal progression seems entirely compatible with the anaphoric approach. According to this approach, temporal progression arises through discourse anaphora to a previously mentioned eventuality or its dependents. Since discourse anaphora can freely go in and out of appositives (see Nouwen 2007, AnderBois et al. 2010), it comes as no surprise that temporal progression is entirely natural in ARCs. As for the discourse coherence approach, the results of this section suggest that medial and final ARCs can be linked to surrounding discourse via basically the same type of rhetorical relations. Although in the data above we did not control for the potential input of rhetorical relations, this prediction needs to be further investigated.

4 The formal account

This section addresses the information status of ARCs. The proposal assigns to ARCs a uniform semantics though at the same time it is flexible enough to explain the sensitivity of information status to linear position. More than that, the discussion provides us with a

unique window into the nature of the at-issue/not-at-issue content distinction and the way semantic content and discourse rules are brought together.

4.1 The account in a nutshell

In Section 3, we argued that ARCs are not at-issue except when they occur sentence-finally. We thus need to explain (i) where this sensitivity to linear position comes from and (ii) what it means for semantic content to be (not) at-issue.

Since conjoined elements inherit the information status of the entire coordinated structure, one potential explanation is that final ARCs just are conjuncts.[21] On this view, 'Jack invited Edna, who is a fearless leader' is equivalent in meaning to 'Jack invited Edna and she is a fearless leader'. However, this line of explanation leads to lack of uniformity: medial and final ARCs are now treated as two different constructions despite the fact that they seem to share the same intonational and syntactic properties. In addition, if final ARCs were just conjuncts, they would be expected to have no extra properties. This expectation is not met: as we will discover in Chapter 4, ARCs in both medial and final position project. We see that the challenges for this type of explanation of the asymmetry in information status are both theoretical and empirical.

I propose that ARCs have a uniform semantics and that the sensitivity of their information status to surface position follows from general restrictions on accepting information in discourse. More specifically, I propose that main clauses and ARCs are syntactically FORCE PHRASES (ForcePs; see Rizzi 1997, 2004, Cinque 1999, Krifka 2001, to appear, and the discussion in Chapter 6). ForcePs are specified for the particular speech act performed, e.g. as [ASS(ERT)] for statements or [ASK] for questions. For ease of presentation, ForcePs will be assumed to be assertive, unless indicated otherwise. ForcePs have two semantic effects: (i) they introduce a discourse referent for the proposition expressed by the

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[21]This view is suggested in AnderBois et al. (2010), who credit the idea to Tamina Stephenson.

embedded constituent, and (ii) they publicly commit their utterer to that proposition. The proposition introduced by a ForceP is the PROPOSAL that the utterer puts forward in her intention to restrict the context set with it. Thus, a sentence with an ARC will contain two ForcePs and consequently will introduce two proposals. Which proposal is at-issue right after the sentence has been uttered depends on two factors: (i) the attachment site of the ARC, and (ii) the discourse restrictions on when asserted content is accepted. I assume that ARCs are adjuncts and can be attached either to their anchor or the top node of the sentence (the latter under the condition that they are string-adjacent to their anchor). Deciding proposals in discourse is restricted by the following two constraints. IMMEDIACY requires that a proposal is accepted or rejected immediately after it has been introduced. In particular, after a new proposal is introduced, the preceding proposal must have been decided. According to IMPLICIT ACCEPTANCE, when a proposal has not been explicitly addressed, it is silently accepted. Since medial ARCs are placed inside the sentence, proposals associated with them are necessarily automatically accepted. This is what gives rise to the intuition that medial ARCs are not at-issue. Final ARCs can be attached to their anchor or to the root node of the sentence. In the former case, they are not at-issue, by the same reasoning as for medial ARCs. In the latter case, their proposal is introduced last and as such is still open. This is why final ARCs can be at-issue.

These ideas are illustrated below. After (55a) is uttered, the proposal associated with the medial ARC is automatically accepted and the proposition expressed by it (that Edna is a fearless leader) automatically restricts the context set. The proposal that is still under discussion is the one associated with the main clause, i.e. whether Edna started the descent. (55a) has the structure in (55b).

(55)   a.   Edna, <u>who is a fearless leader</u>, started the descent. (ARC not at-issue)

b. Force$_1$P
- Force$_1$
- TP
  - DP
    - DP — *Edna*
    - Force$_2$P — *who is a fearless leader*
  - T′
    - T
    - VP — *started the descent*
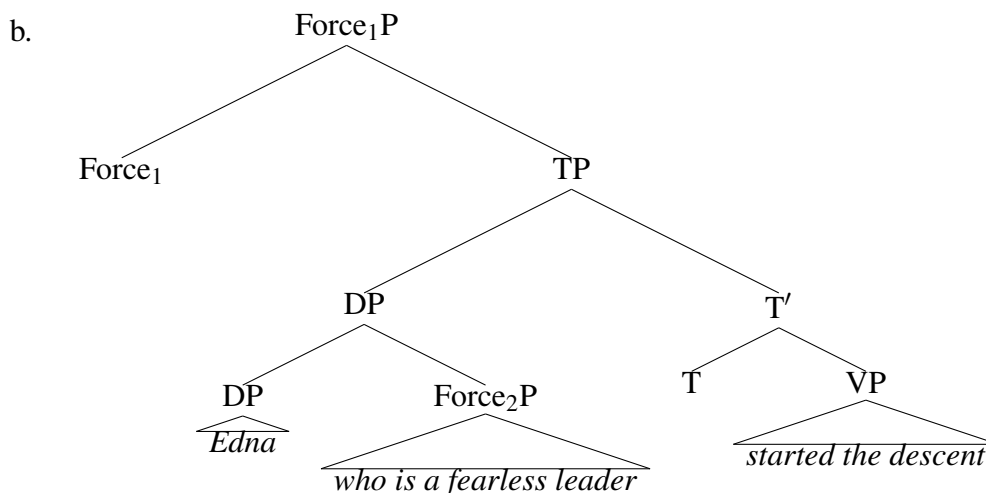
A sentence with a final ARC as in (56) is structurally ambiguous between (56a) and (56b). In (56a), the ARC is embedded in the sentence and thus is necessarily not at-issue, similarly to medial ARCs. The only proposal that is still at issue is the one associated with the main clause. In (56b), the ARC is adjoined to the root node of the sentence and thus its proposal is at-issue, while the proposal associated with the main clause is not. The semantic effect of (56b) is similar to that of a sequence of two independent sentences.[22]

(56)   Jack followed Edna, <u>who is a fearless leader</u>.

a. (ARC not at-issue)
Force$_1$P
- Force$_1$
- TP
  - DP — *Jack*
  - T′
    - T
    - VP
      - V — *followed*
      - DP
        - DP — *Edna*
        - Force$_2$P — *who is a fearless leader*

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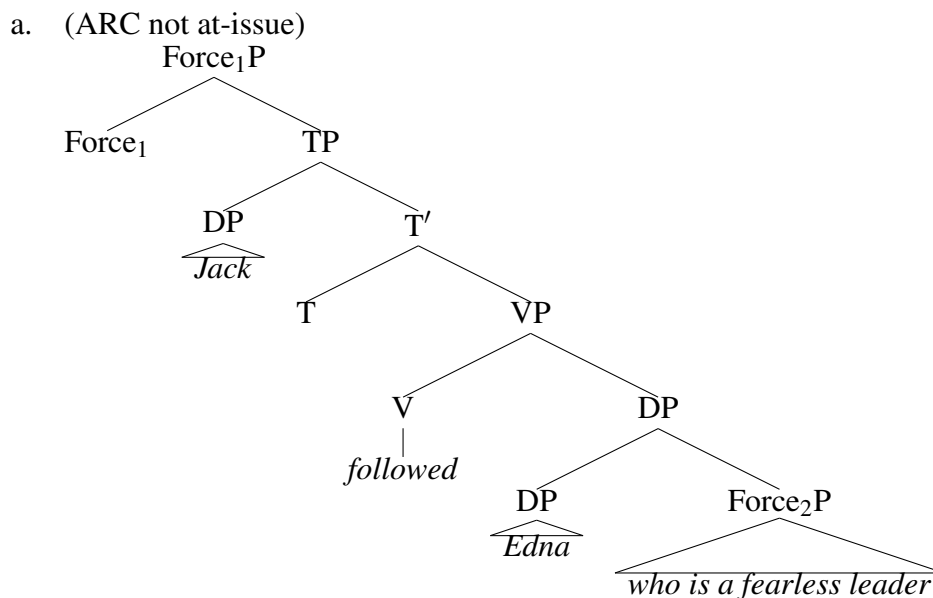
[22]It remains to be seen whether those two structures are further distinguished on the surface, e.g. by intonational differences.

b. (ARC at-issue)

$$\text{Force}_1\text{P}$$

Force$_1$ Force$_2$P

Jack followed Edna   *who is a fearless leader*
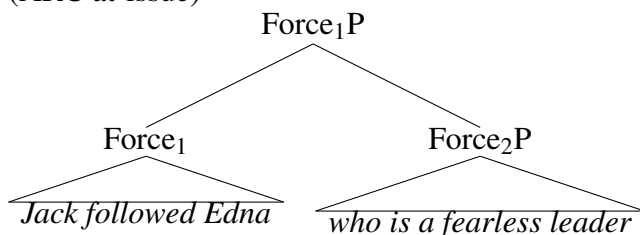
On the current account the concept of "not-at-issue content" plays no theoretical role and hence is not semantically encoded.[23] The theoretically significant concept is that of *at-issue* content, defined as content that is proposed to restrict the context set but has not yet been accepted or rejected. "Not-at-issue content" is any semantic content that does not meet the definition for at-issue content. This could be for either of two reasons. First, content could be not at-issue because it does not express a proposal (e.g. the content of embedded clauses). Second, content could be not at-issue because it is part of a proposal that has already been accepted (e.g. presupposed content) or rejected (e.g. failed proposals). The intuition that certain content is not at-issue is nothing more than a by-product of the discourse dynamics of introducing, accepting, and rejecting proposals.

4.2 The logic: Update with Speech Contexts

This section introduces UPDATE WITH SPEECH CONTEXTS (USC), a typed update logic in which the current proposal is formally implemented. A fully compositional version of USC that can interpret lambda terms and thus can assign meanings down to lexical or functional elements is developed in Chapter 6.

I first outline the design features of the semantics and briefly discuss what motivates the particular choices. In dynamic semantics the meaning of a sentence is defined as its potential to change the current information state. Information states are typically thought of as recording two types of information: factual information and anaphoric information.

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[23]This is unlike some previous accounts, where "not-at-issue content" is semantically encoded and triggers a special type of context set update (see AnderBois et al. 2010, Murray 2010).

The factual information is commonly referred to as the CONTEXT SET and is modeled as a set of possible worlds (see Stalnaker 1978). When a sentence is interpreted, worlds that are incompatible with its semantic content are removed from the context set, i.e. interpretation implies a context set change. What this discourse model leaves out is the possibility that a sentence is interpreted *without* modifying the context set, e.g. because its content had not been accepted by all speech participants. This is why in USC interpreting a sentence does not imply a context set update. Rather, information states only record anaphoric information, i.e. information about what values are assigned to which discourse referent. The context set is part of that anaphoric information: it is recorded by one of the coordinates of the UTTERANCE CONTEXT. The utterance context figures as a discourse referent in the logical representation language: this is a dynamic reinterpretation of Kaplan's (1989) context parameter. A change in the context set is formally achieved by an object language statement that refers to the utterance context and specifies a condition on one of its coordinates, i.e. the context set.

The discourse model is enriched with "individual context sets", i.e. sets of worlds expressing the discourse commitments of individual speech participants (see Gunlogson 2001, Groenendijk & Roelofsen 2009, Farkas & Bruce 2010). This move affords us a more fine-grained picture of discourse, one that keeps track of the ever-changing public commitments of each participant during information exchange. More specifically, we can model the intuition that an assertion updates the commitments of its utterer without also updating the context set. Both the context set and the individual commitment sets are modeled as components of the utterance context, which also contains coordinates for the speaker and the hearer. For the purposes of this dissertation, I assume that a speech context has the following five coordinates: a speaker, a hearer, the discourse commitments of the speaker, the discourse commitments of the hearer, and the context set.[24] I call the first two the KAPLA-

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[24]Additional components, e.g. coordinates for the world/time/location of the utterance, can easily be added.

NIAN COORDINATES and the last three the STALNAKERIAN COORDINATES of a speech context. This is illustrated below.

(57) $c = \langle \underbrace{c_{SP}, c_{HR}}_{\text{Kaplanian coordinates}}, \underbrace{c_{DC.of.SP}, c_{DC.of.HR}, c_{CS}}_{\text{Stalnakerian coordinates}} \rangle$ (speech context)

The merge of the notion of a context set and that of a speech context is theoretically motivated by the presence of the individual discourse commitments. On one hand, the discourse commitments are included in the context set: this is because in a felicitous discourse speech participants are minimally committed to the context set. At the same time, the discourse commitments are linked to the individual discourse participants: e.g. the individual commitments of the speaker and the hearer could differ. We see that the presence of individual discourse commitments necessitates the marriage between the Kaplanian coordinates and the Stalnakerian coordinates. Although there are previous attempts to incorporate indexicality in a dynamic system (see Partee 1989, Condoravdi & Gawron 1996, Zeevat 1999, Bittner 2012), the idea of merging the context set and the speech context is novel.

Finally, it is important to get an idea of how context set change is formally achieved. Since the discourse referent representing the utterance context is assigned different values by different indices (indices are the things that make up the information state; see below), the values of the context set will vary accordingly.[25] This means that at any given point of discourse there will be not one context set but rather several CONTEXT SET CANDIDATES. Eliminating worlds from the context set is thus modeled as eliminating utterance context values with context set candidates containing such worlds. Despite that, it is possible to talk about *the* context set at a given point of discourse. This is because assigning values to variables is exhaustive, i.e. each variable is assigned all possible values that meet the specified requirements. Where *A* is the set of all context set candidates at a given point of

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[25]Nevertheless, the system ensures that the Kaplanian coordinates are unique across an information state. That is, in a given information state there will always going to be a unique speaker and a unique hearer. (See the next section for more on this point.)

discourse, the CONTEXT SET at that point can be defined as $\bigcup A$.[26]

I now turn to introducing USC. As is standard, the set of types is defined in two steps. The set of basic types consists of type e for individuals, type ω for possible worlds, type s for indices (the things that make up information states), and type t for truth values. From this set, the set of all types is inductively defined as including all the basic types and any functional or product types that can be build up from less complex types.

(58) Def (Types)

    a. *BasTyp*, the set of BASIC TYPES, is $\{e, \omega, s, t\}$.

    b. *Typ*, the set of all TYPES, is the smallest set such that

- $BasTyp \subseteq Typ$;
- if $\alpha, \beta \in Typ$, then $(\alpha\beta) \in Typ$;   (functional types)
- if $\alpha_1, ..., \alpha_n \in Typ$, then $\alpha_1 \times ... \times \alpha_n \in Typ$.   (product types)

For the sake of brevity, I introduce the following abbreviations for common complex types: π for ωt (the type of propositions), κ for $e \times e \times \pi \times \pi \times \pi$ (the type of speech contexts, i.e. quintuples consisting of two individuals and three propositions), and $[]$ for $(st)st$ (the type of dynamic terms, i.e. functions from information states to information states).[27]

The vocabulary of USC consists of VARIABLES and CONSTANTS, all of which are assigned types. The set of variables of type α is denoted by Var_α, and the set of all variables is denoted by $Var := \bigcup_{\alpha \in Typ} Var_\alpha$. Similarly, Con_α is the set of constants of type α and $Con := \bigcup_{\alpha \in Typ} Con_\alpha$ is the set of all constants. Constants and variables are TERMS. Since there are complex terms with no corresponding constant or variable symbols in the language, we require that $Var_\alpha \cup Con_\alpha \subseteq Term_\alpha$. The set of all terms is defined as $Term := \bigcup_{\alpha \in Typ} Term_\alpha$.

The syntax of USC specifies how complex terms are constructed from more basic expressions. Complex terms can be subdivided into two classes: functional terms, expressing

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[26] See the definition in (64) below.

[27] The symbol '$[]$' is borrowed from Muskens (1995, 1996). In his system, it can be thought of as a mnemonic for the type of DRT-boxes.

individuals (of type e), propositions (of type π) or sets of propositions (of type πt), and dynamic terms, expressing updates (of type $[]$).

(59) Def (SYNTAX)

    a. FUNCTIONAL TERMS

- If $c \in Term_\kappa$, then $\mathbf{sp}(c), \mathbf{hr}(c) \in Term_e$.
- If $c \in Term_\kappa$, then $\mathbf{dc_{sp}}(c), \mathbf{dc_{hr}}(c), \mathbf{cs}(c) \in Term_\pi$.
- If $p \in Term_\pi$, then $\mathbf{max}(p) \in Term_\pi$.
- If $p \in Term_\pi$ and $u \in Con_e$, then $\mathbf{alt}(p), \mathbf{alt}(p, u) \in Term_{\pi t}$.

    b. DYNAMIC TERMS

- If $R \in Con_{(\omega \times \alpha_1 \times ... \times \alpha_n)t}, p \in Term_\pi$ and
  $t_1 \in Term_{\alpha_1}, ..., t_n \in Term_{\alpha_n}$, then $R_p\{t_1, ..., t_n\} \in Term_{[]}$.
- If $t_1, t_2 \in Term_\alpha$, then $t_1 = t_2 \in Term_{[]}$.
- If $t_1 \in Term_\alpha$ and $t_2 \in Term_{\alpha t}$, then $t_1 \in t_2 \in Term_{[]}$.
- If $t_1 \in Term_{\alpha t}$ and $t_2 \in Term_{\alpha t}$, then $t_1 \subseteq t_2, t_1 \oslash t_2 \in Term_{[]}$.
- If $\phi, \psi \in Term_{[]}$, then $\phi \wedge \psi \in Term_{[]}$.
- If $u \in Var$, then $\exists u \in Term_{[]}$.
- If $u \in Var$ and $\phi, \psi \in Term_{[]}$, then $\forall u (\phi, \psi) \in Term_{[]}$.

Starting with functional terms, for a given speech context variable c, $\mathbf{sp}(c)$ and $\mathbf{hr}(c)$ stand for "the speaker in c" and "the hearer in c", respectively, while $\mathbf{dc_{sp}}(c)$, $\mathbf{dc_{hr}}(c)$ and $\mathbf{cs}(c)$ stand for "the discourse commitments of the speaker in c", "the discourse commitments of the hearer in c" and "the context set in c", respectively. For a propositional variable p and an entity variable u, $\mathbf{max}(p)$ is the maximal value of p throughout the information state, $\mathbf{alt}(p)$ is the set of alternatives triggered by p (the answer set of the polar question $?p$), and $\mathbf{alt}(p, u)$ is the set of alternatives triggered by p for u (the answer set of the content question $?u\, p(u)$). The way dynamic terms are constructed is fairly transparent. I use $\oslash$ for the non-overlap relation; this relation is only defined on sets.

Notice that there are no symbols in the logic expressing propositional operators, such as negation. Such operators will be defined from the available pieces in a less standard way (see below and Chapter 4).

The following definition introduces the hierarchy of typed domains. The base step anchors the primitive domains D_e, D_ω, D_s and D_t to the sets D (of individuals), W (of worlds), I (of indices) and $\{0,1\}$ (of truth values), respectively. Since the latter sets come from the model, the values of the primitive domains are not fixed but will vary with the choice of the model. The recursive step specifies how complex domains are derived. The full domain is the domain of elements of any type.

(60) Def (DOMAINS)

    a. PRIMITIVE DOMAINS

- $D_e := \mathsf{D}$, $D_\omega := \mathsf{W}$, $D_s := \mathsf{I}$, $D_t := \{0,1\}$

    b. COMPLEX DOMAINS

- $D_{\alpha\beta} := D_\beta{}^{D_\alpha}$ (the domain of elements of function types)
- $D_{\alpha_1 \times \ldots \times \alpha_n} := D_{\alpha_1} \times \cdots \times D_{\alpha_n}$
          (the domain of elements of product types)

    c. FULL DOMAIN

- $D := \bigcup_{\alpha \in Typ} D_\alpha$

Models for USC consist of non-empty and pairwise disjoint sets of individuals, worlds, indices and truth values, and a basic interpretation function. The basic interpretation function respects typing, i.e. it assigns to each constant of some type an element of the domain of the same type.

(61) Def (MODELS)
$\mathsf{M} = \langle \mathsf{D}^\mathsf{M} \cup \mathsf{W}^\mathsf{M} \cup \mathsf{I}^\mathsf{M} \cup \{0,1\}, \iota^\mathsf{M} \rangle$ is a MODEL for USC if

- D^M, W^M, I^M, $\{0,1\}$ are pairwise disjoint non-empty sets;
- ι^M is an interpretation function such that $\iota^\mathsf{M}(a) \in D_\alpha$, for all $a \in Con_\alpha$.

In what follows, I omit reference to models whenever possible.

Speech context variables are of type κ (or $e \times e \times \pi \times \pi \times \pi$), i.e. they are interpreted as quintuples consisting of two entities (the speaker and the hearer) and three propositions (the discourse commitments of the speaker, the discourse commitments of the hearer, and the context set). In order to be able to access those coordinates I will use projection functions,

i.e. functions from tuples to one of its coordinates. For example, $\mathbf{proj}_n(A)$ refers to the n-th coordinate of A. Thus, for a context $\mathsf{c} \in D_\kappa$, $\mathbf{proj}_1(\mathsf{c})$ is the speaker in c, $\mathbf{proj}_2(\mathsf{c})$ is the hearer in c, $\mathbf{proj}_3(c)$ is the discourse commitments of the speaker in c, $\mathbf{proj}_4(\mathsf{c})$ is the discourse commitments of the hearer in c, and finally $\mathbf{proj}_5(\mathsf{c})$ is the context set in c. In many cases it is necessary to refer to the UTTERANCE CONTEXT and distinguish it from any other speech context, e.g. reported speech contexts. The variable k will thus be used to represent the utterance context, while other speech contexts will be represented as c, c', etc. The presence of a distinguished variable for the utterance context makes several of the formal definitions below simpler and is also required in order to account for the indexical phenomena discussed in Chapter 5.

Information states are sets of indices which respect certain requirements. Although indices are assigned the primitive type s, they are understood as functions from variables to model-theoretic objects.[28] Similarly to the basic interpretation function, indices respects typing: i.e. for any index $i \in D_s$ and variable $u \in Var_\alpha$, it holds that $i(u) \in D_\alpha$. The indices that we are really interested in have the property of being "well-behaved". Well-behaved indices are restricted with respect to the values they assign to speech context variables: such indices require that the discourse commitments are (i) transparently linked to their agents in the correct way (the speaker's discourse commitments to the speaker, the hearer's discourse commitments to the hearer) and (ii) included in the context set. Those two conditions on well-behaved indices are captured by the following definition.

(62) Def (WELL-BEHAVED INDICES)
      An index $i \in D_s$ is WELL-BEHAVED if for any speech context variable $c \in Var_\kappa$ the following two conditions hold:

- $\forall \mathsf{w} \in \mathbf{proj}_5(i(c)) : \langle \mathsf{w}, \mathbf{proj}_1(i(c)), \mathbf{proj}_3(i(c)) \rangle \in \iota(commit)$ &
  $\langle \mathsf{w}, \mathbf{proj}_2(i(c)), \mathbf{proj}_4(i(c)) \rangle \in \iota(commit)$
- $\mathbf{proj}_3(i(c)) \subseteq \mathbf{proj}_5(i(c))$ & $\mathbf{proj}_4(i(c)) \subseteq \mathbf{proj}_5(i(c))$

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[28]Indices play a similar role to that of assignment functions in static semantic systems.

I call the set of well-behaved indices I_{wb}.

An INFORMATION STATE is a set of well-behaved indices, i.e. it holds that $\sigma \subseteq I_{wb}$, for any information set σ. Since $\sigma \subseteq I_{wb} \subseteq I = D_s$, it correctly follows that $\sigma \in D_{st}$, i.e. an information state is an element of type st.

As far as theory goes, I will only be concerned with two-party discourses consisting of a speaker and a hearer. A discourse-initial information state $\sigma^{a,b}$ anchors the utterance context to the entities a and b, which I will call the SPEAKER and the HEARER of that context, respectively. In other words, $\sigma^{a,b}$ consists of all and only those (well-behaved) indices which assign a to the first coordinate of the utterance context and b to its second coordinate.

(63) Def (DISCOURSE-INITIAL INFORMATION STATE)
A DISCOURSE-INITIAL INFORMATION STATE anchored to speaker $a \in D_e$ and hearer $b \in D_e$ is the information state defined as $\sigma^{a,b} := \{i \in I_{wb} \mid a = \mathbf{proj}_1(i(k))$ & $b = \mathbf{proj}_2(i(k))\}$.

Given an information state, the context set in that state is the set of all worlds found in some context set candidate in that state. That is, the context set consists of the worlds which are still live options for the actual world. The notions of context set candidates and the context set are defined below.

(64) Def (CONTEXT SET CANDIDATES, CONTEXT SET)

a. The set of CONTEXT SET CANDIDATES in an information state $\sigma \in D_{st}$ is defined as $CSC_\sigma := \{p \mid \exists i \in \sigma : p = \mathbf{proj}_5(i(k))\}$.

b. The CONTEXT SET in an information state $\sigma \in D_{st}$ is defined as $CS_\sigma := \{w \mid \exists i \in \sigma : w \in \mathbf{proj}_5(i(k))\}$.

From those definitions it follows that $CS_\sigma = \bigcup CSC_\sigma$, for any state σ. Similarly, we could define the notions of *the* discourse commitments of a speech participant in an information state.

We are now ready to define the semantics of USC. It provides interpretation rules for three types of terms: primitive terms, functional terms and dynamic terms.

(65) Def (SEMANTICS)

    a. PRIMITIVE TERMS

- $[\![t]\!]^{i,\sigma} = \begin{cases} i(t) & \text{if } t \in Var \\ \iota(t) & \text{if } t \in Con \end{cases}$

    b. FUNCTIONAL TERMS

- $[\![\mathbf{sp}(c)]\!]^{i,\sigma} = \mathbf{proj}_1([\![c]\!]^{i,\sigma})$
- $[\![\mathbf{hr}(c)]\!]^{i,\sigma} = \mathbf{proj}_2([\![c]\!]^{i,\sigma})$
- $[\![\mathbf{dc_{sp}}(c)]\!]^{i,\sigma} = \mathbf{proj}_3([\![c]\!]^{i,\sigma})$
- $[\![\mathbf{dc_{hr}}(c)]\!]^{i,\sigma} = \mathbf{proj}_4([\![c]\!]^{i,\sigma})$
- $[\![\mathbf{cs}(c)]\!]^{i,\sigma} = \mathbf{proj}_5([\![c]\!]^{i,\sigma})$
- $[\![\mathbf{max}(p)]\!]^{i,\sigma} = \{\mathsf{w} \mid \exists j \in \sigma : \mathsf{w} \in [\![p]\!]^{j,\sigma}\}$
- $[\![\mathbf{alt}(p)]\!]^{i,\sigma} = \wp([\![\mathbf{max}(p)]\!]^{i,\sigma}) \cup \wp(D_\omega - [\![\mathbf{max}(p)]\!]^{i,\sigma})$
- $[\![\mathbf{alt}(p,u)]\!]^{i,\sigma} = \bigcup\limits_{\mathsf{d} \in D_e} \{\wp(\{\mathsf{w} \mid \exists j \in \sigma : \mathsf{w} \in [\![p]\!]^{j,\sigma} \ \& \ \mathsf{d} = [\![u]\!]^{j,\sigma}\})\}$

    c. DYNAMIC TERMS

- $\sigma[\![R_p\{t_1,...,t_n\}]\!] = \{i \in \sigma \mid \forall \mathsf{w} \in [\![p]\!]^{i,\sigma} : \langle \mathsf{w}, [\![t_1]\!]^{i,\sigma},..., [\![t_n]\!]^{i,\sigma}\rangle \in [\![R]\!]^{i,\sigma}\}$
- $\sigma[\![t_1 R t_2]\!] = \{i \in \sigma \mid [\![t_1]\!]^{i,\sigma} R [\![t_2]\!]^{i,\sigma}\}$, where $R \in \{=, \in, \subseteq, \varnothing\}$
- $\sigma[\![\phi \wedge \psi]\!] = \sigma[\![\phi]\!][\![\psi]\!]$
- $\sigma[\![\exists u]\!] = \{j \mid \exists i \in \sigma : i[u]j\}$
- $\sigma[\![\forall u\,(\phi,\psi)]\!] = \{i \in \sigma \mid i \in \sigma[\![\phi]\!] \Rightarrow i \in \sigma[\![\phi \wedge \psi]\!]\}$

Starting with primitive terms, variables are interpreted by the index parameter and constants are interpreted by the basic interpretation function of the model. Moving on to functional terms, the interpretations of the first five of them is straightforward: they project the different coordinates of the given speech context. The interpretation rules for the last three functional terms are more complex and require access to the entire information state. The term $\mathbf{max}(p)$, the maximal value of p, is interpreted as the set of worlds that are contained in any value assigned to p by indices in the information state. The next two terms trigger question alternatives from propositions and individuals.[29] The term $\mathbf{alt}(p)$ is used to model

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[29]The idea for using such terms comes from Murray (2010). However, Murray only offers an interpretation rule for her equivalent of $\mathbf{alt}(p)$.

polar questions: it is interpreted as the set consisting of the maximal value of p and its complement, and all of their subsets. For content questions, the different alternatives are relativized to the possible values for the missing constituent: the term $\mathbf{alt}(p,u)$ is interpreted as the set of maximal propositions per individual plus all of their subsets. Notice that non-dynamic terms keep track of indices *and* information states. Access to indices is needed in order to interpret variables dynamically while access to entire information states is required for the interpretation of $\mathbf{max}(p)$, $\mathbf{alt}(p)$ and $\mathbf{alt}(p,u)$, as already explained. Finally, dynamic terms are interpreted as expected, with one important addition: dynamic terms describing lexical predicates are relativized to propositions and require that the relation holds throughout the worlds of that proposition.[30] The same relational symbols are used in the object language and the metalanguage.[31] As is standard, the expression $i[u]j$ in the second-to-last line abbreviates the statement that indices i and j differ at most with respect to the values they assign to the variable u.[32]

Depending on the effect dynamic terms have on the context set, they can be informative, interrogative, or hybrids (i.e. both informative and interrogative).[33] Intuitively speaking, informative terms add information to the context set, interrogative terms structure the context set, and hybrid terms do both. We will say that a dynamic term ϕ is INFORMATIVE if and only if there is a world in a context set candidate of some information state σ which is eliminated from any context set candidate when σ is updated with ϕ. We will say that a dynamic term ϕ is INTERROGATIVE if and only if among the context set candidates in some information state σ updated with ϕ there is no greatest element (with respect to the subset relation). Finally, a dynamic term ϕ is a HYBRID in if and only if ϕ is both informative and interrogative. Below, these definitions are stated more formally.

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[30] The idea comes from Stone (1999) and Stone & Hardt (1999).

[31] Recall that $\varnothing$ means set-theoretic non-overlap.

[32] More formally, $i[u]j \; :\Leftrightarrow \; \forall v \in \mathit{Var} : v \neq u \Rightarrow i(v) = j(v)$.

[33] The ideas and most of the terminology in this paragraph follow Groenendijk & Roelofsen (2009). Those authors also define INSIGNIFICANT TERMS as terms that are neither informative nor interrogative (e.g. sentences expressing tautologies).

(66) Def (VARIETIES OF DYNAMIC TERMS)

    a. INFORMATIVE TERMS

$\phi \in Term_{[]}$ is INFORMATIVE if and only if $\exists w \in D_\omega \, \exists \sigma \in D_{st} \, \exists i \in \sigma \, \forall j \in \sigma[\![\phi]\!] : w \in \mathbf{proj}_5(i(k))$ & $w \notin \mathbf{proj}_5(j(k))$.

    b. INTERROGATIVE TERMS

$\phi \in Term_{[]}$ is INTERROGATIVE if and only if $\exists \sigma \in D_{st} \, \neg \exists i \in \sigma[\![\phi]\!] \, \forall j \in \sigma[\![\phi]\!] : \mathbf{proj}_5(j(k)) \subseteq \mathbf{proj}_5(i(k))$

    c. HYBRID TERMS

$\phi \in Term_{[]}$ is a HYBRID if and only if $\phi \in Term_{[]}$ is both informative and interrogative.

From the definition for context set in (64) it follows that a dynamic term ϕ is informative if and only if there is a world w and an information state σ such that $w \in CS_\sigma$ and $w \notin CS_{\sigma[\![\phi]\!]}$. That is, a dynamic term is informative if and only if it eliminates worlds from the context set in some information state.

Those definitions have consequences that might seem striking at first blush but are as intended. For example, dynamic terms expressing simple assertive sentences are *not* informative. Dynamic terms are informative only if they carry an instruction to update the context set. One such example is the representation of a sentence with a medial ARC, whose content is automatically accepted. This feature of the analysis will be further spelled out below.

The last concept that remains to be defined is that of truth. Instead of truth in the classical sense, i.e. truth of a proposition in a world, USC defines *discourse* truth in a world and an information state. Whether or not a sentence is discourse true in a world and an information state is entirely determined by the content expressed by that sentence and what worlds there are in the context set in that information state. If a world in the context set survives/does not survive after a sentence is uttered, the sentence is discourse true/discourse false in it. If a world has already been eliminated from the context set, any sentence that is subsequently uttered is considered discourse false in that world, even when

it is classically true in it.[34]

Since informative, interrogative and hybrid terms are all dynamic terms (i.e. all are of type $[]$), when talking about (discourse) truth, special care is needed. We have to require that only *informative* dynamic terms are assigned a truth value. We state that if a dynamic term ϕ is informative, it is DISCOURSE TRUE in a world w and an information state σ if and only if after σ is updated with ϕ there is at least one context set alternative which contains w, i.e. w survives in some context set alternative in $\sigma[\![\phi]\!]$. Given that, we can define the notion of discourse entailment as follows: a dynamic term ϕ DISCOURSE ENTAILS a sentence ψ in an information state σ if and only if ψ is discourse true in a world w and σ every time ϕ is discourse true in w and σ. The formal definitions are given below.

(67)   Def (DISCOURSE TRUTH, DISCOURSE ENTAILMENT)

    a.   DISCOURSE TRUTH
       If $\phi \in Term_{[]}$ is informative, then ϕ is DISCOURSE TRUE in a world $w \in D_\omega$ and an information state $\sigma \in D_{st}$, in symbols $\vDash_{w,\sigma} \phi$, if and only if $\exists j \in \sigma[\![\phi]\!] : w \in \mathbf{proj}_5(j(k))$.

    b.   DISCOURSE ENTAILMENT
       If $\phi, \psi \in Term_{[]}$ are informative, then ϕ DISCOURSE ENTAILS ψ in an information state $\sigma \in D_{st}$, in symbols $\phi \vDash_\sigma \psi$, if and only if $\forall w \in D_\omega : \vDash_{w,\sigma} \phi \Rightarrow \vDash_{w,\sigma} \psi$.

From this definition and the definition for context set in (64) two statements follow. First, an informative dynamic term ϕ is discourse true in a world w and a state σ if and only if $w \in CS_{\sigma[\![\phi]\!]}$. Also, an informative term ϕ discourse entails the informative term ψ in a state σ if and only if $CS_{\sigma[\![\phi]\!]} \subseteq CS_{\sigma[\![\psi]\!]}$.

This concludes the presentation of USC. In the next section, I demonstrate how accepting and rejecting proposals associated with simple sentences are modeled in the logic.

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[34]Murray (2010) and Bittner (2011) espouse a similar notion of truth.

4.3 The semantics at work: A few simple examples

In this and the next few sections I introduce the discourse model of introducing, accepting and rejecting proposals and demonstrate how different types of sentences interact with it. It should be emphasized that throughout the entire chapter the main focus is on the discourse effect that those sentences have. The particular assumptions I make about syntactic structure, lexical translations, and compositional rules to derive the logical representations given will be detailed in Chapter 6.

Consider the simple sentence in (68a). By uttering this sentence, the speaker puts forward the proposal that Edna is a fearless leader by publicly committing to this proposition. If the hearer does not object and the proposal is accepted, the context set is restricted by the proposal proposition, see (68b). In (68) below, the proposal is represented by the propositional variable p and k stands for the utterance context.[35]

(68)   a.   Edna is a fearless leader.
$$\exists p \wedge \exists u \wedge u = edna \wedge fearless.leader_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$$

        b.   (OK.)
$$\mathbf{cs}(k) \subseteq p$$

Let us now rehearse how this result is formally derived. What would the output information state look like if (68) is uttered in the discourse-initial information state $\sigma^{\mathsf{a,b}}$? In order to answer this question, we need to find out what the expression in (69a) comes down to.

(69)   a. $\sigma^{\mathsf{a,b}}[\![\exists p \wedge \exists u \wedge u = edna \wedge fearless.leader_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p \wedge \mathbf{cs}(k) \subseteq p]\!]$

First we apply multiple times the semantic rule for conjunction, defined in (65c). Doing so gets us to (69b).

(69)   b. $\sigma^{\mathsf{a,b}}[\![\exists p]\!][\![\exists u]\!][\![u = edna]\!][\![fearless.leader_p\{u\}]\!][\![\mathbf{dc_{sp}}(k) \subseteq p]\!][\![\mathbf{cs}(k) \subseteq p]\!]$

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[35]The first and the last conjuncts in (68a) are the import of the ForceP (see Chapter 6). The term in (68b) can be introduced as a default by the discourse rules on deciding proposals (see Section 4.4 below).

From the definition of discourse-initial information states in (63) we know that in $\sigma^{a,b}$, a is the speaker and b is the hearer of the utterance context. Thus, the first condition on the output information state is then that, for all indices i in the input information state, $a = \mathbf{proj}_1(i(k))$ and $b = \mathbf{proj}_2(i(k))$, where k stands for the utterance context. Next, we compute the impact of the first two updates in (69b), expressed by the terms $\exists p$ and $\exists u$. According to the interpretation rule for existential terms (65c), these expressions contain instructions to assign random values to the variables p and u. More formally, we require that any index j contained in the output information state differs from some index i in the input information state at most with respect to the values i and j assign to p and u, i.e. we require that $i[p\,u]j$. This is the second condition on the output information state. The interpretation rules for atomic dynamic terms in (65c) tell us that the third and the fourth updates, represented as $u = edna$ and $fearless.leader_p\{u\}$, require that each index j in the output information state assigns Edna to the variable u and a set of worlds in each of which Edna is a fearless leader to the variable p. The third set of conditions on the output information state are then $j(u) = \iota(edna)$ and $\forall w \in j(p) : \langle w, j(u) \rangle \in \iota(fearless.leader)$. Finally, the last two updates, expressed by $\mathbf{dc_{sp}}(k) \subseteq p$ and $\mathbf{cs}(k) \subseteq p$, restrict the possible values of the utterance context k by requiring that its third and fifth coordinates (representing the speaker's discourse commitments and the context set, respectively) be subsets of the value assigned to p, for any output index j. This again follows from the interpretation rule for atomic dynamic terms in (65c) and furnishes our last set of conditions in the output information state, $\mathbf{proj}_3(j(k)) \subseteq j(p)$ and $\mathbf{proj}_5(j(k)) \subseteq j(p)$. We arrive at the output information in (69c), abbreviated as σ_1.[36]

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[36]Note that in the last two conjuncts in (69a), $\mathbf{dc_{sp}}(k) \subseteq p$ and $\mathbf{cs}(k) \subseteq p$, the possible values of the speaker's discourse commitments and the context set are required to be subsets of p, not $\mathbf{max}(p)$. Although those two options deliver a different output information state, they produce the same output *context set*. Since at least one index in the output information state will assign to p the maximal set of worlds meeting the relevant requirements, the entire sets will be stored by some index and no information will be lost. Using maximal sets is possible but complicates the representation.

$$(69) \quad \text{c.} \quad \left\{ j \middle| \exists i \begin{pmatrix} 1.\, \mathsf{a} = \mathbf{proj}_1(i(k)) \ \& \ \mathsf{b} = \mathbf{proj}_2(i(k)) \\ 2.\, i[p\,u]\,j \\ 3.\, j(u) = \iota(edna) \ \& \\ \quad \forall \mathsf{w} \in j(p) : \langle \mathsf{w}, j(u) \rangle \in \iota(fearless.leader) \\ 4.\, \mathbf{proj}_3(j(k)) \subseteq j(p) \ \& \ \mathbf{proj}_5(j(k)) \subseteq j(p) \end{pmatrix} \right\} =: \sigma_1$$

Next I turn to demonstrating what predictions the definition of discourse truth makes about (68). First, notice that the logical representation of just (68a), i.e. the dynamic term representing an utterance of 'Edna is a fearless leader', is not informative, according to the definition in (66a). This is because this term does not include an instruction to restrict the possible values of the context set. Thus, according to the definition of discourse truth in (67a), this term is not assigned a discourse truth value. However, the term representing the entire discourse in (68) is informative and will be assigned a discourse truth value, for a given world and information state.[37]

Let us now ask ourselves under what conditions the discourse in (68) will be discourse true in some arbitrary chosen world v and the discourse-initial information state $\sigma^{\mathsf{a,b}}$. In other words, what does (70a) below amount to?

(70) a. $\vDash_{\mathsf{v}, \sigma^{\mathsf{a,b}}} \exists p \wedge \exists u \wedge u = edna \wedge fearless.leader_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p \wedge \mathbf{cs}(k) \subseteq p$

According to the definition of discourse truth in (67a), (70a) holds if and only if (70b) holds.

(70) b. $\exists j \in \sigma^{\mathsf{a,b}} [\![\exists p \wedge \exists u \wedge u = edna \wedge fearless.leader_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p \wedge \mathbf{cs}(k) \subseteq p]\!] : \mathsf{v} \in \mathbf{proj}_5(j(k))$

From above we already know that $\sigma^{\mathsf{a,b}}$ updated with (68) amounts to (69c), which we abbreviated as σ_1. Thus, (70b) is equivalent to (70c).

(70) c. $\exists j \in \sigma_1 : \mathsf{v} \in \mathbf{proj}_5(j(k))$

Unwrapping the contents of σ_1 and simplifying the resulting expression brings us to (70d).

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[37] I make the assumption that sequenced dynamic terms, as in (68) above, have the discourse effect of conjunction.

(70) d. $\exists i \exists j$ $\begin{pmatrix} 1.\, \mathsf{a} = \mathbf{proj}_1(i(k)) \;\&\; \mathsf{b} = \mathbf{proj}_2(i(k)) \\ 2.\, i[p\,u]j \\ 3.\, j(u) = \iota(edna) \;\& \\ \quad \forall \mathsf{w} \in j(p) : \langle \mathsf{w}, j(u) \rangle \in \iota(fearless.leader) \\ 4.\, \mathbf{proj}_3(i(k)) \subseteq j(p) \;\&\; \mathbf{proj}_5(i(k)) \subseteq j(p) \\ 5.\, \mathsf{v} \in \mathbf{proj}_5(i(k)) \end{pmatrix}$

The statement in (70d) existentially quantifies over the indices i and j. The former index is needed in order to interpret the utterance context variable k. However, existential quantification over the latter index can be replaced by existential quantification over the model-theoretic objects assigned by it to the variables p and u. First, since j is a total function over variables of USC, there necessarily will be values for $j(p)$ and $j(u)$. Thus, from (70d) we can conclude (70e). Second, let us assume that for any index i, variable v of some type, and a model-theoretic object d of the same type there is an index j which differs from i at most by the fact that it assigns d to v.[38] That is, we assume that there is always an index that minimally differs from another index by assigning to some chosen variable some chosen value. If so, (70e) entails (70d). We have just demonstrated that (70d) and (70e) are equivalent.

(70) e. $\exists i \exists p \exists u$ $\begin{pmatrix} 1.\, \mathsf{a} = \mathbf{proj}_1(i(k)) \;\&\; \mathsf{b} = \mathbf{proj}_2(i(k)) \\ 2.\, \mathsf{u} = \iota(edna) \;\&\; \forall \mathsf{w} \in \mathsf{p} : \langle \mathsf{w}, \mathsf{u} \rangle \in \iota(fearless.leader) \\ 3.\, \mathbf{proj}_3(i(k)) \subseteq \mathsf{p} \;\&\; \mathbf{proj}_5(i(k)) \subseteq \mathsf{p} \\ 4.\, \mathsf{v} \in \mathbf{proj}_5(i(k)) \end{pmatrix}$

This last statement can more transparently be represented as in (70f).

(70) f. $\exists i$ $\begin{pmatrix} 1.\, \mathsf{a} = \mathbf{proj}_1(i(k)) \;\&\; \mathsf{b} = \mathbf{proj}_2(i(k)) \\ 2.\, \forall \mathsf{w} \in \mathbf{proj}_3(i(k)) : \langle \mathsf{w}, \iota(edna) \rangle \in \iota(fearless.leader) \;\& \\ \quad \forall \mathsf{w} \in \mathbf{proj}_5(i(k)) : \langle \mathsf{w}, \iota(edna) \rangle \in \iota(fearless.leader) \\ 3.\, \mathsf{v} \in \mathbf{proj}_5(i(k)) \end{pmatrix}$

According to this last statement, the discourse in (68) is discourse true in a world v and the discourse-initial information state $\sigma^{\mathsf{a},\mathsf{b}}$ if and only if there is an index which assigns to the utterance context variable a speech context such that a is the speaker, b is the hearer (via the first condition in (70f)), the discourse commitments of the speaker and the context set

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[38]This assumption is essentially Axiom 1 of Muskens' (1995, 1996) LOGIC OF CHANGE and can be formally stated as follows: $\forall i \in D_s \forall v \in Var_\alpha \forall \mathsf{d} \in D_\alpha \exists j \in D_s : i[v]j \;\&\; j(v) = \mathsf{d}$.

contain the information that Edna is a fearless leader (via the second condition in (70f)), and, crucially, v is one of the context set worlds (via the third condition in (70f)).[39] More generally, an informative dynamic term will be discourse true in a world and a discourse-initial information state if and only if the content associated with it is classically true in that world.

One should emphasize that this does not hold for non-discourse-initial information states. To see this, imagine that the sentence 'Bill is a coward', represented in the logic as ψ, is uttered and accepted in σ_1, the information state described in (69c). Now, choose a world v' such that 'Bill is a coward' is classically true in v' but v' has already been excluded from all context set candidates in σ_1 because Edna is not a fearless leader in v'. If so, ψ will not be discourse true in v' and σ_1 even though by construction 'Bill is a coward' is classically true in v'. In general, the notion of discourse truth and the classical notion of truth will coincide only with respect to the worlds that are *included* in the current context set. For worlds that have been excluded from the context set the two notions might differ. One could think of the context set as a domain restriction on the worlds in which a piece of discourse can be true or false.

Above, we saw an example whose proposal was accepted. Needless to say, proposals can as well get rejected. Rejecting a proposal, I assume, amounts to introducing a counterproposal, i.e. introducing a proposal which is incompatible with the original proposal. In the simplest cases, a counterproposal would simply express the negation of the original proposal.[40] After a counterproposal has been introduced, the original speaker might in turn accept or reject it, etc. In order to illustrate how rejections are modeled, we first need to say how the semantics handles negation and change of discourse roles.

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[39]The restriction that the hearer too is committed to the proposition that Edna is a fearless leader follows from the fact that *i* ranges over well-behaved indices, i.e. indices that require discourse commitment sets to be subsets of the context set.

[40]In more complicated cases, the hearer might introduce a weaker counterproposal (e.g. 'It might rain tonight') that is, strictly speaking, not incompatible with the original proposal (e.g. 'It will rain tonight'). I leave those more complicated cases of introducing counterproposals to further research.

There is no special symbol in the logic that represents negation. Instead, negation is modeled as a sequence of terms which (i) introduce a discourse referent for the proposition expressed by the non-negated sentence and (ii) states that that proposition is disjoint from the proposition expressed by the negated sentence (see Stone & Hardt 1999, Bittner 2011).[41] Where ϕ is a dynamic term, p and q are propositional variables, and $\varnothing$ expresses the non-overlap relation, $\mathbf{not}_p^q(\phi)$ abbreviates the following sequence of conjuncts.

(71) $\mathbf{not}_p^q(\phi) := \exists q \wedge \phi \wedge p \varnothing \mathbf{max}(q)$

For example, the sentence in (72) is given the logical representation in (72a), which, by (71), can be abbreviated as in (72b).

(72) Edna is **not** a fearless leader.

    a. $\exists p \wedge \exists u \wedge u = edna \wedge \exists q \wedge fearless.leader_q\{u\} \wedge p \varnothing max(q) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

    b. $\exists p \wedge \mathbf{not}_p^q(\exists u \wedge u = edna \wedge fearless.leader_q\{u\}) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

Here p expresses the proposal proposition and q expresses a proposition that is disjoint from it. Crucially, the penultimate conjunct, $p \varnothing \mathbf{max}(q)$, requires that the proposal proposition be disjoint from the maximal value of q, the proposition Edna is a fearless leader. The proposal proposition thus has only worlds in it in which Edna is *not* a fearless leader.[42]

A second piece of machinery is needed in order to model changes of discourse roles among the speaker and the hearer. A change in discourse roles implies that the speaker becomes the hearer, the hearer becomes the speaker, and the two agents exchange their discourse commitments. The only thing that remains unaffected in the utterance context is the context set. In order to model this, I introduce the term $\mathbf{cdr}(k)$, intuitively the CHANGE OF DISCOURSE ROLES in k, which abbreviates the following sequence of conjuncts.

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[41]Negation (along with other propositional operators) is treated in depth in Chapter 4. Here I only sketch the analysis.

[42]Even though there will be many such proposal proposition, one of them will be maximal and thus no information will be lost. See footnote 36 above.

(73) $\mathbf{cdr}(k) := \exists c \wedge \underbrace{\mathbf{sp}(k) = \mathbf{hr}(c)}_{\text{speaker becomes hearer}} \wedge \underbrace{\mathbf{hr}(k) = \mathbf{sp}(c)}_{\text{hearer becomes speaker}} \wedge$

$\underbrace{\mathbf{dc_{sp}}(k) = \mathbf{dc_{hr}}(c)}_{\text{speaker DCs become hearer DCs}} \wedge \underbrace{\mathbf{dc_{hr}}(k) = \mathbf{dc_{sp}}(c)}_{\text{hearer DCs become speaker DCs}} \wedge \underbrace{\mathbf{cs}(k) = \mathbf{cs}(c)}_{\text{CS is inherited}} \wedge$

$\exists k \wedge k = c$

The expression on the right-hand side in (73) is fairly long but easy to understand: the first conjunct assigns a random value to the speech context variable c, the next five conjuncts only keep indices which assign to the specified values coming from the utterance context, and the last two conjuncts overwrite the utterance context with the value of c.[43]

Before proceeding, let us pause for a while and make two global observations about the values of speech context variables within an information state. Consider the following hypothetical information state which consists of nine indices which assign to the utterance context variable k the following values.[44]

σ	k
i_1	$\langle$a, b, $\{w_1\}$, $\{w_2\}$, $\{w_1, w_2\}\rangle$
i_2	$\langle$a, b, $\{w_1\}$, $\{\}$, $\{w_1, w_2\}\rangle$
i_3	$\langle$a, b, $\{\}$, $\{w_2\}$, $\{w_1, w_2\}\rangle$
i_4	$\langle$a, b, $\{\}$, $\{\}$, $\{w_1, w_2\}\rangle$
i_5	$\langle$a, b, $\{\}$, $\{w_2\}$, $\{w_2\}\rangle$
i_6	$\langle$a, b, $\{\}$, $\{\}$, $\{w_2\}\rangle$
i_7	$\langle$a, b, $\{w_1\}$, $\{\}$, $\{w_1\}\rangle$
i_8	$\langle$a, b, $\{\}$, $\{\}$, $\{w_1\}\rangle$
i_9	$\langle$a, b, $\{\}$, $\{\}$, $\{\}\rangle$

Table 1: A hypothetical information state

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[43]Alternatively, one could add a dynamic term $\mathbf{cdr}(c)$ to the logic expressing the information that the discourse roles in c have changed. The definitions could read as follows:

(i) (Syntax) If $c \in Term_\kappa$, then $\mathbf{cdr}(c) \in Term_{[]}$.

(ii) (Semantics) $\sigma[\![\mathbf{cdr}(c)]\!] = \left\{ j \,\middle|\, \exists i \in \sigma \left(\begin{array}{l} 1.\, i[c]j \\ 2.\, \mathbf{proj}_1([\![c]\!]^{i,\sigma}) = \mathbf{proj}_2([\![c]\!]^{j,\sigma})\ \& \\ \quad \mathbf{proj}_2([\![c]\!]^{i,\sigma}) = \mathbf{proj}_1([\![c]\!]^{j,\sigma})\ \& \\ \quad \mathbf{proj}_3([\![c]\!]^{i,\sigma}) = \mathbf{proj}_4([\![c]\!]^{j,\sigma})\ \& \\ \quad \mathbf{proj}_4([\![c]\!]^{i,\sigma}) = \mathbf{proj}_3([\![c]\!]^{j,\sigma})\ \& \\ \quad \mathbf{proj}_5([\![c]\!]^{i,\sigma}) = \mathbf{proj}_5([\![c]\!]^{j,\sigma}) \end{array} \right) \right\}$

[44]Each of those indices can be seen as representing a class of indices which differ with respect to the values they assign to variables other than k.

The first observation is that throughout an information state indices necessarily agree on the Kaplanian coordinates (the first two coordinates). That is, within a state it is not possible for the speaker or the hearer to differ across indices. This is guaranteed by the fact that the discourse-initial information state is anchored to specific individuals and a change in discourse roles merely flips those values. The second observation is that the Stalnakerian coordinates (the last three coordinates) store a maximal proposition and all of its subsets. This is because discourse-initial information states impose no requirements on those sets, except that for any index discourse commitments are included in the context set.[45] Making the simplifying assumption that discourse commitment sets/context set development is monotonic, these subsets can be thought of as representing the *possible developments* of the discourse commitment sets/the context set.

We are now ready to demonstrate how rejections, i.e. introducing counterproposals works. In (74) below, A proposes to add to the context set the information that Edna is a fearless leader. B disagrees and introduces the counterproposal that Edna is not a fearless leader.

(74)   A: Edna is a fearless leader.
$$\exists p \wedge \exists u \wedge u = edna \wedge fearless.leader_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$$

        B: No, she isn't.
$$\mathbf{cdr}(k) \wedge \exists q \wedge \mathbf{not}_q^r(fearless.leader_r\{u\}) \wedge \mathbf{dc_{sp}}(k) \subseteq q$$

Since A has already committed to the initial proposal (the proposition that Edna is a fearless leader), she cannot accept the counterproposal (the proposition that Edna is not a fearless leader) without withdrawing her initial commitment. If, however, A withdraws her initial commitment[46] and accepts B's counterproposal, the context set is restricted to only contain worlds in which Edna is not a fearless leader.

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[45]Recall that information states were defined to only consist of well-behaved indices.

[46]Withdrawal of an existing discourse commitment cannot be modeled in the simple discourse model presented here. In order to be able to model non-monotonicity, a richer notion of discourse commitments is called for, e.g. one that records propositions, not just possible worlds. The same remarks apply to non-monotonic developments of the context set.

In the next section I demonstrate how this picture, coupled with two general constraints on accepting and rejecting proposals in discourse, can explain the shifting information status of ARCs.

4.4 Explaining the information status of ARCs

In Section 3, we argued that when ARCs occur sentence-medially their semantic content is not at-issue whereas when they occur sentence-finally their semantic content can be at-issue. This section offers an explanation of those facts.

In the previous section we provided a model-theoretic analysis for short discourses illustrating how introducing, accepting and rejecting proposals works. However, the important question of the conditions under which such discourse moves are allowed was left open. Below, I formulate two constraints which place certain restrictions on the *timing* and *polarity* of deciding proposals.

(75)   CONSTRAINTS ON DECIDING PROPOSAL

      i.   IMMEDIACY
          A proposal is decided (i.e. accepted or rejected) before another, independent proposal is introduced.

     ii.   IMPLICIT ACCEPTANCE
          If not explicitly addressed, a proposal is implicitly accepted.

According to Immediacy, accepting or rejecting proposals needs to happen before an independent proposal is introduced. I assume that a proposal is introduced when the utterer commits to a proposition, represented in the logic as $\mathbf{dc_{sp}}(k) \subseteq p$, for a propositional variable p. Two proposals are independent if and only if they are compatible with each other, i.e. both can be accepted without producing the empty context set. A proposal and a counterproposal are typically incompatible and thus not independent. Immediacy prevents two independent proposals from being open at a given point in discourse.

Implicit Acceptance states that accepting a proposal is a default that happens if the hearer does not react. Implicit acceptance happens without an overt morphological reflex

and is represented in the logic as $\mathbf{cs}(k) \subseteq p$, for a propositional variable p. Following the "Table" metaphor of Farkas & Bruce (2010) as serving as a conversational scoreboard, $\mathbf{dc_{sp}}(k) \subseteq p$ can be thought of as putting the issue p on the Table, while $\mathbf{cs}(k) \subseteq p$ can be thought of as taking the issue p off the Table.

These two constrains have important consequences for the architecture of grammar assumed in this dissertation. The traditional picture is that logical representations stem exclusively from morphemes in the language. Here this picture is augmented to allow for the possibility that parts of the logical representation come from constraints on discourse development. Rather than pragmatics strictly following semantics, here the two modules of grammar are interleaved.[47]

Let me illustrate how the above constraints pull their weight towards enriching the logical representation on an example. Consider the two-sentence discourse below, uttered without interruptions.

(76)   Bob is rich.
        He recently bought an apartment in downtown Manhattan.

The leading intuition is that if the hearer does not voice an objection after the first sentence is uttered, the content of this sentence silently updates the context set before the second sentence is uttered. Let us abbreviate the first sentence as ϕ^p (where p is the proposal variable associated with this sentence) and the second sentence as ψ^q (where q is the proposal variable associated with the sentence). I assume that dynamic terms that decide proposals can be inserted into logical representations if doing so leads to compliance with the constraints on deciding proposals defined above. Let us see how the following three representations fare with respect to Immediacy and Implicit Acceptance.

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[47]In fact, we have already encountered logical representation bits which cannot be traced back to grammatical form. The term $\mathbf{cdr}(k)$, representing a change in discourse roles, is one such example. This term reflects *who* is speaking, not what they are saying.

(77)   a. $\phi^p \wedge \psi^q$

      b. $\phi^p \wedge \mathbf{cs}(k) \oslash \mathbf{max}(p) \wedge \psi^q$

      c. $\phi^p \wedge \mathbf{cs}(k) \subseteq p \wedge \psi^q$

(77a) is the unadorned representation of (76). Since it does not decide on the proposal introduced by ϕ before a new independent proposal is introduced, it violates Immediacy. The representation in (77b) rejects the proposal associated with ϕ before the new proposal has been introduced and thus obeys Immediacy. However, since the rejection is implicit, it violates Implicit Acceptance. Each of (77a) and (77b) then violates at least one of the constraints on deciding proposals. But (77c) does not: in this case the proposal of ϕ is accepted before the proposal of ψ is introduced, hence this representation obeys both Immediacy and Implicit Acceptance. This last formula is then the optimal candidate for representing the discourse in (76).[48]

Let us now look into sentences with ARCs. So far, we have only seen examples where new proposals are introduced by main clauses. But ARCs, qua Force Phrases, introduce proposals too. A sentence with an ARC introduces two proposals: one associated with the main clause and another associated with the ARC. Which of the two proposals is at-issue immediately after the sentence has been uttered is completely determined by the attachment site of the ARC and the two discourse constraints from above. Let us see why.

I first consider sentences in which the ARC appears sentence-medially and is adjoined to its anchor, as in (78A) below.[49]

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[48]This mechanism of selecting an optimal logical representation from a given set could be made more precise in an optimality-theoretic setting (see Prince & Smolensky 1993/2004, Blutner 2000). For example, enriching logical representations with additional terms has to be generally restricted by a constraint favoring shorter representations, call it SHORT. Immediacy and Implicit Acceptance have to crucially dominate Short: this ensures that logical representations are enriched *only if* doing so leads to better compliance with the constraint hierarchy.

[49]For better readability, the parts in the logical representation that are contributed by appositives are underlined and parts that come from discourse are doubly underlined.

(78)   A: $[_{\text{ForceP}}\ [_{\text{DP}}\ \text{Edna}\ [_{\text{ForceP}}\ \text{who is a fearless leader}]]\ \text{started the descent}]$
$\exists p \wedge \exists u \wedge u = edna \wedge \underline{\exists q \wedge fearless.leader_q\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq q} \wedge \underline{\underline{\mathbf{cs}(k) \subseteq q}} \wedge$
$start.descent_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

By uttering this sentence, the speaker puts forward two proposals: p, that Edna started the descent, and q, that Edna is a fearless leader. As already mentioned, a proposal is introduced at the point at which the speaker commits to it. Above, those points correspond to $\mathbf{dc_{sp}}(k) \subseteq q$, for the proposal q, and $\mathbf{dc_{sp}}(k) \subseteq p$, for the proposal p. Given the medial position of the ARC, the former term appears before the latter term. According to Immediacy, the proposal q has to be decided before a new proposal has been introduced. Assuming that there is no reaction on part of the hearer midway through the utterance, it follows from Implicit Acceptance that q is accepted by default. The locus of this automatic acceptance is marked by $\mathbf{cs}(k) \subseteq q$. It follows that only the proposal associated with the main clause is still open and awaiting resolution.

We can now explain why in (78A) only the main clause content can be directly rejected by the hearer. This is demonstrated by the responses below, directed at the utterance in (78A).

(78)   B: No, she didn't.   (target = MC)
$\underline{\underline{\mathbf{cdr}(k)}} \wedge \exists r \wedge \mathbf{not}_r^{r'}(start.descent_{r'}\{u\}) \wedge \mathbf{dc_{sp}}(k) \subseteq r$

       B′:   # No, she isn't.   (target = ARC)
$\underline{\underline{\mathbf{cdr}(k)}} \wedge \exists r \wedge \mathbf{not}_r^{r'}(fearless.leader_{r'}\{u\}) \wedge \mathbf{dc_{sp}}(k) \subseteq r$

Recall that in Section 3.1 we distinguished between direct (e.g. 'Yes', 'That's not true') and indirect responses (e.g. 'Well,...', 'Actually,...'). We can now characterize this distinction in more theoretical terms by requiring that direct responses address open proposals (i.e. proposal that have not yet been decided) while there is no such restriction on indirect responses.[50] This would account for the intuition that direct responses move the discourse

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[50]This is compatible with the finding that the 'Hey, wait a minute' tag can target either open or closed proposals. (See Experiment 1 of Syrett et al. (ms), discussed in Section 3.1.) The fact that indirect responses are more readily associated with closed proposals could as well arise as a conversational implicature.

forward while indirect responses can stall it. The direct response in (78B′) is infelicitous because it addresses a proposal that has already been closed, i.e. whether Edna is a fearless leader. There is no such problem with (78B), which addresses the open proposal of whether Edna started the descent. The same explanation can be given for *positive* direct responses, which give rise to a similar contrast.

Moreover, (78B′) suffers from one additional problem: its utterer makes a potentially contradictory counterproposal, i.e. a counterproposal that stands no chance of being accepted. If the information that Edna is a fearless leader has already been added to the context set a proposal to also add the information that Edna is *not* a fearless leader is not reasonable.

Let us now consider sentences with final ARC. I assume that such sentences are structurally ambiguous: the ARC is adjoined either to its anchor or to the root node of the sentence. This results in two different logical representations that make different predictions with respect to which proposal is still unresolved. If the ARC is attached to its anchor, the proposal associated with it is automatically accepted—by the same reasoning as in (78A) above. The proposal that is left open is that associated with the main clause. This is why the main clause is freely accessible to direct rejections, as shown below.

(79)   A: $[_{\text{ForceP}}$ Jack followed $[_{\text{DP}}$ Edna $[_{\text{ForceP}}$ who is a fearless leader$]]]$
$\exists p \wedge \exists u \wedge u = jack \wedge \exists v \wedge v = edna \wedge$
$\underline{\exists q \wedge fearless.leader_q\{v\} \wedge \mathbf{dc_{sp}}(k) \subseteq q} \wedge \underline{\underline{\mathbf{cs}(k) \subseteq q}} \wedge$
$follow_p\{u,v\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

        B: No, he didn't.   (target = MC)
$\underline{\underline{\mathbf{cdr}(k)}} \wedge \exists r \wedge \mathbf{not}_r^{r'}(follow_{r'}\{u,v\}) \wedge \mathbf{dc_{sp}}(k) \subseteq r$

If, however, the ARC is attached to the top node of the sentence, the reverse situation obtains: the proposal associated with the main clause is terminated whereas the proposal associated with the ARC is still open. This explains why final ARCs can be felicitously targeted by direct rejections, see (80).

(80) A: $[_{\text{ForceP}_1} [_{\text{ForceP}_1} \text{ Jack followed Edna}] [_{\text{ForceP}_2} \text{ who is a fearless leader}]]$
$\exists p \wedge \exists u \wedge u = jack \wedge \exists v \wedge v = edna \wedge follow_p\{u,v\} \wedge \mathbf{dc_{sp}}(k) \subseteq p \wedge$
$\underline{\underline{\mathbf{cs}(k) \subseteq p}} \wedge \exists q \wedge fearless.leader_q\{v\} \wedge \underline{\mathbf{dc_{sp}}(k) \subseteq q}$

B: No, she isn't.   (target = ARC)
$\underline{\underline{\mathbf{cdr}(k)}} \wedge \exists r \wedge \mathbf{not}_r^{r'}(fearless.leader_{r'}\{u,v\}) \wedge \mathbf{dc_{sp}}(k) \subseteq r$

To summarize: while medial ARCs are predicted to be not open to direct responses, final ARCs can be. We have derived the results of the Direct Response Test.

The account just presented makes at least two interesting predictions that need to be further explored. The first prediction rides on the fact that medial ARCs introduce proposals. If so, they are expected to be open to direct responses immediately after they have been introduced. This indeed seems possible, as (81) illustrates.[51]

(81) A: Edna, who is a fearless leader,...

B: That's not true.

The felicity of the discourse in (81) is at odds with accounts according to which ARCs are *grammatically* marked as "not-at-issue content" (see AnderBois et al. 2010, Murray 2010). What such examples seems to demonstrate is that proposals introduced by medial ARCs are not at-issue not in some absolute sense but only relative to a given point in discourse. The conversational game involves a lot of turn-taking and thus there must be certain implicitly understood "breaking points" at which the hearer can intervene. The fact that the default for such points is sentence boundaries might have to do with politeness and/or the fact that the end of the sentence is usually the point at which a complete thought is expressed. In specific types of discourse, the breaking points could have a denser or a sparser distribution: e.g. denser breaking points can occur in conversations between good friends and sparser breaking points can occur when an authoritative figure is addressing the public.

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[51]The current account still needs to clarify how the hearer in (81) can interpret an incomplete sentence and disagree with it. The compositional mechanism laid out in Chapter 6 does not assign to (81A) a dynamic term, i.e. a term of an update type.

The second interesting prediction of the current account stems from the combined force of Immediacy and Implicit Acceptance. From those constraints it follows that at a given point of conversation *at most one* proposal could be still open. In particular, this predicts that in sentences with final ARCs either the main clause or the appositive can be at-issue, but not both. This is different from cases involving coordinated structures, which introduce a single proposal.[52] It is not very easy to test this prediction but let us try. In (82), there is only proposal expressed by a clausal conjunction and the hearer can agree with both parts simultaneously. This is more difficult in (83), which introduces two proposals and the hearer tries to agree with both of them.

(82)   A: Jack likes Edna and she is a wonderful person.
          B: I agree with both of those things.

(83)   A: Jack likes Edna, who is a wonderful person.
          B: ? I agree with both of those things.

Although the contrast between (82) and (83) is not so sharp, it is suggestive.

Relatedly, the current account predicts that in sentences with final ARCs rejecting the main clause content implies accepting the appositive content, and vice versa. This is because by rejecting one of the proposals the hearer signals that she has chosen the structure in which the other proposal is closed. This seems correct. In (84), the hearer can objects to either the main clause, as in (84B), or the appositive, as in (84B′). In either case, her responses leave the impression that she agrees with the remaining part of the sentence.

(84)   A: Melissa is dating Steven, who is the head of the biology department.
          B: She isn't dating him. They are just friends.
          B′:   He isn't anymore. Steven switched careers and now works for the industry.

We see that both predictions of the current account—that ARCs can be directly challenged immediately after they are uttered and that sentences with final ARCs introduce two

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[52]The fact that conjunctions are always part of the same proposal is discussed in Section 4.6 below.

independent proposals—seem to find empirical support.

4.5 Defining at-issue content

So far I have been using the term "at-issue content" in a semi-theoretical way. We now have enough technical machinery in place to offer a precise definition of it. My strategy will be to first define the auxiliary concepts of "proposal", "counterproposal", "acceptance", and "rejection", and then define "at-issue content" in terms of those concepts.

The most basic concept is that of proposal. As already mentioned, it is defined in terms of individual discourse commitments.

(85)   Def (PROPOSAL)
       A proposition p is a PROPOSAL to update the context set in an information state σ if a discourse participant (the speaker or the hearer) has publicly committed to p in σ, i.e. if $\forall i \in \sigma : [\![\mathbf{dc_{sp}}(k)]\!]^{i,\sigma} \subseteq \mathsf{p}$ or $\forall i \in \sigma : [\![\mathbf{dc_{hr}}(k)]\!]^{i,\sigma} \subseteq \mathsf{p}$.

The definition above makes reference to both speech participants, not just to the speaker. This is needed in order to define the notion of counterproposal below: we want to be able to say that two propositions are proposals with respect to the same information state even when one of the proposals has been decided. Also, this definition does not require that proposals have been uttered: if p is a proposal, so are all propositions which are supersets of p.

A proposal is accepted in an information state if it is discourse true in all the worlds of the context set in that state.

(86)   Def (ACCEPTANCE)
       A proposal p is ACCEPTED in an information state σ if the context set in σ has been restricted to p, i.e. if $\forall i \in \sigma : [\![\mathbf{cs}(k)]\!]^{i,\sigma} \subseteq \mathsf{p}$.

A counterproposal is a proposal that is incompatible with the original proposal.

(87) Def (COUNTERPROPOSAL)
A proposal q is a COUNTERPROPOSAL to a proposal p in an information state σ if

- q is a proposal in σ, and
- it is not possible to accept both p and q in σ without contradiction.

A contradiction arises when the context set is the empty set. Notice also that the notion of counterproposal expresses a symmetric relation between two propositions: if q is a counterproposal to p, then p is a counterproposal to q too.

A proposal is rejected by introducing a counterproposal.

(88) Def (REJECTION)
A proposal p is REJECTED in an information state σ if there is a counterproposal q to p in σ.

Notice that while acceptances can be implicit or explicit, rejections are always explicit. This follows from the fact that rejections are achieved by introducing counterproposals, which are necessarily explicit.

We can now define the notion of at-issue content, which is central to this chapter. Roughly, a propositional content is at-issue if it represents an open proposal.

(89) Def (AT-ISSUE CONTENT)
A proposition p is AT-ISSUE in an information state σ if

- p is a proposal in σ, and
- p has not been accepted or rejected in σ.

Let me emphasize a few obvious points captured by this definition. First, the property of at-issueness applies to *semantic content*, not grammatical form. Saying that a main clause is at-issue really means that its semantic content is at-issue. Second, at-issue content is *propositional*. It makes little sense to ask whether the content of a given phrase is at-issue if that phrase does not expresses a full proposition. Third, content is at-issue not in some absolute sense but only *relative* to an information state. A given semantic content can be at-issue in some but not other states: in fact, this is the rule rather than the exception. Finally, this is a definition of *at-issue* content and not a definition of not-at-issue content. Content is

not at-issue either because it is not a proposal (the first condition does not hold) or because it is a proposal that has already been accepted or rejected (the second condition does not hold). Thus, as far as ARCs are concerned, the concept of "not-at-issue content" has no role to play in the official account.

Below, I illustrate the way the information status of content changes as discourse progresses. The first sentence in (90A) introduces the proposal p. Immediately after the sentence is uttered, p is a proposal that has not been resolved, i.e. according to the definition above it is at-issue. Since the hearer does not object, p gets silently accepted and is no more at-issue. The second sentence in (90A) introduces the new proposal q, which too is at-issue immediately after the sentence is uttered. This proposal remains at-issue until the counter-proposal r is introduced in (90B).[53] From then on, q is rejected and is no more at-issue, while r becomes at-issue.

(90)   A: Jeremy is from Vancouver. (OK.) He is a passionate Canucks fan.
$\exists p \wedge \exists u \wedge u = jeremy \wedge grow.up.in.vancouver_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$
$\underline{\underline{\mathbf{cs}(k) \subseteq p}}$
$\overline{\exists q \wedge passionate.canucks.fan_q\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq q}$

B: No, he isn't.
$\underline{\underline{\mathbf{cdr}(k)}} \wedge \exists r \wedge \mathbf{not}_r^{r'}(passionate.canucks.fan_{r'}\{u\}) \wedge \mathbf{dc_{sp}}(k) \subseteq r$

In short, the information status of proposition changes depending on the point of evaluation in the discourse development.

4.6 More structures

So far we have assumed that only main clauses and ARCs introduce new proposals. In Chapter 6 this property is attributed to the fact that those constructions form Force Phrases.[54] It is then important to ask what predictions this assumption makes about the information

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[53]This explains the intuition that r is a counterproposal with respect to q, not p.

[54]In Chapter 7 I consider the possibility that other parenthetical constructions, i.e. nominal appositives, also form Force Phrases.

status of related constructions, such as clausal conjuncts or restrictive relative clauses. Also, what about interrogative clauses, which, as we saw in Section 3 of the current chapter, can be answered by ARCs or can themselves be ARCs? The current section aims at showcasing the semantic properties and the resulting information status of those additional constructions. A compositional account that derives the logical representations provided is detailed in Chapter 6.

Coordinate structures are necessarily relativized to the same proposal. For example, the two conjuncts in (91) put restrictions on the proposal associated with the single Force Phrase present in the sentence.

(91) $[_{\text{ForceP}} [_{\text{CoorP}} [_{\text{TP}}$ Edna is a fearless leader$]$ and $[_{\text{TP}}$ she started the descent$]]]$
$\exists p \wedge \exists u \wedge u = edna \wedge fearless.leader_p\{u\} \wedge start.descent_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

This analysis is supported by the fact that the two conjuncts are equally available to direct responses. Moreover, as pointed out in Section 4.4 above, a direct response can take issue with both conjuncts simultaneously, e.g. by uttering 'I agree with that'.

Similarly, restrictive relative clauses are interpreted intersectively with their head noun. This is why the content of the head noun and that of the relative clause are necessarily relativized to the same proposal, as illustrated in (92).

(92) $[_{\text{ForceP}} [_{\text{DP}}$ A $[_{\text{NP}}$ woman $[_{\text{CP}}$ who spoke Sherpa$]]]$ started the descent$]$
$\exists p \wedge \exists u \wedge woman_p\{u\} \wedge speak.sherpa_p\{u\} \wedge start.descent_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

This analysis correctly predicts that the content of the head noun and the content of the relative clause are equally open to direct responses. For example, the hearer can disagree with (92) equally well by uttering 'No, that was a man' or 'No, she spoke Dzongkha'; in doing so, the hearer introduces a counterproposal and thus commits herself to the proposition that a man who spoke Sherpa started the descent or the proposition that a woman who spoke Dzongkha started the descent, respectively. More generally, in coordinate constructions either both parts are at-issue or neither is.

Interrogative clauses deviate from most of the data discussed so far because they do

not introduce proposals but rather introduce alternatives that structure the context set. This assumption broadly follows the PROPOSITION SET APPROACH to the semantics of questions (see Hamblin 1973, Karttunen 1977, Groenendijk & Stokhof 1984, Groenendijk & Roelofsen 2009, Murray 2010, a.o.). The alternatives introduced by an interrogative clause represent the CONGRUENT ANSWERS to the question performed when the interrogative is uttered. I impose the following restrictions on congruent answers. First, congruent answers are *possible* answers, i.e. answers that could exclude the actual world. Second, congruent answers represent *complete* answers and all their subsets. Complete answers are expressed by a single (maximal) alternative that resolves the issue raised by the question. Subsets of complete answers are needed in order to treat conjoined questions.[55] Finally, for convenience I make the simplifying assumption that congruent answers to constituent questions are always *singular*. That is, alternatives are created per singular individuals, not per sums of individuals. For example, a question like 'Who left?' will have alternatives such as 'Will left' and 'Alyson left', but not 'Will and Alyson left'.

Before going into the discussion, we need to take a closer look into the interpretation rules of USC for functional terms that trigger question alternatives. Where p is a propositional variable and u is an individual variable, we make use of the following two functional terms, interpreted as shown below.

(93)   a. $[\![\mathbf{alt}(p)]\!]^{i,\sigma} = \wp([\![\mathbf{max}(p)]\!]^{i,\sigma}) \cup \wp(D_\omega - [\![\mathbf{max}(p)]\!]^{i,\sigma})$
       b. $[\![\mathbf{alt}(p,u)]\!]^{i,\sigma} = \bigcup_{\mathsf{d} \in D_e} \{\wp(\{\mathsf{w} \mid \exists j \in \sigma : \mathsf{w} \in [\![p]\!]^{j,\sigma} \ \& \ \mathsf{d} = [\![u]\!]^{j,\sigma}\})\}$

The term $\mathbf{alt}(p)$ is used to model polar questions and creates the set of alternatives triggered by the question content expressed by p. According to (93a), $\mathbf{alt}(p)$ is interpreted as the set of propositions included either in the maximal value of p or its complement. For example, let $D_\omega = \{\mathsf{w}_1, \mathsf{w}_2, \mathsf{w}_3, \mathsf{w}_4\}$ and $[\![\mathbf{max}(p)]\!]^{i,\sigma} = \{\mathsf{w}_1, \mathsf{w}_2\}$. Then, the first set in the union in (93a) is the power set $\{\{\mathsf{w}_1, \mathsf{w}_2\}, \{\mathsf{w}_1\}, \{\mathsf{w}_2\}, \{\}\}$ and the second set in the union is the

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[55]See the example in (97) below.

power set $\{\{w_3,w_4\},\{w_3\},\{w_4\},\{\}\}$. What $\mathbf{alt}(p)$ amounts to is the union of the two sets, i.e. $\{\{w_1,w_2\},\{w_1\},\{w_2\},\{w_3,w_4\},\{w_3\},\{w_4\},\{\}\}$. Assuming that the question is 'Did Gabe win?', the two maximal sets, $\{w_1,w_2\}$ and $\{w_3,w_4\}$, represent the 'Yes' and the 'No' answers to that question, respectively. The set $\mathbf{alt}(p)$ is downward closed under the subset relation.

The second term, $\mathbf{alt}(p,u)$, is needed to model content questions and represents the set of alternatives triggered by p for u. In order to understand its interpretation in (93b), note first that $\{w\,|\,\exists j \in \sigma : w \in [\![p]\!]^{j,\sigma} \,\&\, a = [\![u]\!]^{j,\sigma}\}$ is the set of worlds in the values of p assigned by any index in σ which also assigns a to u. The power set of that last set is $\wp(\{w\,|\,\exists j \in \sigma : w \in [\![p]\!]^{j,\sigma} \,\&\, a = [\![u]\!]^{j,\sigma}\})$. If we now take the union of all power sets for each individual in the domain, we get to the interpretation of $\mathbf{alt}(p,u)$. To illustrate, let $D_\omega = \{w_1,w_2,w_3,w_4\}$, $D_e = \{a,b\}$, and let there be the following eight indices in σ which assign values to p for u as specified below.

σ	p	u
i_1	$\{w_1,w_2\}$	a
i_2	$\{w_1\}$	a
i_3	$\{w_2\}$	a
i_4	$\{\}$	a
i_5	$\{w_3,w_4\}$	b
i_6	$\{w_3\}$	b
i_7	$\{w_4\}$	b
i_8	$\{\}$	b

Table 2: A hypothetical information state

Given that, $\{w\,|\,\exists j \in \sigma : w \in [\![p]\!]^{j,\sigma} \,\&\, a = [\![u]\!]^{j,\sigma}\}$ is $\{w_1,w_2\}$ and $\{w\,|\,\exists j \in \sigma : w \in [\![p]\!]^{j,\sigma} \,\&\, b = [\![u]\!]^{j,\sigma}\}$ is $\{w_3,w_4\}$. The power sets of those two sets are $\{\{w_1,w_2\},\{w_1\},\{w_2\},\{\}\}$ and $\{\{w_3,w_4\},\{w_3\},\{w_4\},\{\}\}$, respectively, so $\mathbf{alt}(p,u)$ is interpreted as $\{\{w_1,w_2\},\{w_1\},\{w_2\},\{w_3,w_4\},\{w_3\},\{w_4\},\{\}\}$. For example, if the question is 'Who won?' and there are only two people under consideration, $\{w_1,w_2\}$ and $\{w_3,w_4\}$ express the proposition that one or the other won. As above, the set is downward closed under set inclusion.

Let us now demonstrate how those alternative-generating terms can be put to use. Polar questions as in (94) receive the logical representation given below. The content expressed by the sentence is stored in the values assigned to p. This variable triggers the two maximal alternatives, i.e. that Gabe won and that Gabe did not win, which (together with all of their subsets) are stored in the values assigned to q. After (94A) is interpreted, the context set will consist of all possible candidates none of which contains worlds in which Gabe won and worlds in which Gabe did not win. If a positive (94B) or a negative answer (94B$'$) is given and accepted (not represented here), the question is answered.[56]

(94)   A: Did Gabe win?
$$\exists q \wedge \exists p \wedge \exists u \wedge u = gabe \wedge win_p\{u\} \wedge q \in \mathbf{alt}(p) \wedge \mathbf{cs}(k) \subseteq q$$

        B: Yes, he did.
$$\underline{\mathbf{cdr}(k)} \wedge \exists r \wedge win_r\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq r$$

        B$'$: No, he didn't.
$$\underline{\mathbf{cdr}(k)} \wedge \exists r \wedge \mathbf{not}_r^{r'}(win_{r'}\{u\}) \wedge \mathbf{dc_{sp}}(k) \subseteq r$$

Similar remarks can be made about the content question in (95A), with the important difference that here the alternatives are relativized to the values assigned to u. Since the only restriction is that u won in some world, the question alternatives will range over all winners in the model. One proposal for an answer is given in (95B). If accepted, it will resolve the issue.

(95)   A: Who won?
$$\exists q \wedge \exists p \wedge \exists u \wedge won_p\{u\} \wedge q \in \mathbf{alt}(p, u) \wedge \mathbf{cs}(k) \subseteq q$$

        B: Gabe did.
$$\underline{\mathbf{cdr}(k)} \wedge \exists r \wedge \exists v \wedge v = gabe \wedge win_r\{v\} \wedge \mathbf{dc_{sp}}(k) \subseteq r$$

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[56] Although I do not analyze the import of response particles like 'Yes' or 'No', the most natural assumption is that such particles are propositional anaphors whose antecedent is the proposition expressed by the polar question. In (94), a simple 'Yes' response can be represented as $\underline{\mathbf{cdr}(k)} \wedge \mathbf{dc_{sp}}(k) \subseteq p$ and a simple 'No' response as $\underline{\mathbf{cdr}(k)} \wedge \mathbf{dc_{sp}}(k) \subseteq \overline{\mathbf{max}(p)}$, where $[\![\bar{A}]\!]^{i,\sigma} = D_\alpha - [\![A]\!]^{i,\sigma}$, for any $A \in Term_{\alpha t}$. That is, 'Yes' commits the speaker to the proposition expressed by the polar question and 'No' commits the speaker to the complement of that proposition. (This analysis follows Murray 2010 and Farkas & Roelofsen ms.)

The notion of answerhood used in the exposition above is a relation between two dynamic terms. It can be defined as follows.[57]

(96) Def (Complete answerhood)
Let $\phi \in Term_{[]}$ be interrogative and $\psi \in Term_{[]}$ be informative. Then, ψ provides a COMPLETE ANSWER to ϕ if and only if $\forall \sigma \in D_\omega \exists p \in D_\omega : p \in CSC_{\sigma[\![\phi]\!]}$ & $p = CS_{\sigma[\![\phi \wedge \psi]\!]}$ & $\neg \exists q \in CSC_{\sigma[\![\phi]\!]} : p \subset q$.

What this definition says is that *psi* provides a complete answer to *phi* if and only if for any state σ exactly one maximal context set candidate in $\sigma[\![\phi]\!]$ survives in $\sigma[\![\phi \wedge \psi]\!]$.

Note that the dynamic terms in (94A) and (95A) are both interrogative, in the sense of the definition in (66) in Section 4.2. That is, after those terms are interpreted, there is no greatest element among the context set candidates in the resulting information state. Rather, there are two or more maximal sets.

I now turn to data with questions involving appositives. In Section 3.2 it was argued that ARCs can in principle answer question. One illustration for how this happens is given in (97). In this short discourse A asks a conjoined question and B answers it by uttering a sentence with a final ARC. Here I focus on the structure in which the ARC is attached to the object of the main clause, i.e. its content is silently accepted.

(97) A: $[_{ForceP_{[ASK]}} [_{CoorP} [_{CP}$ Who did you meet at the party$]$ and $[_{CoorP}$ what did they bring$]]]$
$\exists q \wedge \exists p \wedge \exists u \wedge meet_p\{\mathbf{hr}(k), u\} \wedge q \in \mathbf{alt}(p, u) \wedge \exists p' \wedge \exists u' \wedge bring_{p'}\{u, u'\} \wedge q \in \mathbf{alt}(p', u') \wedge \mathbf{cs}(k) \subseteq q$

B: I met $[_{DP}$ Paula $[_{ForceP}$ who brought cookies$]]$
$\underline{\mathbf{cdr}(k)} \wedge \exists p \wedge \exists u \wedge u = paula \wedge \exists p' \wedge bring.cookies_{p'}\{u\} \wedge \underline{\mathbf{dc_{sp}}(k) \subseteq p'} \wedge \underline{\underline{\mathbf{cs}(k) \subseteq p'}} \wedge meet_p\{\mathbf{sp}(k), u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

(OK.)
$\underline{\underline{\mathbf{cs}(k) \subseteq p}}$

First notice that in (97A), in order to get the right values for q, the alternative sets have to

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generate not only the maximal alternatives but also all their subsets. Otherwise, q, which is among the alternatives for both conjuncts, might turn out to be the empty set. After the question is interpreted, there will be several maximal sets among the context set candidates and each of them will entail exactly one answer to either issue. In (97B), the appositive resolves one of the issues and the main clause (assuming that its content is accepted) resolves the other. Thus, (97B) provides a complete answer to (97A) in the sense of the definition in (96): a single maximal alternative is selected. In all of the worlds of that alternative it will hold that the addressee met Paula and that Paula brought cookies.

Last but not least, I discuss some of the data from Section 3.3 in which the main clause and the ARC are of different clausal type and perform different speech acts. I focus on sentences in which the ARC occurs medially. In (98a), the main clause expresses a question and the ARC expresses an assertion. Since a direct response can only address the question, we know that the ARC is not at-issue, i.e. its content is automatically added to context set. Thus, (98a) is informative (it would eliminate the worlds from the context set in which Jack was not talking to Marcia a minute ago) but it is also interrogative (it would split the context set into the proposition that Jack goes home, the proposition Jack does not go home, and all their subsets). This sentence is thus a hybrid, i.e. both informative and interrogative, as visible from its logical representation in (98b) which would update and structure the context set.

(98) Has Jack, who was talking to Marcia a minute ago, gone home?
$\exists q \wedge \exists p \wedge \overline{\exists u \wedge u = jack \wedge \exists r \wedge \exists v \wedge v = marcia \wedge talk.to_r\{u, v\} \wedge \mathbf{dc_{sp}}(k) \subseteq r} \wedge$
$\underline{\underline{\mathbf{cs}(k) \subseteq r}} \wedge go.home_p\{u\} \wedge q \in \mathbf{alt}(p) \wedge \mathbf{cs}(k) \subseteq q$

In (99), the ARC expresses a question and the main clause expresses an assertion. We know from Section 3.3 that the question cannot be directly answered and only the main clause is open to direct responses. If the question tag on the ARC is pronounced with a final rise, this sentence is purely interrogative: it asks whether Jack wanted to meet Marcia and proposes that Marcia has just arrived. This reading is illustrated in (99a). If, however,

the question tag is pronounced with a final fall, we assumed that the question receives a default positive answer and the reading obtained is similar to a sentence with a declarative ARC. In this latter case the sentence is purely informative, as it would eliminate the worlds in context set in which Jack did not want to meet Marcia. This reading is represented in (99b).

(99) Marcia, <u>whom Jack wanted to meet</u>, didn't he (?), has just arrived.

    a. $\exists p \wedge \exists u \wedge u = marcia \wedge$
$\underline{\exists q \wedge \exists r \wedge \exists v \wedge v = marcia \wedge want.meet_r\{v,u\} \wedge q \in \mathbf{alt}(r) \wedge \mathbf{cs}(k) \subseteq q \wedge}$
$\overline{arrive_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p}$

    b. $\exists p \wedge \exists u \wedge u = marcia \wedge$
$\underline{\exists q \wedge \exists r \wedge \exists v \wedge v = marcia \wedge want.meet_r\{v,u\} \wedge q \in \mathbf{alt}(r) \wedge \mathbf{cs}(k) \subseteq q \wedge}$
$\underline{\underline{\mathbf{cs}(k) \subseteq r}} \wedge arrive_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

In conclusion, we see that the account proposed for ARCs can be extended to related constructions and interrogative sentences. We also find that—to some extent—the information status of interrogative clauses obeys similar restrictions as that of declarative clauses. However, in Section 4.5 the term "at-issue content" was defined for declarative clauses only, i.e. for clauses which introduce proposals. For interrogative clauses, the relevant property seems to be that of being asked but not yet answered.[58] Although more work needs to be done to show how and if the term "at-issue content" can be defined so that it applies to all kinds of speech acts, the general direction of the enterprise seems promising enough.

5 Previous approaches to not-at-issueness

In the previous section we developed a discourse model that correctly predicts the information status of ARCs and a range of other constructions. In this section I discuss three previous approaches that try to theoretically explicate the at-issue/not-at-issue distinction.

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[58]I thank Roger Schwarzschild for suggesting how the term at-issue content could be extended in this way.

I also point out some of the challenges that each of these approaches faces.

5.1 The discourse topic approach

One line of thought seeks to explain the information status of semantic content in terms of its relationship to the main topic of the conversation. I call this approach the DISCOURSE TOPIC APPROACH (see Amaral et al. 2007, Roberts et al. 2009, Simons et al. 2010). According to the discourse topic approach, what makes a semantic content not at-issue is the fact that it does not address the discourse topic, also called the QUESTION UNDER DISCUSSION (QUD).[59] In contrast, at-issue content has to address the QUD. The discourse topic approach also establishes a tight link between not-at-issue information status and projection behavior. In what follows, I focus on Simons et al. (2010), who offer the most theoretical detail.

Simons et al. (2010) define at-issue content in two steps. First, the notion of relevance to a question is defined in terms of answerhood to that question (100). Then, at-issue content relative to a question under discussion is defined in terms of relevance to that question (101).

(100)   RELEVANCE TO A QUESTION (Simons et al. 2010; slightly modified)
An assertion p is RELEVANT to a question Q if and only if p entails a partial or complete answer to Q.

(101)   AT-ISSUE CONTENT in terms of Relevance (Simons et al. 2010; slightly modified)
A proposition p is AT-ISSUE relative to a question under discussion Q if and only if asserting p is relevant to Q.

Putting those two definitions together, we arrive at the following direct definition of at-issue content.

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[59]Explicit accounts of how the QUD structures discourse are developed in Ginzburg (1996), Roberts (1996), Büring (2003), and Farkas & Bruce (2010).

(102) AT-ISSUE CONTENT
A proposition *p* is AT-ISSUE relative to a question under discussion *Q* if and only if *p* entails a partial or complete answer to *Q*.

From (102) it follows that a proposition is not at-issue relative to a question under discussion if and only if it does not entail an answer to that question.

The authors illustrate the workings of the account on examples as in (103).

(103) *Scenario*: A nutritionist has been visiting first grade classrooms to talk to the children about healthy eating.

Q: What most surprised you about the first graders?
A: They didn't know that you can eat raw vegetables.   (Simons et al. 2010)

The utterer of (103A) is committed to two implications: that the first graders did not know that you can eat raw vegetables and that you can eat raw vegetables. Clearly, only the former implication entails an answer to the question under discussion, made explicit by the overt question. By the definition in (102), we correctly predict that the latter implication (that you can eat raw vegetables), triggered by the factive verb 'know', is not at-issue relative to the question in (103Q).

The far-reaching goal of the discourse topic approach is to get a handle on projective content by using the notion of at-issueness. Projective content is defined as an implication that survives when its lexical trigger is embedded under an entailment-canceling operator. Given that, the proponents of this approach put forward the following general hypothesis about the relationship between projective meaning and information status.[60]

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[60]The precise statement reads as follows:

"All and only those implications of (embedded) sentences which are not-at-issue relative to the Question Under Discussion in the context have the potential to project" (Simons et al. 2010:315).

The phrasing "have the potential to project" is introduced to cover cases in which projective meanings are not seen to project because their triggers are not syntactically embedded under an operator (David Beaver, p.c.). With that issue aside, the authors regard not-at-issue meanings and projective meanings (in a given pragmatic context) as purely equivalent. This is visible from the following statements:

(104)   PROJECTION-NOT-AT-ISSUENESS HYPOTHESIS (cf. Roberts et al. 2009, Simons et al. 2010)
An implication p projects in a pragmatic context c if and only if p is not at-issue relative to the question under discussion in c.

The projection properties of ARCs are discussed in Chapter 4 and those of nominal appositive and slifting parentheticals are discussed in Chapter 7. However, already at this point it is worth exploring the consequences of this approach.

The discourse topic approach does not regard not-at-issue content as arising from grammar but rather as arising from its relation to the discourse topic. According to this approach, all kinds of semantic content could potentially address the QUD and count as at-issue relative to that question. As far as ARCs are concerned, this seems correct: recall that they can fairly easy address questions.[61] However, it is less clear whether the same holds true for grammatical elements that seem to exclusively trigger not-at-issue implications, e.g. expressives (see Potts 2005, 2007) or certain evidential markers (see Murray 2010, Koev 2011). Simons et al. (2010) are well-aware of this issue and suggest that at least some syntactic constructions or lexical items mark their content for a particular information status.

Let me now turn to the potential weaknesses of this approach. I start off with two general observations. First, given the biconditional nature of the statement in (104), it follows that, in a given pragmatic context, not-at-issue meanings are *equivalent* to projective meanings. If those two types of meanings characterize the same class of implications, then the question arises of why projection should be explained in terms of not-at-issueness, and not, say, vice versa. For example, one could imagine an alternative account which regards not-at-issue information status as a by-product of the fact that projective meanings are logically

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"Projective meaning just is not-at-issue meaning" (Roberts et al. 2009:6)
"All and only the not-at-issue content of a constituent projects, given an appropriate context of utterance" (Roberts et al. 2009:7)
"Meanings project IFF they are not at-issue" (Simons et al. 2010:309).

[61]Similar judgments are obtained for nominal appositives, which too can marginally well answer questions. (See Chapter 7.)

separated from the rest of the sentence, e.g. as in Potts (2005). Although it is not immediately clear what the details of such an account would look like, it seems that nothing on the conceptual level prefers one direction of explanation over the other.

Second, the link between not-at-issue meanings and projective meanings is less clear under this approach. In particular, the discourse topic account does not explain *why* not-at-issue content should project; the authors simply assert that operators only target at-issue content.[62] Since operators are routinely found in expressions that instantiate not-at-issue content, e.g. in ARCs, this last claim needs to be limited to operators that are *external* to the lexical trigger of such content. More importantly, operator scope is typically thought of as arising from a particular structural configuration, i.e. as pertaining to the syntax-semantics interface. Given that, it might appear surprising that operators are sensitive to the discourse status of the elements in their syntactic scope. What seems to be missing is a specific mechanism that explains why not-at-issue content is invisible to external operators. Although the current account offers one such mechanism (see Chapter 4), it is unclear whether it can be extended to constructions other than appositives.

The discourse topic approach correctly emphasizes the very strong link between not-at-issue status and projection behavior across empirical domains (see recent work on presupposition, appositives, expressive adjectives, honorifics, evidentials, etc.). Yet, the claimed overlap between those two categories seems far from perfect: not-at-issue meanings need not project and projective meanings can be at-issue (with respect to the same pragmatic context). Complements of non-factive verbs, especially of world-creating verbs like 'dream' or 'imagine', exemplify the first type of exception.[63] In (105), the complement of 'imagine' does not address the discourse topic made explicit by the overt question and thus is

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[62]Simons et al. (2010) write: "Operators (modals, negation, etc.) target at-issue content" (p.315).

[63]Embedding verbs like 'see', 'hear', 'think' or 'say' can, in addition to their ordinary interpretation, receive a so-called PARENTHETICAL INTERPRETATION, which makes their complements the main point of the utterance, i.e. at-issue. For example, complements of such verbs can often felicitously answer questions. (See Simons 2007 for discussion.) Similarly, complements of (semi)factive predicates can sometimes bear the main point, as in the often-cited example 'We regret to inform you that your application has been rejected.'

not at-issue, by the definition of at-issue content in (103). Hence, by the hypothesis in (105), its content should project. In spite of that, the utterance in (106B) does not carry the implication that Jessica became the next Miss USA.

(105)   A: What happened last night?
          B: Jessica **imagined** she became the next Miss USA.

Final ARCs exemplify the second type of exception: they project but can express at-issue content. In (106), the ARC projects past the possibility modal and thus, is predicted by the hypothesis in (104) to have not-at-issue status. And yet, it is open to direct rejections, so according to the Direct Response Test it is at-issue.[64]

(106)   A: Liz **might** be with her husband, who has prostate cancer.
          B: That's not true—he has lung cancer.

Above, I have offered an account of why final ARCs can express at-issue content. In Chapter 4 I demonstrate that despite their potential at-issue status, final ARCs are predicted to project. More generally, the examples above suggest that not-at-issueness and projection are not as tightly related and that having one property cannot be taken as an indication of also having the other. Still, the discourse topic approach provides an important step towards studying the exciting relationship between projection and not-at-issueness.

5.2   The update type approach

AnderBois et al. (2010) (see also Murray 2010) pursue a different approach to the at-issue/not-at-issue content distinction. Their approach has a much narrower empirical scope than the discourse topic approach as it aims to explain the not-at-issue status of *asserted* content only. The leading idea is that at-issue and not-at-issue asserted content differ in *how* they update the context set: indirectly (with the addressee's approval), in the case

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[64]Importantly, this argument only goes through if one assumes that A and B address *the same* QUD. I thank Roger Schwarzschild for pointing out this to me.

of at-issue content, or directly (without the addressee's approval), in the case of not-at-issue content. Main clauses introduce proposals that can be accepted or rejected by the addressee. This is similar to the account defended in this dissertation. In contrast, appositive content carries an instruction to be directly added to the context set and is thus not open to direct responses. The difference in information status between regular asserted content and appositive content boils down to a difference in update type. I refer to this approach as the UPDATE TYPE APPROACH.

AnderBois et al. (2010) couch their account in a version of DYNAMIC PREDICATE LOGIC (see Groenendijk & Stokhof 1991). Since their formal system shares several important features with the logic developed in the current dissertation, I prefer to illustrate their ideas in USC, thus glossing over the differences.

Consider the following sentence and its logical representation.[65]

(107)   a.   John, who nearly killed a woman with his car, visited her in the hospital.
         b. $\exists p \wedge \exists u \wedge u = john \wedge \exists v \wedge woman_{\mathbf{cs}(k)}\{v\} \wedge nearly.kill_{\mathbf{cs}(k)}\{u,v\} \wedge$
              $visit.in.hospital_p\{u,v\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$ (cf. AnderBois et al. 2010)

The main difference to my approach is that on AnderBois et al.'s approach ARCs do not introduce proposals. In (107), there is a single proposal introduced by the main clause. The appositive content is relativized directly to the context set. Assuming that the proposal is accepted, both the ARC and the main clause will update the context set but in a different way: the ARC will do so directly, i.e. by means of its semantics, while the main clause will do so only because its proposal was accepted by the addressee.

How can this analysis derive the fact that direct responses cannot felicitously target ARCs (for now excluding ARCs in sentence-final position)? Although AnderBois et al. (2010) are not very explicit on this point, the idea seems to be fairly clear. Direct responses

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[65]AnderBois et al. (2010) add a "proposal accepted" conjunct to the logical representation in (107b). Unfortunately, this predicts that the main clause proposal automatically updates the context set, something that would obliterate the intended distinction in update type between appositive and main clause content. I will thus assume that such acceptance cannot be part of the meaning of the sentence.

can only target content that is part of the proposal. Since appositive content has an imme-
diate impact on the context set and thus never becomes part of the proposal, it is not a good
target for direct responses.

Although this account can elegantly explain the often not-at-issue status of ARCs, it
leaves out their sensitivity in information status to linear position. Why are final ARCs ac-
cessible to direct responses? The authors observe that final ARCs behave like conjunctions
rather than true appositives but do not incorporate this idea into their account. One might
try to push the idea further and hypothesize that final ARCs are exceptional in that they
are relativized to the proposal proposition. For example, the sentence in (108a) could be
represented as in (108b), where both the main clause content and the appositive content are
relativized to the proposal proposition.

(108)   a. Paula met Jimmy, who nearly fainted.
         b. $\exists p \wedge \exists u \wedge u = paula \wedge \exists v \wedge v = jimmy \wedge meet_p\{u,v\} \wedge nearly.faint_p\{v\} \wedge$
             $\mathbf{dc_{sp}}(k) \subseteq p$

This hypothesis treats final ARCs as conjuncts with no special properties and correctly
predicts their availability to direct responses. At the same time, the hypothesis seems to
lack explanatory power. This is because ARCs, independently of where they occur in the
sentence, seem to otherwise share the same empirical properties. One such property that
is shared between medial and final ARCs is projection (see Chapter 4). More importantly,
the observed dependency between linear position and information status cracks the door
open to the elusive nature of not-at-issueness and the way it comes into being, all topics
that were explored at length in Section 4 above.

5.3 The anaphoric approach

Another approach to not-at-issue content is based on the anaphoric availability of seman-
tic content to subsequent discourse. The main idea behind this approach is simple: while
grammar makes at-issue content anaphorically accessible by introducing a propositional

discourse referent for it, there is no such discourse referent introduced for not-at-issue content. I call this the ANAPHORIC APPROACH to not-at-issue content. The anaphoric approach is suggested in the analysis of slifting parentheticals in Jayez & Rossari (2004) and is worked out for evidential markers in Cheyenne (Algonquian) and other constructions in Murray (2010). Below, I follow the presentation in Murray (2010).

Actually, Murray's account blends two major ideas. As in the update type approach, at-issue and not-at-issue content are distinguished by the different ways they update the context set: at-issue content by introducing a proposal that is accepted and not-at-issue directly. As in anaphoric approaches, there is a propositional discourse referent introduced for the at-issue content only. Either of those two components, when taken in isolation, has the potential to explain how the intuition of not-at-issueness arises. The former component was discussed in the previous section. In this section, I focus on the latter component of Murray's account.

The idea behind the anaphoric approach can be illustrated without going into much technical detail. Consider the exchange in (109) below.

(109)   A: Tivi, <u>who is a cat</u>, likes to chase her tail.

            B: That's not true.
                ('that' = 'Tivi likes to chase her tail', 'that' $\neq$ 'Tivi is a cat')

                                  (after Murray 2010)

According to Murray (2010), in (109A) there is a discourse referent introduced for the main clause proposition (that Tivi likes to chase her tail) but there is no corresponding referent introduced for the appositive proposition (that Tivi is a cat). Assuming that 'that' in (109B) is a propositional anaphor, it is then clear why this anaphor can only pick out the former proposition. This difference in anaphoric availability explains the intuition that the main clause proposition is at-issue while the appositive proposition is not.[66]

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[66]The account of AnderBois et al. (2010), reviewed in the previous section, naturally lends itself to the same type of explanation. Under their account, there is a propositional referent introduced for the at-issue main clause content (the 'proposal') but no corresponding referent for the appositive content. It is not clear

Although the anaphoric account to not-at-issue content is very intuitive, it also makes very specific predictions about the anaphoric possibilities of semantic content. For example, it predicts that direct responses *necessarily* include propositional anaphors. This is straightforward for responses like 'No', 'Kinda' or 'Not really', but it is less clear for responses like 'I am sure he didn't go'. On the flip side, this approach predicts that indirect responses target not-at-issue content by a mechanism other than anaphora. In a sense, there is no point in distinguishing between direct and indirect responses anymore: the only relevant distinction is that between responses that include propositional anaphors and those that do not. These predictions call for further investigation.

More generally, the anaphoric approach needs to be complemented with a theory of when propositional discourse referents are introduced and how this is connected to grammatical form. For our purposes, the anaphoric approach needs to explain why propositional referents are introduced (or, at least, are more salient) for ARCs when they occur sentence-finally but not when occur sentence-medially.

5.4 Conclusion

I have critically examined three approaches to not-at-issue content: the discourse topic approach, the update type approach, and the anaphoric approach. It should be noted that those three approaches differ not only on how they try to explain information status but first and foremost on the discourse model assumed. The discourse topic approach is based on the discourse model in Roberts (1996), in which discourse moves are driven by the goals set up by the QUD. The update type approach takes as a starting point Stalnaker's (1978) discourse model according to which semantic content is incrementally added to the context set with the aim of increasing the information shared between speech participants.

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to me whether this design feature of their formal system was meant to allow this type of explanation.

Provided that those two discourse models can be integrated,[67] it would be interesting to see if the differences between the first two approaches to not-at-issue content are as big as they initially appear to be. The strength of the anaphoric approach is that it has a more grammatical flavor and seems compatible with either discourse model.

6 Summary

In this chapter, I argued that ARCs contribute truth-conditional content. It was demonstrated that although ARCs are typically not at-issue, their information status is sensitive to linear position: while medial ARCs are not at-issue, final ARCs can be at-issue. The account was embedded into a discourse model that makes crucial use of Stalnaker's (1974, 1978, 1999, 2002) view of assertion as a proposal on part of the speaker to update the context set. This discourse model allowed us to define the central notion of at-issue content, while the notion of "not-at-issue content" was reduced to independently motivated concepts. The account was implemented in the update logic of USC which could rigorously capture the information status of ARCs and related constructions. In following chapters, I demonstrate that the assumptions made here about discourse structure and grammatical form can also explain the projection properties of ARCs and, potentially, the interpretational properties of other parenthetical expressions.

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[67]See Farkas & Bruce (2010) for an attempt in this direction.

Chapter 3

Experimental evidence: Truth-conditional contribution and information status

1 Introduction

This chapter summarizes two experiments described in greater detail in Syrett et al. (ms). The goal of the first experiment (Experiment 3 in Syrett et al. ms) was to determine whether appositives contribute to the truth conditions of the entire sentence. The second experiment (Experiment 2 in Syrett et al. ms) aimed to probe into the information status of appositives and determine whether it is sensitive to the form and position of the appositive.[1]

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[1]This chapter is based on joint work with Kristen Syrett, Nicholas Angelides and Maxwell Kramer, and largely overlaps with Syrett et al. (ms).

2 The truth-conditional contribution of appositives

This section provides experimental support for the claim that appositives make a purely truth-conditional contribution to the sentence in which they appear.

2.1 Method: Participants, stimuli, procedure

60 undergraduates (range: 18–25 years) participated.

Participants were presented with a series of sentences, and asked to render a judgment. Test items consisted of single sentences with appositives. The truth value of the main clause and the appositive were manipulated, giving rise to all four possible combinations: True-True, True-False, False-True, False-False. All individual propositions from main clauses and appositives were pseudorandomized and distributed as separate sentences to undergraduates to ensure that their true/false status was common knowledge. We also built in a manipulation of the medial/final position of the false appositive, motivated by the finding that sentence-final appositive relative clauses can be treated as at-issue content (see Ander-Bois et al. 2010, Koev 2012, and Experiment 2 of Syrett et al. ms, summarized below) and thus may be more likely to interact with main clause content for the calculation of the truth value of the entire utterance. Finally, we manipulated the type of false content in the appositive (False vs. blatantly False). Given claims in the literature that the information contained in appositives should not be controversial (see Potts 2005, Schlenker 2009, ms), we asked whether it may be harder to disregard the truth value of a blatantly false (or controversial) appositive, or, alternatively, whether this information is so clearly (even ridiculously) false that it is overlooked in favor of the main clause content. An example of the permutations of one test sentence based on these variables is presented in (1)-(6) below.[2]

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[2]Here MC stands for "main clause" and APP stands for "appositive". Although this experiment did not distinguish between appositive types, there was an equal number of nominal appositives and appositive relative clauses in the stimuli and each participant saw 5 of each.

(1) (MC = True, APP = True; position = medial)
Australia, <u>which is a continent</u>, is in the Southern hemisphere.

(2) (MC = True, APP = False; position = medial)
Australia, <u>which is a planet</u>, is in the Southern hemisphere.

(3) (MC = True, APP = blatantly False; position = medial)
Australia, <u>which is part of the Axis of Evil</u>, is in the Southern hemisphere.

(4) (MC = True, APP = False; position = final)
There is a continent named Australia, <u>which is in the Northern hemisphere</u>.

(5) (MC = False, APP = True; position = medial)
Australia, <u>which is a continent</u>, is in the Northern hemisphere.

(6) (MC = False, APP = False; position = medial)
Australia, <u>which is a planet</u>, is in the Northern hemisphere.

There were 10 such sets of test sentences, resulting in a total of 60 test sentences. Sentences were then distributed among 10 participant lists in a Latin square fashion such that each participant saw each type of sentence, but only one sentence from each set.

The experimental session included 10 test items and 29 control items, all pseudorandomized for sentence type and predicted truth value judgment. There were four types of control items: 6 sentences that were easily judged True or False (cf. (7)); 6 sentences with obscure facts that were not easily judged True or False (cf. (8)); 6 true/false sentences with an adverbial clause and a comma to appear similar on the surface to sentences with an appositive (cf. (9)); and 11 non-complete sentences that asked participants to choose the correct response in order to fill in the blank, which we hoped would help them to focus on the content of the sentence (cf. (10)).

(7) Spiders have eight legs.

(8) Ratanakiri is a province in northeastern Cambodia.

(9)   Twice a year, the U.S. President delivers speeches in Yiddish.

(10)   Fish breathe with __ .

    a.   gills

    b.   lungs

During the experimental session participants were asked to (i) judge the truth of the sentences as True or False and (ii) assess their confidence in their judgment on a scale of 1 (not at all confident) to 5 (extremely confident).

2.2 Results

The results for the test items are presented in Table 1. Results for the control items are presented in Table 2.

TV combination	True responses	average CR
$\langle \text{T}_{\text{MC}}, \text{T}_{\text{APP}} \rangle$	94.0%	4.7
$\langle \mathbf{T}_{\mathbf{MC}}, \mathbf{F}_{\mathbf{APP\text{-}MED}} \rangle$	**6.0%**	**4.8**
$\langle \mathbf{T}_{\mathbf{MC}}, \mathbf{F}_{\mathbf{APP\text{-}MED\text{-}BLAT}} \rangle$	**16.0%**	**4.6**
$\langle \mathbf{T}_{\mathbf{MC}}, \mathbf{F}_{\mathbf{APP\text{-}FIN}} \rangle$	**2.0%**	**4.9**
$\langle \text{F}_{\text{MC}}, \text{T}_{\text{APP}} \rangle$	3.0%	4.9
$\langle \text{F}_{\text{MC}}, \text{F}_{\text{APP}} \rangle$	1.0%	5.0

Table 1: Results for each of the truth value (TV) combinations in the test items, including percentage of True responses and average confidence rating (CR) on a scale of 1–5. Crucial truth value combinations (true main clause and false appositive) are marked in bold.

control type	correct responses	average CR
unclear T/F	45.3%	2.2
clear T/F	93.3%	4.6
non-T/F	98.2%	4.8
T/F adverbials	97.8%	4.8

Table 2: Results for the four control item types, including percentage of correct responses and average confidence rating (CR) on a scale of 1–5

Looking at Table 1, these results show unambiguously that the $\langle T_{MC}, T_{APP} \rangle$ combination stands apart from all other combinations: it is only when both the main clause and the appositive are true that the entire sentence is robustly assigned a truth value of True. All other percentages are extremely low. Not surprisingly, this pattern is supported by pairwise comparisons between $\langle T_{MC}, T_{APP} \rangle$ sentences and all other sentence types: $\langle T_{MC}, F_{APP-MED} \rangle$: $W = 3916$, $z = 8.15$, $p < .0001$; $\langle T_{MC}, F_{APP-MED-BLAT} \rangle$: $W = 3315$, $z = 7.39$, $p < .0001$; $\langle T_{MC}, F_{APP-FIN} \rangle$: $W = 4278$, $z = 8.33$, $p < .0001$; $\langle F_{MC}, T_{APP} \rangle$: $W = 4186$, $z = 8.28$, $p < .0001$; $\langle F_{MC}, F_{APP} \rangle$: $W = 4371$, $z = 8.37$, $p < .0001$. Thus, whenever the appositive is false, participants treat the entire sentence as false. It is somewhat surprising that $\langle T_{MC}, F_{APP-MED-BLAT} \rangle$ sentences, i.e. sentences with a true main clause and a "blatantly false" appositive, received a higher percentage of true ratings than any of the other sentences besides $\langle T_{MC}, T_{APP} \rangle$. Indeed, while other pairwise comparisons were not significant, this sentence received a higher percentage of True ratings than either $\langle T_{MC}, F_{APP-MED} \rangle$ or $\langle T_{MC}, F_{APP-FIN} \rangle$ ($W = 105$, $z = 1.95$, $p = .05$ and $W = 133$, $z = 2.89$, $p = .004$, respectively).

We also note that the truth values were accompanied by consistently high confidence ratings (see Table 2). Thus, participants not only judged sentences with appositives as false, but they were rather confident in doing so. Evidence that they used the entire confidence rating scale and were cognizant of those instances in which they were uncertain of response comes from the average confidence rating exhibited for the unclear T/F controls, i.e. sentences that asked participants to render a T/F judgment about potentially obscure facts. With these sentences, participants performed at chance and had a consistently low confidence rating.

2.3 Discussion

The current experiment was designed to determine whether the truth value of an appositive contributes to the calculation of the truth value of the entire sentence. Our results revealed

that appositives indeed have a truth-conditional contribution: a false appositive renders the entire sentence false, regardless of appositive position. Thus, our experimental participants treated sentences with appositives much like conjunctions. One could imagine that this pattern would still obtain, but that participants would have been confused by the truth-value mismatch and uncertain of their decision. That this was not the case is reflected in the consistently high confidence ratings. The finding that appositives have a conjunctive interpretation directly follows from the current account (see Chapter 2) but is particularly problematic for two-dimensional accounts of appositives and related expressions, such as Berckmans (1994), Bach (1999), Dever (2001), Jayez & Rossari (2004), Potts (2005).[3]

Interestingly, we observed a higher percentage of True judgments associated with the sentences with a blatantly false medial appositive. Although it is not initially clear how to explain this pattern, it is possible that outrageously false information is taken less seriously by participants and is thus more likely to be disregarded when computing the truth value of the entire sentence. If this is the correct explanation, it appears to go against suggestions in the literature that the more salient the appositive content the more likely it is to play a role in computing the truth value of the sentence (see in particular Bach 1999; see also Potts 2005, Schlenker 2009, ms).

Despite the uniform findings of this experiment, it still could be asked whether sentences with appositives are indeed interpreted as conjunctions. For example, one could argue that the binary forced-choice design of our task pigeonholed participants into choosing False in instances where they knew they did not want to choose True. In order to address this question, we conducted a follow-up experiment which gave participants a wider range of truth-value choices. This experiment confirmed our initial findings.[4]

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[3]See also Chapter 4 for an overview of two-dimensional accounts with an eye on the projection properties of appositives.

[4]See Experiment 4 in Syrett et al. (ms) for details.

3 The information status of appositives

This section provides experimental evidence that sentence-final appositive relative clauses can acquire at-issue status, as demonstrated by their availability to direct rejections.

3.1 Method: Participants, stimuli, procedure

38 undergraduate students (range: 18–25 years) participated.

The test items consisted of brief dialogues between two interlocuters such that the speaker delivered an initial utterance and the hearer voiced a direct rejection. Each initial utterance consisted of a sentence with appositives and varied for the purpose of manipulating our target variables across three dimensions: (i) appositive type (nominal appositive (NA) vs. appositive relative clause (ARC)), (ii) sentential position of the appositive (medial vs. final), and (iii) ARC aspect (stative vs. eventive). Direct rejections targeted either the appositive or the main clause and participants were given a forced choice between the two forms of rejection. The examples in (11)-(16) illustrate the six test item types.

(11)   (appositive type = NA; sentential position = medial; appositive aspect = n/a)

       A: My friend Sophie, <u>a classical violinist</u>, performed a piece by Mozart.

       B_1: No, she's not.   (target = APP)

       B_2: No, she didn't.   (target = MC)

(12)   (appositive type = NA; sentential position = final; appositive aspect = n/a)

       A: The symphony hired my friend Sophie, <u>a classical violinist</u>.

       B_1: No, she's not.   (target = APP)

       B_2: No, they didn't.   (target = MC)

(13)   (appositive type = ARC; sentential position = medial; appositive aspect = stative)

       A: My friend Sophie, <u>who is a classical violinist</u>, performed a piece by Mozart.

       B_1: No, she's not.   (target = APP)

       B_2: No, she didn't.   (target = MC)

(14)   (appositive type = ARC; sentential position = final; appositive aspect = stative)

    A: The symphony hired my friend Sophie, <u>who is a classical violinist</u>.

    B_1:   No, she's not.   (target = APP)

    B_2:   No, they didn't.   (target = MC)

(15)   (appositive type = ARC; sentential position = medial; appositive aspect = eventive)

    A: My friend Sophie, <u>who performed a piece by Mozart</u>, is a classical violinist.

    B_1:   No, she's not.   (target = MC)

    B_2:   No, she didn't.   (target = APP)

(16)   (appositive type = ARC; sentential position = final; appositive aspect = eventive)

    A: The symphony hired my friend Sophie, <u>who performed a piece by Mozart</u>.

    B_1:   No, she didn't.   (target = APP)

    B_2:   No, they didn't.   (target = MC)

In order to reinforce the difference between the appositive and main clause as distinct parts of A's utterance, those utterances were prerecorded so that they had the typical "parenthetical" feel of an appositive, accomplished with COMMA INTONATION (see Nespor & Vogel 1986, Potts 2005, Selkirk 2005, Dehé 2009). These sound files were paired with the sentences on the screen.

3.2 Results

The dependent measure for this experiment was the percentage of 'no' responses. The main comparison was between the percentage of time a 'no' response was chosen as targeting the appositive as opposed to targeting the main clause. As expected, participants strongly preferred the direct 'no' rejection to target the main clause rather than the appositive (73.9% vs. 26.1%, respectively).

In spite of the fact that participants generally dispreferred the appositive content as being target of direct rejections, there was an effect of appositive type and position. We

conducted a series of pairwise comparisons of the variables manipulated within the appositive clause to determine if these variables had an effect on whether the appositive was seen as at-issue or not by participants. The percentage of 'no' responses for each appositive subtype is presented in Table 3.

appositive type	target = APP	target = MC
medial NA	18.4%	81.6%
final NA	25.0%	75.0%
medial ARC (stative)	17.1%	82.9%
medial ARC (eventive)	25.0%	75.0%
final ARC (stative)	36.8%	63.2%
final ARC (eventive)	34.2%	65.8%

Table 3: Percentage of 'no' responses to either the appositive or the main clause, depending on appositive classification

There was no significant difference between the two appositive types (NA vs. ARC) ($U_A = 24776$, $z = -1.26$, $p = .21$) or ARC aspect (stative vs. eventive) ($W = 79$, $z = .49$, $p = .62$). However, there was a significant effect of medial vs. final appositive position ($W = 862$, $z = 2.37$, $p = .02$). Within this distinction, there was a significant difference between medial and final ARCs ($W = 471$, $z = 2.21$, $p = .03$), but no difference between medial and final NAs ($W = 55$, $z = .88$, $p = .38$). Moreover, there was a significant difference between medial NAs and both types of final ARCs (stative: $W = 106$, $z = 2.73$, $p = .006$; eventive: $W = 96$, $z = 2.08$, $p = .04$), and between medial stative ARCs and both types of final ARCs (stative: $W = 168$, $z = 2.25$, $p = .02$; eventive: $W = 101$, $z = 2.02$, $p = .04$), but no significant difference between medial NAs and medial stative ARCs ($W = -9$, $z = -.2$, $p = .84$), medial NAs and medial eventive ARCs ($W = 51$, $z = .82$, $p = .41$), medial stative and medial eventive ARCs ($W = 70$, $z = .94$, $p = .35$), or final stative and final eventive ARCs ($W = -14$, $z = -.32$, $p = .75$). Thus, final ARCs surfaces as the best candidate for appositives acquiring at-issue status, and did so approximately a third of the time.

3.3 Discussion

The results of this experiment revealed that while participants largely avoided a 'no' response targeting the appositive, there was a striking effect of appositive type and position, with the highest percentage of 'no' responses exhibited in sentence-final ARCs (an average of 35.5%). While these percentages were still below those for 'no' rejections targeting the main clause (an average of 73.9%), they were still higher than what might have been expected. Indeed, it may seem rather surprising that approximately a third of the time participants chose the appositive as the target of the direct rejection, when they could have chosen the main clause instead. This experiment thus allows us to claim that although appositives are largely not at-issue, they *can*, in fact, contribute at-issue content—even when participants are given the choice between targeting the appositive or the main clause with a 'no' rejection. Moreover, not all appositives have this status: final ARCs are the most likely candidates to adopt it. Needless to say, the significant result that content which is typically not at-issue can, under certain condition, acquire at-issue status calls for a theoretical explanation.

4 Summary

In this section we discussed experimental evidence for the claim that appositives make a purely truth-conditional contribution to the sentence in which they appear. We also saw experimental evidence that while usually not at-issue, ARCs can acquire at-issue status when occurring in a sentence-final position. Both the truth-conditional status of appositives and the potential at-issue status of sentence-final ARCs are predicted by the account developed in Chapter 2.

Chapter 4

The projection behavior of appositive relative clauses

1 Introduction

This chapter offers an explanation of why appositive relative clauses (ARCs) are interpreted in situ with respect to order-dependent phenomena (like discourse anaphora, presupposition, ellipsis) but nevertheless their interpretation is not affected by operators placed elsewhere in the sentence. The next chapter (Chapter 5) seeks to reconcile the otherwise robust projection behavior of ARCs with various apparent exceptions to it by recourse to independent mechanisms.[1]

The general consensus in the semantics literature is that ARCs cannot be interpreted under the scope of external operators, i.e. under the scope of operators that are not part of the ARC itself but are placed elsewhere in the sentence (see Keenan 1971, Böer & Lycan 1976, Chierchia & McConnell-Ginet 2000, Dever 2001, Potts 2005, Wang et al. 2006, Arnold 2007, Nouwen to appear, a.o.). For example, (1a) does not have a reading

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[1]Chapter 4 and Chapter 5 are based on Koev (to appear).

according to which the ARC is interpreted in the scope of the negation and in (1b) the ARC cannot be interpreted in the scope of the modal auxiliary. Both sentences imply the unaltered appositive content.

(1)   a. Dick, <u>who is an expert on Austin</u>, does not love the Bonzo Dog Band

        b. It might have been the case that John, <u>who is honest</u>, was a politician.

(both examples from Böer & Lycan 1976)

Examples like these demonstrate a very robust pattern and have motivated the view that ARCs PROJECT, i.e. do not interact with operators placed elsewhere in the sentence. At the same time, ARCs participate in order-dependent phenomena such as discourse anaphora, ellipsis, and presupposition (see Section 2 below). It is then unclear why ARCs are exempted from the scope of external operators but nevertheless interact with neighboring discourse with respect to order-dependent phenomena.

The major innovation for explaining this puzzling combination of facts involves interpreting ARCs in surface position but endowing lexical expressions (predicates or operators) with propositional variables (see Stone 1999, Stone & Hardt 1999 on the latter assumption). As a consequence, operators can bind lexical predicates while higher operators can bind lower operators. Assuming that ARCs are ForcePs and Force heads are operators that cannot be bound, it follows that ARCs project past higher operators. This mechanism of binding semantic content explains why operators only target expressions that (i) are in their syntactic scope and (ii) carry the same propositional variable.

The chapter is structured as follows. Section 2 demonstrates the projection behavior of ARCs. Section 3 presents the formal account which explains why ARCs project. Section 4 reviews previous approaches to appositive projection, including the SCOPAL APPROACH (see Demirdache 1991, Del Gobbo 2003, 2007, Schlenker 2009, ms, Nouwen to appear), the TWO-DIMENSIONAL APPROACH (see Potts 2005; see also Karttunen & Peters 1979), the PRESUPPOSITIONAL APPROACH (see Keenan 1971, Sæbø 2011; see also Chierchia & McConnell-Ginet 2000, Schlenker 2009, ms), and the DISCOURSE TOPIC APPROACH (see

Roberts et al. 2009, Simons et al. 2010). Section 5 addresses some remaining issues.

2 The projection properties of ARCs

In this short section I motivate the view that ARCs are interpreted in situ yet nonetheless project.

It has been noticed in the literature that phenomena like discourse anaphora, presupposition, and VP ellipsis are not sensitive to the appositive/main clause distinction (see Potts 2005, Arnold 2007, AnderBois et al. 2010). In the (a)-sentences below the antecedent occurs in a main clause (MC) and the dependent occurs in an ARC, while in the (b)-sentences the distribution of antecedent and dependent is reversed. In either case, there is no problem for the dependency to be established and the sentences are felicitous.

(2) (discourse anaphora)

    a. Jeremy^u helped Sarah, <u>who thanked him$_u$</u>.   (MC $\rightarrow$ ARC)

    b. Sarah, <u>who got help from Jeremy^u</u>, thanked him$_u$.   (ARC $\rightarrow$ MC)

(3) (presupposition; from AnderBois et al. 2010)

    a. John saw Mary, <u>who saw him **too**</u>.   (MC $\rightarrow$ ARC)

    b. John, <u>who saw Mary</u>, saw Susan **too**.   (ARC $\rightarrow$ MC)

(4) (VP ellipsis; from Arnold 2007)

    a. Someone that [$_{VP}$ supports the war] insulted Kim, <u>who doesn't $\triangle$</u>.
                                                    (MC $\rightarrow$ ARC)

    b. Sandy, <u>who [$_{VP}$ supports the war]</u>, insulted someone that doesn't $\triangle$.
                                                      (ARC $\rightarrow$ MC)

It is well-known that discourse anaphora, presupposition, and VP ellipsis are subject to linear restrictions: roughly, the antecedent needs to precede the dependent. If it does not, the result is usually an infelicitous piece of discourse. Below, this is shown for the examples in (2a), (3a), and (4a).

(5) a. # He$_u$ helped Sarah, <u>who thanked Jeremy^u</u>.   (discourse anaphora)

b. # John saw Mary **too**, <u>who saw him</u>.   (presupposition)

c. # Someone that △ insulted Kim, <u>who doesn't [$_{VP}$ support the war]</u>.
(VP ellipsis)

The fact that ARCs can participate in order-dependent phenomena strongly suggests that they are interpreted in surface position. Given that, it is initially striking that ARCs project out of outside operators, as we will now show. The fairly robust projection behavior of ARC is most easily demonstrated when sentences with ARCs are subjected to the PROJECTION FAMILY TEST (see Chierchia & McConnell-Ginet 2000, a.o.). This test states that an implication associated with a particular sentence projects if that implication does not vanish when the sentence is negated, modalized, hypothetically assumed, or questioned.[2] Despite the presence of an operator, each of the sentences in (6) implies the unaltered appositive content, i.e. that Edward is from Minnesota.

(6) a. It is **not** true that Edward, <u>who is from Minnesota</u>, enjoys cold winters.

b. It is **possible** that Edward, <u>who is from Minnesota</u>, enjoys cold winters.

c. **If** Edward, <u>who is from Minnesota</u>, enjoys cold winters, then he'll like it around here.

d. Does Edward, <u>who is from Minnesota</u>, enjoy cold winters**?**

Thus, one of the main challenges in this chapter is the fact that ARCs behave like integrated into the sentence with respect to order-dependent phenomena while they behave like non-integrated into the sentence with respect to scopal phenomena. This seems like a contradiction, as it might appear that ARCs are interpreted both in situ and not in situ. To bring the point home, consider (7) below. In this sentence the anaphoric dependences observe linear order, i.e. the anaphors follow their antecedents. As (7a)-(7b) demonstrate,

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[2]In their discussion of this test, Chierchia & McConnell-Ginet (2000) seem to conflate the notion of projection with that of not-at-issueness, which they refer to as BACKGROUNDEDNESS. Here I make the reasonable assumption that the Projection Family Test is a diagnostic for projection, not for not-at-issueness.

the ARC cannot be interpreted as entirely preceding or entirely following the main clause without producing incoherent discourse.

(7) John^u, <u>who$_u$ nearly killed a^v woman with his$_u$ car</u>, visited her$_v$ in the hospital.

(AnderBois et al. 2010)

    a. ?? He$_u$ nearly killed a^v woman with his$_u$ car and John^u visited her$_v$ in the hospital.

    b. # John^u visited her$_v$ in the hospital and he$_u$ nearly killed a^v woman with his$_u$ car.

At the same time, if (7) is embedded under an operator, e.g. under a possibility modal as in (8), the implication triggered by the ARC is *not* affected and survives.

(8) It's **possible** that John, <u>who nearly killed a woman with his car</u>, visited her in the hospital.

Existing dynamic semantic accounts of apposition (see Nouwen 2007, AnderBois et al. 2010, Koev 2012) interpret ARCs in situ but cannot easily explain why ARCs project.[3] In turn, static semantic accounts (see e.g. Potts 2005, Schlenker 2009, ms, a.o.) explain the projection behavior of ARCs by separating them from the rest of the sentence but typically ignore the fact that ARCs can participate in order-dependent phenomena. This state of affairs is not a coincidence. Phenomena like discourse anaphora, presupposition and ellipsis are sensitive to linear order and thus can be considered dynamic in nature.[4] In contrast, operator scope depends on a particular structural configuration and pertains to the syntax-semantics interface. My goal here is to offer a semantics that can capture both types of phenomena.

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[3]Neither Nouwen (2007) nor AnderBois et al. (2010) define a rule for negation or other propositional operators in their logic. Koev (2012), following up on a suggestion of Robert Henderson (p.c.), offers an interpretation rule for negation that applies to atomic formulas only and thus lacks the required generality.

[4]There are also static accounts of discourse/donkey anaphora (e.g. Heim 1990, Elbourne 2005). However, such accounts seem to lack the tools needed to model the formal link between the antecedent and the anaphor. The typical claim is that the antecedent is saliently present in the context in which the anaphor is evaluated; yet, no attempt is made to formally define the notion of context.

3 Capturing the projection properties of ARCs

In the previous section we saw that ARCs project even though they are interpreted in situ with respect to order-dependent phenomena like discourse anaphora, presupposition, and VP ellipsis. This section offers a formal account that captures both of those (seemingly contradictory) properties.

3.1 Basic ideas and assumptions

I claim that ARCs are adjoined to their anchors, with the exception that final ARCs can also be attached to the root node of the sentence.[5] ARCs are interpreted as dynamic conjuncts in surface position. This explains their participation in order-dependent phenomena, demonstrated in the previous section. In order to derive the projection behavior of ARCs, I assume that operators and predicates are adorned with propositional variables (see Stone 1999, Stone & Hardt 1999). Thus, operators can bind predicates while higher operators can bind lower operators. I assume that main clauses and ARCs are Force Phrases whose syntactic heads are operators that cannot be bound by a higher operator. It then follows that ARCs project even when they are syntactically embedded under a higher operator.

More specifically, I make the following assumptions about the way propositional variables are distributed in syntactic structures.

(9)   ASSUMPTIONS ABOUT THE DISTRIBUTION OF PROPOSITIONAL VARIABLES

    i. Operators (e.g. Force, negation) introduce fresh propositional variables.

    ii. Lexical operators (e.g. negation, modals, attitude verbs) and lexical predicates (e.g. 'man', 'rich') are marked by the propositional variable introduced by the closest higher operator.

Assumption (9i) requires operators to be assigned fresh propositional variables, i.e. variables that are not found elsewhere in the syntactic structure. This assumption allows

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[5]See Section 2.2 of Chapter 6 for the specific claims about the syntax of ARCs made in this dissertation.

operators to introduce a propositional variable which stores the semantic content of the constituent in their scope. Assumption (9ii) ensures that semantic content is always interpreted relative to the closest operator that is higher up in the syntactic tree: a lexical operator, if such is present, or else a Force head. This assumption will typically have as a result that propositional variables are shared by lexical relations within a clause.[6] Importantly, Force heads do not depend on variables introduced by higher operators: while negation, attitude verbs, or other lexical operators can be bound by higher operators, Force heads cannot. This is, then, what makes ARCs "invisible" to external operators.

The assumptions in (9) are spelled out for pedagogical purposes only. Since they will be encoded in the compositional fragment introduced in Chapter 6, they need not be independently stipulated.

Here is an illustration of how those assumptions work together to ensure that ARCs project. In (10a), only main clause is interpreted in the scope of negation while the appositive content projects. Why this is can be read off from (10b), the syntactic structure associated with (10a). There are three operators in (10b): the higher Force head, the negation, and lower Force head. According to assumption (9i), each of these operators introduces a propositional variable. Given assumption (9ii), the main clause predicate 'rich' is bound by q (the variable introduced by the negation), the negation is bound by p (the variable introduced by the higher Force head), and the appositive predicate 'lawyer' is bound by r (the variable introduced by the lower Force head). Crucially, Force operators are not lexical and cannot be bound. Thus, the appositive content, even though in the syntactic scope of the negation, is not affected by it and projects.

(10)   a.   Jack, who is a lawyer, is**n't** rich.

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[6] This assumption needs to be somewhat qualified, though. For example, it is well-known that DPs headed by strong determiners can receive an interpretation that is temporally and modally independent of the interpretation of the rest of the clause. (See Percus (2000), Keshet (2010), Schwarz (2012), and the discussion in the last paragraph of the current section.)

b.

```
                          ForceP
                         /      \
                  Force^p        TP
                               /    \
                          not^q_p    TP
                                    /    \
                                  DP      T'
                                 /  \    /  \
                               DP  ForceP  T   AP
                              Jack  /   \  |   rich_q
                              Force^r  TP is
                                      /   \
                                    DP    T'
                                   who   /  \
                                        T   DP
                                        is  a lawyer_r
```
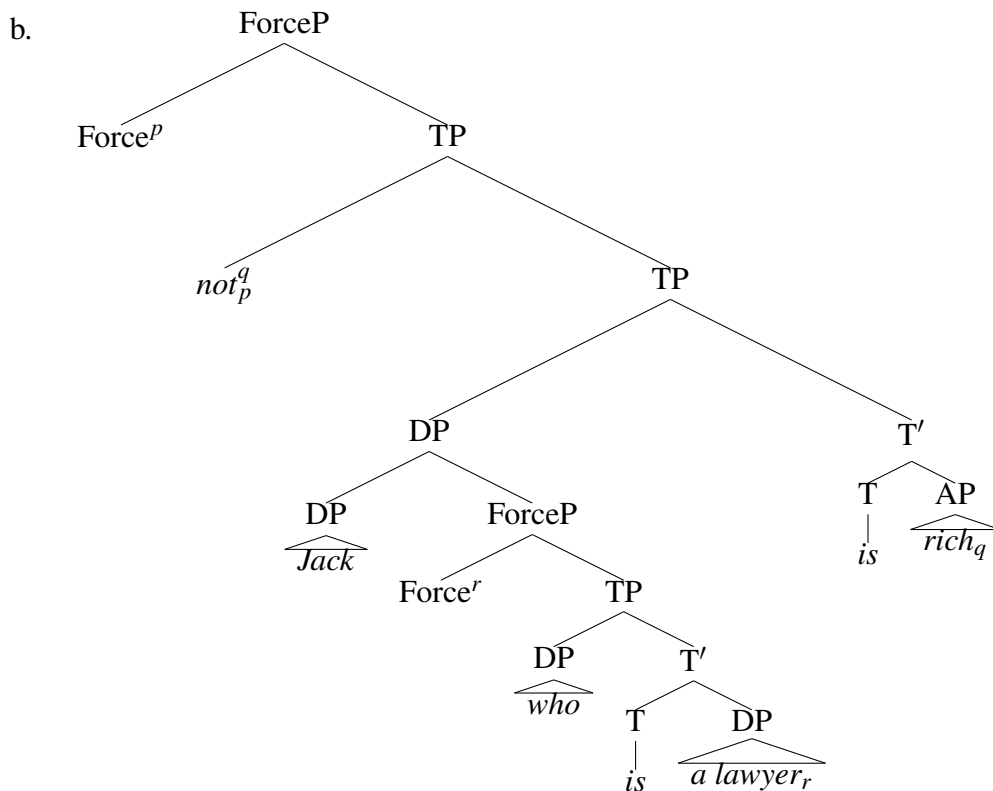
The overall effect of the two assumptions in (9) is that operators can target semantic content that is in their syntactic scope *selectively*. That is, among the various content that falls in the syntactic scope of an operator, only content that is relativized to the propositional variable introduced by that operator is affected. The rest of the semantic content is interpreted as if it were outside the syntactic scope of the operator.

This way of looking at things requires a modification of the traditional notion of operator scope. The new notion requires operator scope to take into consideration not only syntactic scope but also the presence of propositional variables.

(11)   OPERATOR SCOPE
       A phrase α is in the SCOPE of an operator O if and only if

   i. α is in the syntactic scope of O, and
   ii. α is marked by the propositional variable introduced by O.

This definition effectively equates operator scope with operator binding. The novelty is that propositional content operators (such as negation or attitude predicates) can now be

regarded as a particular kind of binding operators. This is the way I will use the term "operator scope" in the remainder of the dissertation.

It should be noted that there are parallels between the current analysis of operator scope and assumptions in the literature about the way situation variables are distributed within the sentence (see Percus 2000, Keshet 2010, Schwarz 2012, a.o.).[7] The latter work is motivated by the observation that lexical content can receive transparent (=*de re*) or opaque (=*de dicto*) readings, depending on syntactic category and syntactic environment. For example, Percus (2000) points out that the quantificational phrase 'every semanticist' in (12) can describe actual semanticists (the transparent reading) or hypothetical semanticists (the opaque reading).

(12)　　If **every semanticist** owned a villa in Tuscany, what a joy this world would be.

(Percus 2000)

In order to account for such data those authors do not rely on syntactic movement (e.g. Quantifier Raising; see May 1977, 1985) but rather state constraints on the choice of situation variables that can occur in a given structural position. Although this latter work is concerned with different data, it is similar in spirit to the current analysis, which too seeks to explain the projection behavior of ARCs without recourse to syntactic movement.

3.2　An overview of the logic

The account sketched above of the projection behavior of ARCs is spelled out in a logic called UPDATE WITH SPEECH CONTEXTS (USC). Since USC was already introduced in Section 4.2 of Chapter 2, here I only review its main characteristics.

USC is an update system which has types for entities (e), possible worlds (ω), indices (s, the things that make up information states), and truth values (t). There are abbreviations for important complex types, such as types for propositions ($\pi := \omega t$, sets of worlds),

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[7]I thank I-Ta Hsieh and Roger Schwarzschild for pointing out this piece of literature to me.

types from speech contexts ($\kappa := e \times e \times \pi \times \pi \times \pi$, quintuples consisting of the speaker, the hearer, the discourse commitments of the speaker, the discourse commitments of the hearer, and the context set), and dynamic terms ($[] := (st)st$, functions from information states to information states). The speech context variable represents the context of utterance at any point of the conversation. The fifth coordinates of k's values assigned by different indices in the information state produce the various options for the development of the context set.

Models for USC consist of non-empty and pairwise disjoint sets of individuals, worlds, indices and truth values, and a basic interpretation function. The basic interpretation function respects typing, i.e. it assigns to each constant of some type a model-theoretic object of the same type.

Information states are sets of "well-behaved" indices, where indices are functions from variables to objects. Similarly to basic interpretation functions, indices respect typing. Indices are well-behaved if they assign only such values to context variables for which it holds that the discourse commitments are (i) linked to their agents in the correct way (the speaker's discourse commitments to the speaker, the hearer's discourse commitments to the hearer), and (ii) included in the context set.

Given an information state, the context set in that state is the set of all worlds found in some context set candidate in that state. As already mentioned, context set candidates are the fifth coordinate of any value assigned to the utterance context variable k by some index in the information state.

Below, I repeat the interpretation rules of USC and briefly comment on the intuitive ideas behind those rules.

(13) Def (SEMANTICS)

    a. PRIMITIVE TERMS

$$\bullet \quad [\![t]\!]^{i,\sigma} = \begin{cases} i(t) & \text{if } t \in \mathit{Var} \\ \iota(t) & \text{if } t \in \mathit{Con} \end{cases}$$

b. FUNCTIONAL TERMS

- $[\![\mathbf{sp}(c)]\!]^{i,\sigma} = \mathbf{proj}_1([\![c]\!]^{i,\sigma})$
- $[\![\mathbf{hr}(c)]\!]^{i,\sigma} = \mathbf{proj}_2([\![c]\!]^{i,\sigma})$
- $[\![\mathbf{dc_{sp}}(c)]\!]^{i,\sigma} = \mathbf{proj}_3([\![c]\!]^{i,\sigma})$
- $[\![\mathbf{dc_{hr}}(c)]\!]^{i,\sigma} = \mathbf{proj}_4([\![c]\!]^{i,\sigma})$
- $[\![\mathbf{cs}(c)]\!]^{i,\sigma} = \mathbf{proj}_5([\![c]\!]^{i,\sigma})$
- $[\![\mathbf{max}(p)]\!]^{i,\sigma} = \{\mathsf{w} \mid \exists j \in \sigma : \mathsf{w} \in [\![p]\!]^{j,\sigma}\}$
- $[\![\mathbf{alt}(p)]\!]^{i,\sigma} = \wp([\![\mathbf{max}(p)]\!]^{i,\sigma}) \cup \wp(D_\omega - [\![\mathbf{max}(p)]\!]^{i,\sigma})$
- $[\![\mathbf{alt}(p,u)]\!]^{i,\sigma} = \bigcup_{\mathsf{d} \in D_e} \{\wp(\{\mathsf{w} \mid \exists j \in \sigma : \mathsf{w} \in [\![p]\!]^{j,\sigma} \ \& \ \mathsf{d} = [\![u]\!]^{j,\sigma}\})\}$

c. DYNAMIC TERMS

- $\sigma[\![R_p\{t_1,...,t_n\}]\!] =$
  $\{i \in \sigma \mid \forall \mathsf{w} \in [\![p]\!]^{i,\sigma} : \langle \mathsf{w}, [\![t_1]\!]^{i,\sigma},..., [\![t_n]\!]^{i,\sigma} \rangle \in [\![R]\!]^{i,\sigma}\}$
- $\sigma[\![t_1 R t_2]\!] = \{i \in \sigma \mid [\![t_1]\!]^{i,\sigma} R [\![t_2]\!]^{i,\sigma}\}$, where $R \in \{=, \in, \subseteq, \varnothing\}$
- $\sigma[\![\phi \wedge \psi]\!] = \sigma[\![\phi]\!][\![\psi]\!]$
- $\sigma[\![\exists u]\!] = \{j \mid \exists i \in \sigma : i[u]j\}$
- $\sigma[\![\forall u (\phi, \psi)]\!] = \{i \in \sigma \mid i \in \sigma[\![\phi]\!] \Rightarrow i \in \sigma[\![\phi \wedge \psi]\!]\}$

Starting with primitive terms, variables are interpreted by the index parameter i and constants are interpreted by the basic interpretation function ι of the given model. The interpretation of the first five functional terms is straightforward: those terms extract (by means of projection functions) the various coordinates of the speech context represented by c. The interpretation rules for the last three functional terms are more complex. $\mathbf{max}(p)$ denotes the maximal value of the propositional variable p, i.e. the set of worlds that are contained in any value assigned to p by indices in the given information state σ. The terms $\mathbf{alt}(p)$ and $\mathbf{alt}(p,u)$, where p is a propositional variable and u is an individual variable, are needed to represent question meanings and are not of any relevance in this chapter; they were included for the sake of completeness. Finally, dynamic terms are interpreted as in other update systems but also introduce a few peculiarities. First, arguments and predicates have access not only to indices but also to entire information states. Access to indices is needed in order to interpret variables dynamically while access to entire information states is required for the

interpretation of $\mathbf{max}(p)$, $\mathbf{alt}(p)$ and $\mathbf{alt}(p,u)$. Second, dynamic terms describing lexical relations are relativized to sets of worlds and require that the relation hold throughout that set. The remaining parts of the interpretation rules are rather straightforward.

Instead of true in a world, dynamic terms can be "discourse true", i.e. true in a world and an information state. Whether or not a sentence is discourse true in a world and an information state is entirely determined by the content expressed by that sentence and what worlds there are in the context set associated with that information state. If a world in the context set survives after the sentence updates the information state, the world is still a live option and the sentence is discourse true in it.

This concludes the presentation of USC. The interested reader is referred to Section 4.2 of Chapter 2 for more details.

3.3 Explaining the projection properties of ARCs

In this section I address the central question of the current chapter: Why do ARCs project? As in Chapter 2, the theoretical explanation will be based on logical representations of linguistic examples. The way those logical representations are derived compositionally is detailed in Chapter 6.

As a warm-up, let me briefly review the logical analysis of sentences without operators. The simple sentence in (14a) is represented in USC as in (14b).

(14)   a.   Jack is rich.   (OK.)

b. $\exists p \wedge \exists u \wedge u = jack \wedge rich_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$ $\mathbf{cs}(k) \subseteq p$

An utterance of this sentence introduces a proposal variable p with the semantic content that Jack is rich. This is because the proposal is restricted by the conjunct $rich_p\{u\}$, which requires that Jack be rich in all of the worlds represented by p. The introduction of the proposal is effected by the conjunct $\mathbf{dc_{sp}}(k) \subseteq p$, which commits the speaker to the content of the proposal. If the proposal is accepted, the worlds in the context set that are incompatible with the proposal are removed, by means of the conjunct $\mathbf{cs}(k) \subseteq p$.

Sentences with ARCs behave similarly, although they introduce multiple proposals. In (15), the main clause receives the same interpretation as in (14): it introduces the proposal that Jack is rich, represented as p. The ARC, whose contribution to the logical representation is underlined for better readability, introduces another proposal, that Jack is from Brooklyn, represented as q. This last proposal is introduced midsentence and, given the constraints on deciding proposals in Section 3.4 of Chapter 2, it is automatically accepted. The acceptance of the appositive proposal is formally represented as $\mathbf{cs}(k) \subseteq q$. The proposal associated with the main clause is accepted or rejected in subsequent discourse.

(15)　　a.　Jack, <u>who is from Brooklyn</u>, is rich.
　　　　b.　$\exists p \wedge \exists u \wedge u = jack \wedge \underline{\exists q \wedge from.brooklyn_q\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq q} \wedge \mathbf{cs}(k) \subseteq q \wedge$
　　　　　　$rich_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

In more standard versions of update semantics, negation is modeled as a sentential operator that has the semantic effect of removing all indices from the information state that survive after the information state is updated with the non-negated sentence (see e.g. Heim 1982, Veltman 1996, Groenendijk et al. 1996). This is illustrated in (16) below.

(16)　$\sigma[\![\neg\phi]\!] = \sigma - \sigma[\![\phi]\!]$

This way of proceeding is hard to reconcile with the observation that certain parts of the non-negated sentence, i.e. the ones contributed by appositives, escape the scope of negation. On the current analysis, which follows Stone & Hardt (1999), negation is not a primitive of the logic but rather is decomposed into a series of conjuncts. To improve readability, I use the abbreviation in (17) for what is intuitively *not* ϕ, where ϕ is a dynamic term.

(17)　$\mathbf{not}_p^q(\phi) \; := \; \exists q \wedge \phi \wedge p \oslash \mathbf{max}(q)$

Negation has the following three semantic effects: (i) it introduces a propositional variable (here q) for the content of the term in its scope (here ϕ), (ii) it processes its scope term,[8]

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[8]The compositional rules introduced in Chapter 6 ensure that q occurs free in ϕ and encodes the propositional content of ϕ.

and (iii) it states that the proposition expressed by the negated sentence (here p) is disjoint from the maximal value of the proposition expressed by the scope term. Let us call the proposition introduced by operators the SCOPE PROPOSITION and the proposition which operators are anaphoric to the REFERENCE PROPOSITION. In (17), the scope proposition is represented by q and the reference proposition is represented by p.[9] In the absence of higher lexical operators, the reference proposition would simply be the proposal proposition.

Consider the sentence with negation in (18). The abbreviated representation of that sentence is given in (18a), which, by (17), is can be expanded to (18b).

(18)   Jack is**n't** rich.

    a. $\exists p \wedge \mathbf{not}_p^q(\exists u \wedge u = jack \wedge rich_q\{u\}) \wedge \mathbf{dc_{sp}}(k) \subseteq p$
    b. $\exists p \wedge \exists q \wedge \exists u \wedge u = jack \wedge rich_q\{u\} \wedge p \oslash \mathbf{max}(q) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

In (18b), there are two propositions present: the proposal/reference proposition, represented as p and introduced by the main clause, and the scope proposition, represented as q and introduced by the negation. What the entire formula expresses is that the proposal associated with the sentence is disjoint from the scope proposition, i.e. the proposition that Jack is rich. In other words, the proposal of (18) is any set of worlds throughout which it holds that Jack is not rich.

This treatment of negation is general enough to allow interaction between operators. For example, the sentence with double negation in (19a) is assigned the logical representation in (19b).

(19)   a.   Jack is **not not** rich.
      b. $\exists p \wedge \mathbf{not}_p^q(\mathbf{not}_q^r(\exists u \wedge u = jack \wedge rich_r\{u\})) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

This last formula contains three propositional variables: p, q, and r. The variable r rep-

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[9]Strictly speaking, the scope proposition is the proposition expressed by the *maximal* value of the variable introduced by the operator. In (17), this is the proposition expressed by $\mathbf{max}(q)$. Yet, it would be easier if we gloss over this technicality and informally think of the scope proposition as the proposition expressed by the variable introduced by the operator.

resents the proposition that Jack is rich, and the variable q represents the proposition that Jack is not rich. The external negation requires that the proposal represented as p be disjoint from the proposition that Jack is not rich, from which it follows that p represents the proposition that Jack is rich. This correctly predicts that the proposal of (19a) is—modulo pragmatic effects—the same as that of (14), that Jack is rich.

With that much machinery in place, we can now see why ARCs escape the scope of external negation. Consider the example in (20a), logically represented in (20b).

(20)   a.   Jack, who is from Brooklyn, is**n't** rich.
       b. $\exists p \wedge \mathbf{not}_p^q(\exists u \wedge u = jack \wedge \exists r \wedge from.brooklyn_r\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq r \wedge$
            $\mathbf{cs}(k) \subseteq r \wedge rich_q\{u\}) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

The negation operator requires that the proposal introduced by the main clause (expressed by p) be disjoint from the proposition that Jack is rich. However, the proposal introduced by the ARC is represented as r and is thus not related to the negation. In other words, the appositive content scopes out of the negation, making (20a) synonymous in propositional content to 'Jack is from Brooklyn and he isn't rich'. This is exactly as required.

Let me also demonstrate why ARCs project when found in the syntactic scope of attitude predicates such as 'think'. Where p, q are propositional variables, v is an individual variable, and ϕ is a dynamic term, I will use the following abbreviation.

(21) $\mathbf{think}_p^q(v, \phi) := \exists q \wedge \phi \wedge think_p\{v, q\}$

According to (21), $\mathbf{think}_p^q(v, \phi)$ stands for a dynamic formula which requires that in all of the worlds in the reference proposition the attitude holder thinks the content of the scope proposition.[10]

To illustrate, in (22) the verb 'think' introduces the scope proposition that Jack is rich and states that Mary thinks that proposition in all of the worlds of the proposal. In short, this

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[10]Again, the compositional rules of Chapter 6 guarantee that q occurs free in ϕ and records its propositional content.

sentence expresses the proposal that Mary thinks that Jack is rich, which is the intuitively correct result.

(22)   Mary **thinks** that Jack is rich.

    a. $\exists p \wedge \exists v \wedge v = mary \wedge \mathbf{think}_p^q(v, \exists u \wedge u = jack \wedge rich_q\{u\}) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

    b. $\exists p \wedge \exists v \wedge v = mary \wedge \exists q \wedge \exists u \wedge u = jack \wedge rich_q\{u\} \wedge think_p\{v, q\} \wedge$
       $\mathbf{dc_{sp}}(k) \subseteq p$

Consider now examples in which an ARC occurs in the syntactic scope of 'think'.

(23)   Mary **thinks** that Jack, <u>who is from Brooklyn</u>, is rich.

    a. $\exists p \wedge \exists v \wedge v = mary \wedge \mathbf{think}_p^q(v, \exists u \wedge u = jack \wedge rich_q\{u\}) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

    b. $\exists p \wedge \exists u \wedge u = mary \wedge \mathbf{think}_p^q(u, \exists v \wedge v = jack \wedge$
       <u>$\exists r \wedge from.brooklyn_r\{v\} \wedge \mathbf{dc_{sp}}(k) \subseteq r \wedge \mathbf{cs}(k) \subseteq r \wedge rich_q\{v\}) \wedge$</u>
       $\mathbf{dc_{sp}}(k) \subseteq p$

In (23a), the proposition that Jack is from Brooklyn is attributed to the utterer of the sentence, not to the attitude holder, i.e. Mary. Why this is so can be seen from the logical representation of this sentence. In (23b), the propositional variable introduced by the embedding predicate 'think' is q, and only the content of the embedded clause, that Jack is rich, is relativized to this variable. The content expressed by the ARC, that Jack is from Brooklyn, is relativized to the propositional variable r, introduced by the ARC itself. Thus, (23a) is correctly predicted to mean the same as 'Jack is from Brooklyn and Mary thinks that he is rich'. Even though the ARC is syntactically part of the embedded clause, it is not interpreted in the scope of 'think'.

Other attitude predicates can be treated in a similar fashion. Certain complications arise when the presence of a reported speech context can be implied (particularly salient with verbs of saying as embedding verbs). In such cases appositive content can undergo a shift in perspective and be attributed to the agent of this secondary speech context. The next chapter (Chapter 5) is devoted to the phenomenon of shifted appositives and its parallels to shifted indexical pronouns in some languages.

There is one important detail in the proposed analysis that was left implicit and that requires further mentioning. Since Hintikka (1969), standard semantic accounts of propositional attitude predicates typically achieve two things at the same time: (i) they analyze the structure of the predicate, e.g. by treating attitude verbs as binary relations between individuals and propositions, and (ii) they decompose the lexical meaning of the modal by specifying the relation that holds between the attitude holder and the scope proposition. Above, I restricted myself to the former and more modest task. However, the full analysis needs to be more specific about how the scope proposition of attitude verbs is related to the reference proposition and the role the attitude holder plays in that.

Before closing the section, I discuss two alternative semantic analyses of the epistemic modals 'might' and 'must'. Both of those analyses are couched in the format already proposed for negation and attitude verbs and thus correctly predict that ARCs in the syntactic scope of 'might' and 'must' project. The first analysis is based on Veltman (1996). According to Veltman, sentences of the form *might ϕ* are not informative and say nothing about how the world is. Rather, such sentences are tests on the entire information state and thus say something about our *knowledge* of the world. More formally, *might ϕ* checks whether ϕ is consistent with the current information state σ: if so, $\sigma[\![might\ \phi]\!]$ is just σ, if not, $\sigma[\![might\ \phi]\!]$ is the absurd information state. Veltman's idea can be extended to sentences of the form *must ϕ*: such sentences check whether ϕ is entailed by the current information state σ. If that is the case, $\sigma[\![must\ \phi]\!]$ is σ; if not, $\sigma[\![must\ \phi]\!]$ is the absurd information state.

Those ideas about the semantics of 'might' and 'must' can be imported in USC. In lieu of Veltman's information states, which in his formal system directly encode the factual information, I will use the context set of an information state, defined as $CS_\sigma := \{w \mid \exists i \in \sigma :$ $w \in \mathbf{proj}_5(i(k))\}$ (see Section 4.2 of Chapter 2). I also introduce the propositional logical constants $\mathbf{1}$ and $\mathbf{0}$ as representing the entire set of worlds and the empty set, respectively, i.e. $[\![\mathbf{1}]\!]^{i,\sigma} = \mathsf{W}$ and $[\![\mathbf{0}]\!]^{i,\sigma} = \{\}$, for any i,σ. With that much formalism in place, we can give the following Veltman-style interpretation rules for $\mathbf{might}_p^q(\phi)$ and $\mathbf{must}_p^q(\phi)$.

(24)   a. $\sigma[\![\mathbf{might}^q_p(\phi)]\!] = \begin{cases} \sigma[\![\exists q \wedge \phi \wedge p \subseteq \mathbf{1}]\!] & \text{if } CS_{\sigma[\![\exists q \wedge \phi \wedge \mathbf{cs}(k) \subseteq q]\!]} \neq \{\} \\ \sigma[\![\exists q \wedge \phi \wedge p \subseteq \mathbf{0}]\!] & \text{otherwise} \end{cases}$

       b. $\sigma[\![\mathbf{must}^q_p(\phi)]\!] = \begin{cases} \sigma[\![\exists q \wedge \phi \wedge p \subseteq \mathbf{1}]\!] & \text{if } CS_\sigma \subseteq CS_{\sigma[\![\exists q \wedge \phi \wedge \mathbf{cs}(k) \subseteq q]\!]} \\ \sigma[\![\exists q \wedge \phi \wedge p \subseteq \mathbf{0}]\!] & \text{otherwise} \end{cases}$

$\mathbf{might}^q_p(\phi)$ introduces a scope proposition (here represented by the discourse referent q) for the content of ϕ and imposes a vacuous restriction on the reference proposition (by means of the condition $p \subseteq \mathbf{1}$) if accepting q does not result in the empty context set, otherwise it requires that p be interpreted as the empty set of worlds (by means of the condition $p \subseteq \mathbf{0}$).[11] $\mathbf{must}^q_p(\phi)$ expresses a similar meaning, except that it imposes a vacuous restriction on p only if accepting q would not remove any worlds from the context set. In any case, there are either no restrictions on the reference proposition or it is the empty set. This preserves Veltman's view that modal sentences are not informative.

The definitions in (24) give the correct interaction of modals with negation. In particular, 'might' and 'must' behave like DUALS with respect to each other: it holds that $\mathbf{not}^q_p(\mathbf{might}^r_q(\phi)$ and $\mathbf{must}^q_p(\mathbf{not}^r_q(\phi))$ express the same factual information (encoded in the values of p), and similarly for $\mathbf{not}^q_p(\mathbf{must}^r_q(\phi))$ and $\mathbf{might}^q_p(\mathbf{not}^r_q(\phi))$. As an illustration of the first of those equivalences, consider the following (intuitively equivalent) sentences and their respective translations.

(25)   a.   It is not true that it might be raining.
       b. $\exists p \wedge \mathbf{not}^q_p(\mathbf{might}^r_q(raining_r)) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

(26)   a.   It must not be raining.
       b. $\exists p \wedge \mathbf{must}^q_p(\mathbf{not}^r_q(raining_r)) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

Both sentences say that rain is impossible. Formally, the content of each sentence is encoded by the reference proposition (represented by p) and there are two cases to check in order to determine its value: (i) that it is raining in some of the worlds in the input

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[11]The condition $p \subseteq \mathbf{1}$ requires that p be a set of worlds and as such is completely superfluous. It is only included for ease of comparison to the condition $p \subseteq \mathbf{0}$ in the "otherwise" case.

context set, and (ii) that it is not raining in any of the worlds in the input context set. First, if it is raining in some worlds of the context set, then $CS_{\sigma[\![\exists r \wedge raining_r \wedge \mathbf{cs}(k) \subseteq r]\!]} \neq \{\}$. According to the interpretation rule for 'might', in (25b) the maximal value of q is the entire set of worlds and, since p needs to be disjoint from it, q has to be the empty set. Under the same assumption that it is raining in some worlds of the context set, adding the information that it is not raining would eliminate the "rain worlds" from the context set, i.e. $CS_\sigma \not\subseteq CS_{\sigma[\![\exists q \wedge \mathbf{not}^r_q(raining_r) \wedge \mathbf{cs}(k) \subseteq q]\!]}$. Thus, by the interpretation rule for 'must', in (26b) p can only be assigned the empty set. Second, if it is not raining in any of the worlds in the context set, it follows that $CS_{\sigma[\![\exists r \wedge raining_r \wedge \mathbf{cs}(k) \subseteq r]\!]} = \{\}$. According to the interpretation rule for 'might', in (25b) q is assigned the empty set and the maximal value of p is the entire set of words. Keeping with the same assumption of no rain, it follows that $CS_\sigma \subseteq CS_{\sigma[\![\exists q \wedge \mathbf{not}^r_q(raining_r) \wedge \mathbf{cs}(k) \subseteq q]\!]}$, and then from the interpretation rule for 'must' we know that the maximal value of p is again the entire set of words. Either way, (25a) and (26a) express the same information and a speaker would make the same commitment whether she utters one or the other. The reader can verify that 'It is not true that it must be raining', translated as $\exists p \wedge \mathbf{not}^q_p(\mathbf{must}^r_q(raining_r)) \wedge \mathbf{dc_{sp}}(k) \subseteq p$, and 'It might not be raining', translated as $\exists p \wedge \mathbf{might}^q_p(\mathbf{not}^r_q(raining_r)) \wedge \mathbf{dc_{sp}}(k) \subseteq p$, express the same content, thus verifying the second dual equivalence.

The second analysis of epistemic modals builds on Stone (1997, 1999) and Stone & Hardt (1999). The rough idea is that modals state a relationship between the reference proposition and the scope proposition: possibility modals require that there be a non-empty overlap whereas necessity modals require that the reference proposition be included in the scope proposition. These relationships are further restricted by a MODAL BASE and an ORDERING SOURCE (see Lewis 1973, Kratzer 1991).

Following up on some of these ideas, I will write MB_w for the modal base at a world w, where MB_w is a set of worlds. In general, different worlds will generate different modal

bases.[12] I introduce a new functional term $\mathbf{mb}(p)$ of type πt, where p is a term of type π. Intuitively, $\mathbf{mb}(p)$ denotes the set of all the modal bases generated by worlds in p, i.e. $[\![\mathbf{mb}(p)]\!]^{i,\sigma} = \bigcup_{w \in [\![p]\!]^{i,\sigma}} \{\{MB_w\}\}$. I also introduce the two new relational symbols $\Box$ and $\sqsubseteq$ into the logic by means of the following new rule for constructing atomic dynamic terms.

(27) If $P \in Term_{\pi t}, q \in Term_\pi$, then $P \Box q, P \sqsubseteq q \in Term_{[]}$.

Intuitively, $\Box$ means overlap and $\sqsubseteq$ means subset, where both distribute over the first argument. As with other logical relations, I use the same symbols in the object language and the metalanguage and take $\Box$ and $\sqsubseteq$ to abbreviate the following, where $\mathsf{P} \in D_{\pi t}$, $\mathsf{p, q} \in D_\pi$, and $\bigcirc$ means set-theoretic overlap (the non-negated counterpart of $\varnothing$).

(28) a. $\mathsf{P} \Box \mathsf{q} :\Leftrightarrow \forall \mathsf{p} \in \mathsf{P} : \mathsf{p} \bigcirc \mathsf{q}$
      b. $\mathsf{P} \sqsubseteq \mathsf{q} :\Leftrightarrow \forall \mathsf{p} \in \mathsf{P} : \mathsf{p} \subseteq \mathsf{q}$

Given all these preliminaries, $\mathbf{might}_p^q(\phi)$ and $\mathbf{must}_p^q(\phi)$ can be taken to stand for the following series of updates.[13]

(29) a. $\mathbf{might}_p^q(\phi) := \exists q \wedge \phi \wedge \mathbf{mb}(p) \Box \mathbf{max}(q)$
      b. $\mathbf{must}_p^q(\phi) := \exists q \wedge \phi \wedge \mathbf{mb}(p) \sqsubseteq \mathbf{max}(q)$

According to (29), $\mathbf{might}_p^q(\phi)$ states that all the modal bases associated with the worlds in the reference proposition (here represented as p) have a non-empty overlap with the (maximal) scope proposition (represented as $\mathbf{max}(q)$). In turn, $\mathbf{must}_p^q(\phi)$ states that all the modal bases generated by worlds in the reference proposition are included in the (maximal) scope proposition.

Since modal bases are allowed to differ across worlds, under this analysis modal statements can be informative. For example, if MB_{w_1} includes "rain worlds" while MB_{w_2} ex-

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[12]Modal bases should potentially be further restricted to conversational agents and structured by ordering sources.

[13]I am indebted to David Beaver for pointing out a problem with a previous version of these definitions which tried to relate the reference proposition and the scope proposition directly, i.e. without the intermediary of modal bases.

cludes such worlds, $\{w_1\}$ but not $\{w_1, w_2\}$ would be a possible reference proposition for the sentence 'It might be raining'. This is in contrast to the Veltman-style analysis discussed above, which predicts that sentences with epistemic modals are not informative.

Under this second analysis, the dual equivalences between $\mathbf{not}_p^q(\mathbf{might}_q^r(\phi))$ and $\mathbf{must}_p^q$ $(\mathbf{not}_q^r(\phi))$, and between $\mathbf{not}_p^q(\mathbf{must}_q^r(\phi))$ and $\mathbf{might}_p^q(\mathbf{not}_q^r(\phi))$ are upheld. For example, recall the two equivalent sentences in (25)-(26), repeated from above.

(25)   a.   It is not true that it might be raining.

         b. $\exists p \wedge \mathbf{not}_p^q(\mathbf{might}_q^r(raining_r)) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

(26)   a.   It must not be raining.

         b. $\exists p \wedge \mathbf{must}_p^q(\mathbf{not}_q^r(raining_r)) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

In (25), the reference proposition is the complement of the proposition that only generates modal bases in which rain is possible. In (26), the reference proposition is the proposition which only generates modal bases in which rain is not possible. Clearly, the two reference propositions encode equivalent semantic content, as required.

This section offered an explanation for the fact that operators have no effect on the way ARCs are interpreted, even when the latter occur in their syntactic scope. This demonstrates that it is possible to interpret ARCs in situ while at the same time account for their projection behavior.

4 Previous approaches to appositive projection

In this section I critically examine existing approaches to appositive projection.

4.1 The scopal approach

The main idea behind the SCOPAL APPROACH to appositive projection is a *syntactic* one: ARCs escape the scope of external operators because, at the relevant level of interpretation, they are attached to a high syntactic node. This high available syntactic node could be the

root node of the sentence (e.g. Demirdache 1991, Schlenker 2009, ms, Nouwen to appear) or a text node (e.g. Del Gobbo 2003, 2007). Under this approach, ARCs are interpreted as clausal conjuncts (e.g. Schlenker 2009, ms, Nouwen to appear) or independent clauses that follow the main sentence (e.g. Demirdache 1991, Del Gobbo 2003, 2007). Below, I take the account proposed in Schlenker (2009, ms) as showcasing the scopal approach.

According to Schlenker (2009, ms), ARCs can be attached to any node of propositional type that dominates the anchor. However, there is a preference for high syntactic attachment, which explains why ARCs typically do not interact with operators. Low syntactic attachment is dispreferred but possible: it is needed to account for cases in which ARCs appear to take scope under an operator and thus are problematic for the current account.[14] Semantically, ARCs are interpreted as conjoined with the clause they are syntactically attached to. Glossing over the technical details, the sentence in (30) has the Logical Form as in (30a) and gets interpreted as in (30b). The indexing on the syntactic nodes marks the attachment site of the ARC: in (30b), the ARC is attached to the TP node even though in the surface string it is right-adjacent to the subject.[15]

(30)   Jaden, <u>who smokes</u>, is**n't** sick.

    a.   (Logical Form)
       $[_{TP_i} \text{not} [_{TP_i} \text{jaden} [_{CP_i} \text{who smoke}] \text{sick}]]$

    b.   (interpretation)
       $[[_{TP_i} \text{not} [_{TP_i} \text{jaden} [_{CP_i} \text{who smoke}] \text{sick}]]]^{M,g} = 1$
       iff $[[_{TP_i} \text{not} [_{TP_i} \text{jaden sick}]]]^{M,g} = 1 \,\&$
         $[[_{CP_i} \text{who smoke}]]^{M,g}([\text{jaden}]^{M,g}) = 1$
       iff $[\text{jaden}]^M \notin [\text{sick}]^M \,\&\, [\text{jaden}]^M \in [\text{smoke}]^M$

What is important here is that the ARC in (30) is interpreted outside the scope of the negation and thus is correctly predicted to project. To these assumptions, Schlenker adds a pragmatic requirement on ARCs which derives their typically not-at-issue information

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[14]See Section 4 of Chapter 5 for discussion of some such cases.

[15]See Schlenker (ms) for details on how the assumptions made about the syntax and semantics of ARCs derive this result.

status (see Chapter 2) and also explains their presupposition-like projection pattern (see Section 3.3 below for discussion on this point).

Needless to say, Schlenker's account is simple enough and thus very appealing. ARCs are indeed intuitively felt to not be fully integrated into the sentence and it is natural to assume that they are interpreted as conjoined to the rest of the sentence. However, there are some challenges. The first challenge concerns the surface position of ARCs. If ARCs were indeed attached to the root node of the sentence, it has to be explained why in the surface form they are adjacent to their anchors. To derive this fact, Schlenker imports the proposal of McCawley (1982, 1988), which allows transformations to change the linear order of elements without affecting their constituent structure. That is, in (30) the ARC is attached to the main clause but is subjected to a series of transformations which linearize it as right-adjacent to the anchor. This mechanism derives the surface position of ARCs but is also based on non-standard assumptions about syntactic structure.

A second challenge for this account stems from the assumption that ARCs can attach to lower clausal constituents. Although low syntactic attachment is crucial to explaining certain embedded interpretation of ARCs (again, see Section 4 of Chapter 5 for discussion of those cases), the account does not explain why high syntactic attachment is generally preferred and under what conditions low attachment is allowed. If low attachment is in principle possible, then the fairly robust projection behavior of ARCs starts to look like a mystery.

None of the previous two points seem too critical as various responses to them can be offered. The major issue for Schlenker's account, as I see it, is that it is not obvious how it would derive the order-dependent phenomena discussed in Section 2 above. Recall that those data were taken as evidence that ARCs are interpreted in surface position; e.g. in (7), repeated from above, the ARC cannot be interpreted as separate from the rest of the sentence without disrupting the anaphoric dependences.

(7) John^u, who$_u$ nearly killed a^v woman with his$_u$ car, visited her$_v$ in the hospital.

<div align="right">(AnderBois et al. 2010)</div>

However scopal accounts might want to interpret examples as in (7), the interpretation procedure should be made sensitive to the *linear order* between the appositive and the remaining sentence. But this requirement goes against the assumption of such accounts that ARCs are interpreted independently of the clause in which they occur.

4.2 The two-dimensional approach

According to the TWO-DIMENSIONAL APPROACH (see Dever 2001, Potts 2005; see also Karttunen & Peters 1979, Bach 1999), appositive content is separated from the main clause content in a secondary meaning dimension. This is why external operators have no effect on the way appositives are interpreted and the latter project. In this section I focus on the two-dimensional account of Potts (2005).

In his influential book, Potts (2005) argues that appositive content belongs to the meaning class of CONVENTIONAL IMPLICATURES, a term he borrows from Grice (1975) but redefines to describe secondary entailments triggered by linguistic phenomena as diverse as parenthetical expressions, expressive adjectives, honorifics, etc. The assumption made by Potts that is of most interest for our purposes is the INDEPENDENCE ASSUMPTION, according to which conventional implicatures are logically and compositionally independent of at-issue entailments. From the independence assumption it follows that conventional implicatures necessarily project. Although appositives are syntactically adjoined to their anchors, they belong to the larger class of conventional implicature triggers and thus their content projects.

To illustrate, the (extensional version) of Potts' LOGIC FOR CONVENTIONAL IMPLI-CATURE derives for the sentence in (31a) the interpretation in (31b), for any model M and

an assignment function g.[16]

(31) a. Lance, <u>who is a cyclist</u>, did**n't** win.

   b. $\langle \underbrace{[\![\neg\text{win}(\text{lance}) : t^a]\!]^{M,g}}_{\text{at-issue entailment}}, \{ \underbrace{[\![\text{cyclist}(\text{lance}) : t^c]\!]^{M,g}}_{\text{convenitonal implicature}} \} \rangle$

The sentence in (31a) makes two meaning contributions, which Potts calls the at-issue entailment and the conventional implicature. The at-issue entailment (expressed by the main clause) entails that Lance didn't win and the conventional implicature (expressed by the appositive) entails that Lance is a cyclist. Crucially, the negation operator only takes scope over the main clause content and has no effect on the appositive content. This is as required.

Unfortunately, the two-dimensional account of Potts (2005) inherits the same major problem as that of scopal accounts: it does not seem to make room for the fact that ARCs are interpreted as integrated into the sentence with respect to order-dependent phenomena (see Section 2 above). This account neatly separates the two meaning dimensions, thus excluding unwarranted scopal interaction between them. But its biggest virtue is also its bane: in doing so, it destroys the linear order between the appositive and the rest of the sentence. Yet, it is exactly this order that the interpretation procedure should be made sensitive to, if the order-sensitivity of discourse anaphora involving appositives is to be explained. Even though Potts' account is impressive in its empirical scope, it clearly ignores the fact that appositives participate in order-dependent phenomena.

In addition, the predictions Potts' account makes with respect to truth-value intuitions about sentences with appositives seem problematic. The account has the apparent virtue of assigning to appositives a purely truth-conditional semantics. In his informal characterization, Potts (2005) describes appositives as triggering entailments and contributing to

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[16]In order to define the composition rules, Potts splits traditional types into AT-ISSUE TYPES (superscripted with a) and CONVENTIONAL IMPLICATURE TYPES (superscripted with c). In (31b), the at-issue entailment is of type t^a and the conventional implicature is of type t^c. The technical details of Potts' system shall not concern us here.

the truth-conditional content of the sentence. Recalling Experiment 3 of Syrett et al. (ms), reviewed in Chapter 3, this is as it should be: participants judge sentences with false appositives simply as false. Yet, it is not clear how Potts's *formal* account can predict that. Since appositive content is separated from at-issue content in the meaning dimension, the lack of a single truth value per sentence predicts that when participants are forced into a binary judgment, they either (i) disregard the appositive content, or (ii) exhibit reluctance to render a judgment. None of those predictions is borne out, though. This is why I briefly investigate possible modifications of Potts' original account that could correctly capture the truth-conditional contribution of appositives.

The semantic composition of Potts' Logic for Conventional Implicature produces parsetrees in which conventionally implicated content is separated from the rest of the sentence. The Parsetree Interpretation rule maps parsetrees into two-dimensional semantic objects. The extensional version for Parsetree Interpretation, specified for our purposes to only fit entire sentences, is given in (32).

(32) PARSETREE INTERPRETATION (Potts 2005:68, slightly modified)
Let T be a semantic parsetree with the at-issue term $\alpha : t^a$ on its root node and distinct terms $\beta_1 : t^c,...,\beta_n : t^c$ on nodes in it. Then, the interpretation of T in a model M and relative to a variable assignment g is the tuple $\langle [\![\alpha : t^a]\!]^{M,g}, \{[\![\beta_1 : t^c]\!]^{M,g},..., [\![\beta_n : t^c]\!]^{M,g}\} \rangle$.

A semantics involving such a rule truly merits the name "two-dimensional" since it separates the two dimensions not only in the logical representation but also in the meaning dimension. That is, Parsetree Interpretation does not assign a *single* truth value per sentence but rather associates with a sentence a tuple whose first coordinate is the truth value of the at-issue content and whose second coordinate is the set consisting of the truth values of the various conventionally implied propositions. There are two ways to think about the predictions this rule makes with respect to the truth-conditional contribution of appositives. First, it is possible that the secondary dimension is fully ignored and truth is assigned solely based on the truth value found in the first dimension. This, however, seems implausible: the

sentence 'Obama, <u>who was born in Kenya</u>, was born in Hawaii' sounds contradictory but it should be judged true if the appositive content were really ignored. Alternatively, it is possible that speakers are reluctant to assign a single truth-value to sentences with appositives. Yet, speakers seem to have absolutely no problem assigning truth values to sentences with appositives, in particular when the appositive expresses true information. Either way, if the truth values of the different meaning dimensions are *not* combined, we seem to get unwelcome results.

In order to make the theory predict truth-conditional import for appositives, we could try to combine the two meaning dimensions in the semantics. Following this line of thought, we could collapse the different meaning dimensions by modifying the Parsetree Interpretation rule as follows:

(33) PARSETREE INTERPRETATION (one-dimensional version)
Let T be a semantic parsetree with the at-issue term $\alpha : t^a$ on its root node and distinct terms $\beta_1 : t^c,...,\beta_n : t^c$ on nodes in it. Then, for any model M and variable assignment g, $[\![T]\!]^{M,g} = 1$ if and only if $[\![\alpha : t^a]\!]^{M,g} = 1$, $[\![\beta_1 : t^c]\!]^{M,g} = 1,...,[\![\beta_n : t^c]\!]^{M,g} = 1$.

This interpretation rule predicts a conjunctive interpretation of appositive content. It is thus in line with Potts' emphasis that the distinction between the different kinds of content is in the representation language, not in the syntax or the model. For example, Potts writes:

"Perhaps the most fundamental question that arises when devising a description logic is where to locate these distinctions among the different kinds of content. They could trace back to the syntax, the description logic, or the models—perhaps to all three. But CI [=conventional implicature] expressions are syntactically heterogeneous. And in a variety of cases, the models for conventionally implicated phrases are the same as those for at-issue phrases. The meaning language is thus the only viable tool for the job." (Potts 2005:51)

Under this new reformulation of Potts' Parsetree Interpretation, it is not possible anymore to talk about different *meaning* dimensions, as the distinction is now solely in the logical representation language. This format of the rule makes all the desired predictions: it treats appositives as truth-conditional, it predicts that sentences with appositives are true or false,

and it explains why appositives project. However, forcing a binary judgment on sentences with conventional implicatures goes against the spirit of two-dimensional accounts, whose leading intuition is that sentences with appositives express multiple propositions. In fact, adopting the rule in (33) makes Potts' account look not much different from the scopal accounts discussed in the previous section.

We could as well follow a dynamic route and claim that the different meaning dimensions are interpreted as dynamic conjuncts which are sequentially added to the context. A dynamic version of the Parsetree Interpretation rule could look as follows.

(34)   PARSETREE INTERPRETATION (dynamic version)
Let T be a semantic parsetree with the at-issue term $\alpha : t^a$ on its root node and distinct terms $\beta_1 : t^c,...,\beta_n : t^c$ on nodes in it. Then, the interpretation of T in a model M and relative to an information state σ is the defined as $\sigma [\![\alpha : t^a]\!]^M [\![\beta_1 : t^c]\!]^M ...$
$[\![\beta_n : t^c]\!]^M$.

This last rule achieves the same result as that in (33): appositives are interpreted as regular assertions but they are also predicted to project. The rule also calls for a reformulation of Potts' logic in dynamic terms. It is, however, not clear how the rule in (34) is any better than the rule in (33). Most importantly, neither of the two rules solves the main challenge to two-dimensional accounts raised above, i.e. the fact that processing appositives as entirely following or entirely preceding the host clause destroys the anaphoric connections between them and the remaining sentence. Any account that extracts the appositive from the rest of a sentence would need a special mechanism to recover the anaphoric dependencies.

To conclude: We see that in addition to the difficulty of interpreting appositive content in surface position, the two-dimensional approach also makes problematic predictions with respect to truth-value judgments of sentences with appositives. Yet, we could find no easy way to modify the interpretation rules but preserve the gist of the approach.

4.3 The presuppositional approach

The basic idea behind the PRESUPPOSITIONAL APPROACH is that ARCs are presuppositions and thus typically project out of higher operators (see Keenan 1971, Sæbø 2011; see also Schlenker 2009, ms). Presuppositional accounts of appositives are clearly underrepresented in the literature. Keenan (1971) makes an early mentioning of the fact that ARCs project out of negation and concludes that they are presupposition triggers. Sæbø (2011) seems to offer the only existing account of appositives as presuppositions, which he treats as definedness conditions.[17] However, Sæbø's paper focuses on (alleged) embedded readings of appositives in downward-entailing contexts,[18] and thus the consequences of his proposal are not fully explored. As discussed above, Schlenker (2009, ms) defends a scopal account of ARCs. However, he also imposes a pragmatic condition on ARCs, called TRANSLUCENCY, which makes appositive content mimic the projection pattern and not-at-issue status of presuppositions. Translucency can be summarized as follows: Sentences with ARCs can be felicitously uttered in a global context C only if there exists a minimally strengthened context C^+ which makes the ARC content locally entailed. If felicitous, the sentence is interpreted with respect to this strengthened context C^+, not with respect to C. This pragmatic condition derives the fact that ARCs are both informative (in the original context) and presupposed (in the strengthened context). On this view, ARCs are interpreted similarly to globally accommodated presuppositions.

Unlike scopal or two-dimensional accounts, which predict that ARCs strongly project (i.e. the projection of ARCs cannot be canceled), presuppositional accounts make a different and more specific prediction: ARCs match the distinct projection pattern of presuppositions. In particular, inferences triggered by ARCs are predicted to be cancelable in certain environments, similarly to cancelation of classical presuppositions. The mechanism

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[17]Although Sæbø's paper is only concerned with nominal appositives, he conjectures that other appositives, including ARCs, share the same properties.

[18]I discuss this data in Section 3 of Chapter 5.

that explains presupposition projection should then also explain the projection pattern of ARCs.[19]

My goal here is to compare the projection properties of ARCs to those of classical presuppositions. If implications associated with ARCs and presuppositional implications turn out to share most of their properties, then ARCs and presupposition triggers should be thought of as pertaining to the same empirical domain; otherwise, ARCs should be clearly distinguished from presuppositional elements. I first discuss two more general points in which ARC content and classical presuppositions differ and then zero in on differences in their projection pattern.

The first major difference is that ARCs, unlike classical presuppositions, seem to make a purely truth-conditional contribution to the sentence in which they appear. As already discussed in Chapter 3, Syrett et al. (ms) offer robust experimental evidence which is compatible with the claim that false ARCs make the whole sentence false, not infelicitous.[20]

The second major difference is that ARCs typically express new (see Chierchia & McConnell-Ginet 2000, Potts 2005), albeit unsurprising information (see Schlenker 2009, ms). The informativeness property follows from the assumption that ARCs express assertions and the lack-of-surprise property could stem from their typically not-at-issue status (see Chapter 2). Classical presuppositions also express unsurprising information but arguably for a different reason: their content is discourse-old.

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[19]There are several influential theories of presupposition projection. CUMULATION-PLUS-CANCELATION ACCOUNTS (see Gazdar 1979) endow all presuppositions with the potential to project but assume that projection is canceled if incompatible with the entailments or the conversational implicatures triggered by the sentence. According to LOCAL CONTEXT ACCOUNTS (see Stalnaker 1973, 1974, Karttunen 1974, Heim 1983, 1992, Beaver 2001; see also Schlenker 2007, 2009), a sentence can be felicitously uttered only if its presuppositions are entailed by the local context. If a given presupposition is not entailed by the local context, it needs to be entailed by the global context, which gives the intuition of projection. ANAPHORIC ACCOUNTS (see van der Sandt 1992, Geurts 1999) view presupposition phenomena as a special case of anaphora. If the anaphor cannot find its antecedent in the sentence, it needs to find it globally, which produces the effect of projection. Under the (dubious) assumption that ARCs are presuppositional, any of those theories would derive the fact that they project.

[20]Experiment 4 in Syrett et al. (ms) offers some comparisons with corresponding experimental data on presupposition.

We now come to the projection pattern of ARCs, which, I claim, significantly differs from that of classical presuppositions. As is well known, presuppositions can be canceled in certain environments (see Karttunen 1973, 1974, a.m.o.), something that does not seem possible for implications arising from ARCs. To illustrate, the embedding predicate 'regret' typically presupposes the content of its complement, but its presupposition is blocked in the sentences in (35). In each case, the proposition that Fred kissed Betty projects only to the preceding clause, which entails it. Since the whole sentence is only hypothetically assumed, the entailment is blocked and thus the sentence as a whole does not imply that Fred kissed Betty.

(35)   a.   It's **possible** that Fred kissed Betty, and that he regrets that he kissed her.
        b.   **If** Fred kissed Betty, then he regrets that he kissed her.

(both from Geurts 1999)

Crucially, both sentences in (35) are felicitous, unlike the structurally similar sentences with ARCs in (36), which sound markedly odd.

(36)   a.   # It's **possible** that Obama is a socialist and that the President, <u>who is a socialist</u>, will raise taxes on the rich.
        b.   # **If** Obama is a socialist, then the President, <u>who is a socialist</u>, will raise taxes on the rich.

The reason why the two sentences in (36) sound odd, I claim, is that the implication triggered by the ARC, i.e. the proposition that Obama is a socialist, is *not* canceled. Given that this proposition is also hypothetically assumed, the speaker is simultaneously (conversationally) implying that she is certain and not certain that Obama is a socialist, which results in infelicity. In (35), where the presupposition triggered by 'regret' is filtered out, the speaker only implies uncertainty towards the proposition that Fred kissed Betty and the sentences are felicitous.

One could object that the two sentences in (36) are ruled out for a different reason, e.g. because it is difficult to interpret 'Obama' and 'the President' as coreferential, or because

in discourse it is usually not good to repeat the same wording, here 'is a socialist'.[21] To block this criticism, I constructed minimal pairs in which examples with presuppositions and examples with ARCs share the exact same referential terms and the same amount of word repetitions; cf. (37) and (38). Even so, in (37) the presuppositions are canceled and the examples are felicitous whereas in (38) the appositive content is implied and the examples are ruled out.

(37) a. It's possible that Obama did it and that the President regrets that he did it.
      b. If Obama did it, then the President regrets that he did it.

(38) a. # It's possible that Obama did it and that the President, who did it, doesn't want to try it again.
      b. # If Obama did it, then the President, who did it, doesn't want to try it again.

Schlenker (2009) provides comparisons as in (39)-(40) which purport to show that appositive implications, similarly to presuppositions, can participate in conditional inferences.[22]

(39) a. If John is over 60, then he knows that he can't apply.
      b. ⇒ If John is over 60, he can't apply.   (after Schlenker 2009)

(40) a. If you start an affair with Jessica, then your wife, who will be furious, will divorce you.
      b. ⇒ If you start an affair with Jessica, then your wife will be furious.

Examples as in (40) are problematic for my account because it predicts that the appositive content proper, not a conditional inference, is entailed. Such examples will be further discussed in Section 3 of Chapter 5. Here, I would like to merely point out that if the ARC

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[21] I am indebted to Roger Schwarzschild for pointing out the need to control for that latter factor.

[22] Schlenker's original examples are from French and involve conjunction, disjunction, and negative quantifiers. I have found that, for English, the conjunction examples actually imply the appositive content proper and the judgments involving negative quantifiers are not as sharp. Schlenker also discusses examples involving disjunction, which can receive a similar analysis to that in (40).

in (40a) is interpreted as part of the consequent—or, in Schlenker's terms, as demonstrating low syntactic attachment to the 'then'-clause,—the inference obtained already follows from propositional logic. This is because $p \rightarrow (\underline{q} \wedge r)$ entails $p \rightarrow \underline{q}$, where p stands for 'You start an affair with Jessica', $\underline{q}$ stands for 'Your wife will be furious' (the content of the ARC), and r stands for 'Your wife will divorce you'. If so, no extra pragmatic condition that forces ARCs to receive a similar interpretation as that of presuppositions is needed in order to explain such conditional inferences.

In conclusion: The presuppositional approach to ARCs can easily account for the fact that they escape the scope of outside operators. However, in addition to several more general differences between ARC implications and classical presuppositions, we find that ARCs project *stronger* than classical presuppositions, i.e. implications triggered by ARCs are harder to cancel than presupposed content. This fact casts serious doubt on the view that the scopal inertness of ARCs is best explained in terms of presupposition projection.

4.4 The discourse topic approach

Finally, the DISCOURSE TOPIC APPROACH seeks to derive the projective nature of appositives and other constructions from their special discourse status, i.e. their NOT-AT-ISSUE status (see Amaral et al. 2007, Roberts et al. 2009, Simons et al. 2010). According to this approach, not-at-issue content is content that is not relevant to the discourse topic/the textscQuestion Under Discussion (see Roberts 1996, Ginzburg 1996, Büring 2003, and Farkas & Bruce 2010 on the latter term). A sentence is relevant to a question under discussion if and only if it contextually entails a partial or complete answer to that question. Since the discourse topic approach was already reviewed in Section 5.1 of Chapter 2, I will only briefly repeat two of the major challenges for this approach.

First, explaining projection in terms of a special discourse status is intriguing because of the strong correlation between projective meanings and not-at-issue meanings across empirical domains. However, the authors view this correlation as a mere *equivalence* be-

tween those two types of meanings, and this seems too strong. One can fairly easily find empirical evidence suggesting that certain not-at-issue meanings do not project and projective meanings can sometimes be at-issue. One example of meanings that are not at-issue but project are complements of non-factive verbs, in particular complements to world-creating verbs like 'dream' or 'imagine'. In (41), the complement of 'imagine' does not address the discourse topic, here explicitly specified as the things that happened last night. Nevertheless, the content of the embedded clause does not project, i.e. the entire sentence does not imply it.

(41) A: What happened last night?
   B: Jessica **imagined** she became the next Miss USA.

Examples of projecting but at-issue meanings include implications associated with sentence-final ARCs. Such implications were argued in Chapter 2 to be sometimes at-issue, and yet they routinely project. This is illustrated in (42), where the appositive projects past the possibility modal but is nevertheless a legitimate target of direct rejections, i.e. is at-issue.

(42) A: Liz **might** be with her husband, who has prostate cancer.
   B: That's not true—he has lung cancer.

The account defended in this dissertation preserves the robust projection pattern of ARCs but also has the required flexibility to explain why final ARCs can be at-issue (see Chapter 2 and Section 3 of the current chapter).

Second, the discourse topic account does not explain *why* (certain types of) not-at-issue content project. The fact that operators only target at-issue content is stipulated and not derived. Under traditional assumptions about the syntax-semantics interface, operator scope is a matter of a particular structural configuration (and the way propositional variables are distributed in the syntactic tree, under the current account). Thus, it is surprising that operators should be sensitive to the discourse status of the elements in their scope. The current account can explain the link between projection and (the possibility of) not-at-issue status

in ARCs. Both of those properties ride on the fact that ARCs form ForcePs, which cannot be bound by outside operators (see Section 3 above).

5   Remaining issues

This section addresses four sticking points for the analysis of appositive projection defended in this chapter. The first point is a caveat about the in-situ interpretation of ARCs. The second point concerns limitations on accessibility of discourse referents introduced in the scope of entailment-canceling operators to subsequent discourse. The third addresses the fact that quantified nominal phrases placed in the main clause cannot usually bind pronouns placed in the ARC. The fourth and last point is about some potential challenges for integrating presupposition phenomena into the current account.

5.1   More on the in-situ interpretation of ARCs

In this chapter, I claimed that ARCs are interpreted in surface position. The argument was based on the fact that ARCs freely participate in order-dependent phenomena such as discourse anaphora. For example, in (7), repeated from above, the anaphors in the ARC find their antecedent in the preceding part of the sentence and the anaphors in the following part of the sentence find their antecedent in the ARC.

(7)   John^u, who$_u$ nearly killed a^v woman with his$_u$ car, visited her$_v$ in the hospital.
(AnderBois et al. 2010)

The sentence above represents a piece of felicitous discourse because all the antecedents precede their anaphors. Let us call this the LINEARITY REQUIREMENT. The important question is: At what level of the grammar should this requirement apply? The way the argument for interpreting ARCs in surface position was framed suggests that the linearity

requirement applies at the level of surface structure, which seems empirically correct.[23] However, the real goal of this requirement is to make the syntactic structure interpretable, i.e. it needs to ensure that antecedents are *interpreted* before their dependents. Thus, the linearity requirement really needs to be understood as a condition on interpretation, not syntactic structure.

This fact places the burden on the translation rules, which need to ensure that if the antecedent precedes the anaphor in the overt syntax, it also does so in the logical representation. The translation rules given in Chapter 6 below achieve that by typically preserving the order of the major constituents in the sentence. However, there are some issues with this strategy. For example, in (43) the object follows the transitive verb in the overt syntax but their contributions to the logical representation come in the reverse order. Reversing the order in the representation language is required because the variable introduced by the object needs to bind the argument position of the verbal predicate.

(43)   a.   Zelda^u $\underbrace{\text{grew}}_{\text{verb}}$ $\underbrace{\text{a}^v \text{ ficus}}_{\text{object}}$.

   b. $\exists p \wedge \exists u \wedge u = zelda \wedge \underbrace{\exists v \wedge ficus_p\{v\}}_{\text{object contribution}} \wedge \underbrace{grow_p\{u,v\}}_{\text{verb contribution}} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

The compositional rules in Chapter 6 also ensure that ARCs are interpreted immediately after their anchors and thus the anaphoric relations in examples like (7) are easily captured. Hence, linear order is, to a big extent, transferred from the syntactic domain to the semantic domain. Yet, it should be clear that the match between surface form and semantic interpretation is not perfect and that there are potential issues lurking in the dark.

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[23]Note, however, the various examples of backwards anaphora discussed in Carden (1982), Reinhart (1983), and Chierchia (1995).

5.2 Accessibility of discourse referents

The second issue that I would like to address involves the accessibility of discourse referents introduced in the syntactic scope of entailment-canceling operators. It is typically claimed that such discourse referents are not accessible from outside the scope of the operator. This is demonstrated below. The discourse referent introduced in (44a), which does not include an operator, is anaphorically available for subsequent anaphora, while the discourse referent introduced in (44b) is not because of the presence of the negation. Thus, (44c) can felicitously follow (44a) but not (44b).

(44)   a.   John has a^u car.
        b.   John does**n't** have a^u car.
        c.   It$_u$ is parked in front of his house.

Such data are usually explained by defining conditions on the accessibility of discourse referents from surrounding discourse. In DISCOURSE REPRESENTATION THEORY (DRT; see Kamp & Reyle 1993, Kamp et al. 2011) accessibility conditions are based on the environment in the representation language in which the particular discourse referent is introduced and the subordination relations between boxes.[24] For example, in (45a), the DRT representation of (44a), the discourse referent for the car, , is introduced in the main box and is freely available for subsequent anaphora. In contrast, in (45b), the DRT representation of (44b), the same discourse referent is introduced in a subordinate box in the scope of negation and is not accessible to conditions placed outside that box.

(45)   a. $[v\,u\,|\,v = john,\,car(u),\,have(v,u)]$
        b. $[v\,|\,v = john,\,\neg[u\,|\,car(u),\,have(v,u)]]$

The "flat" architecture of modeling operators in USC does not allow for a structural explanation of the contrast in (44). For example, in both (46a), the logical translation of

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[24]In other dynamic frameworks, such as DYNAMIC PREDICATE LOGIC (see Groenendjik & Stokhof 1991), the accessibility of discourse referents under various connectives is encoded into the interpretation rules for formulas containing those connectives.

(44a), and (46b), the logical translation of (44b), the discourse referent representing the car, v, is introduced on the "ground level". That is, it is not syntactically embedded under an operator and should be freely available in subsequent discourse, despite the data in (44).

(46) a. $\exists p \wedge \exists u \wedge u = john \wedge \exists v \wedge car_p\{v\} \wedge have_p\{u,v\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

  b. $\exists p \wedge \exists q \wedge \exists u \wedge u = john \wedge \exists v \wedge car_q\{v\} \wedge have_q\{u,v\} \wedge p \oslash \mathbf{max}(q) \wedge$
  $\mathbf{dc_{sp}}(k) \subseteq p$

Why is the same discourse referent a possible antecedent in (44a) but not in (44b)? Below, I suggest one direction into which the explanation could go, pointing at existing literature. Stone (1997, 1999) and Stone & Hardt (1999) argue that discourse referents introduced in a modal scenario are freely available in subsequent sentences if those sentences elaborate on the scenario already given. However, if a subsequent sentence refers back to such discourse referents but makes a claim about a different scenario, e.g. the actual situation, the anaphoric link could be blocked. This is due to the fact that entities that exist in the worlds of some modal scenario need not exist in the worlds outside it.

In order to incorporate these ideas into the current analysis, we need to make three temporary additions to the semantics. First, let us allow for the possibility that terms representing random assignments to individual variables are sensitive to sets of worlds, i.e. the worlds in which the entities assigned to the variable are assumed to exist. The rules below do exactly that.[25]

(47) a. If $u \in Var_e$ and $p \in Var_\pi$, then $\exists_p u \in Term_{[]}$.

  b. $\sigma[\![\exists_p u]\!] = \{j \mid \exists i \in \sigma : i[u]j \ \& \ \forall w \in [\![p]\!]^{j,\sigma} : \langle w, [\![u]\!]^{j,\sigma} \rangle \in [\![in]\!]^{j,\sigma}\}$

Second, proposal propositions are required to be subsets of the current context set. Formally, this is achieved by requiring that $p \subseteq \mathbf{cs}(k)$, for a proposal p.[26] The third and last temporary addition is that lexical conditions presuppose that the terms occurring in them

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[25] The predicate in denotes existence in a world. It is taken from Muskens (1995) and made further use of in Stone (1999), and Stone & Hardt (1999).

[26] This is as in AnderBois et al. (2010), although it is not clear what their motivation for this choice had been.

exist throughout the worlds of their propositional argument.[27] The revised interpretation rule for lexical conditions that implements this idea could look as follows.

(48)   a. $\sigma[\![R_p\{t_1,...,t_n\}]\!]$ is defined if and only if $\forall i \in \sigma \, \forall w \in [\![p]\!]^{i,\sigma} : \langle w, [\![t_1]\!]^{i,\sigma} \rangle \in [\![in]\!]^{i,\sigma}, ..., \langle w, [\![t_n]\!]^{i,\sigma} \rangle \in [\![in]\!]^{i,\sigma}.$

        b.   If defined, $\sigma[\![R_p\{t_1,...,t_n\}]\!] = \{i \in \sigma \,|\, \forall w \in [\![p]\!]^{i,\sigma} : \langle w, [\![t_1]\!]^{i,\sigma}, ..., [\![t_n]\!]^{i,\sigma} \rangle \in [\![R]\!]^{i,\sigma}\}.$

Given these three additions, the sentences in (44a), (44b), and (44c) are now represented as in (49a), (49b), and (49c), respectively.[28]

(49)   a. $\exists p \wedge p \subseteq \mathbf{cs}(k) \wedge \exists u \wedge u = john \wedge \exists_p v \wedge car_p\{v\} \wedge have_p\{u,v\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

        b. $\exists p \wedge p \subseteq \mathbf{cs}(k) \wedge \mathbf{not}_p^q(\exists u \wedge u = john \wedge \exists_q v \wedge car_q\{v\} \wedge have_q\{u,v\}) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

        c. $\exists r \wedge r \subseteq \mathbf{cs}(k) \wedge park_r\{v\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

According to (49a), a car exists in all the worlds of the proposal p. Given that p is accepted, any further proposal will be a subset of p and thus the car introduced by the given index will be freely available. In particular, the lexical condition $park_r\{v\}$ in (49c) can be interpreted since its presupposition—that a car exists in all of the r-worlds—will be met. Hence, the anaphora in (44a)-(44c) is correctly predicted to be felicitous. In contrast, according to (49b), a car exists only in the worlds of the scope of the negation, q. Since negation requires that p be disjoint from (the maximal value of) q, once p restricts the context set, no further proposal will have a car with the relevant characteristics in it. This means that the lexical condition $park_r\{v\}$ in (49c) cannot be interpreted and explains why the anaphora in (44b)-(44c) is blocked.[29]

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[27]This assumption too is based on Stone (1997). Coming from a different angle, Beaver (1997:ft.39) makes the related observation that predication conditions presuppose familiarity of their arguments.

[28]Following common practice in semantics, I assume that proper names are directly referential, i.e. their referents exist throughout the modal space. This is why the discourse referent associated with 'John' above is not relativized to a propositional variable.

[29]A similar explanation can be given to the minimally different sentences with ARCs below.

(i)   John has a^u car, which$_u$ is parked in front of his house.

That this analysis is on the right track is suggested by the data in (50). In all three examples a car is introduced in a negative environment and according to the structural approach of Kamp and collaborators it should not be accessible from subsequent discourse, even though it is. The current approach could explain these data as follows. In (50a), a car is assumed to exist in some set of worlds that is disjoint from the worlds of the proposal proposition and an anaphoric dependency is possible if a subsequent sentence elaborates on that disjoint set of worlds. (50b) involves double negation and thus the first sentence is roughly equivalent to the respective positive sentence. In (50c), John's car is assumed to exist even though it has changed hands.

(50)   a.   John does**n't** have a^u car. It$_u$ would be parked in front of his house.

            b.   It is **not** the case that John does**n't** have a^u car. It$_u$ is parked outside.

                                                                                              (Chierchia 1995)

            c.   John does**n't** have a^u car anymore. Paul has it$_u$.   (Chierchia 1995)

Although my focus here was on discourse referents introduced under negation, the same approach can be extended to environments involving other propositional operators.[30]

5.3   Binding into ARCs

The account presented above excludes ARCs from the scope of *propositional content* operators, such as negation, modals, propositional attitude verbs, etc. It is thus important to ask what predictions the current account makes with respect to the interaction between ARCs and operators that do not involve propositional content, such as quantificational DPs.

It is often observed that a quantificational DP placed in the main clause typically cannot bind a pronoun placed in the ARC (see Jackendoff 1977, Safir 1986, Demirdache 1991,

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(ii)   # John does**n't** have a^u car, which$_u$ is parked in front of his house.

The parallel between relative pronouns in ARCs and discourse anaphors has first been noted in Sell (1985).

[30]I refer the interested reader to the classic work in Karttunen (1976) and Roberts (1989), and to Stone & Hardt (1999) and Stone (1999) for technical details.

Del Gobbo 2003, Potts 2005, Arnold 2007; see also Dever 2001 and Nouwen 2007, to appear for similar observations involving nominal appositives).[31] The following examples illustrate the point.

(51) a. * Everyone^u there had a wife, <u>who loved him$_u$</u>. (Jackendoff 1977)
      b. * Every^u Christian forgives John, <u>who harms him$_u$</u>. (Safir 1986)

At the same time, various authors have noted that quantifier binding into an ARC is sometimes possible.

(52) a. Every^u Christian prays to God, <u>who forgives him$_u$</u>. (Engdahl via Safir 1986)
      b. Every^u chess set comes with a spare pawn, <u>which you will find taped to the top of the$_u$ box</u>. (Sells 1985)
      c. Every^u American film producer pays the lead actress, <u>who hates his$_u$ guts</u>, a fortune. (Kamp & Reyle 1993)
      d. Every^u parrot sang a song, <u>which it$_u$ ruined</u>. (Kempson 2003)

Although it is not clear under what conditions quantifier binding into an ARC becomes available, the general consensus seems to be that data in which binding is possible are the exception rather than the rule. What predictions does the current account make with respect to quantifier binding into ARCs? First, let us remind ourselves of the interpretation rule for universally quantified terms.[32]

(53) $\sigma[\![\forall u\,(\phi, \psi)]\!] = \{\, i \in \sigma \mid i \in \sigma[\![\phi]\!] \Rightarrow i \in \sigma[\![\phi \wedge \psi]\!]\,\}$

According to (53), updating with $\forall u\,(\phi, \psi)$ amounts to keeping only those indices in the input information state for which it holds that if the index survives when the state is updated with the restrictor, the index also survives when the state is updated with the restrictor and the nuclear scope.[33]

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[31]Although this is rarely noted, the reverse statement generally holds true too: a quantificational DP found in an ARC cannot bind into the main clause.

[32]The particular form of the interpretation rule for universally quantified terms is not crucial for the point made below.

[33]As with other operators, the compositional rules ensure that the variable associated with the quantifier occurs free in both the restrictor and the nuclear scope (see Chapter 6).

The predictions this rule makes are clear enough: binding into ARCs should be possible. For example, assuming that the ARC in (54) is in the syntactic scope of the matrix subject, there is nothing that prevents the ARC from accessing the variable associated with the universal quantifier. In spite of that, the sentence is ungrammatical under the suggested indexation.

(54)   a.   * Every^u cheerleader greets [Chomsky, who remembers her$_u$].

    b. $\exists p \wedge \forall u \, (cheerleader_p\{u\}, \exists v \wedge v = chomsky \wedge greet_p\{u,v\} \wedge$
        $\exists q \wedge remember_q\{v,u\} \wedge \mathbf{dc_{sp}}(k) \subseteq q) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

Within USC, there is no obvious explanation of why quantifier binding into ARCs is generally ruled out. However, in Chapter 6 I will suggest an explanation within Compositional USC. The main idea is that dynamic binding and quantifier binding represent two independent mechanisms that operate on different objects in the representation language: while dynamic binding involves discourse referents, treated as *constants*, quantifier binding operate on regular variables. Since free variables are generally prohibited in ARCs (as well as root sentences), quantifier binding from an outside operator is blocked.

It should be acknowledged that some of the competing approaches of appositive projection reviewed in Section 4 can automatically derive the ban on quantifier binding into ARCs. For example, according to the scopal approach (e.g. Schlenker ms) ARCs are (or can be) placed outside the syntactic scope of the quantificational DP, which excludes quantifier binding. Under the two-dimensional approach (e.g. Potts 2005) the appositive content is interpreted in a separate dimension and hence no binding between the main clause content and the appositive content is possible. Unlike the current account, these approaches offer a direct and uniform explanation for the relative lack of scopal interaction between ARCs and the remaining part of the sentence.

5.4 Integrating presupposition

Recall that part of the argumentation for interpreting ARCs in situ was the fact that those constructions participate in *presupposition* phenomena, which generally respect linear order. For example, the presupposition triggered by 'too' is supported by previous discourse in (55a) but not in (55b) (assuming that this sentence is uttered in an out-of-the-blue context), hence the contrast in acceptability.

(55)   a.   John saw Mary, <u>who saw him **too**</u>.   (AnderBois et al. 2010)
        b.   # John, <u>who was **too** seen by Mary</u>, saw her.

There are (at least) two theories of presupposition that have gained wide currency in semantic research: the LOCAL CONTEXT APPROACH of Stalnaker (1973, 1974), Karttunen (1974), Heim (1983, 1992), Beaver (2001) (see also Schlenker 2007, 2009), and the ANAPHORIC APPROACH of van der Sandt (1992) and Geurts (1999). In this section, I briefly discuss the theoretical difficulties that emerge when trying to integrate either of these approaches into the current account.

According to the local context approach, a sentence can be felicitously uttered only if its presuppositions are entailed by the local context. Under this approach, in conjunctive sentences the first conjunct is added to the context and the second conjunct is interpreted against this newly updated context. Hence, presuppositions associated with the second conjunct are satisfied if entailed by the local context, i.e. the global context updated with first conjunct. For example, (56) is felicitous because the presupposition triggered by 'regret' is entailed by the first part of the sentence and thus will be satisfied independently of which context the sentence is uttered in.

(56)   Mary majored in philosophy but now she regrets it.

However, on the current account the two conjuncts in (56) both contribute to the single proposal associated with the entire sentence (see Chapter 2, Section 4.6). This means that when the second conjunct is interpreted, the first conjunct has not yet updated the context

set. Thus, if the local context approach is to be upheld, it needs to be modified in such a way that presupposed content is required to be entailed by *either* the context set or a standing proposal.

The anaphoric approach views presuppositions as anaphors that need to be bound by antecedents found in previous discourse. Under this approach, (56) above can be felicitously uttered because the propositional anaphor 'it' can be bound by the first conjunct. Crucially, the mechanism of binding anaphors depends on the particular *structural configuration* that holds between the anaphor and the antecedent in the representation language of DRT (see again van der Sandt 1992 and Geurts 1999). However, the "flat" architecture of USC makes it difficult to implement this idea in a straightforward way. If so, the story about the accessibility of discourse referents in USC outlined in Section 5.2 needs to be made general enough so as to also cover presupposition phenomena. I leave the question of how exactly presupposition phenomena can be integrated into the current account to further research.

6 Summary

This chapter started off with the empirical observation that ARCs participate in order-dependent phenomena such as discourse anaphora, presupposition, and VP ellipsis but nevertheless escape the syntactic scope of external operators. This observation created the impression that ARCs are both integrated and not integrated into the sentence, though with respect to two different kinds of phenomena. This necessitated an analysis under which ARCs are interpreted in surface position but are nevertheless predicted to project. The projection behavior of ARCs was derived from particular assumptions about the distribution of propositional variables among syntactic constituents and the claim that ARCs form Force Phrases, which cannot be bound by higher operators. The next chapter (Chapter 5) discusses several apparent exceptions to appositive projection and ways in which they can be

explained without important modifications to the core account.

Chapter 5

Exceptions to projection, including perspective shift in appositive relative clauses

1 Introduction

In the previous chapter (Chapter 4) we offered an explanation for the fact that appositive relative clauses (ARCs) project out of external operators such as negation, modals, or attitude verbs. Yet, scholars have uncovered several exceptions to the claimed projection behavior of ARCs. One type of exception involves cases in which the appositive content is seemingly interpreted in the scope of an attitude predicate and attributed to the agent of that predicate (see Thompson 1971, Amaral et al. 2007, Harris & Potts 2009). The following examples illustrate this case. In (1), the information that Harold's girlfriend is a little bit crazy is attributed to Harold; in (2), the information that Joan's chip was installed last month is attributed to Joan.

(1)   Harold **says** that his girlfriend, <u>who is a little bit crazy</u>, wants to go to Hanoi, but I
       think she's too rational to try it.   (Thompson 1971)

(2) *Joan is crazy. She's hallucinating that some geniuses in Silicon Valley have invented new brain chip that's been installed in her left temporal lobe and permits her to speak any of a number of languages she's never studied.*

Joan **believes** that her chip, <u>which she had installed last month</u>, has a twelve year guarantee. (Amaral et al. 2007)

I will argue that even though in such examples the appositive occurs in the syntactic scope of the attitude verb, it is not *interpreted* in its scope. Rather, such embedded-like readings arise through PERSPECTIVE SHIFT of the appositive content to the agent of a secondary speech context that is different from the context of utterance. Empirical support for this view comes from the observation that perspective shift in appositives occurs only if the existence of an additional speech context can be inferred from the larger discourse. Since verbs of saying introduce additional speech contexts by means of their lexical semantics, perspective shift canonically occurs after verbs of saying. Under certain conditions, perspective shift can also occur in other environments, e.g. after other attitude predicates or even in the absence of such predicates.

A second case of apparent low scope interpretation of ARCs involves a claimed interaction between polarity and appositive interpretation. Sæbø (2011) claims that in downward-entailing modal contexts (created by 'surprise', 'does not believe', etc.) appositives are preferably interpreted in the scope of the modal operator. For example, on its most salient reading, the sentence in (3) implies that Mary is surprised at the combination of the two facts stated in the appositive and the embedded clause, i.e. that John belongs to the conservative Christian movement of Laestadianism and that he (nevertheless) wears a necktie.

(3) Mary was **surprised** that John, <u>who is a Laestadian</u>, wears a necktie.
(Sæbø 2011, slightly modified)

I will show that such examples do not present real cases of semantically embedded ARCs. I will argue that ARCs as in (3) retain their speaker-orientation but the rhetorical relation they bear to the main clause (i.e. EXPLANATION) makes it reasonable for the addressee to infer that the attitude holder believes the content of the appositive.

Finally, there are cases in which ARCs are interpreted in the scope of 'if'-operators or operators that license the subjunctive mood in French (see Schlenker 2009, ms). In (4a), the appositive content is interpreted as part of the conditional antecedent and the sentence is virtually synonymous to its conjunctive counterpart in (4b).

(4)   a.   **If** tomorrow I call the Chair, <u>who in turn calls the Dean</u>, then we will be in deep trouble.   (Schlenker ms)

           b.   **If** tomorrow I call the Chair and he in turn calls the Dean, then we will be in deep trouble.

Although I do not offer an explanation of why ARCs fail to project in such cases, I point out that such embedded interpretations seem contingent upon the fact that the ARC contributes to the temporal structure of discourse. This suggests that such constructions, despite their superficial similarity to ARCs, might be really instances of temporal clauses that lack the typical attributes of ARCs, i.e. projection behavior and potential not-at-issue status. If so, it comes as no surprise that they can be interpreted in the scope of higher operators.

The chapter is structured as follows. Section 2 focuses on perspectively shifted ARCs and forms the bulk of the chapter. Section 3 looks into ARCs in downward-entailing modal contexts. Section 4 discusses semantically embedded ARCs that contribute to temporal structure.

2   Perspective shift in ARCs

One set of data that challenges the generalization that appositives necessarily project comes from cases in which ARCs are syntactically embedded under attitude predicates and do not imply commitments for the speaker (see Thompson 1971, Amaral et al. 2007, Harris & Potts 2009). The following examples, repeated from above, provide an illustration.

(1)   Harold **says** that his girlfriend, <u>who is a little bit crazy</u>, wants to go to Hanoi, but I think she's too rational to try it.   (Thompson 1971)

(2) *Joan is crazy. She's hallucinating that some geniuses in Silicon Valley have in-*
vented new brain chip that's been installed in her left temporal lobe and permits
her to speak any of a number of languages she's never studied.

Joan **believes** that her chip, <u>which she had installed last month</u>, has a twelve year
guarantee.   (Amaral et al. 2007)

In (1)-(2), the appositive content is attributed to the attitude holder, i.e. Harold or Joan,
respectively. In fact, in those sentences a speaker-oriented reading of the ARC does not
seem available at all.[1]

To my knowledge, no formal account of such data exists. It has nevertheless been sug-
gested in the literature that such readings do not arise from appositive embedding under an
operator but are best explained as instances of indexicality/perspective shift (see Amaral et
al. 2007, Harris & Potts 2009). I agree with this assessment and will analyze such readings
as involving ARCs that have undergone perspective shift. I argue that shifted ARCs are
attributed to another agent not directly but only through the intermediary of a *secondary*
speech context. Such secondary speech contexts are canonically introduced by verbs of
saying. However, they can also be introduced by other attitude predicates and their exis-
tence can be inferred even in the absence of an intensional predicate. Importantly, ARCs
seem unable to undergo perspective shift if the existence of an additional speech context
cannot be inferred. More generally, perspective shift in ARCs is argued to pertain to the
same empirical domain as shifted indexical pronouns in a variety of world's languages (see
Rice 1986, Speas 1999, Schlenker 2003, Anand & Nevins 2004, Anand 2006, a.o.). The
main motivation for this claim lies in the observation that the two phenomena obey similar
restrictions and can receive a uniform treatment.

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[1]The same data can be replicated for nominal appositives, which too can undergo perspective shift (see
Chapter 7).

2.1 Empirical properties of shifted ARCs

In this section I take a closer look at the phenomenon of shifted ARCs and uncover several empirical properties that went unnoticed in previous research. The core argument will be that the mechanism underlying appositive shift cannot be explained in terms of semantic embedding under an operator but rather involves reference to the agent of a secondary speech context.

Above, we looked at cases in which ARCs undergo perspective shift to the matrix subject in the presence of attitude predicates. Such examples indeed create the impression that the ARC is semantically embedded under the attitude predicate. However, these examples involved positive attitude predicates. In sentences with *negative* attitude predicates, the two mechanisms of perspective shift and semantic embedding peel apart. Consider the example below.

(5) *Joan is crazy. She's hallucinating that some geniuses in Silicon Valley have invented a new brain chip that's been installed in her left temporal lobe and permits her to speak any of a number of languages she's never studied. She is now worried about the battery life of her chip.*

Joan **doubts**/does**n't believe** that her chip, which she had installed ten years ago, will last for another year. (after Amaral et al. 2007)

If the ARC above were indeed interpreted in the scope of the attitude verb, the expected reading would be that Joan doubts/disbelieves two propositions: that her (imaginary) chip was installed ten years ago (i.e. the content of the ARC), and that it will last for another year (i.e. the content of the embedded clause). Instead, (5) says that only the latter proposition, that the brain chip will last for another year, is doubted/disbelieved by Joan. The former proposition, that the brain chip was installed ten years ago, is actually part of what Joan believes.

In addition, Harris & Potts (2009) provide experimental evidence showing that appositive shift can occur even in the absence of an embedding predicate. One such example is given below.

(6)   My aunt is extremely skeptical of doctors in general.
      Dentists, <u>who are only in it for the money anyway</u>, are not to be trusted at all.
                                                          (Harris & Potts 2009)

Harris & Potts find that appositive shift in non-intensional contexts is harder but still pos-sible. Unless some covert predicate is postulated for those cases, it is difficult to imagine how a semantic embedding story would explain such data. We are then forced to look somewhere else for a viable analysis of perspectivally shifted ARCs.

   As a first step towards such an analysis, let us ask a very basic question: What are the conditions that govern the possibility of perspective shift of ARCs? One important obser-vation is that perspective shift does not occur after just *any* modal operator. For example, in the following sentence it seems very hard to attribute the appositive content to Bill.

(7)   We **might** visit Bill, <u>who is a famous sumo fighter</u>.

Such data are initially striking, given the fact that ARCs can shift even in the absence of an intensional operator, as demonstrated in (6) above.

   The canonical environments in which appositives can shift their perspective seem to involve verbs of saying. This is consistent with the experimental findings in Harris & Potts (2009), which show that with such verbs shifted readings are often strongly preferred, and examples as in (1) above. However, other propositional attitude verbs, such as 'think' or 'believe', facilitate perspective shift too, witness (8)-(9).

(8)   My aunt is extremely skeptical of doctors in general.
      She **thinks** that dentists, <u>who are only in it for the money anyway</u>, are not to be trusted at all.   (after Harris & Potts 2009)

(9)   Poor Joan seems to have grown crazier than ever.
      She **believes** that her apartment was bugged by the Feds, <u>who are listening to her every word</u>.   (after Harris & Potts 2009)

In fact, it seems that the large majority of propositional attitude verbs in English allow

ARCs in their syntactic scope to shift.[2]

There are two possible lines of exploration here. One could assume that the shifting possibilities for ARCs are entirely determined by the lexical semantics of the embedding predicate. Such assumption would predict that the shifting possibilities for ARCs could differ from predicate to predicate as well as from language to language. Picking up on the discussion above, it is possible to claim that English attitude verbs allow perspective shift while English modal auxiliaries do not. Although I acknowledge that the lexical semantics of the embedding predicate plays an important role, I find such a stance problematic. The main reason is that, as already noted in (5)-(6), appositive shift can occur even when the attitude verb is negated or not present at all. Such data suggest that there are factors involved that go beyond the lexical semantics of intensional predicates.

Instead, I claim that appositive shift is allowed when the existence of a secondary speech context can be inferred from the sentence *and* the larger discourse. This is, I argue, because shifted ARCs are attributed to the agent of such secondary speech contexts. The fact that shifting is most easy after verbs of saying is explained by the reasonable assumption that such verbs, as a matter of their lexical semantics, introduce an additional speech context in the discourse. The fact that shifting is also possible after other attitude verbs can be explained by noticing that such predicates are compatible with the presence of a secondary speech context. Even when no attitude predicate is around, there is the possibility of a default inference that an additional speech act has occurred.

Put simply, my claim is that shifted ARCs are understood as (i) *uttered* (not as be-

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[2]Factive verbs are least tolerant to perspective shift. However, even with those verbs shifting is sometimes possible. Consider the following example with 'regret' in it.

(i)   I think Jill is innocent and should be released immediately.
      But the judge found she broke the law and **regrets** that Jill, <u>who has committed a serious offense</u>, has to go to jail.

Notice that here, similarly to (5), the judge only regrets the content of the embedded clause, i.e. that Jill has to go to jail. The proposition expressed by the ARC, i.e. that Jill has committed a serious offense, is something the judge could just believe or have announced.

lieved, conjectured, doubted, etc.) and (ii) this utterance is performed by the *agent* (not the addressee) of a secondary speech context. This claim makes two testable predictions. The first prediction is that perspective shift of ARCs is not allowed when the inference to the existence of a speech context is blocked by the larger discourse. This prediction seems supported by the data. Let us consider examples containing the attitude verbs 'think' and 'believe', for which we already know from (8)-(9) that they allow perspective shift. The example in (10) involves animals as attitude holders. This is a particularly good test case because animals are typically attributed (basic) mental states but not verbal communication. The example in (11) involves attitude states whose content has been inferred from cues other than verbal communication.

(10)   My old horse is such a picky eater, it's unbelievable.
       He only likes his food fresh.
       # He **thinks** the lush grass he got today, <u>which looks so dry</u>, is not worth eating at all.

(11)   *Sarah Palin, a right-wing politician with strong religious beliefs, has criticized liberal politicians on literally every social issue. Even though she never explicitly said it, it is clear that her political opinions stem from her belief that liberals have no moral values and should not be allowed to lead the country. You are liberally minded and don't share Palin's beliefs. You say:*

       ?? Palin **believes** that liberals, <u>who have no moral values</u>, should not be allowed to lead the country.

Although the judgments are not easy, in these examples a perspective shift of the ARC seems hard or impossible and the discourses sound odd.[3] Under the current view, this is due to the fact that no verbal communication has occurred between the attitude holder and

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[3]Some informants comment that a shifted reading of (11) becomes possible if the ARC is meant sarcastically, i.e. as ostensibly stating the opposite of what is intended. It could be that the speaker is making it very clear that she completely disagrees with the view that liberals have no moral values and thus the hearer can infer that, possibly, this is Palin's view. Be this as it may, what is important is that a shifted reading of the ARC in (11) is difficult. For example, note the contrast between (11) and the minimally different (i), in which the existence of a reported speech context is supported by the larger discourse and a shifted reading of the ARC is available.

the speaker and thus no additional speech context is available that could be picked up by the ARC.

The second prediction of the current approach is that ARCs cannot shift to a party other than the agent of a speech context. This prediction too seems to be borne out. In (12) below, the ARC can only be attributed to the agent of the matrix verb 'say'. This is independent of the fact that another person, the speaker's uncle, is mentioned in the sentence and whether the agent is the grammatical subject, as in (12a), or an (oblique) object, as in (12b).[4]

(12)   *Crazy aunt, crazy uncle.*

    a. **My aunt** said to my uncle that the Feds, who are following her, have bug-ged her apartment.   ('my aunt' = subject; ARC = aunt-oriented)

    b. My uncle heard from **my aunt** that the Feds, who are following her, have bugged her apartment.   ('my aunt' = object; ARC = aunt-oriented)

Having garnered enough empirical support for the claim that perspective shift of ARCs is contingent upon the presence of a secondary speech context, I now demonstrate how the formal account of appositive projection developed in the previous chapter (Chapter 4) can accommodate such data.

2.2 Shifted ARCs explained

We have seen that sentences with verbs of saying exhibit a canonical environment in which ARCs can undergo perspective shift (recall Harris & Potts 2009 and the sentence in (1) above). We thus need to determine what makes such verbs special. I claim that verbs of saying differ from other propositional attitude predicates in that they, due to their lexical

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    (i) *Sarah Palin, a right-wing politician with strong religious beliefs, has claimed on many occasions that liberals have no moral values and should not be allowed to lead the country. You are liberally minded and don't share Palin's beliefs. You say:*
        Palin **believes** that liberals, who have no moral values, should not be allowed to lead the country.

    [4]I am indebted to Roger Schwarzschild for suggesting the idea of constructing such minimal pairs.

meaning, introduce a speech context. I will use the dynamic term $\mathbf{say}_p^{c;q}(v, \phi)$ to express that v says ϕ in the speech context c.[5]

(13) $\mathbf{say}_p^{c;q}(v, \phi) \; := \; \exists c \wedge v = \mathbf{sp}(c) \wedge \exists q \wedge \phi \wedge say_p\{c, v, q\}$

According to (13), $\mathbf{say}_p^{c;q}(v, \phi)$ abbreviates a series of conjuncts which introduce the speech context variable c, require that v, the agent of 'say', be the speaker of c, and state that v said q in all of the worlds of p. Note also that c enters as an additional argument into the predicate *say*, which expresses a ternary relation between a speech context, an individual, and a proposition.

With this much formalism in place, sentences with 'say'-verbs as in (14) can be logically represented as in (14a). By using the recipe in (13), (14a) can be expanded to (14b).

(14) Harold **says** that his girlfriend is a little bit crazy.

    a. $\exists p \wedge \exists v \wedge v = harold \wedge \mathbf{say}_p^{c;q}(v, \exists u \wedge girlfriend.of_q\{u, v\} \wedge crazy_q\{u\}) \wedge$ $\mathbf{dc_{sp}}(k) \subseteq p$

    b. $\exists p \wedge \exists v \wedge v = harold \wedge \exists c \wedge v = \mathbf{sp}(c) \wedge \exists q \wedge \exists u \wedge girlfriend.of_q\{u, v\} \wedge$ $crazy_q\{u\} \wedge say_p\{c, v, q\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

We can now offer a straightforward explanation of why ARCs can shift to non-speaker orientation after verbs of saying. The simple idea is that in the presence of two speech contexts, the utterance context and some additional speech context, appositive content can restrict the discourse commitments of the agent of either context. When the appositive content targets the utterance context, it is interpreted as non-shifted/speaker-oriented; when, however, the appositive content targets the reported speech context, it gives rise to the shifted/non-speaker-oriented reading. This view presupposes that lexical translations of ARCs are underspecified with respect to which context they are related to. I will assume that ARCs can be anaphoric to any (salient) context, be it the utterance context or some additional speech context.

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[5]Here v is an individual variable, ϕ is a dynamic term, c is a speech context variable, and p and q are propositional variables expressing the reference proposition and the scope proposition, respectively.

Let us consider an example. The logical representation for the non-shifted reading of the sentence in (15) is given in (15a). The crucial bit in the formalism is the conjunct $\mathbf{dc_{sp}}(k) \subseteq r$ in the underlined part of the formula. This conjunct requires that the semantic content of the ARC, recorded by the propositional variable r, restrict the discourse commitments of the speaker of the *utterance* context, represented as k. That is, the agent responsible for the content of the ARC is the actual utterer of the sentence and the ARC is speaker-oriented.

(15) Harold **says** that his girlfriend, <u>who is a little bit crazy</u>, wants to go to Hanoi.

      a.   (non-shifted ARC reading)
$$\exists p \wedge \exists v \wedge v = harold \wedge \mathbf{say}_p^{c;q}(v, \exists u \wedge girlfriend.of_q\{u,v\} \wedge$$
$$\underline{\exists r \wedge crazy_r\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq r} \wedge \underline{\underline{\mathbf{cs}(k) \subseteq r}} \wedge want.go.to.hanoi_q\{u\}) \wedge$$
$$\mathbf{dc_{sp}}(k) \subseteq p$$

In the shifted reading for the ARC, the appositive content narrows down the discourse commitments of the speaker of the *reported* speech context. The logical representation for this reading is illustrated in (15b). The conjunct that relates the reported speech context (represented as c) with the appositive content (represented as r) is $\mathbf{dc_{sp}}(c) \subseteq r$.

(15)   b.   (shifted ARC reading)
$$\exists p \wedge \exists v \wedge v = harold \wedge \mathbf{say}_p^{c;q}(v, \exists u \wedge girlfriend.of_q\{u,v\} \wedge$$
$$\underline{\exists r \wedge crazy_r\{u\} \wedge \mathbf{dc_{sp}}(c) \subseteq r} \wedge want.go.to.hanoi_q\{u\}) \wedge \mathbf{dc_{sp}}(k) \subseteq p$$

Let me now comment on three important points about the proposed analysis. The first point concerns the relationship between perspective shift and proposal making. Notice one important difference between the logical representations in (15a) vs. (15b). In (15a), the portion contributed by the non-shifted ARC is followed by the conjunct $\mathbf{cs}(k) \subseteq r$, which achieves an automatic restriction of the context set with the appositive content. There is no corresponding conjunct in the logical representation in (15b), where the ARC shifts. This difference follows from the definition of a proposal and the discourse constraints on deciding proposals stated in Chapter 2 (see Section 4.4 and Section 4.5). The appositive in (15a) incurs discourse commitments for the speaker of the utterance context and thus

introduces a proposal, which is automatically accepted. In contrast, the appositive in (15b) does not incur discourse commitments for a speech participant in the utterance context and does not constitute a proposal. This correctly derives the intuition that uttering (15) entails that Harold's girlfriend is a little bit crazy on the non-shifted reading of the ARC only.[6]

Second, notice that ARCs are linked to speech context variables through the mechanism of discourse anaphora. For example, in (15a), the appositive content is anaphoric to the utterance context (via the conjunct $\mathbf{dc_{sp}}(k) \subseteq r$), and in (15b), the appositive content is anaphoric to the speech context introduced by 'say' (via the conjunct $\mathbf{dc_{sp}}(c) \subseteq r$). This implies that no *structural* configuration is required to hold between the intensional verb and the shifted ARC: as long as the existence of a secondary speech context can be inferred from the preceding discourse, ARCs can shift to the agent of that speech context. This analysis is corroborated by the possibility that a verb of saying licenses appositive shift across a sentence boundary, as demonstrated in the following example, where the ARC can be attributed to Harold.

(16)   Harold **told** me a bunch of interesting things the other night.
       His new girlfriend, <u>who is a little bit crazy</u>, wants to go to Hanoi.

Although in most of the examples discussed so far the shifted ARC was in the syntactic scope of an intensional verb, (16) shows that appositive shift is primarily a discourse-level phenomenon that calls for a dynamic analysis.

Third, in the previous section I argued that shifted ARCs are interpreted as being uttered. This is consistent with the fact that they were modeled as imposing restrictions on the discourse commitments of the relevant conversational agent. However, nothing in the semantics so far establishes a link between what an agent reportedly said and her discourse commitments. To see what is at stake, consider (17) below.

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[6]One might wonder whether shifted appositives update the context set associated with the secondary speech context. Intuitively, sentences with shifted appositives do provide clues as to whether the appositive content has been accepted in the secondary speech context, so I suggest that this question should receive a negative answer.

(17) Harold said that his girlfriend, <u>who is a little bit crazy</u>, is not crazy at all.

This sentence does not allow a shifted interpretation for the ARC. The only available interpretation is that Harold said that his girlfriend is not crazy while the speaker believes otherwise. A shifted reading is excluded because it would attribute to Harold two inconsistent propositions. Yet, nothing in the theory blocks a shifted reading for the ARC in (17). As it stands, the semantics allows for Harold to have said that his girlfriend is not crazy and have committed that his girlfriend is a little bit crazy. In order to fill this lacuna, I propose the following meaning postulate on 'say' (and verbs of saying in general).

(18) MEANING POSTULATE ('say')
$$\forall w \in D_\omega\, \forall c \in D_\kappa\, \forall a \in D_e\, \forall p \in D_\pi:$$
$$\langle w, c, a, p\rangle \in \iota(say) \Rightarrow (\mathbf{proj}_1(c) = a\ \&\ \mathbf{proj}_3(c) \subseteq p)$$

The postulate states that if a said p in a speech context c and a world w, then a is the speaker of c and a is publicly committed to p in c. Put simply, we require sayers to be publicly committed to what they say. From this meaning postulate one can conclude that in (17) Harold is committed to the proposition that his girlfriend is not crazy. Given that, one cannot attribute the content of the ARC, that Harold's girlfriend is a little bit crazy, to Harold without a contradiction, i.e. without producing the empty set for Harold's discourse commitments.

    In the close of this section, I turn to the shifting possibilities of ARCs in the absence of verbs of saying. Recall from the previous section that perspective shift after non-'say' attitudes is generally possible, *except* when it is clear from the larger discourse that no speech act communicating the content of the appositive has occurred. This might be taken as evidence that in such cases the additional speech context is not introduced by the intensional verb itself but is rather due to a pragmatic inference. Such inferences are reasonable because one typically gains knowledge of other people's mental states through verbal communication. For example, from "*A* thinks that *p*" the hearer might conclude "*A* said that *p*". Alternatively, one might claim that non-'say' verbs in English are lexically ambiguous

between a regular form and form which introduces a speech context. On the former view, the lexical meaning of the English verb 'think' is based on the representation in (19a) but can be pragmatically enriched to (19b). On the latter view, 'think' is lexically ambiguous between (19a) and (19b).

(19)   a. $\mathbf{think}_p^q(v, \phi) := \exists q \wedge \phi \wedge think_p\{v, q\}$
        b. $\mathbf{think}_p^{c;q}(v, \phi) := \mathbf{think}_p^q(v, \phi) \wedge \mathbf{say}_p^{c,r}(v, \phi) \wedge q = r$

Although I will not decide between those two views, choosing one option over the other will have implications when discussing below the parallel between shifted appositives in English and shifted indexical pronouns in some languages.

This analysis implies that the existence of an additional speech context is not warranted in the presence of attitude verbs other than verbs of saying. The generous hearer would typically assume that the 'say'-version of the attitude verb has been used, if a broader range of interpretational possibilities are called for. However, if the existence of an additional speech context is not compatible with the broader discourse, the simpler version will be selected. In this latter case appositive shift will be disallowed.

Finally, what about the possibility of perspective shift in the absence of intensional verbs? One possible solution would be to claim that in such cases there is a covert operator that facilitates perspective shift. Yet, this seems implausible, as (20) demonstrates. While a shifted reading with an overt attitude verb can be coordinated with an adversative clause expressing speaker's disagreement (20a), this is not possible when an attitude verb is absent (20b).

(20)   My aunt is extremely skeptical of doctors in general.   (after Harris & Potts 2009)

        a.   She **says** that dentists, who are only in it for the money anyway, are not to be trusted at all, yet I disagree with her.

        b.   # Dentists, who are only in it for the money anyway, are not to be trusted at all, yet I disagree with her.

Such data suggests that there is no covert operator present in (20b) that facilitates perspective shift. Instead, I will assume that—in the absence of an intensional verb—a default

inference can be drawn to the effect that a secondary speech act had occurred and thus an additional speech context is present. Although I leave the exact details to further research, it should be clear that this mechanism is meant as a last resort and appositive shift under such circumstances is expected to be more difficult.[7]

In conclusion, we see that the phenomenon of perspectivally shifted ARCs can be captured by the current account. This is done without any modifications of the main claim of the previous chapter that ARCs robustly project past external operators.

2.3 Shifted ARCs and related phenomena

In this subsection I compare perspectivally shifted ARCs to three related phenomena: free indirect discourse, modal subordination, and shifted indexical pronouns. All three phenomena involve interpretation that depends on the broader linguistic context and thus bear superficial similarity to the phenomenon of shifted ARCs. I will conclude that shifted ARCs substantially differ from free indirect discourse and modal subordination. However, shifted ARCs seem to share some core properties with shifted indexical pronouns and can receive a uniform treatment.

2.3.1 Shifted ARCs and free indirect discourse

FREE INDIRECT DISCOURSE (FID) refers to a way of reporting an agent's words or thoughts without the use of syntactic embedding (as in standard indirect discourse) or quotation devices (as in direct discourse). For example, the second sentence in the short discourse below is an instance of FID. Its content expresses Ryan's thought, not necessarily that of the narrator.

(21) Ryan arrived at the hotel.
      Yes, (he thought,) it had been a long journey.

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[7]This prediction is confirmed in Harris & Potts (2009).

Although FID is predominantly used as a literary technique and is not a very well-defined linguistic phenomenon, it has received a considerable amount of attention in the semantics literature (see Banfield 1982, Doron 1991, Schlenker 2004, Sharvit 2004, 2008, Maier ms). Below, I compare some of the empirical properties of FID and shifted ARC by investigating the behavior of perspective-sensitive elements in those two types of environments.

It is well-known that some of the elements occurring in FID are interpreted from the perspective of the speaker (e.g. tenses and pronouns) while other elements are interpreted from the perspective of the agent whose words or thoughts have been reported (e.g. in-dexical adverbials). This split in perspective is typically modeled by interpreting FID with respect to *two* speech contexts: the utterance context and a shifted context (see Doron 1991, Schlenker 2004, Sharvit 2004, 2008). This bicontextual approach bears a formal re-semblance to the proposed analysis of shifted ARCs. It is thus important to ask whether elements found in shifted ARCs demonstrate the same split in perspective as when found in FID. We will demonstrate that this is not the case: elements found in those two environ-ments do not have the same perspectives available to them.

A first difference between FID and shifted ARCs is that temporal and locative indexical adverbials in FID are anchored to the time and place of the agent whose words or thoughts have been reported. This is demonstrated in (22), where 'here' and 'today' refer not to the current place and time but rather to Mary's temporal and spatial location at her utterance.

(22)   She loved it **here today**, said Mary.
                        ('here' = Mary's here, 'today' = Mary's today; after Sharvit 2008)

In contrast, indexical adverbials in shifted ARCs retain their speaker-orientation. In (23)-(24), 'here' and 'tomorrow' can only be interpreted as anchored to the speaker's time and location, and the sentences are infelicitous. In (23), this is due to the clash between 'there' and the unshifted 'here' inside the ARC: the aliens cannot be on the moon and on Earth at the same time. In (24), there is a clash between the Past tense inside the ARC and the unshifted 'tomorrow': it is not possible that the hypothetical end of our civilization lies in

the past and is on the day that follows the day of the utterance.

(23) Poor Martha seems to be losing it.
Yesterday she called me and said she is on the moon meeting there with the aliens, <u>who like it **here** a lot</u>.   ('here' = speaker's here = the Earth)

(24) Poor Joan seems to have grown crazier than ever.
Last week she said that the end of our civilization, <u>which was **tomorrow**</u>, had finally arrived.   ('tomorrow' = speaker's tomorrow)

A second difference concerns the perspective of pronominal features. At first glance, it appears that pronouns in both FID and shifted ARCs are invariably speaker-oriented. This can be seen from the FID example in (25) and the discourse with a shifted ARC in (26).

(25) Yes, Mary thought, **she** wanted to marry **me**.
       ('she' = Mary, 'me' = the speaker; after Sharvit 2008)

(26) Poor Joan seems to have grown crazier than ever.
She now claims that her/my apartment was bugged by the Feds, <u>who are listening to **her**/**my** every word</u>.   ('her' = Joan's, 'my' = the speaker's)

Despite that, the *Gender* feature on pronouns can obtain non-speaker oriented readings in FID but not in shifted ARCs. To see that, consider the contrast between (27) and (28) below.

(27) *John mistakenly thinks Bill is a woman.*

    She/#**he** liked him, he could tell(, thought John).   (Sharvit 2008)

(28) *Max is having mental issues. He often talks about the aliens and also mistakenly believes that his best friend Jessica is a man.*

    Max was again talking weird stuff about Jessica^u.
He said that the aliens, <u>who want to hijack **her**$_u$/#**him**$_u$</u>, want to move to another planet.

The contrast between (22) and (23)-(24) and the one between (27) and (28) points at the different shifting possibilities that FID and shifted ARCs make available to elements placed in them.

A final argument against the idea that shifted ARCs are instances of FID comes from the type of the mental act involved. FID can report the agent's thoughts even when it is clear from the discourse that no speech act has occurred. For example, in (21) the narrator could be describing the inner life of her character. At the same time, we have argued in Section 2.1 that ARCs can undergo perspective shift only in discourses in which the presence of a secondary speech context/additional speech act can be inferred.

To conclude: FID and shifted ARCs significantly differ in the perspectives they make available to elements occurring in them. Thus, it seems unlikely that the two phenomena pertain to the same empirical domain.

2.3.2 Shifted ARCs and modal subordination

Another phenomenon that has a similar flavor to that of shifted ARCs is modal subordination. The term MODAL SUBORDINATION describes cases whereby a clause is not in the syntactic scope of a preceding modal operator and yet it is interpreted *as if* it were (see Karttunen 1976, Roberts 1989, Frank & Kamp 1997, Geurts 1999, Stone 1999, Brasoveanu 2010, a.o.). In the short discourse in (29), the second sentence is interpreted as part of the hypothetical scenario introduced by the modal auxiliary in the first sentence. This is evidenced by the fact that the pronoun 'it' in the second sentence is anaphorically dependent on the hypothetical wolf introduced in the first sentence.

(29)   A wolf **might** walk in.
        It would eat you.   (Stone 1997)

The main empirical difference between modally subordinated clauses and shifted ARCs lies in the *conditions* under which those two phenomena occur. For example, the modal environment created in (29) does not allow ARCs to undergo perspective shift. This is illustrated in (7), repeated from above, where it seems impossible to attribute the appositive content to Bill.

(7)   We **might** visit Bill, <u>who is a famous sumo fighter</u>.

On the current account, such findings are explained by the fact that (7) does not support an inference to there being a conversation in which Bill claimed to be a famous sumo fighter.

To be sure, ARCs can be modally subordinated if they bear the right mood morphology. In (30), the ARC talks about the hypothetical book introduced in the conditional antecedent of the first sentence, i.e. it is modally dependent on the first sentence.

(30) If John bought a book, he would be home reading it.
      The book, which **would be**/#**is** a murder mystery no doubt, would be very expensive.   (after Roberts 1989)

The above example reveals another difference between modal subordination and perspective shift in appositives. While modally subordinated clauses are marked by mood morphology, shifted ARCs are not.[8]

The formal mechanisms proposed in the literature to explain modal subordination seem either sufficiently different or plainly incompatible with the formal account of shifted ARCs proposed here. According to Roberts (1989), modally subordinated clauses are interpreted by placing them in the (extended) scope of a preceding modal operator. However, in Section 2.1 above we argued against the idea that shifted ARCs are interpreted in the scope of an operator. The anaphoric approach to modal subordination of Stone (1999) and Brasoveanu (2010) come closer to the current account of shifted ARCs. On this approach, a modally

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[8]This observation is based on English, so it raises the question of its crosslinguistic significance. One language that seems to morphologically mark shifted ARCs is Bulgarian (Slavic). The shifted ARC below is marked by the EVIDENTIAL MOOD (EvM; see Izvorski 1997, Sauerland & Schenner 2007, Koev 2011, Smirnova 2012).

(i) BULGARIAN

   *Tvoj-at   lud   prijatel tvyrde-še,   če kitajci-te,   koito ima-**li**   specialna tehnologija,*
   your-DEF crazy friend   claim-PAST that Chinese-DEF who have-**EvM** special   technology
   skoro šte-li   da kontrolirat syznanie-to   na hora-ta.
   soon will-EvM to control   consciousness-DEF of people-DEF

   'Your crazy friend claimed that the Chinese, who according to him are in possession of a special technology, will soon control the minds of all people.'

It remains to be seen whether the "shift" effected by the mood morphology obeys the same restrictions as shifted appositives do.

subordinated sentence is anaphorically dependent on the hypothetical proposition introduced by a preceding modal operator; on my account, shifted ARCs are anaphorically dependent on a secondary speech context introduced by verbs of saying. Although the general mechanism is superficially similar, it is apparently triggered in different environments, as argued above.

The relationship between modal subordination and shifted ARCs begs further research. For the time being, however, I will assume that these are two related but different phenomena.

2.3.3 Shifted ARCs and shifted indexical pronouns

Finally, I compare the properties of shifted ARCs to those of shifted indexical pronouns in some languages.

Kaplan (1989) alleges that indexical expressions in English are directly referential and denote parameters of the utterance context. Kaplan conjectures that operators that shift the context—which he famously called MONSTERS—do not exist in English. For example, in (31) the indexicals 'I' and 'now' can only refer to the current speaker and time. Despite the presence of the hypothetical monster 'in some contexts', these indexicals cannot be interpreted as referring to speakers and times other than those of the utterance context.

(31)   In some contexts it is true that **I** am not tired **now**.   (Kaplan 1989)

Yet, Kaplan himself notices that in direct quotations indexical expressions shift their reference to parameters of the reported context. Schlenker (2003) discusses several other examples of shiftable indexical expressions in Indo-European languages, including the indexical temporal adverbial 'two days ago' in English and the Present Tense in Russian.

The current section focuses on First and Second Person pronouns in some languages and their possibility to shift their reference in the presence of an intensional predicate (see Rice 1986 on Slave (Athabaskan), Speas 1999 on Navajo (Athabaskan), Schlenker 2003 on Amharic (Semitic), Anand & Nevins 2004 and Anand 2006 on Zazaki (Iranian),

a.o.). When shifting occurs, First Person pronouns refer to the agent of a secondary speech context (this agent is typically denoted by the matrix subject) and Second Person pronouns refer to the actual speaker. The examples below, all taken from the literature, illustrate the phenomenon of pronominal shift. In each case, a First Person pronoun is embedded under an intensional verb and is coreferential with the matrix subject.[9]

(32) SLAVE

Rosie ?erákie?ie wihsį   sedeyįdi.
Rosie parka   **1SG**.made 3SG.told.**1SG**

'Rosie told me that she (=Rosie) made a parka.'   (Rice 1986)

(33) NAVAJO

Jáan chidí nahałnii'   ní.
Jaan car   3SGO.PERF.**1SGS**.buy 3.say

'John says he (=John) bought a car.'   (Schauber 1979:19; cited in Speas 1999)

(34) AMHARIC

*ǰon ǰəgna nə-**ññ**   yɨl-all.*
John hero   be.PF-**1SO** 3M.say-AUX.3M

'John says that he (=John) is a hero.'   (Schlenker 2003)

(35) ZAZAKI

Hɛseni   (mɨ-ra) va kɛ ɛz dɛwletia.
Hesen.OBL (I.OBL-to) said that **I** rich.be-PRES

'Hesen said that he (=Hesen) is rich.'   (Anand & Nevins 2004)

The important question is: What are the conditions under which indexical pronouns can shift? More specifically, are there restrictions on the type of predicates that can serve as a monster? Even though not much emphasis is put on this fact and remarks about it are

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[9]I omit any referential indices from the original examples and disambiguate pronouns in the translations by explicitly citing the referent.

often buried in footnotes, authors typically observe that pronominal shift is either limited or most natural under verbs of saying. For example, Speas (1999) writes that judgments about shifted pronouns in Navajo are solid only under *ní* 'say' (ft.4); Schlenker (2003) notes that pronominal shift in Amharic seems to only occur after an all-purpose attitude verb which originally means 'say' (ft.39); Anand & Nevins (2004) observe that shifting of pronouns in Zazaki seems limited to contexts that include the verb *vano* 'say' (ft.3). It is also significant that in Ewe (Niger-Congo), logophoric pronouns, i.e. pronouns that necessarily shift away from the utterance context, can only felicitously occur in reportative contexts (see Clements 1975). One dissenting voice to the emerging generalization that indexical pronouns shift most readily under verbs of saying is Rice (1986). Rice claims that the verbs allowing pronominal shift in Slave do not form a natural class and hence must be marked as such in the lexicon. In particular, she lists two verbs of saying, *hadi* 'he says' (intransitive) and *-édi, -édedi* 'he tells, he asks' (transitive), as shifting verbs. However, she also mentions that *gogháhurehtę* 'he teaches' and *ʔekáhededi* 'he says thus' prohibit pronominal shift. Although it is possible to analyze those last two verbs as verbs of saying, it seems that they are not typical such verbs.[10] I leave those potential challenges to further research.

Below, I present novel data from Kurmanji (Iranian).[11] These data confirm the generalization that verbs of saying are the canonical monsters for indexical pronoun shift. In Kurmanji, First and Second Person pronouns can shift under *go* 'say', as illustrated in (36) and (37), respectively.

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[10] Keren Rice (p.c.) categorizes *gogháhurehtę* 'he teaches' as a verb of knowing. She also informs me that *ʔekáhededi* 'he says thus' includes the stem *-di* 'say' and the prefix *eká-*, usually translated as 'thus'. Rice suggests that there is something about the lexical semantics of the prefix that makes this verb a non-shifting predicate.

[11] Kurmanji is the main dialect of the Kurdish language and is spoken in Turkey, Iraq, Syria and neighboring countries. All data are from my own fieldwork. In the glosses the following abbreviations are used: 1SG = First Person Singular (and similarly for other Person-Number markings), COP = copula, ERG = Ergative, EXF = ezafe, HAB = habitual, NOM = Nominative, PART = participle, PL = plural, PRED = predicative.

(36) *Ehmet is visibly not feeling well and says to you:*

    a. *Ez   e   nexoş-ım.*
        I.NOM COP ill-1SG
        'I am ill.'

Later you meet Adan and say to her:

    b. *Ehmet   go   kı **ez**   e   nexoş-ım.*
        Ehmet.ERG say.PART that **I**.NOM COP ill-1SG
        'Ehmet said that he (=Ehmet) is ill.'

(37) *You are not feeling well. Ehmet, who is a doctor, examines you and says:*

    a. *Tı   i   nexoş-i.*
        you.NOM COP ill-2SG
        'You are ill.'

Later you meet Adan and say to her:

    b. *Ehmet   go   kı **tı**   i   nexoş-i.*
        Ehmet.ERG say.PART that **you**.NOM COP ill-1SG
        'Ehmet said that I was ill.'

It is important to convince ourselves that such cases do not involve direct/quoted speech. There is ample evidence against such a view. A first cue is the fact that in Kurmanji *kı* 'that'-complementizers cannot introduce direct speech. Second, relative clause extraction from shifted complements is possible.

(38) *Kɛčık-ê* [*kı Hesen go* [*mı _ pač kır*]] *ê   rındık-e.*
     girl-EZF that Hesen said I.ERG kiss did   PRED pretty-COP
     'The girl that Hesen said he (=Hesen) kissed is pretty.' (modeled on Anand 2006)

Finally, a negative polarity item like *kes* 'anyone' occurring in a shifted complement can be externally licensed by negation.

(39) *Eşxan-e **ne** go* [*kı mı **kes**   pač kır*].
     Esxan-ERG **not** said that I.ERG **anyone** kiss did
     'Esxan didn't say that she (=Esxan) kissed anyone.'   (modeled on Anand 2006)

From these data it is clear that shifted complements in Kurmanji interact with the rest of the sentence in the usual way. That would be unexpected if such complements were instances of direct speech.

Indexical shifting under *ino* 'belief' is impossible when there is no speech act to be reported. This is illustrated in (40)-(41) below for First Person and Second Person pronouns, respectively.

(40) *Ehmet believes that he is a rich man. Although he never said it, you know he thinks that because of the way he behaves. You meet Adan and say to her:*

    # Ehmet   *ino*   *dı-k-e*   *kı*   **ez**   *e*   *zengin-ım.*
    Ehmet.NOM belief HAB-do-COP that **I**.NOM COP rich-1SG

    'Ehmet believes that he (=Ehmet) is rich.' (intended)

(41) *You don't have that much money but your friend Ehmet, who has been poor his entire life, believes that you are rich. Although Ehmet never said it, you know it because of the way he treats you. You meet Adan and say to her:*

    # Ehmet   *ino*   *dı-k-e*   *kı*   **tı**   *i*   *zengin-i.*
    Ehmet.NOM belief HAB-do-COP that **you**.NOM COP rich-2SG

    'Ehmet believes that I am rich.' (intended)

Interestingly enough, pronominal shift is not possible even in cases in which a 'belief'-report is based on an existing speech act.

(42) *Ehmet believes that he is a rich man. You know it because he often says it in front of his friends. You meet Adan and say to her:*

    # Ehmet   *ino*   *dı-k-e*   *kı*   **ez**   *e*   *zengin-ım.*
    Ehmet.NOM belief HAB-do-COP that **I**.NOM COP rich-1SG

    'Ehmet believes that he (=Ehmet) is rich.' (intended)

(43) *You don't have much money but Ehmet believes that you are rich. You know that because he often says it to you. You meet Adan and say to her:*

    # Ehmet   *ino*   *dı-k-e*   *kı*   **tı**   *i*   *zengin-i.*
    Ehmet.NOM belief HAB-do-COP that **you**.NOM COP rich-2SG

    'Ehmet believes that I am rich.' (intended)

Note that the data in (42)-(43) cannot be explained by claiming that speech contexts are not reportable by means of 'belief'-predicates. As (44) demonstrates, this is generally allowed.

(44) *Ehmet says to you that Adan is pretty. Later you say:*

    Ehmet   ino dı-k-e   kı Adan   e   rındık-e.
    Ehmet.NOM belief HAB-do-COP that Adan.NOM COP pretty-3SG

    'Ehmet believes that Adan is rich.'

The tentative generalization seems simple enough: indexical pronouns in Kurmanji can shift under verbs of saying but not under 'believe'-predicates. This is true even when the attitude report is based on a speech act. We thus find more crosslinguistic support for the generalization that verbs of saying are the canonical environment for pronominal shift. I will thus tentatively propose the following candidate for an implicational language universal.

(45) SAY SHIFT (a potential language universal)
    If a language allows a perspective-sensitive element to shift in the presence of any intensional operator, the element can shift in the presence of a verb of saying.

Although in most of the languages cited above indexical pronouns can shift only after verbs of saying, Rice (1986) demonstrates that in Slave shifting is also possible after *yeniwe* 'he wants, he thinks' (intransitive) and *hudeli* 'he wants, he thinks' (transitive). What Say Shift prohibits is the existence of a perspective-sensitive element in some language which cannot shift after a verb of saying but can shift after some other intensional predicate.

Other potential universal constraints discussed in the literature on perspective shift are SHIFT TOGETHER and STRICT LOCALITY. According to Shift Together, a given perspective holds throughout the entire complement, i.e. all perspective-sensitive elements in a clause are interpreted with respect to the same context. Strict Locality states that the perspective of a complement is solely determined by the immediately dominating predicate, not by predicates that are higher up in the syntactic tree.[12] Since there appear to be severe empirical challenges to both of those constraints (see Rice 1986, Speas 1999, Anand &

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[12] Anand (2006) defines a related but weaker constraint called NO INTERVENING BINDER. No Intervening Binder states that a shiftable indexical cannot pick up reference from a context CA if there is an intervening context CB which another indexical picks up reference from (see Anand 2006:103).

Nevins 2004, Anand 2006 and Bittner 2012 for discussion), I will temporarily assume that Say Shift is the most reliable candidate for a universal constraint on pronominal shift.

Our goal now is to compare shifted appositives in English to shifted indexical pronouns in the languages mentioned above. We will see that the two phenomena agree in at least two respects: they both obey Say Shift, and they both can be licensed pragmatically.

We already know from Section 2.1 that shifted ARCs in English obey Say Shift. Recall that ARCs can shift only if the presence of a secondary speech context can be implied. Since verbs of saying introduce such context by virtue of their lexical semantics, it follows that such verbs are always possible licensers of appositive shift.[13]

In most of the literature, it is assumed that pronominal shift is only licensed if the pronoun is in the syntactic scope of a monstrous operator.[14] Such operators are assumed to manipulate the context with respect to which the constituent in their scope is interpreted. Yet, there is empirical evidence showing that shifted ARCs in English or shifted indexical pronouns in Kurmanji need *not* occur in the syntactic scope of an overt intensional predicate (or a silent operator associated with it). In both (16) (repeated from above) and (46), a perspective shift is licensed across a sentence boundary.

(16) Harold **told** me a bunch of interesting things the other night.
      His new girlfriend, who is a little bit crazy, wants to go to Hanoi.

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[13]As for Shift Together, this constraint seems to be violated in English. In (23), repeated from above, the ARC is shifted but the shiftable adverbial 'here' retains its speaker-orientation.

(23) Poor Martha seems to be losing it.
      # Yesterday she called me and said she is on the moon meeting there with the aliens, who like it
      here a lot.   ('here' = speaker's here = the Earth)

Strict Locality does not to hold for shifted ARCs in English either. In the example below, the ARC is embedded under two verbs of saying but can nevertheless be attributed to the denotation of the matrix subject, i.e. the speaker's aunt.

(i) My crazy aunt claims that I said that her apartment, which was bugged by the Feds, is no more a safe haven.

As already noted, those two constraints are problematic for shifted indexicals too.

[14]Monstrous operators are assumed to be silent (see e.g. Anand & Nevins 2004, Anand 2006) or realized as the embedding predicate itself (see e.g. Schlenker 2003).

(46) *You talked to Ehmet last night and he complained that he is ill. Later you say:*

Mın dhuni Ehmet ra şor kır-ın.
I.ERG yesterday Ehmet with **word did**-PL

'Yesterday I talked to Ehmet.'

Ez e nexoş-ım.
I.NOM COP ill-1SG

'He (=Ehmet) is ill.'

In addition, there are hints in the literature that the same might hold for other perspective-sensitive phenomena. Clements (1975:170–171) provides an example from Ewe in which the antecedent of a logophoric pronoun is found in a previous sentence. All those data suggest that analyses of indexical shift in terms of operators c-commanding the shifted pronoun might be mistaken. For example, it is not immediately clear how the analyses of Schlenker (2003) or Anand (2006) could account for the Kurmanji data in (46). More plausibly, perspective shift is licensed from preceding discourse without the need for a particular structural configuration. I will thus assume the more liberal view that pronominal shift, similarly to appositive shift, is governed by discourse and calls for a dynamic analysis (see also Bittner 2012).

In short, shifted ARCs in English and shifted indexical pronouns seem to obey similar distributional restrictions: they both occur if the existence of a reported speech context can be inferred and they both can be licensed pragmatically. This fact suggests that shifted ARCs and shifted indexical pronouns belong to the same class of empirical phenomena and should preferably receive a uniform analysis. Below, I provide a sketch of how the Kurmanji data can be incorporated into the current account.

I assume that in Kurmanji 'say'-predicates but no other intensional predicates introduce secondary speech contexts. Indexical pronouns in this language are lexically underspecified with respect to which context they are dependent on for their interpretation. If they are anaphoric to the utterance context, they refer to participants of the actual context; if they are anaphoric to a secondary speech context, they refer to participants of this latter context.

This simple analysis is illustrated on the example below. The part in the formula that gives rise to the ambiguity between a non-shifted and a shifted pronoun reading is framed.

(47)   KUMANJI

*Ehmet   go   kı **ez**   e   nexoş-ım.*
Ehmet.ERG say.PART that **I**.NOM COP ill-1SG

'Ehmet said that I am/he (=Ehmet) is ill.'

  a.   (non-shifted pronoun reading)
       $\exists p \wedge \exists v \wedge v = ehmet \wedge \mathbf{say}_p^{c,q}(v, ill_q\{\boxed{\mathbf{sp}(k)}\}) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

  b.   (shifted pronoun reading)
       $\exists p \wedge \exists v \wedge v = ehmet \wedge \mathbf{say}_p^{c,q}(v, ill_q\{\boxed{\mathbf{sp}(c)}\}) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

In Section 2.2 above, we considered the possibility that secondary speech contexts in English are introduced through a pragmatic inference. Since this mechanism does not seem available in Kurmanji (recall (42)-(43)), we have to assume that in this language either there are different pragmatic constraints involved or that indexical pronouns need to depend on speech contexts that are lexically introduced.

One question that remains is the following: Why do English First and Second Person pronouns not shift? The reason could be sought either in the lexical semantics of the attitude predicates or the lexical semantics of the pronouns. The first path is not open to us: we know that verbs of saying and other attitude verbs can shift the perspective of appositives. I will then assume that the reason why pronouns in English do not shift lies in their lexical semantics: 'I' is represented as $\mathbf{sp}(k)$ and 'you' is represented as $\mathbf{hr}(k)$. That is, both are lexically specified to depend on the utterance context and thus can only refer to the actual speech participants. This is as in Kaplan (1989), but adapted to the current formalism.

So far we have seen evidence that secondary speech contexts can play a role in the interpretation of two types of constructions: ARCs and indexical pronouns. The same pattern extends to other empirical domains. Kratzer (1999) observes that in the presence of verbs of saying expressive elements can shift their perspective away from the speaker. She

provides the example in (48), in which the opinion that Webster is a bastard is that of the speaker's father, not that of the speaker herself.

(48)   My father **screamed** that he would never allow me to marry that <u>bastard</u> Webster.

(Kratzer 1999)

Taken together, all these data point towards the emerging generalization that secondary speech contexts govern the shifting possibilities of perspective-sensitive elements across empirical domains.

3   ARCs in downward-entailing environments

Another set of data that purports to demonstrate that appositives need not always project comes from Sæbø (2011). Sæbø's major claim is that the appositives projects in a certain type of environments but can be semantically embedded in other types of environments. More specifically, speaker-oriented (or unembedded) readings of appositives are assumed to be preferred in upward-entailing modal contexts. This is illustrated in (49), where the assessment that Chuck is an old codger would typically be attributed to the speaker, not Sheila. However, in *downward*-entailing modal contexts non-speaker-oriented (or embedded) readings of appositives are preferred.[15] This latter case is illustrated in (50), where the proposition that John is a Laestadian or that Mary is a virgin would naturally be attributed to Mary, not the speaker.[16]

(49)   (upward-entailing context ⇒ speaker-oriented appositive)
       Sheila **believes** that Chuck, <u>an old codger</u>, is fit to watch the kids.

(after Amaral et al. 2007)

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[15]Sæbø seems to indentify lack of semantic embedding with speaker-orientation and semantic embedding with non-speaker-orientation. I disagree with this assumption: as discussed in Section 2.1 above, shifted ARCs are interpreted outside the scope of higher operators but are nevertheless non-speaker-oriented. For simplicity, I will follow Sæbø's implicit assumption throughout this section.

[16]Sæbø's data only involves nominal appositives. However, he suggests that the observations he makes possibly hold for all appositive constructions, including ARCs. (See Sæbø 2011, ft.1.)

(50)　(downward-entailing context $\Rightarrow$ non-speaker-oriented appositive)

    a.　Mary is **surprised** that John, <u>a Laestadian</u>, wears a necktie.

    b.　Mary could **not believe** that she, <u>a virgin</u>, would have a child.

<div align="right">(both examples from Sæbø 2011)</div>

The explanation that Sæbø offers for the contrast in (49) vs. (50) is a pragmatic one. In upward-entailing contexts speaker-oriented readings of appositives are more frequent because in such contexts they derive a weaker sentence, thus giving it a better chance to be true. For example, where p represents the appositive proposition and q represents the embedded proposition, "*A* believes that p and q" (the embedded reading) asymmetrically entails "*A* believes that q" (the unembedded reading). Sæbø's idea is that if a sentence is ambiguous between those two readings, the generous hearer would prefer the latter and weaker reading because it stands a better chance of being true. In downward-entailing contexts the picture is reversed. In this case non-speaker-oriented readings of appositives are more frequent because they would make for a weaker statement and thus one that is more likely to be true. That is, since "*A* doesn't believe that q" (the unembedded reading) asymmetrically entails "*A* doesn't believe that p and q" (the embedded reading), the generous speaker will have a bias towards the latter weaker reading.[17]

Sæbø notices the following exception to his claim that appositives in downward-entailing modal contexts are typically non-speaker-oriented. In (51), the appositive occurs in a downward-entailing context but it is nevertheless speaker-oriented.

(51)　Mary is **surprised** that John, <u>a notorious casanova</u>, betrays her.　　(Sæbø 2011)

Exceptions as in (51) already point at an alternative characterization of Sæbø's data. Generally speaking, it is not reasonable to be surprised that a notorious casanova betrays his

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[17]There appears to be a potential problem with Sæbø's argument. In unembedded readings, the appositive proposition is entailed by the entire sentence and thus, it seems to me, it should be represented as an independent conjunct. For example, for the upward-entailing case the real comparison should be between "*A* believes that p and q" and "p and *A* believes that q". Since there is no entailment relation between sentences with such shapes, it is not clear to what extent Sæbø's pragmatic explanation is feasible.

lovers, so the appositive in (51) can only be attributed to the speaker, not Mary. It is thus possible to reanalyze the unexpected non-speaker-orientation of the appositives in (50) in terms of the particular rhetorical relation that holds between the appositive and the rest of the sentence.[18] The appositives in (50) serve as EXPLANATION to the rest of the sentence. That is, the fact that John is a Laestadian explains why Mary is surprised that he wears a necktie; also, the fact that Mary is a virgin explains her disbelief towards the finding that she is pregnant. Since both sentences describe mental states, i.e. surprise or disbelief, the hearer is forced to conclude that those mental states are due to the fact that not only the speaker but also the attitude holder believes the appositive proposition. In short, my suggestion is that the appositives in (50) are speaker-oriented. The fact that, in addition, their content is attributed to another agent is an inference triggered by their discourse role and the lexical semantics of the main clause predicate.

The above analysis makes the prediction that when the rhetorical relation of Explanation between the ARC and the main clause is present, an ARC can receive a non-speaker-oriented reading regardless of the polarity of the embedding predicate. This prediction is borne out, as demonstrated in (52)-(53) below. In those examples the ARC provides an explanation for the rest of the sentence and is most naturally interpreted as (also) subject-oriented, even when found in an upward-entailing context.

(52)   a. (upward-entailing context + Explanation ⇒ subject-oriented ARC)
            Mary **believes** that Jack, <u>who studied Chinese</u>, can translate comrade Mao's book for us.
        b. (downward-entailing context + Explanation ⇒ subject-oriented ARC)
            Mary does**n't believe** that Jack, <u>who never studied Chinese</u>, can translate comrade Mao's book for us.

(53)   a. (upward-entailing context + Explanation ⇒ subject-oriented ARC)
            Mary was **not surprised** that Bill, <u>who is a Mormon</u>, wears a sacred undergarment.

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[18]An analysis in terms of rhetorical relations is suggested in Hirschberg (2011).

b. (downward-entailing context + Explanation ⇒ subject-oriented ARC)
Mary was **surprised** that Bill, <u>who is a Mormon</u>, doesn't wear a sacred undergarment.

In contrast, when the rhetorical relation of Explanation is missing, the non-speaker-orientation of appositives in downward-entailing contexts should vanish. This prediction is also met, as (54) demonstrates. Here the ARCs cannot be read as explaining why the event described by the main clause happened and can only receive a speaker-oriented reading.

(54) (downward-entailing context ⇒ speaker-oriented ARC)

a. Mary does**n't believe** that Jack, <u>who just walked in</u>, can translate comrade Mao's book for us.

b. Mary was **surprised** that Bill, <u>who had dropped his pants</u>, wears a sacred undergarment.

To sum up: Sæbø's (2011) alleged examples of non-speaker-oriented/embedded appositives in downward-entailing intensional contexts can be attributed to a pragmatic inference triggered by the specific rhetorical relation that holds between the appositive and the rest of the sentence. Crucially, this inference is contingent upon the fact that the appositive content is speaker-oriented, i.e. entailed by the entire sentence.

4 Other non-projecting ARCs

Schlenker (2009, ms) presents several classes of examples which challenge the claim that ARCs necessarily project. Schlenker's data involves (i) ARCs interpreted in the scope of 'if'-clauses and (ii) ARCs in the subjunctive mood in French interpreted in the scope of a modal operator.[19] In both of those cases, it appears that the ARC receives a semantically

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[19]Schlenker discusses two more cases of apparent appositive embedding, both involving embedded interpretations of Past tenses in ARCs. First, Schlenker claims that in (i) the Past tense in the ARCs is semantically vacuous due to the presence of a higher Past tense. This is the familiar sequence-of-tense effect.

(i) John decid**ed** yesterday that tomorrow he would tell his parents that he was in Vegas with Ann, <u>who **was** about to become his wife</u>. (Schlenker 2009)

embedded interpretation. Although I will not attempt an explanation of why such interpretations are possible, I will hint at one potential path of exploration.

The first class of counterexamples includes ARCs interpreted in the scope of 'if'-conditionals. In (4a), the ARC is interpreted as part of the conditional antecedent and the sentence is virtually synonymous with its conjunctive counterpart in (4b) (both sentences are repeated from above).

(4)   a.   **If** tomorrow I call the Chair, <u>who in turn calls the Dean</u>, then we will be in deep trouble.   (Schlenker ms)

       b.   **If** tomorrow I call the Chair and he in turn calls the Dean, then we will be in deep trouble.

The second class of counterexamples involves the French subjunctive. In French, the subjunctive mood is typically used in subordinate clauses and needs to be licensed by a higher modal operator; otherwise, the sentence is ungrammatical. In (55) below, the ARC is in the subjunctive mood and can be licensed by the main clause predicate *supposer* 'suppose'.[20] This suggests that the ARC is syntactically embedded or, at least, it is interpreted as if it were.

(55)   FRENCH

       Suppose *que Jean ait   appelé sa mère, qui **ait**   appelé son avocat.*
       suppose that Jean has.SUBJ called his mother who has.**SUBJ** called her lawyer

       'Suppose that Jean has called his mother, who had called her lawyer.'

Also, in (ii) the ARC has a Past tense which receives a future-oriented interpretation because of the presence of a higher Future tense.

(ii)   After the next elections, we **will** be in a situation in which the Republican candidate won thanks to the far-right, <u>with which he **struck** an alliance</u>.   (Schlenker ms)

However, according to the native speakers I consulted, the embedded reading of the ARC in (i) is difficult and the embedded reading of the ARC in (ii) is almost unavailable. The significance of these data is thus yet to be determined.

[20]Schlenker's original sentence involves a similar example with *concevable* 'conceivable' as a main clause predicate. In my fieldwork I found that speakers of French deem it almost impossible to interpret a subjunctive ARC under this predicate. However, examples with *supposer* 'suppose' are readily accepted.

Schlenker accounts for these data by allowing ARCs to syntactically attach to a lower node and be interpreted in the scope of an external operator.[21] This option, however, is not open to us: we have argued that even though appositives are syntactically embedded, they cannot be interpreted in the scope of external operators and necessarily project. Instead, one might try to look for discourse-level dependencies which would derive the desired readings of such data. For example, one might propose that these data exemplify cases of modal subordination. However, Schlenker is careful to contrast the examples in (4a) and (55) with minimally different sentences in which the ARCs are substituted by CLAUSAL PARENTHETICALS, i.e. full clauses inserted into a sentence. As (56) shows, in those examples it is entirely impossible to establish a dependency between the parenthetical and the preceding operator.

(56)   a.   # If tomorrow I call the Chair (he in turn calls the Dean) then we will be in deep trouble.   (Schlenker ms)

        b.   FRENCH

            # ***Suppose*** *que Jean ait*   *appelé sa mere*   (*elle **ait***   *appelé*
            suppose   that Jean has.SUBJ called his mother she   has.**SUBJ** called
            son avocat).
            her lawyer

            'Suppose that Jean has called his mother (she had called her lawyer).' (intended)

This suggests that modal subordination is not the right story for the semantically embedded reading of the ARCs in (4a) and (55). If it were, it would be very hard to explain why modal subordination is disallowed in (56).

Although I will not offer an explanation of these data, I would like to point out that aspect and, potentially, participation in temporal structure, seem to be a contributing factor. This is straightforward for (4a), where there are two events involved and the calling of the Dean temporally follows the calling of the Chair in an instance of temporal progression.

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[21]Schlenker's scopal account of appositive projection was reviewed in Section 4.1 of Chapter 4.

Interestingly, the order of events in (55) is reversed: the hypothetical call to the lawyer has to precede the hypothetical call to the mother, as suggested by the English translation. This example is then not a case of temporal progression. Even so, it seems important that if the ARC in (55) is modified such that it describes a state, the embedded reading of the ARC almost vanishes. This is illustrated in (57), where the ARC is stative and cannot be easily interpreted in the scope of the modal operator.

(57)   FRENCH

   ?? ***Suppose*** *que Jean ait   appelé sa mère,   qui **ait**   l'aimé*
   suppose   that Jean has.SUBJ called his mother who has.SUBJ him.loved
   au dessus de tout.
   above.all

   'Suppose that Jean has called his mother, who had loved him above all.' (intended)

The important point is that although Schlenker's examples do not fit the account of appositive projection defended in this dissertation, they seem to have a limited empirical scope. A confounding factor for such embedded readings seems to be the requirement that the ARC describes an eventive predicate and, potentially, participates in the temporal structure of the surrounding discourse. It thus seems possible to view these constructions not as ARCs but rather as instances of some kind of a temporal clause.[22] Even though such temporal clauses are syntactically similar to (and thus difficult to tell them apart from) regular ARCs, they potentially lack the special properties ARCs can have, i.e. not-at-issue status and projection behavior. Whether or not this idea can be worked out to explain the data discussed in this section is a matter of further research.

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[22]Compare the related notion of CONTINUATIVE RELATIVE CLAUSES (see Jespersen 1964, Cornilescu 1981, Holler 2005, Loock 2007).

5 Summary

This chapter looked into three types of exceptions to appositive projection: (i) perspectivally-shifted ARCs, (ii) apparently non-projecting ARCs occurring in downward-entailing modal environments, and (iii) ARCs interpreted in the scope of 'if'-operators or operators that license the subjunctive mood in French. I argued that perspectivally-shifted ARCs are anaphoric to a secondary speech context, showed that ARCs occurring in downward-entailing modal environments project but are also attributed to the attitude holder if the ARC bears a special rhetorical relation to the rest of the sentence, and suggested that ARCs interpreted in the scope of 'if'-operators or subjunctive mood licensers are limited in use and might be instances of a different construction. This demonstrates that such data can either be explained by recourse to mechanisms that do not involve semantic embedding of ARCs or else have a limited empirical scope.

Chapter 6

The compositional account: Grammar, syntax-semantics interface, and logic

1 Introduction

This chapter has three major goals. The first goal is to argue for the view that appositive relative clauses (ARCs) owe their special interpretational properties, i.e. their potential not-at-issue status (see Chapter 2 and Chapter 3) and their projection behavior (see Chapter 4 and Chapter 5), to their syntactic status as Force Phrases. The second goal is to offer a semantics which can derive the logical representations of the core examples discussed in previous chapters in a compositional manner. The last goal is to modify the USC logic developed in Chapter 2 by adding lambda terms.

The structure of the chapter reflects those three goals. Section 2 discusses the grammatical properties of ARCs, Section 3 offers a small fragment of English, and Section 4 introduces Compositional USC. The Appendix at the end of the chapter lists some additional empirical properties of ARCs that are not discussed in this dissertation.

2 The grammar of ARCs: What makes them special?

In previous chapters we focused on two interpretational properties exhibited by ARCs: their potential not-at-issue status (see Chapter 2 and Chapter 3) and their projection behavior (see Chapter 4 and Chapter 5). I claimed that both of those properties follow from the fact that ARCs perform an independent speech act from that performed by the rest of the sentence. The main question that this section addresses is the following: What part of the grammar is responsible for the illocutionary independence of ARCs? There are two potential answers to this question that will be explored here. One could claim that this illocutionary independence originates with the intonational properties of ARCs or, alternatively, that it is due to their syntactic properties. After evaluating the two options I will tentatively decide for the latter syntactic option.

2.1 ARCs and the Intonational Phrase

The first hypothesis to be explored is that the special semantic properties of ARCs are a reflex of the fact that these constructions are *prosodically* marked. More specifically, the claim is that ARCs obligatorily form an INTONATIONAL PHRASE (IntP). This is the stance taken in Potts (2005), for example. I will start off with a short discussion of the phonetic attributes of IntPs and their relationship to syntactic phrases before looking into the intonational properties of sentences with ARCs.

IntPs form a single prosodic contour. In English, an IntP is characterized by a "comma pause" at the two edges, a continuation rise or a deep final fall at the right edge, and an upward pitch reset at the left edge of the IntP (see e.g. Selkirk 2005). Selkirk (2005) assumes that phonological phrases in general are linked to syntactic constituents in a systematic way: morphosyntactic words form Prosodic Words, non-maximal syntactic nodes form Minor Phrases, maximal projections form Major Phrases, and Comma Phrases form Intonational Phrases. It is the last correspondence—that between Comma Phrases and IntPs—that

we are primarily interested in. The Comma Phrase is Selkirk's structural reinterpretation of the syntactic feature [COMMA], introduced in Potts (2005).[1]

The question that needs to be asked next is what syntactic constituents can form Comma Phrases. Nespor & Vogel (1986) assume that IntPs are associated with two types of syntactic constituents: root clauses and parenthetical expressions. In Selkirk's (2005) terms, this amounts to claiming that Comma Phrases are instantiated as (or embed) root clauses or parenthetical expressions. Applying this idea blindly to the sentence in (1), we get the phonological structure as shown.

(1) ($_{IntP}$ My brother, ($_{IntP}$ who absolutely loves animals), just bought himself an exotic tropical bird).   (Nespor & Vogel 1986, slightly modified)

Unfortunately, there are numerous empirical problems with the claim that root clauses and parentheticals are matched with IntPs. At the heart of those problems lies the observation that the way in which a string is parsed into IntPs does not necessarily reflect the way it is naturally broken up into meaningful parts.

First, note that (1) involves *recursive* prosodic structure, i.e. structure in which one IntP is embedded into another IntP. However, it is not clear whether recursive prosodic structure really exists. For example, Nespor & Vogel (1986)—in seeming contradiction to their major claim—assume that parenthetical expressions force the preceding and the following sentential material to form their own IntPs, even when such material does not form a syntactic constituent. According to this view, the sentence in (1) above is really parsed as in (2a). (2b) provides another example in which the first IntP does not correspond to a syntactic constituent.[2]

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[1]According to Potts (2005), the [COMMA] feature has two types of effect on the phrase it marks: (i) the marked phrase is intonationally set off from the rest of the sentence, i.e. it forms an independent IntP; (ii) the marked phrase is interpreted as conventionally implied content. However, Potts himself notices that not all expressions associated with IntPs represent conventionally implied content. This problem is further discussed in Amaral et al. (2007) and the current section.

[2]Selkirk (2005) attributes such prosodic phrasing to "stylistic promotion" of Major Phrases to IntPs.

(2)   a.   ($_{IntP}$ My brother), ($_{IntP}$ <u>who absolutely loves animals</u>), ($_{IntP}$ just bought him-
self an exotic tropical bird).

        b.   ($_{IntP}$ Isabelle is), ($_{IntP}$ <u>as you know</u>), ($_{IntP}$ an artist).

(both examples from Nespor & Vogel 1986)

Recursive prosodic structure is rarely attested in linguistic corpora. Dehé (2009) presents a corpus study of British English and finds no cases of recursive IntPs in sentences with ARCs—although recursive IntPs are possible (though rare) in sentences with clausal and slifting parentheticals. In short, the empirical evidence for recursive IntPs is scarce.

A second challenge is presented by sentences with clausal conjuncts. As Nespor & Vogel (1986) argue, such sentences necessarily involve two IntPs. This is illustrated in (3) below.

(3)   ($_{IntP}$ Billy's mother was a merchant) ($_{IntP}$ and his father was a secret agent).

(after Downing 1970, cited in Nespor & Vogel 1986)

Prosodic structures as in (3) are also attested in Austrian German (see Truckenbrodt 2005). In his experimental study, Truckenbrodt found that a right edge of an IntP is consistently present at the right edge of all clauses, including root clauses, clausal conjuncts, and embedded clauses. Such intonational phrasings make incorrect predictions, if IntPs were indeed to be associated with independently asserted propositions. For example, the prosodic structure in (3) incorrectly predicts that the string is interpreted as two independent sentences and thus only the last conjunct is at-issue. However, unlike independent sentences, coordinated clauses necessarily share the same information status (see Section 4.6 of Chapter 2).

Last but not least, the same string can be associated with different phonological phrasings without a noticeable semantic effect. Nespor & Vogel (1986) and Selkirk (2005) discuss several factors that can contribute to such restructuring, one of which is the length of the string. Longer sentences often form not one big IntP but rather several smaller IntPs. For example, the sentence in (4) would typically form one IntP (4a). However, it could be restructured so as to form two (4b) or even three (4c) IntPs.

(4) My friend's baby hamster always looks for food in the corners of its cage.

    a. ($_{IntP}$ My friend's baby hamster always looks for food in the corners of its cage).

    b. ($_{IntP}$ My friend's baby hamster) ($_{IntP}$ always looks for food in the corners of its cage).

    c. ($_{IntP}$ My friend's baby hamster) ($_{IntP}$ always looks for food) ($_{IntP}$ in the corners of its cage).   (Nespor & Vogel 1986)

In addition, Selkirk (2005) observes an asymmetry between the two edges of parentheticals: while the right edge has all the hallmarks of an IntP edge, the left edge often displays the properties of a Major Phrase. This implies that an ARC can build a single IntP with the preceding material. (5) below illustrates a case in which the subject anchor and the following appositive share the same IntP.

(5) ($_{IntP}$ The Romans, <u>who arrived early</u>), ($_{IntP}$ found a land of wooded hills).

                                              (Selkirk 2005)

To sum up: The flexibility of IntP formation posits significant problems for the claim that IntPs have a special semantics attached to them. This is because of the following two reasons: (i) IntP boundaries are often inserted between syntactic constituents that share the same information status and projection properties (see (3)-(4)); (ii) two syntactic constituents are sometimes bundled together even when they need not share the same information status and projection properties (see e.g. (5)). Thus, an intonational explanation of the special semantic properties of appositives—and potentially other parenthetical expressions—both overgenerates and undergenerates. This is why I will pursue an alternative approach.

2.2 On the syntax of ARCs

The option that I will tentatively adopt is that the special interpretational properties of ARCs stem from their *syntactic* status. More specifically, I will assume that ARCs, similarly to root clauses, syntactically encode their illocutionary force. This assumption al-

ready predicts that (assertively specified) ARCs express independent propositions and thus project and are potentially not at-issue. In order to explain why final ARCs can be at-issue (see Chapter 2 and Chapter 3), I allow ARCs to attach either to their anchor or (under certain conditions) to the root node of the sentence.

Below, I first review existing syntactic accounts of ARCs with an eye on the properties that are relevant to our discussion. The assumptions that such accounts make about the semantics of ARCs are often left unspecified, so I will only give a sense of the general predictions in this respect. After that, I discuss the assumptions about the syntax of ARCs made by the current account.

2.2.1 Existing syntactic approaches

There are three main approaches to the syntax of ARCs. The older view is that ARCs are generated outside the host clause: e.g. as conjoined with the host clause, as adjoined to the host clause, or as discontinuous constituents that enter the syntactic derivation at a later stage. Given this assumption, a special mechanism is invoked to ensure that ARCs are eventually placed in their surface position as adjacent to their anchors. This approach is typically referred to as the ORPHANAGE APPROACH and is defended in Ross (1967), Emonds (1979), McCawley (1982, 1988), Safir (1986), Fabb (1990). Under this approach, ARCs are interpreted in their underlying host-external position. This assumption successfully accounts for the relative independence of ARCs from the rest of the sentence. In particular, the orphanage approach can derive the projection of ARCs without further stipulations. It cannot, however, easily account for the in-situ interpretation of ARCs with respect to discourse-level phenomena such as discourse anaphora (see Chapter 4).

According to the more recent CONSTITUENCY APPROACH, ARCs are fully integrated into the host clause and form a constituent with their anchor (see Jackendoff 1977, Kayne 1994, de Vries 2002, 2006, Potts 2005, Citko 2008). At the same time, ARCs are assumed to bear a special relation to their anchors. The accounts of de Vries (2002, 2006), and espe-

cially Potts (2005), are most explicit in this respect. These authors assume that ARCs enjoy a special syntactic status—of specifying conjuncts, according de Vries; of being marked by a [COMMA] feature, according to Potts—that makes them "invisible" to the rest of the sentence.[3] The constituency approach is then compatible with the in-situ interpretation and the projection behavior of ARCs. Thus, while the orphanage approach derives the semantic independence of ARC from the syntactic *position* in which they are interpreted, the constituency approach takes the surface position of ARCs at face value but relies on syntactic *marking* in order to derive their special properties.

There is also a MIXED APPROACH which tries to integrate features of the two main approaches (see Demirdache 1991, Del Gobbo 2003, 2007; see also Schlenker ms). As under the constituency approach, ARCs are generated locally to their anchors. However, similarly to the orphanage approach, ARCs are not interpreted in situ: they are raised to the root clause at the relevant level of interpretation.[4] This approach thus proceeds in the opposite direction from that of the orphanage approach. Like the orphanage approach though, it derives the semantic independence of ARCs from their syntactic position.

As far as I can tell, none of these syntactic approaches makes any predictions about the information status of ARCs. Yet, it is also important to ask how those approaches fare with respect to the additional properties of ARCs not discussed in this dissertation. The Appendix at the end of this chapter lists many of those properties.

2.2.2 Assumptions about the core syntax of ARCs

The current syntactic analysis of ARCs is predicated upon two main assumptions: (i) ARCs are typically generated as adjoined to their anchor but under certain conditions (to be specified below) can be adjoined to the root node of the sentence; (ii) ARCs are Force Phrases,

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[3]See the review of Potts' two-dimensional account in Chapter 4, Section 4.2.

[4]In Del Gobbo (2003), ARCs are actually raised to a Text node. In Schlenker ms, ARCs are not raised but are nevertheless interpreted as conjoined with the host clause.

i.e. syntactic phrases that encode illocutionary force. The first assumption mostly follows the constituency approach but also allows for root node attachment. The second assumption builds on work by Rizzi (1997, 2004), Cinque (1999) and Krifka (2001, to appear). Below, I discuss each of those assumptions in turn.

The assumption that ARCs are adjoined to their anchors is a very natural one because it reflects surface order. Allowing ARCs to attach to the root clause at surface structure is more controversial. The main question is whether there is good evidence for such high attachment.[5] There are several known cases in which sentence-final ARCs are not adjacent to their anchors and can plausibly be analyzed as adjoined to the entire sentence. First, let us look at cases in which an ARC is not adjacent to its *object* anchor. This can happen because there is an intervening element, e.g. a temporal adverbial (6), a past participle (7), or a slifting parenthetical (8). Also, when the relative pronoun has split antecedents, the ARC is not adjacent to its first antecedent (9). Finally, when the appositive fragment consists of two coordinated ARCs, the second ARC is not adjacent to the shared anchor (10).

(6)   a. I met **John** yesterday, <u>who I like a lot</u>.   (Fabb 1990)

        b. I was talking to **Howard** the other day, <u>who tells me that you want to resign</u>.
           (Peterson 2004)

        c. SWEDISH

          *Jag gav bok-en till den **flicka** igår,   som Anna hade nämnt.*
          I   gave book-the to the girl   yesterday that Anna had mentioned

          'I gave the book, which Anna had mentioned, to the girl yesterday.'
           (Platzack 1997)

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[5]The literature often talks about "extraposition" of ARCs. Since for our purposes it is not important whether ARCs are moved to a higher position or are generated there, I will not follow this terminology.

(7) a. DUTCH

Ik heb **Joop** *gezien, die twee zusters heeft.*
I have Joop seen   who two sisters has

'I saw John, who has two sisters.' [my translation]   (de Vries 2002)

b. GERMAN

Gestern habe ich **Karin** *getroffen, die übrigens viel zugenommen*
yesterday have I   Karin met   who by.the.way much gained.weight
hat.
has

'Yesterday I met Karin, who, by the way, has gained a lot of weight.'

(8) Vera lives in **Brooklyn Heights**, I think, <u>which is the coolest part of New York</u>.

(9) Kim likes **muffins**, but Sandy prefers **scones**, <u>which they eat with jam</u>.
(Arnold 2007)

(10) I saw **John**, <u>who I like and who always wears a hat</u>.   (Fabb 1990)

There are also rare cases in which an ARC is separated from its *subject* anchor. Two such examples drawn from the literature are listed below.[6]

(11) a. **A man** finally appeared, <u>who ordered us to leave the room</u>.
(Reinhart 1984)

b. **John** is coming to stay, <u>who we haven't seen for ages</u>.   (Kempson 2003)

The grammaticality of (8)-(10) can possibly be attributed to the natural linear restrictions that arise from the complexity of those examples. At the very least though, the examples in (6)-(7) and, possibly, (11) look like real cases of high attachment of ARCs. Yet, the possibilities for such high attachment are severely restricted. For example, the sentence is (12) is not ambiguous between a reading on which the ARC modifies the subject and a

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[6]Note, however, that (11a) has the unaccusative verb 'appear' in it, which might suggest that the surface subject is generated in the object position, i.e. as adjacent to the ARC. Also, some speakers find (11b) severely degraded.

reading on which the ARC modifies the object. In reality, only the latter reading is available.

(12) **Nick** fell in love with **Stephanie**, <u>who grew up in Vermont.</u>

One might think that a subject-modifying reading of (12) is blocked due to the intervention of the object, which is a closer possible antecedent for the ARC. However, even in cases in which there is no potential intervener, a long-distance dependence between a subject anchor and an ARC can be blocked. This is demonstrated in (13), where the ARC has to be adjacent to the anchor.

(13)   a.   **Jessica**, <u>who grew up in the countryside</u>, likes to cook.
          b.   * **Jessica** likes to cook, <u>who grew up in the countryside.</u>

Note also that the data in (13b) is in a direct contradiction with the data in (11) above despite the structural similarity.

Are non-adjacent ARCs best explained in terms of high syntactic attachment? An alternative analysis could rely on a conservative syntax and a more liberal linearization mechanism. For example, it is possible to claim that ARCs are obligatorily adjoined to their anchors but that a linearization constraint could reorder the usual mapping under certain conditions. One such linearization constraint could require that the material following ARCs be "heavy".[7]

(14) POST-PARENTHETICAL HEAVINESS (PPH)
      Lexical material that follows a parenthetical expression is phonologically heavy.

The data below seems to garner some initial empirical support for the presence of PPH. When a light adverbial like 'yesterday' occurs at the end of a sentence, it has to precede the ARC, thus separating it from its anchor, see (15). When, however, the adverbial is heavier,

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[7]The idea that such a constraint might be operative in grammar was brought to my attention by Jane Grimshaw.

the reverse pattern is preferred: the adverbial comes at the end of the sentence and the ARC is linearized as adjacent to its anchor, see (16).

(15)   a.   I met **John** yesterday, <u>who I like a lot</u>.   (Fabb 1990)
            b.   ?? I met **John**, <u>who I like a lot</u>, yesterday.

(16)   a.   ? I met **John** yesterday after work, <u>who I like a lot</u>.
            b.   I met **John**, <u>who I like a lot</u>, yesterday after work.

Clearly, no high syntactic attachment is needed in order to explain these data. They would directly follow from PPH.

Unfortunately, PPH does not explain why the data in (11), where the intervening material seems heavy enough, is ruled in and the (claimed) contrast in grammaticality between (11) and (13b), where the intervening VPs are of about the same phonological weight. Even worse, PPH predicts that (17a) should be ungrammatical that (17b) should be preferred, given the presence of a phonologically light VP. In reality, the exact opposite judgments are found.[8]

(17)   a.   **The dean**, <u>who was here earlier today</u>, left.
            b.   * **The dean** left, <u>who was here earlier today</u>.

I will thus leave the possibility of a phonological constraint like PPH to further research and tentatively assume that the data involving non-adjacent ARCs is best explained in terms of high syntactic attachment. Since high attachment of ARCs is severely limited (recall e.g. (13b) and (17b)), we have to prohibit it in most cases. I assume that ARCs are subject to the following condition.

(18)   CLOSENESS
       ARCs are linearly close to their anchors.

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[8]Several responses could be offered in order to salvage PPH. For example, one could observe that (15)-(16) involve adjunct interveners while (17) involves a VP intervener. We could then make PPH apply to adjuncts only. Yet, such a move would imply that PPH is not a purely *phonological* constraint.

Although the notion of closeness needs to be made precise, this condition provides a good first approximation of the condition that we are after.[9]

The second major claim I adopt is that the syntax of ARCs encodes illocutionary force. The idea that the illocutionary component is part of the grammar is not new. In an early article, Stenius (1967) distinguished between the SENTENCE RADICAL and the MODAL ELEMENT of a sentence. The sentence radical is that part of the sentence that expresses its descriptive content; the modal element is the mood morphology. Rizzi (1997, 2004) draws a similar distinction. He proposes that the complementizer system specifies both the force and the finiteness of the clause. Rizzi's fine structure of the complementizer system has a Force Phrase on top and embeds the finite clause.[10] Cinque (1999) argues on independent grounds (based on the relative order of adverbs and functional morphemes in the clause) for a fixed universal hierarchy of clausal functional projections. On top of that hierarchy he places $Mood_{speech.act}P$, a functional projection that encodes speech act information. Finally, Krifka (to appear) assumes that illocutionary operators are located in a Force Phrase and embed the finite component of the sentence.[11]

Building on this previous work, I assume that root clauses and ARCs are headed by FORCE PHRASES (ForcePs). ForcePs host features for speech acts: e.g. [ASS(ERT)] for assertions, [ASK] for questions, etc. The claim that ARCs are ForcePs is supported by the intuition that ARCs perform an independent speech act (see Thorne 1972, McCawley 1988, Peterson 2004, Arnold 2007). In (19), the main clause expresses a request while the ARC

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[9]The Closeness condition does not yet explain why the examples in (11) are good, if they really are. If high attachment is thought of as extraposition of ARCs, this condition needs to be rephrased as a short-distance constraint on extraction.

[10]Rizzi (1997, 2004) places between ForceP and TP a number of functional projections that host topics and foci. Cinque (1999; see below) expresses the worry that his own MoodP might not be equivalent to Rizzi's ForceP. This is because in Italian speech act adverbials like 'frankly' can occur in a lower syntactic position than topics and foci, which suggests that Cinque's MoodP is lower in the structure than Rizzi's ForceP. For our purposes, there is no harm in assuming that constituents can move above ForceP for information structure purposes.

[11]See also Krifka (2001), where ASSERT, QUEST, and COMMAND operators are used without further discussion about their syntactic status.
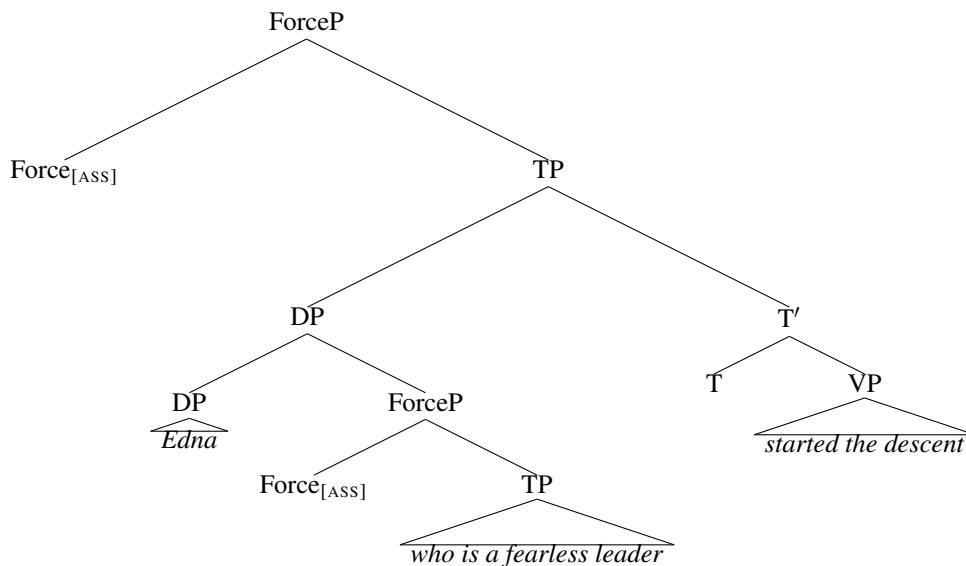
performs a statement.

(19)   Put the turkey, <u>which is in the refrigerator</u>, into the oven.   (McCawley 1988)

In addition, sentential adverbials like 'frankly' or 'honestly' can occur in ARCs but not, say, in restrictive relative clauses (see Thorne 1972, Emonds 1979, Peterson 2004). This is illustrated in (20).[12]

(20)   a.   The girl, <u>who **frankly** he had praised</u>, left the room blushing.
       b.   * The girl [who **frankly** he had praised] left the room blushing.
                               (both examples from Thorne 1972)

Given the Closeness condition and the possibility for local or high attachment of ARCs, the following structures become available. When ARCs occur sentence-medially, they are attached to their anchor (21). When ARCs occur sentence-finally, they can be attached to their anchor (22a) or the root sentence (22b).

(21)   a.   Edna, <u>who is a fearless leader</u>, started the descent.
       b.

ForceP
├── Force[ASS]
└── TP
    ├── DP
    │   ├── DP
    │   │   └── *Edna*
    │   └── ForceP
    │   ├── Force[ASS]
    │   └── TP
    │   └── *who is a fearless leader*
    └── T′
        ├── T
        └── VP
            └── *started the descent*

---

[12]David Beaver (p.c.) points out that coordinated clauses behave like ForcePs with respect to both of those properties: they can express performative acts and they accept sentential adverbials. This leads to the dubious conclusion that coordinated clauses are ForcePs too. There are at least two possible replies to this issue. One is that (certain) sentential connectives do not introduce scope propositions but operate on the proposal proposition directly that is introduced by the ForceP. (See, for example, the lexical translation of 'and' in Section 3.1 below, which does exactly that.) Another possibility is that in certain cases speech acts can indeed be coordinated or embedded (see e.g. Krifka 2001).

(22)   Jack followed Edna, <u>who is a fearless leader</u>.

a.

```
                        ForceP
                      /        \
              Force[ASS]        TP
                              /    \
                            DP      T′
                            ⌒      /   \
                           Jack   T      VP
                                       /    \
                                      V      DP
                                      |     /    \
                                  followed DP      ForceP
                                          ⌒      /      \
                                         Edna   Force[ASS]   TP
                                                          ⌒
                                                   who is a fearless leader
```

b.

```
                              Force₁P
                          /              \
                    Force₁P               Force₂P
                   /      \              /       \
           Force₁[ASS]     TP     Force₂[ASS]      TP
                           ⌒                       ⌒
                    Jack followed Edna        who is a fearless leader
```
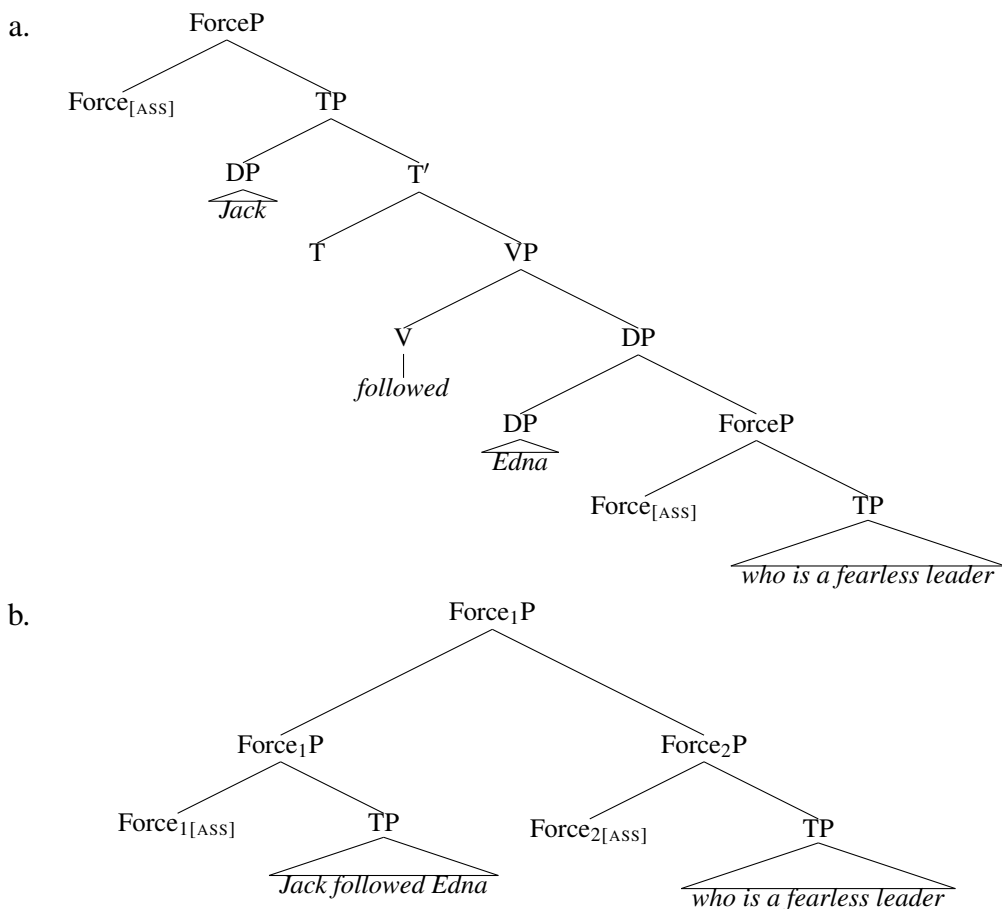
The assumption that ARCs form ForcePs—when coupled with an appropriate semantics for ForcePs and their featural content (see the following section)—correctly derives the fact that ARCs are associated with independent speech acts. This concludes our short discussion of the syntax of ARCs.

3 The syntax-semantics interface

This section presents a small fragment of English. On its basis, I demonstrate how the logical representations assigned to core examples in previous chapters can be compositionally derived.

3.1 A fragment of English

Let us start off by reminding ourselves of the basic semantic types in USC and some important complex types. These are summarized below.

object	type	abbreviation
individuals	e	
possible worlds	ω	
truth values	t	
propositions	ωt	π
speech contexts	$e \times e \times \pi \times \pi \times \pi$	κ
indices	s	
information states	st	
updates	$(st)st$	$[\,]$

Table 1: Typed ontology

There are four basic types in our ontology: types for individuals, possible worlds, indices, and truth values. From those, we can construct complex types which are either functional or product. There are a several complex types that require special attention: types for propositions (sets of possible worlds), types for speech contexts (quintuples of two entities and three propositions), types for information states (sets of indices), and types for updates (functions from information states to information states). The abbreviation for the update type can be written as brackets around other types by means of the definition $[\alpha_1 ... \alpha_n] := \alpha_1 ... \alpha_n[\,]$. For example, a function from entities to a function from propositions to updates is of type $e\,\pi[\,]$, which, according to the definition above, can be more elegantly written as $[e\,\pi]$.[13]

Below, I list the basic logical translations for lexical and functional items that are indispensible for deriving the core examples in this dissertation. The reader will notice that

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[13]The symbol $[\,]$ and this particular way of writing it around other types is taken from Muskens (1995, 1996).

instead of e and π, we use small cap versions of those types, i.e. E and Π, respectively. Formally, we define $\text{E} := s(st)e$ and $\Pi := s(st)\pi$. This is needed in order to interpret discourse referents (see Section 4 below) and need not concern us at this point. Somewhat sloppily, we will continue to talk about expressions of type E as representing individuals and expressions of type Π as representing propositions. Also, discourse referents and constants will not be italicized in the representation language. This is because discourse referents will be treated as *constants*, not as variables (see again Section 4).

lexical/functional item	translation	type
Jack$^{\text{u}}$	$\lambda P \lambda p.\exists \text{u} \wedge \text{u} = \text{jack} \wedge P(\text{u})(p)$	$[[\text{E}\Pi]\Pi]$
he$_{\text{u}}$, him$_{\text{u}}$	$\lambda P \lambda p.P(\text{u})(p)$	$[[\text{E}\Pi]\Pi]$
he$_x$, him$_x$	$\lambda P \lambda p.P(x)(p)$	$[[\text{E}\Pi]\Pi]$
who$_{\text{u}}$ (in ARCs)	$\lambda P \lambda p.P(\text{u})(p)$	$[[\text{E}\Pi]\Pi]$
who$^{\text{u}}$ (in questions)	$\lambda P \lambda p.\exists \text{u} \wedge P(\text{u})(p)$	$[[\text{E}\Pi]\Pi]$
I, me	$\lambda P \lambda p.P(\mathbf{sp}(\text{k}))(p)$	$[[\text{E}\Pi]\Pi]$
you	$\lambda P \lambda p.P(\mathbf{hr}(\text{k}))(p)$	$[[\text{E}\Pi]\Pi]$
a$^{\text{u}}$	$\lambda P \lambda Q \lambda p.\exists \text{u} \wedge P(\text{u})(p) \wedge Q(\text{u})(p)$	$[[\text{E}\Pi][\text{E}\Pi]\Pi]$
every^x	$\lambda P \lambda Q \lambda p.\forall x(P(x)(p),Q(x)(p))$	$[[\text{E}\Pi][\text{E}\Pi]\Pi]$
man	$\lambda x \lambda p.\text{man}_p\{x\}$	$[\text{E}\Pi]$
sleep	$\lambda x \lambda p.\text{sleep}_p\{x\}$	$[\text{E}\Pi]$
rich	$\lambda x \lambda p.\text{rich}_p\{x\}$	$[\text{E}\Pi]$
like	$\lambda Q \lambda x.Q(\lambda y \lambda p.\text{like}_p\{x,y\})$	$[[[[\text{E}\Pi]\Pi]\Pi]\text{E}\Pi]$
not$^{\text{q}}$	$\lambda P \lambda p.\mathbf{not}_p^{\text{q}}(P(\text{q}))$	$[[\Pi]\Pi]$
think$^{\text{q}}$	$\lambda P \lambda x \lambda p.\mathbf{think}_p^{\text{q}}(x,P(\text{q}))$	$[[\Pi]\text{E}\Pi]$
think$^{\text{c,q}}$	$\lambda P \lambda x \lambda p.\mathbf{think}_p^{\text{c,q}}(x,P(\text{q}))$	$[[\Pi]\text{E}\Pi]$
say$^{\text{c,q}}$	$\lambda P \lambda x \lambda p.\mathbf{say}_p^{\text{c,q}}(x,P(\text{q}))$	$[[\Pi]\text{E}\Pi]$
and	$\lambda P \lambda Q \lambda p.Q(p) \wedge P(p)$	$[[\Pi][\Pi]\Pi]$
who (in RRCs)	$\lambda P \lambda Q \lambda x \lambda p.Q(x)(p) \wedge P(x)(p)$	$[[\text{E}\Pi][\text{E}\Pi]\text{E}\Pi]$
Force$_{[\text{ASS}]\text{c}}^{\text{p}}$	$\lambda P.\exists \text{p} \wedge P(\text{p}) \wedge \mathbf{dc_{sp}}(\text{c}) \subseteq \text{p}$	$[[\Pi]]$
OK$_{\text{p}}$	$\mathbf{cs}(\text{k}) \subseteq \text{p}$	$[]$
Q$^{\text{p}}$ (in polar questions)	$\lambda P \lambda q.\exists \text{p} \wedge P(\text{p}) \wedge q \in \mathbf{alt}(\text{p})$	$[[\Pi]\Pi]$
right?$^{\text{p}}$	$\lambda P \lambda q.\exists \text{p} \wedge P(\text{p}) \wedge q \in \mathbf{alt}(\text{p})$	$[[\Pi]\Pi]$
Q$^{\text{p}}$ (in content questions)	$\lambda P \lambda x \lambda q.\exists \text{p} \wedge P(x)(\text{p}) \wedge q \in \mathbf{alt}(\text{p},x)$	$[[\text{E}\Pi]\text{E}\Pi]$
Force$_{[\text{ASK}]\text{c}}^{\text{q}}$	$\lambda P.\exists \text{q} \wedge P(\text{q}) \wedge \mathbf{cs}(\text{c}) \subseteq \text{q}$	$[[\Pi]]$

Table 2: Basic translations

The major feature that most of those translations share is that they include lambda ab-
straction over propositional variables. Propositional discourse referents are introduced by
operators and play a crucial role in the interpretation of elements in the scope of those
operators. Lambda abstraction over propositional variables thus makes sure that the propo-
sitional discourse referents introduced by operators get passed down the syntactic tree.
There are several more points to be made about the particular translations, but I will defer
further discussion until the next section, where these translations are put to use.

I will make use of the following three compositional rules.

(23)   COMPOSITIONAL RULES

a. $\dfrac{A \leadsto \alpha_a \quad B \leadsto \beta_{ab}}{AB \leadsto (\beta(\alpha))_b \quad BA \leadsto (\beta(\alpha))_b}\text{FA}$

b. $\dfrac{A \leadsto \alpha_{[]} \quad B \leadsto \beta_{[]}}{AB \leadsto (\alpha \wedge \beta)_{[]}}\text{SEQ}$

c. $\dfrac{A^{\text{u}} \leadsto \alpha_{[[\text{E}\Pi]\Pi]} \quad B \leadsto \beta_{[]}}{A^{\text{u}}B \leadsto (\lambda P \lambda p.\, \alpha(\lambda x \lambda q.\beta)(p) \wedge P(\text{u})(p))_{[[\text{E}\Pi]\Pi]}}\text{DP-ARC}$

The first rule is the familiar rule of FUNCTION APPLICATION. Given two sister nodes, this
rule feeds the translation of one of the nodes into the translation of the other in a function-
argument fashion. Notice that this rule is type-driven and there is no implied order between
the function and the argument: the function can precede or follow the argument and the
rule will apply as long as the types match. The second rule is called SEQUENCING. It takes
two dynamic terms and creates a new dynamic term by conjoining them. The Sequencing
rule is used in two types of environments: (i) it combines the translations of a root sen-
tence with that of a final ARC attached to it, and (ii) it combines any two dynamic terms
that are adjacent in discourse.[14] The last rule allows us to combine the translation of an
ARC with that of its DP anchor and is appropriately called the DP-ARC rule. There are
several things to observe about this more complex rule. First, note that the type of the term

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[14]Notice that—unless a Text node is introduced—this second case does not require that the two terms
form a syntactic unit. This second case stretches a bit the standard view of semantic composition.

that is produced matches the type of the input term that translates the appositive anchor. This is necessary because appositives do not fill argument positions in grammar. Also, the DP-ARC rule is not purely type-driven: it only applies to anchors that introduce an (individual) discourse referent. Going back to the list of basic translations in Table 2, we see that quantificational anchors are excluded because the translation of 'every' does not introduce a discourse referent. This feature of the rule accounts for the empirical observation that ARCs usually cannot attach to quantificational DPs (see Smith 1964, Ross 1967, Rodman 1976, Jackendoff 1977, McCawley 1988, de Vries 2002, Potts 2005). The relevant contrast is illustrated below (see also the following section).

(24) a. **Edna**, <u>who is a fearless leader</u>, started the descent.
      b. # **Every female climber**, <u>who is a fearless leader</u>, started the descent.

Finally, I will assume that free variables are prohibited in ForcePs (again, see the following section). Given that, the only "free" elements that can occur in ARCs are discourse referents (which, remember, are constants!). This means that the lambda operators in the DP-ARC rule that abstract over the variables x_E and q_Π bind vacuously and cannot accidentally bind into β, the translation of the ARC. Thus, no additional restrictions on what variables can occur in β are needed.

3.2 Deriving core examples

In this section I demonstrate how the logical representations of the core examples discussed in previous chapters are compositionally derived in the English fragment introduced above.

Before starting, it is important to distinguish between two ways in which anaphoric dependencies can arise. An anaphoric element can be bound by an antecedent either in the grammar, i.e. in the course of the semantic composition, or in discourse, i.e. by means of co-indexation of the antecedent and the dependent. In the former case, binding is obligatory: it does not depend on the particular choice of variable or discourse referent names. For example, in 'A man walked in' the discourse referent introduced by the indefinite article

necessarily binds the argument positions of the two predicates 'man' and 'walk in'. In the latter case, binding crucially depends on the choice of names for the anaphoric elements. For example, in 'A man walked in. He sat down' the pronoun in the second sentence is bound by the discourse referent introduced by the indefinite article in the first sentence only if the two elements are represented by the same discourse referent. Similarly, in 'Every man thinks that he is strong' the pronoun in the embedded clause is bound by the quantificational subject only if the two share the same variable. The distinction between those two types of binding will be encoded in LOGICAL FORMS (LFs).[15] In LFs, anaphoric elements will be marked by subscripts and their antecedents will be marked by superscripts.[16] Anaphoric dependencies will be so indexed only if they are instances of the latter type of binding. Since this latter type of dependency does not follow from the compositional component of grammar, it needs to be present in the LF. Anaphoric dependencies of the former type are predictable and need not be encoded in LFs.

Let us first consider sentences without ARCs or operators. A simple sentence as in (25) has the LF as in (25a) and is compositionally assigned the logical translation as in (25b).

(25) Edna is a fearless leader.

    a. $[_{\text{ForceP}} \text{Force}_{[\text{ASS}]_k}^p [_{\text{TP}} \text{Edna}^u \text{ is a fearless leader}]]$

    b. $\exists p \wedge \exists u \wedge u = \text{edna} \wedge \text{fearless.leader}_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

    c. $\exists p \wedge \exists u \wedge u = \text{edna} \wedge \text{fearless.leader}_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p \wedge \underline{\underline{\mathbf{cs}(k) \subseteq p}}$

Given the logical translations for proper names and one-place predicates in the English fragment above, the FA compositional rule derives $\lambda p. \exists u \wedge u = \text{edna} \wedge \text{fearless.leader}_p\{u\}$ as the translation for the TP node. This term is of type $[\Pi]$, i.e. expresses a function from propositions to updates.[17] Intuitively, meanings of this type are associated with sentence

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radicals, i.e. the part of the sentence that represents the descriptive content and ignores the illocutionary force (see Stenius 1967). If we take this translation and combine it (again, via the FA rule) with the translation for $\text{Force}_{[\text{ASS}]_k}^p$, we arrive at (25b).

An utterance of (25) puts forward the proposal that Edna is a fearless leader. Let us assume that this proposal has been accepted by the hearer by an overt utterance of 'OK', translated as $\mathbf{cs}(k) \subseteq p$. By means of the Seq rule, this dynamic term can be conjoined with the dynamic term translating the preceding sentence, which gives us (25c).

Next, I consider sentences with medial ARCs. The sentence in (26) has the LF as in (26a) and is logically represented as in (26b).

(26)   Edna, <u>who is a fearless leader</u>, started the descent.

    a. $[_{\text{ForceP}} \text{Force}_{[\text{ASS}]_k}^p [_{\text{DP}} \text{Edna}^u [_{\text{ForceP}} \text{Force}_{[\text{ASS}]_k}^q \text{who}_u \text{ is a fearless leader}]]$ started the descent$]$

    b. $\exists p \wedge \exists u \wedge u = \text{edna} \wedge \underline{\exists q \wedge \text{fearless.leader}_q\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq q} \wedge \underline{\underline{\mathbf{cs}(k) \subseteq q}} \wedge$ $\text{start.descent}_p\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

There are two important points to be made about (26). First, the derivation of (26b) makes crucial use of the DP-ARC compositional rule. This rule is used to combine the translation of the anchor, $\lambda P \lambda p. \exists u \wedge u = \text{edna} \wedge P(u)(p)$, with that of the ARC, $\exists q \wedge \text{fearless.leader}_q\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq q$, to get to the translation of 'Edna, <u>who is a fearless leader</u>', $\lambda P \lambda p. \exists u \wedge u = \text{edna} \wedge \underline{\exists q \wedge \text{fearless.leader}_q\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq q} \wedge P(u)(p)$. Second, there is nothing in the LF in (26a) that corresponds to the dynamic term $\mathbf{cs}(k) \subseteq q$ in (26b). This term signals that the proposal introduced by the ARC has been silently accepted and thus restricts the context set.[18] The leading intuition is that such acceptance terms are pragmatic defaults triggered by discourse constraints on deciding proposals. For the purposes of semantic composition, I will assume that such acceptance terms can be conjoined to dynamic

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$\dfrac{A \rightsquigarrow \alpha_{[\text{EП}]} \quad B \rightsquigarrow \beta_{[\text{EП}]}}{AB \rightsquigarrow (\lambda x \lambda p. \alpha(x)(p) \wedge \beta(x)(p))_{[\text{EП}]}}$ PM. I will typically gloss over such minor complications.

[18] As seen from (25c), acceptance terms also translate polar particles like 'OK'.

terms (via the Seq rule) at any point of the derivation. However, only the most optimal representation will survive and less optimal representations will be filtered out.[19]

The following two sentences have final ARCs in them. In (27), the ARC is adjoined to its anchor while in (28) it is adjoined to the root node of the sentence.

(27) Jack followed Edna, <u>who is a fearless leader</u>.

    a. $[_{\text{ForceP}}$ Force$_{[\text{ASS}]_k}^p$ Jack^u followed $[_{\text{DP}}$ Edna^v $[_{\text{ForceP}}$ Force$_{[\text{ASS}]_k}^q$ who$_v$ is a fearless leader$]]]$

    b. $\exists p \wedge \exists u \wedge u = \text{jack} \wedge \exists v \wedge v = \text{edna} \wedge$
$\underline{\exists q \wedge \text{fearless.leader}_q\{v\} \wedge \boldsymbol{dc_{sp}}(k) \subseteq q \wedge \underline{\underline{\boldsymbol{cs}(k) \subseteq q}} \wedge}$
$\text{follow}_p\{u,v\} \wedge \boldsymbol{dc_{sp}}(k) \subseteq p$

(28) Jack followed Edna, <u>who is a fearless leader</u>.

    a. $[_{\text{ForceP}}$ $[_{\text{ForceP}}$ Force$_{[\text{ASS}]_k}^p$ Jack^u followed Edna^v $]$ $[_{\text{ForceP}}$ Force$_{[\text{ASS}]_k}^q$ who$_v$ is a fearless leader$]]$

    b. $\exists p \wedge \exists u \wedge u = \text{jack} \wedge \exists v \wedge v = \text{edna} \wedge \text{follow}_p\{u,v\} \wedge \boldsymbol{dc_{sp}}(k) \subseteq p \wedge$
$\underline{\underline{\boldsymbol{cs}(k) \subseteq p}} \wedge \underline{\exists q \wedge \text{fearless.leader}_q\{v\} \wedge \boldsymbol{dc_{sp}}(k) \subseteq q}$

The ARC is composed with its node of attachment by the DP-ARC rule in (27) and the Seq rule in (28). The placement of acceptance terms is different in the two representations and follows the discourse constraints on deciding proposals (see again Section 4.4 of Chapter 2). This predicts a different information status for the appositive proposal in each case. In (27), the proposal associated with the ARC is closed, i.e. is not at-issue, while the proposal associated with the main clause is on the discourse Table, i.e. is at-issue. In (28), the reverse situation obtains.

Sentences with clausal conjuncts are analyzed as shown in (29) below.

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[19]This implies that a piece of discourse is typically associated not with a single representation but rather with a set of logical representations. See Section 4.4 of Chapter 2 for more discussion on how the optimization procedure works.

(29) Edna is a fearless leader and she started the descent.

    a. $[_{\text{ForceP}}\ \text{Force}_{[\text{ASS}]k}^{p}\ [_{\text{CoorP}}\ [_{\text{TP}}\ \text{Edna}^{u}\ \text{is a fearless leader}]\ \text{and}\ [_{\text{TP}}\ \text{she}_{u}\ \text{started the descent}]]]$

    b. $\exists p \wedge \exists u \wedge u = \text{edna} \wedge \text{fearless.leader}_{p}\{u\} \wedge \text{start.descent}_{p}\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

In the English fragment presented above the conjunction 'and' receives the translation $\lambda P \lambda Q \lambda p.\,Q(p) \wedge P(p)$, i.e. it combines the translations of two sentence radicals and produces a translation for a more complex sentence radical.[20] This last term then combines with the translation of the Force head, which derives the translation in (29b). Crucially, there is a single ForceP in (29), and, as a result, a *single* proposal is introduced. This correctly predicts that the two conjuncts share the same information status and projection behavior. Despite superficial similarities, conjoined sentences significantly differ in interpretational properties from sentences with final ARCs.

Next, I consider sentences with restrictive relative clauses.

(30) A woman who spoke Sherpa started the descent.

    a. $[_{\text{ForceP}}\ \text{Force}_{[\text{ASS}]k}^{p}\ [_{\text{TP}}\ \text{a}^{u}\ [_{\text{NP}}\ \text{woman}\ [_{\text{CP}}\ \text{who spoke Sherpa}]]\ \text{started the descent}]]$

    b. $\exists p \wedge \exists u \wedge \text{woman}_{p}\{u\} \wedge \text{speak.sherpa}_{p}\{u\} \wedge \text{start.descent}_{p}\{u\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

Structures consisting of nouns modified by restrictive relative clauses are similar to coordinated structures. The translations of the head noun and the complement of the relative element are both of type [EΠ], i.e. functions from entities to sentence radical meanings, while the relative element acts as a coordinator and is of type [[EΠ][EΠ]EΠ]. More specifically, 'who' is translated as $\lambda P \lambda Q \lambda x \lambda p.\,Q(x)(p) \wedge P(x)(p)$ and combines with $\lambda x \lambda p.\,\text{speak.}$ $\text{sherpa}_{p}\{x\}$ (the translation for 'spoke Sherpa') and $\lambda x \lambda p.\,\text{woman}_{p}\{x\}$ (the translation for 'woman') to form $\lambda x \lambda p.\,\text{woman}_{p}\{x\} \wedge \text{speak.sherpa}_{p}\{x\}$. From this last translation it is clear that the semantic content of the noun and that of the restrictive relative clause are relativized to the *same* proposition. This correctly predicts that the head noun and the re-

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[20]In more syntactic terms, 'and' and other coordinators operate on TPs, not on full sentences/ForcePs.

strictive relative clause are on a par with respect to information status and projection be-havior. Again, despite their superficial similarity to sentences with ARCs, sentences with restrictive relative clauses exhibit very different interpretational properties.

I assume that interrogative sentences have two syntactic layers on top of the TP node: a QUESTION PHRASE (QP) and a Force Phrase, specified as [ASK]. The QP layer is what is usually called the Complementizer Phrase, i.e. the syntactic locus of raised question words and auxiliaries. The meaning expressed by a Q head takes a sentence radical mean-ing and creates the question alternatives associated with it. The meaning expressed by the Force$_{[ASK]}$ head then takes those question alternatives and splits the context set accordingly.

Polar questions are composed as shown in the example below.

(31)   Did Gabe win?

    a. $[_{\text{ForceP}} \text{Force}_{[ASK]k}^{q} [_{\text{QP}} [_{Q^{\text{P}}} \text{ did}] [_{\text{TP}} \text{Gabe win}]]]$
    b. $\exists q \wedge \exists p \wedge \exists u \wedge u = \text{gabe} \wedge \text{win}_{p}\{u\} \wedge q \in \mathbf{alt}(p) \wedge \mathbf{cs}(k) \subseteq q$

The TP is the sentence radical and gets translated as $\lambda p. \exists u \wedge u = \text{gabe} \wedge \text{win}_{p}\{u\}$. This translation is combined with $\lambda P \lambda q. \exists p \wedge P(p) \wedge q \in \mathbf{alt}(p)$, the translation for Q heads in polar questions, to produce $\lambda q. \exists p \wedge \exists u \wedge u = \text{gabe} \wedge \text{win}_{p}\{u\} \wedge q \in \mathbf{alt}(p)$.[21] This last trans-lation is then combined with the translation for the Force$_{[ASK]}$ head, which leads to (31b). In (31b), p encodes the content of the sentence while q encodes the question alternatives (by means of the conjunct $q \in \mathbf{alt}(p)$) and splits the context set (by means of $\mathbf{cs}(k) \subseteq q$).

These ideas can be put to use when analyzing ARCs with question tags. I assume that question tags are adjoined to TPs and receive the same translation as that of Q heads in polar questions. A tag question like 'Dan left, right?' receives the same translation as its regular polar question counterpart 'Did Dan leave?'.[22] In interrogative ARCs, it is the question

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[21]Here, I ignore the semantic contribution of raised auxiliaries in QP.

[22]Needless to say, this is an oversimplification. Tag questions differ from regular polar questions in that they are biased towards a positive answer. For example, 'Dan left, right?' suggests that the speaker expects a positive answer while there is no such expectation associated with 'Did Dan leave?'. See Reese (2007) and Reese & Asher (2007) for more discussion.

tag that creates the question alternatives and the rest of the derivation is similar to that of polar questions. For example, the fragment in (32) is derived in a similar way as the polar interrogative in (31) above.

(32) ..., who is rich, right?,...

    a. $[_{\text{ForceP}} \text{Force}_{[\text{ASK}]_k}^q \, [_{\text{TP}} \, [_{\text{TP}} \, \text{who}_u \text{ is rich}] \text{ right}^p]]$

    b. $\exists q \wedge \exists p \wedge \text{rich}_p\{u\} \wedge q \in \textbf{alt}(p) \wedge \textbf{cs}(k) \subseteq q$

The compositional translation of content questions is slightly more complicated. (33) below provides an example.

(33) Who won?

    a. $[_{\text{ForceP}} \text{Force}_{[\text{ASK}]_k}^q \, [_{\text{QP}} \, \text{who}^u \, [_{\text{Q}'} \, Q^p \, [_{\text{TP}} \, \text{won}]]]]$

    b. $\exists q \wedge \exists u \wedge \exists p \wedge \text{won}_p\{u\} \wedge q \in \textbf{alt}(p, u) \wedge \textbf{cs}(k) \subseteq q$

I follow the standard assumption that the question word in English is placed in the specifier of QP (=CP). Given that, the translation of the Q head for content questions is first composed with the TP translation and the result is composed with the translation of the question word. The resulting term then combines with the translation of the Force head and gets us to (33b).

Next, I consider sentences with operators. The logical translations for the sentence with negation in (34) and the sentence with an attitude verb in (35) are derived from the LFs given.[23]

(34) Edna is **not** a fearless leader.

    a. $[_{\text{ForceP}} \text{Force}_{[\text{ASS}]_k}^p \, [_{\text{TP}} \, \text{not}^q \, [_{\text{TP}} \, \text{Edna}^u \text{ is a fearless leader}]]]$

    b. $\exists p \wedge \textbf{not}_p^q(\exists u \wedge u = \text{edna} \wedge \text{fearless.leader}_q\{u\}) \wedge \textbf{dc}_{\textbf{sp}}(k) \subseteq p$

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[23]Recall from Chapter 4 that $\textbf{not}_p^q(\phi)$ abbreviates $\exists q \wedge \phi \wedge p \varnothing \textbf{max}(q)$ and $\textbf{think}_p^q(v, \phi)$ abbreviates $\exists q \wedge \phi \wedge \text{think}_p\{v, q\}$.

(35) Mary **thinks** that Jack is rich.

    a. $[_{\text{ForceP}}\ \text{Force}_{[\text{ASS}]_k}^p\ \text{Mary}^u\ \text{thinks}^q\ [_{\text{TP}}\ \text{Jack}^v\ \text{is rich}]]$

    b. $\exists p \wedge \exists v \wedge v = \text{mary} \wedge \textbf{think}_p^q(v, \exists u \wedge u = \text{jack} \wedge \text{rich}_q\{u\}) \wedge \textbf{dc}_{\textbf{sp}}(k) \subseteq p$

Operators like negation or propositional attitudes express functions from sentence radical meanings. Such operators introduce a scope proposition, apply it to the sentence radical meaning, and make a statement about the relationship between the scope proposition and the reference proposition. In (34)-(35), the scope proposition is represented as q and the reference proposition is represented as p.

Examples of sentences with ARCs in the syntactic scope of negation or attitude verbs are provided in (36) and (37), respectively. The logical representations are fully determined by the LFs given and the basic translations of the English fragment in the previous section.[24]

(36) Jack, who is from Brooklyn, is**n't** rich.

    a. $[_{\text{ForceP}}\ \text{Force}_{[\text{ASS}]_k}^p\ [_{\text{TP}}\ \text{not}^q\ [_{\text{TP}}\ \text{Jack}^u\ [_{\text{ForceP}}\ \text{Force}_{[\text{ASS}]_k}^r\ \text{who}_u\ \text{is from Brooklyn}]\ \text{is rich}]]]$

    b. $\exists p \wedge \textbf{not}_p^q(\exists u \wedge u = \text{jack} \wedge \underline{\exists r \wedge \text{from.brooklyn}_r\{u\} \wedge \textbf{dc}_{\textbf{sp}}(k) \subseteq r} \wedge \text{rich}_q\{u\})$
       $\wedge \textbf{dc}_{\textbf{sp}}(k) \subseteq p$

(37) Mary **thinks** that Jack, who is from Brooklyn, is rich.

    a. $[_{\text{ForceP}}\ \text{Force}_{[\text{ASS}]_k}^p\ \text{Mary}^u\ \text{thinks}^q\ [_{\text{TP}}\ \text{Jack}^v\ [_{\text{ForceP}}\ \text{Force}_{[\text{ASS}]_k}^r\ \text{who}_v\ \text{is from Brooklyn}]\ \text{is rich}]]$

    b. $\exists p \wedge \exists u \wedge u = \text{mary} \wedge \textbf{think}_p^q(u, \exists v \wedge v = \text{jack} \wedge$
       $\underline{\exists r \wedge \text{from.brooklyn}_r\{v\} \wedge \textbf{dc}_{\textbf{sp}}(k) \subseteq r} \wedge \text{rich}_q\{v\}) \wedge \textbf{dc}_{\textbf{sp}}(k) \subseteq p$

In (36)-(37), the appositive content is relativized to a different proposition (represented as r in both examples) from the one introduced by the operator (represented as q in both examples) and expectedly projects. The projective behavior of ARCs thus primarily follows from semantic composition: the propositional discourse referent introduced by operators

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[24]Here I omit the representation of updates triggered by the structure of discourse (see Chapter 2).

binds the content of the complement but not the appositive content. The only non-trivial assumption needed is that Force heads introduce *fresh* propositional discourse referents, i.e. referents that have not been used in preceding representations. In order to achieve that, I impose a general condition requiring that all discourse referents introduced by lexical elements or functional heads be new.[25] This condition is a generalization of Heim's NOVELTY condition, according to which indefinite noun phrases cannot carry the index of another noun phrase that has previously been used in discourse (see Heim 1982, 1983).

It was argued in Chapter 5 that ARCs can shift their perspective if a secondary speech context is present in discourse. In order to capture these data, Force heads need to be able to refer back to the utterance context or any other (salient) speech context. Since no restrictions are imposed on the choice of speech context referents in the translation of Force, we get the shiftability of ARC for free. For example, the shifted reading of the ARC below can straightforwardly be derived by assuming that the Force head in the ARC is subscripted with the speech context referent introduced by the verb 'say'.

(38) Harold **says** that his girlfriend, <u>who is a little bit crazy</u>, wants to go to Hanoi.

    a. $[_{\text{ForceP}} \text{Force}_{[\text{ASS}]k}^{p} \text{ Harold}^{u} \text{ says}^{c,q} [_{\text{TP}} \text{his}^{v} \text{ girlfriend } [_{\text{ForceP}} \text{Force}_{[\text{ASS}]k}^{r} \text{who}_{v} \text{ is a little bit crazy}] \text{ wants to go to Hanoi}]]$

    b. $\exists p \wedge \exists v \wedge v = \text{harold} \wedge \textbf{say}_{p}^{c,q}(v, \exists u \wedge \text{girlfriend.of}_{q}\{u, v\} \wedge$ <u>$\exists r \wedge \textit{crazy}_{r}\{u\} \wedge \textbf{dc}_{\textbf{sp}}(c) \subseteq r$</u> $\wedge \text{want.go.to.hanoi}_{q}\{u\}) \wedge \textbf{dc}_{\textbf{sp}}(k) \subseteq p$

Since root clauses are ForcePs, they too are predicted to be shiftable, by means of the same mechanism as that just described for ARCs. This predication is correct, as the following discourse demonstrates. In (39), the second sentence is attributed to the speaker's aunt, not the speaker herself.

(39) My aunt says the craziest things ever.
The Feds have bugged her apartment and are listening to her every word.
                                               (after Harris & Potts 2009)

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[25]There are various strategies that can be devised in order to weaken this condition so that discourse referent names can be reused without harm. However, I see no theoretical gain in doing that.

Finally, recall that quantifier binding into ARCs is difficult (see Section 5.3 of Chapter 4). The following example illustrates the point: in (40), the pronoun placed in the ARC cannot be bound by the matrix subject and can only refer to some unspecified individual.

(40)   Every cheerleader greets Chomsky, <u>who remembers her</u>.

We can now give an explanation of why that is. There are three main ingredients to it. The first ingredient is the fact that quantifier binding involves variables, as can be seen from the translation assigned to 'every' in the English fragment above. The second ingredient is the claim that ARCs form ForcePs. The third ingredient is the assumption that ForcePs are "syntactically closed" in that they cannot contain free variables. I state the following condition on ForcePs.[26]

(41)   NO FREE VARIABLES
       All variables occurring in a ForceP are bound within that ForceP.

Given those ingredients, it is clear why a bound reading of the pronoun in (40) is not possible. First, let us assume that the ARC in this sentence is adjoined to the anchor and is in the syntactic scope of the quantified matrix subject. Since ARCs are ForcePs, by the condition in (41) the ARC in (40) cannot contain free variables. Thus, the only option left for the pronoun in the ARC is that it is represented as a discourse referent that is bound from previous discourse. The LF and the logical representation for this sentence are given below.

(40)   a. $[_{\text{ForceP}} \text{Force}_{[\text{ASS}]k}^{p} [_{\text{TP}} \text{every}^{x} \text{ cheerleader greets } [_{\text{DP}} \text{Chomsky } [_{\text{ForceP}} \text{Force}_{[\text{ASS}]k}^{q} \text{who}_v \text{ remembers her}_u]]]]$

       b. $\exists p \wedge \forall x(\text{cheerleader}_p\{x\}, \exists v \wedge v = \text{chomsky} \wedge \text{greet}_p\{x,v\} \wedge \exists q \wedge \text{remember}_q\{v,u\} \wedge \mathbf{dc_{sp}}(k) \subseteq q) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

In Chapter 4, we saw several apparent exceptions to the prohibition against quantifier binding into ARCs. Since the current account does not make room for such data, the only

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[26]I thank Paul Portner for discussion of this point.

possibility left to us is to reanalyze such examples as cases of dynamic binding involving discourse referents.[27] That is, in such cases a discourse referent is introduced by the anchor and the DP-ARC compositional rule can apply. I leave this issue to further research.

To conclude: This section demonstrated that the basic translations in the English fragment, when coupled with a few compositional rules and discourse constraints on deciding proposals, can derive the logical representations used in previous chapters.

4 Compositional USC

In the previous section, we assigned lambda terms as translations for lexical and functional items. The original logic of USC did not have lambda terms in it (see Chapter 2). In this section, I develop a fully compositional version of USC which can interpret lambda terms.

4.1 Background ideas

Muskens (1995, 1996) combines the dynamics of DISCOURSE REPRESENTATION THE-ORY (DRT; see Kamp 1981, Kamp & Reyle 1993, Kamp et al. 2011) with the compositionality of MONTAGUE GRAMMAR (see Montague 1973, Dowty et al. 1981) into a new formal system called COMPOSITIONAL DRT. The major step is the insight that DRT terms can be thought of as abbreviations of type-logical terms.[28] What would have been a metalanguage describing the interpretation of DRT terms is now injected into the object language, i.e. expressed in type logic and interpreted in a way familiar from Montague Grammar. In order to ensure that discourse referents are interpreted dynamically and distinguish them from lambda-bound variables, discourse referents are treated as *constants* that represent func-

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[27]See Demirdache (1991) for potential arguments.

[28]While in Muskens (1996) DRT terms are abbreviations of type logic, in Muskens (1995) DRT terms are mapped into type logic via a *translation* function. There are non-trivial differences between those two methods: the abbreviation method does not imply that DRT terms are part of a logic while the translation method requires a full-blown DRT logic and a proof that the translation function is meaning-preserving.

tions from indices to values of the relevant type.[29] Assuming that indices are sequences of values, we can think of discourse referents as expressing projection functions which take an index and extract from it one of its coordinates.

Bittner (2011) applies the same idea to an update system called UPDATE WITH CENTERING. While in Muskens (1996) DRT boxes abbreviate type-logical terms that express binary relations between indices (i.e., are of type *sst*, where *s* is the type of indices), in Bittner's system boxes abbreviate type-logical terms that express functions from information states to information states (i.e., are of type (*st*)*st*).

Although I take my lead from Muskens and Bittner in modeling discourse referents as functions which pick out different objects depending on the index/the information state, I do not treat USC terms as abbreviations of type logic. In order not to complicate the system, I will preserve USC in more or less unchanged form. However, since discourse referents are constants interpreted as functions from indices and information states, the semantic rules will ensure that anaphoric information is passed along. As a result, variables and discourse referents are interpreted by two completely independent mechanisms: variables are interpreted by assignment functions and discourse referents (relative to indices and information states) are interpreted by the basic interpretation function. The resulting logic, which I call COMPOSITIONAL USC (CUSC), is thus both compositional and dynamic.

4.2 The logic

Since the core features of USC were already discussed in Chapter 2, the main emphasis in this section will be on the properties that are particular to CUSC.

I first define semantic types. I use *e* for the type of entities, ω for the type of possible worlds, *s* is the type of indices, and *t* is the type of truth values. From those basic types, we

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[29]To be precise, this is only true for Muskens (1995). Muskens (1996) introduces a non-logical constant *V* interpreted as a function from a discourse referent and an index into the value of the discourse referent at that index.

can define functional types and product types.

(42) Def (TYPES)

      a.   *BasTyp*, the set of BASIC TYPES, is $\{e, \omega, s, t\}$.

      b.   *Typ*, the set of all TYPES, is the smallest set such that

- *BasTyp* $\subseteq$ *Typ*;
- if $\alpha, \beta \in Typ$, then $(\alpha\beta) \in Typ$;   (functional types)
- if $\alpha_1, ..., \alpha_n \in Typ$, then $\alpha_1 \times ... \times \alpha_n \in Typ$.   (product types)

The following abbreviations for complex types or type schemas that come up often are introduced.

(43) Def (ABBREVIATED TYPES)

- $\pi := \omega t$ (the type of propositions)
- $\kappa := e \times e \times \pi \times \pi \times \pi$ (the type of speech contexts)
- A $:= s(st)\alpha$, where A is the small cap version of α, for any $\alpha \in Typ$
- $[\alpha] := \alpha(st)st$, for any $\alpha \in Typ$

Types for terms that can serve as discourse referents are singled out in a special category. I assume that discourse referents can represent entities, propositions, or speech contexts.[30]

(44) Def (DISCOURSE REFERENT TYPES)
$DrefTyp := \{E, \Pi, K\}$

    The vocabulary of CUSC consists of typed VARIABLES and CONSTANTS: Var_α is the set of variables of type α and Con_α is the set of constants of type α. Variables and constants are more generally called TERMS, although complex terms are neither variables nor constants, i.e. $Var_\alpha \cup Con_\alpha \subseteq Term_\alpha$. Constants of discourse referent types, i.e. constants of type $\{E, \Pi, K\}$, are called DISCOURSE REFERENTS.[31]

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[30]As seen from the following definition, discourse referents represent functions from indices and information states to values of the intuitively correct type, e.g. E $:= s(st)e$ for referents representing entities. This is necessary in order to be able to interpret discourse referents dynamically, as will be explained below.

[31]Regular constants like 'john' are of type E, which is a discourse referent type. This will require a special stipulation to the effect that such elements have a constant denotation across indices. (See Muskens 1996 on this point.)

The syntactic rules of the logic are listed below. In addition to the FUNCTIONAL and DYNAMIC terms of USC, CUSC also has what I call COMPOSITION terms. These terms add lambda abstraction and application to the formal system.

(45) Def (SYNTAX)

    a. FUNCTIONAL TERMS

- If $c \in Term_K$, then $\mathbf{sp}(c), \mathbf{hr}(c) \in Term_E$.
- If $c \in Term_K$, then $\mathbf{dc_{sp}}(c), \mathbf{dc_{hr}}(c), \mathbf{cs}(c) \in Term_\Pi$.
- If $p \in Term_\Pi$, then $\mathbf{max}(p) \in Term_\Pi$.
- If $p \in Term_\Pi$ and $u \in Term_E$, then $\mathbf{alt}(p), \mathbf{alt}(p, u) \in Term_{\Pi t}$.

    b. COMPOSITION TERMS

- If $x \in Var_\alpha$ and $B \in Term_\beta$, then $\lambda x. B \in Term_{\alpha\beta}$.
- If $A \in Term_{\beta\alpha}$ and $B \in Term_\beta$, then $A(B) \in Term_\alpha$.

    c. DYNAMIC TERMS

- If $R \in Term_{(\omega \times \alpha_1 \times ... \times \alpha_n)t}, p \in Term_\Pi$ and $t_1 \in Term_{A_1}, ..., t_n \in Term_{A_n}$, then $R_p\{t_1, ..., t_n\} \in Term_{[]}$.
- If $t_1, t_2 \in Term_\alpha$, then $t_1 = t_2 \in Term_{[]}$.
- If $t_1 \in Term_\alpha$ and $t_2 \in Term_{\alpha t}$, then $t_1 \in t_2 \in Term_{[]}$.
- If $t_1 \in Term_{\alpha t}$ and $t_2 \in Term_{\alpha t}$, then $t_1 \subseteq t_2, t_1 \oslash t_2 \in Term_{[]}$.
- If $\phi, \psi \in Term_{[]}$, then $\phi \wedge \psi \in Term_{[]}$.
- If $a \in Con_\alpha$ (for $\alpha \in DrefTyp$), then $\exists a \in Term_{[]}$.
- If $x \in Var_\alpha$ and $\phi, \psi \in Term_{[]}$, then $\forall x(\phi, \psi) \in Term_{[]}$.

Next, I define the hierarchy of typed domains. In (46), D is a set of entities, W is a set of worlds, I is a set of indices, and $\{0, 1\}$ is the set of truth values. All those sets are specified by the particular model under consideration.

(46) Def (DOMAINS)

    a. PRIMITIVE DOMAINS

- $D_e := \mathsf{D}, D_\omega := \mathsf{W}, D_s := \mathsf{I}, D_t := \{0, 1\}$

    b. COMPLEX DOMAINS

- $D_{\alpha\beta} := D_\beta{}^{D_\alpha}$ (the domain of elements of function types)
- $D_{\alpha_1 \times ... \times \alpha_n} := D_{\alpha_1} \times \cdots \times D_{\alpha_n}$
                                (the domain of elements of product types)

    c.   FULL DOMAIN

- $D := \bigcup_{\alpha \in Typ} D_\alpha$

    d.   DISCOURSE REFERENT DOMAIN

- $D_{DR} := \bigcup_{\alpha \in DrefTyp} D_\alpha = D_E \cup D_\Pi \cup D_K$

Models for CUSC consist of non-empty and pairwise disjoint sets of entities, worlds, indices and truth values, and a basic interpretation function that respects typing.

(47)   Def (MODELS)
      $M = \langle D \cup W \cup I \cup \{0,1\}, \iota \rangle$ is a MODEL for CUSC if

- $D, W, I, \{0,1\}$ are pairwise disjoint non-empty sets,
- ι is an interpretation function such that $\iota(a) \in D_\alpha$, for all $a \in Con_\alpha$.

Reference to models will generally be omitted.

Assignment functions map variables to a value of the same semantic type.

(48)   Def (ASSIGNMENT FUNCTIONS)
      $g : Var \to D$ is an ASSIGNMENT FUNCTION if it respects typing, i.e. $g(v) \in D_\alpha$, for all $v \in Var_\alpha$.

Where u is a constant of a discourse referent type and i is an index, I write $\mathbf{val}(u, i)$ for the value of u in i. Discourse referents express functions from indices and information states to an object of the relevant type. In order to represent the denotation of discourse referents more transparently, I write $\iota(u)i\sigma$ as $\mathbf{val}(u, i)$, where $u \in Con_A$ and $\mathbf{val}(u, i) \in D_\alpha$, for any $A \in DrefTyp$. Thus, if $u \in Con_E$, $\mathbf{val}(u, i) \in D_e$; if $u \in Con_\Pi$, $\mathbf{val}(u, i) \in D_\pi$; and finally, if $u \in Con_K$, $\mathbf{val}(u, i) \in D_\kappa$. Notice that the interpretation of discourse referents is fully determined with respect to an index. Information states are only needed for the interpretation of the functional terms $\mathbf{max}(p)$, $\mathbf{alt}(p)$ and $\mathbf{alt}(p, u)$, whose interpretation requires access to the entire information state (see below). Following Muskens (1996), I stipulate that regular constants of discourse referent type receive an invariant interpretation across indices; e.g., $\mathbf{val}(john, i) \in D_e$ is the same entity for any index $i \in D_s$.

Speech contexts are quintuples with coordinates for the speaker, the hearer, the speaker's discourse commitments, the hearer's discourse commitments, and the context set. The UT-

TERANCE CONTEXT at any stage of the conversation is represented by the discourse refer-

ent k.

INDICES are treated as primitive objects of type s. Indices are WELL-BEHAVED if the

values they produce for speech context discourse referents obey the following two restric-

tions: (i) the conversational agents are related to their commitment sets in the right way,

and (ii) both sets of commitments are included in the context set.

(49) Def (WELL-BEHAVED INDICES)
An index $i \in D_s$ is WELL-BEHAVED if for any speech context discourse referent
$c \in Con_K$ the following two conditions hold:

- $\forall w \in \mathbf{proj}_5(\mathbf{val}(c,i)) : \langle w, \mathbf{proj}_1(\mathbf{val}(c,i)), \mathbf{proj}_3(\mathbf{val}(c,i)) \rangle \in \iota(commit)$ &
$\langle w, \mathbf{proj}_2(\mathbf{val}(c,i)), \mathbf{proj}_4(\mathbf{val}(c,i)) \rangle \in \iota(commit)$
- $\mathbf{proj}_3(\mathbf{val}(c,i)) \subseteq \mathbf{proj}_5(\mathbf{val}(c,i))$ & $\mathbf{proj}_4(\mathbf{val}(c,i)) \subseteq \mathbf{proj}_5(\mathbf{val}(c,i))$

The set of well-behaved indices is I_{wb}.

An INFORMATION STATE is a set of well-behaved indices. Information states are thus

of type st. In two-party discourses, a DISCOURSE-INITIAL information state $\sigma^{a,b}$ anchors

the utterance context to the entities a (the SPEAKER) and b (the HEARER).

(50) Def (DISCOURSE-INITIAL INFORMATION STATE)
A DISCOURSE-INITIAL INFORMATION STATE anchored to speaker $a \in D_e$ and
hearer $b \in D_e$ is the information state defined as $\sigma^{a,b} := \{i \in I_{wb} \mid a = \mathbf{proj}_1(\mathbf{val}(k,i))$
& $b = \mathbf{proj}_2(\mathbf{val}(k,i))\}$.

A CONTEXT SET CANDIDATE in a given state is the fifth coordinate of any value of the

utterance context. The union of all such context set coordinates is the CONTEXT SET in that

state.

(51) Def (CONTEXT SET CANDIDATES, CONTEXT SET)

a. The set of CONTEXT SET CANDIDATES in an information state $\sigma \in D_{st}$ is
defined as $CSC_\sigma := \{p \mid \exists i \in \sigma : p = \mathbf{proj}_5(\mathbf{val}(k,i))\}$.

b. The CONTEXT SET in an information state $\sigma \in D_{st}$ is defined as $CS_\sigma :=$
$\{w \mid \exists i \in \sigma : w \in \mathbf{proj}_5(\mathbf{val}(k,i))\}$.

The following two abbreviations are standard. The first abbreviation involves manipu-

lation of assignment functions in a way familiar from first-order logic: $g[x/d]$ is the same

assignment as g except that it assigns the object d to the variable x, independently of what g assigns to x. The second abbreviation compares two indices and is commonly used in dynamic semantics to express random assignment to variables. Here it is adapted to reflect the way discourse referents are treated in CUSC: $i[u]j$ means that the index i differs from the index j at most with respect to the value the discourse referent u has in each of them.

(52) Def (ABBREVIATIONS)

    a. $g[x/d] := (g - \{\langle x, c \rangle \mid c \in D_\alpha\}) \cup \{\langle x, d \rangle\}$, where $x \in Var_\alpha$ and $d \in D_\alpha$

    b. $i[u]j :\Leftrightarrow \forall v(v \neq u \Rightarrow \textbf{val}(v, i) = \textbf{val}(v, j))$, where $u \in Con_\alpha$, $v \in Con_\beta$ and $\alpha, \beta \in DrefTyp$

The interpretation rules of CUSC extend and modify the interpretation rules of USC in several respects. As seen from the first two definitions for dynamic terms, arguments to lexical or logical relations are interpreted as functions from indices and information states to model-theoretic objects of the relevant type. Since discourse referents express functions from indices and information states, they are interpreted dynamically. The first five functional terms refer to parameters of speech contexts and require access to indices only. The last three functional terms refer to propositions or sets thereof and require access to the entire information state. Composition terms are interpreted as in static type logic: they interpret lambda terms or separate functions from their arguments and thus are crucial for compositionality. The rest of the semantics is as in USC.

(53) Def (SEMANTICS)

    a. PRIMITIVE TERMS

$$\bullet \quad [\![t]\!]^g = \begin{cases} g(t) & \text{if } t \in Var \\ \iota(t) & \text{if } t \in Con \end{cases}$$

    b. FUNCTIONAL TERMS

        • $[\![\textbf{sp}(c)]\!]^g i\sigma = \textbf{proj}_1([\![c]\!]^g i\sigma)$

        • $[\![\textbf{hr}(c)]\!]^g i\sigma = \textbf{proj}_2([\![c]\!]^g i\sigma)$

        • $[\![\textbf{dc}_{\textbf{sp}}(c)]\!]^g i\sigma = \textbf{proj}_3([\![c]\!]^g i\sigma)$

        • $[\![\textbf{dc}_{\textbf{hr}}(c)]\!]^g i\sigma = \textbf{proj}_4([\![c]\!]^g i\sigma)$

        • $[\![\textbf{cs}(c)]\!]^g i\sigma = \textbf{proj}_5([\![c]\!]^g i\sigma)$

- $[\![\mathbf{max}(p)]\!]^g i\sigma = \{\mathsf{w} \mid \exists j \in \sigma : \mathsf{w} \in [\![p]\!]^g j\sigma\}$
- $[\![\mathbf{alt}(p)]\!]^g i\sigma = \wp([\![\mathbf{max}(p)]\!]^g i\sigma) \cup \wp(D_\omega - [\![\mathbf{max}(p)]\!]^g i\sigma)$
- $[\![\mathbf{alt}(p,u)]\!]^g i\sigma =$
  $\bigcup_{\mathsf{d} \in D_e} \{\wp(\{\mathsf{w} \mid \exists j \in \sigma : \mathsf{w} \in [\![p]\!]^g j\sigma \ \& \ \mathsf{d} = [\![u]\!]^g j\sigma\})\}$

c. COMPOSITION TERMS

- $[\![\lambda x.B]\!]^g(\mathsf{d}) = [\![B]\!]^{g[x/\mathsf{d}]}$, where $x \in Var_\alpha$ and $\mathsf{d} \in D_\alpha$, for any $\alpha \in Typ$
- $[\![A(B)]\!]^g = [\![A]\!]^g([\![B]\!]^g)$

d. DYNAMIC TERMS

- $\sigma[\![R_p\{t_1,...,t_n\}]\!]^g =$
  $\{i \in \sigma \mid \forall \mathsf{w} \in [\![p]\!]^g i\sigma : \langle \mathsf{w}, [\![t_1]\!]^g i\sigma, ..., [\![t_n]\!]^g i\sigma \rangle \in [\![R]\!]^g\}$
- $\sigma[\![t_1 R t_2]\!]^g = \{i \in \sigma \mid [\![t_1]\!]^g i\sigma R [\![t_2]\!]^g i\sigma\}$, where $R \in \{=, \in, \subseteq, \varnothing\}$
- $\sigma[\![\phi \wedge \psi]\!]^g = \sigma[\![\phi]\!]^g [\![\psi]\!]^g$
- $\sigma[\![\exists a]\!]^g = \{j \mid \exists i \in \sigma : i[a]j\}$
- $\sigma[\![\forall x(\phi, \psi)]\!]^g = \{i \in \sigma \mid \forall \mathsf{d} : i \in \sigma[\![\phi]\!]^{g[x/\mathsf{d}]} \Rightarrow i \in \sigma[\![\phi \wedge \psi]\!]^{g[x/\mathsf{d}]}\}$

The remaining definitions are almost identical to the definitions of USC. A dynamic term is INFORMATIVE if and only if it can eliminate worlds from the context set and it is INTERROGATIVE if and only if it can split the context set in such a way that among its candidates there is no greatest element. If a dynamic term is both informative and interrogative, it is a HYBRID.

(54) Def (VARIETIES OF DYNAMIC TERMS)

a. INFORMATIVE TERMS
$\phi \in Term_{[]}$ is INFORMATIVE if and only if $\exists \mathsf{w} \in D_\omega \ \exists \sigma \in D_{st} \ \exists i \in \sigma \ \forall g \ \forall j \in \sigma[\![\phi]\!]^g : \mathsf{w} \in \mathbf{proj}_5(\mathbf{val}(\mathsf{k}, i)) \ \& \ \mathsf{w} \notin \mathbf{proj}_5(\mathbf{val}(\mathsf{k}, j))$.

b. INTERROGATIVE TERMS
$\phi \in Term_{[]}$ is INTERROGATIVE if and only if $\exists \sigma \in D_{st} \ \forall g \ \neg \exists i \in \sigma[\![\phi]\!]^g \ \forall j \in \sigma[\![\phi]\!]^g : \mathbf{proj}_5(\mathbf{val}(\mathsf{k}, j)) \subseteq \mathbf{proj}_5(\mathbf{val}(\mathsf{k}, i))$.

c. HYBRID TERMS
$\phi \in Term_{[]}$ is a HYBRID if and only if ϕ is both informative and interrogative.

Finally, an informative dynamic term is DISCOURSE TRUE in a world and an information state if and only if the world survives in the context set after the information state is

updated with that term. If, for any an information state, a dynamic term always produces a context set that is contained in the context set produced by another dynamic term, the former term DISCOURSE ENTAILS the latter term.

(55)   Def (DISCOURSE TRUTH, DISCOURSE ENTAILMENT)

    a. DISCOURSE TRUTH
        If $\phi \in Term_{[]}$ is informative, then ϕ is DISCOURSE TRUE in a world $w \in D_\omega$ and an information state $\sigma \in D_{st}$, in symbols $\vDash_{\sigma,w} \phi$, if and only if $\exists j \in \sigma[\![\phi]\!]^g : w \in \mathbf{proj}_5(\mathbf{val}(k, j))$.

    b. DISCOURSE ENTAILMENT
        If $\phi, \psi \in Term_{[]}$ are informative, then ϕ DISCOURSE ENTAILS ψ in an information state $\sigma \in D_{st}$, in symbols $\phi\vDash_\sigma \psi$, if and only if $\forall w \in D_\omega : \vDash_{\sigma,w}\phi \Rightarrow \vDash_{\sigma,w}\psi$.

This concludes the presentation of CUSC.

5 Summary

In this chapter, I achieved several goals. I tried to argue that the potential not-at-issue status and the projection behavior of ARCs goes back to their syntactic status as ForcePs. I also introduced a small English fragment that provided compositional translations for the core examples of the dissertation. Doing so resulted in wider empirical coverage: we could explain why ARCs usually cannot attach to quantificational anchors and why quantifier binding into ARCs is generally ruled out. The compositional account was couched into an extended update logic which can interpret lambda terms.

Appendix: Some additional empirical properties of ARCs

So far, we have discussed the following empirical properties of English ARCs: truth-conditional status (see Chapter 2 and 3), information status (Chapter 2 and 3), temporal properties (Chapter 2), illocutionary independence (Chapter 2 and the current chapter), projection properties (Chapter 4 and 5), behavior with respect to discourse anaphora and

other order-dependent phenomena (Chapter 4), quantifier binding properties (Chapter 4 and the current chapter), semantic restrictions on anchors (the current chapter), right adjacency to the anchor (the current chapter), and intonational properties (the current chapter). In this Appendix, I list several additional properties that are not discussed elsewhere in the dissertation.

1. Non-nominal anchors. ARCs can take as anchors any major syntactic category, not just DPs (see Jackendoff 1977, McCawley 1988, Fabb 1990, Demirdache 1991, de Vries 2002, 2006, Del Gobbo 2003, Arnold 2007).

(56)   a.   [$_{CP/TP}$ The three wise men advised resignation], <u>which is good</u>.
        b.   The dog has [$_{VP}$ thrown up], <u>which the cat hasn't</u>.
        c.   She denied being [$_{AP}$ corrupt], <u>which she really was</u>.
        d.   He ran [$_{AdvP}$ fast], <u>which is how an athlete should run</u>.
        e.   John looked [$_{PP}$ behind himself], <u>which is where I stood</u>.
                                        (all examples from de Vries 2002, slightly modified)

2. No WCO effects. ARCs do not trigger Weak Crossover effects (see Safir 1986).

(57)   John$_i$, <u>who$_i$ his$_i$ wife loves t$_i$</u>, arrived early.   (Safir 1986)

3. No parasitic gaps. Parasitic gaps cannot appear in ARCs (see Safir 1986).

(58)   * John is a man who$_i$ Bill, <u>who knows __$_i$</u>, admires __$_i$.   (Safir 1986)

4. No NPI licensing. Negative polarity items cannot be licensed from outside the ARC (see Jackendoff 1977, Fabb 1990).

(59)   * I didn't see Bill, <u>who had had **any** drinks</u>.   (Jackendoff 1977)

5. "Disappearance" under ellipsis. ARCs are usually not "copied" when associated with the antecedent for ellipsis (see McCawley 1982, 1988, Arnold 2007, Schlenker 2009, ms).

(60) John sold Mary, <u>who had offered him $600 an ounce</u>, a pound of gold, but Arthur refused to [~~sell Mary a pound of gold~~].   (McCawley 1982)

6. Finiteness. ARCs cannot be non-finite (see McCawley 1988, Demirdache 1991, Arnold 2007).

(61) * This is Fred Horner, <u>to whom to send your receipts</u>.   (McCawley 1988)

Chapter 7

More parentheticals: Nominal appositives and slifting parentheticals

1 Introduction

Studies of parenthetical expressions typically either focus on one particular parenthetical construction or treat all kinds of parentheticals on a par. In this dissertation, I have followed the first route. The empirical focus so far has been on appositive relative clauses (ARCs) and the formal account reflected that. The current chapter looks beyond ARCs and investigates in some detail two related constructions: nominal appositives and slifting parentheticals. By doing so, it situates ARCs in the broader landscape of parenthetical expressions and gives us a sense of the diversity in semantic properties that exists. At the same time, the broader range of data uncovers the limitations and points at possible extensions of the proposed account.

2 Nominal appositives

The empirical bulk of this dissertation is devoted to the semantic properties of ARCs. Beyond ARCs, English has a variety of other appositive expressions, including NOMINAL

APPOSITIVES (NAs), SMALL CLAUSE APPOSITIVES (SCAs), and ADJECTIVAL APPOSI-
TIVES (AAs), as illustrated in (1).

(1) a. Lance, <u>who was about to retire</u>, admitted to doping.   (ARC)
     b. Jon Stewart, <u>my favorite comedian</u>, appeared on Larry King Live.   (NA)
     c. The representatives, <u>most of them women</u>, wore fancy attires.   (SCA)
     d. The guest, <u>visibly angry at the host</u>, left the studio.   (AA)

The current section is devoted to the second category, that of NAs. As we will see, NAs share core semantic properties with ARCs. There are also some differences between the two constructions, though. For example, NAs do not easily acquire at-issue status, even when occurring sentence-finally. In addition, certain uses of NAs seem semantically embeddable in environments in which ARCs project.

2.1 Information status

It is typically claimed in the literature that appositive content is not at-issue, i.e. secondary to the content expressed by the remaining part of the sentence (see Böer & Lycan 1976, Bach 1999, Chierchia & McConnell-Ginet 2000, Potts 2005, AnderBois et al. 2010, Murray 2010, Koev 2012, Schlenker ms). In Chapter 2, I argued that ARCs exhibit a richer pattern in that their information status depends on their syntactic position. In short, the claim was that sentence-medial ARCs are not at-issue while sentence-final ARCs can be at-issue. This sensitivity to linear position in ARCs is illustrated in (2)-(3) below, repeated from Chapter 2. Those examples use as a diagnostic the Direct Response Test, according to which only at-issue content can be directly targeted (e.g. targeted by responses prefixed by polarity particles such as 'yes', 'no', 'maybe', etc.).

(2) A: Edna, <u>who is a fearless leader</u>, started the descent.
     B: # No, she isn't. (She is a coward.)   (cf. Amaral et al. 2007)

(3) A: Jack invited Edna, <u>who is a fearless leader</u>.
     B: No, she isn't. (She is a coward.)

These data are compatible with the findings of Experiment 2 in Syrett et al. (ms).[1] The same study found no significant linear effects in corresponding sentences with NAs. For example, the two short discourses below seem equally infelicitous.

(4) A: Jon Stewart, a journalist, appeared on Larry King Live.
     B: # That's not true—Jon Stewart is a comedian.

(5) A: Bill's wife had dinner with Jon Stewart, a journalist.
     B: # That's not true-Jon Stewart is a comedian.

However, Syrett et al. did not control for linguistic factors that could make NAs more salient and tip the judgments about their information status. For example, one could ask whether NAs that are longer (6a), have an argument-predicate structure (6b), or include a finite component in a restrictive relative clause (6c) would be more likely to acquire at-issue status.

(6) a. Chick Corea, a very influential saxophone player, is a scientologist.
     b. Scranton, a city located in the southeast corner of Pennsylvania, has more than 50,000 inhabitants.
     c. Michio Kaku, a Japanese physicist who arrived in the U.S. in his thirties, is the author of several popular science books.

Given that linear restrictions exist for ARCs, it is also important to ask whether NAs are more likely to be at-issue when in addition to having the above characteristics they occur sentence-finally.

The judgments obtained do not paint a very clear picture. Even though sentence-finality might slightly influence the information status of these more complex NAs, the effect is not strong enough to allow such NAs to be naturally interpreted as at-issue content.

(7) a. A: Chick Corea, a very influential saxophone player, is a scientologist.
         B: ?? That's not true—he is a very influential piano player.

_____

[1]See Chapter 3 for a summary.

b. A: Mia recorded a tune with Chick Corea, <u>a very influential saxophone player</u>.

B: ? That's not true—he is a very influential piano player.

(8) a. A: Scranton, <u>a city located in the southeast corner of Pennsylvania</u>, has more than 50,000 inhabitants.

B: # That's not true—Scranton is located in the northeast corner of Pennsylvania.

b. A: His dad moved back to Scranton, <u>a city located in the southeast corner of Pennsylvania</u>.

B: ?? That's not true—Scranton is located in the northeast corner of Pennsylvania.

(9) a. A: Michio Kaku, <u>a Japanese physicist who arrived in the U.S. in his thirties</u>, is the author of several popular science books.

B: ?? That's not true—Michio Kaku was born in the U.S.

b. A: The department hired Michio Kaku, <u>a Japanese physicist who arrived in the U.S. in his thirties</u>.

B: ? That's not true—Michio Kaku was born in the U.S.

For the time being, I will tentatively assume that NAs cannot obtain at-issue status. Still, the fact that the judgments seem to improve when the NA occurs sentence-finally asks for further investigation. If the contrast between the (a)-sentences and the (b)-sentences above is found significant, it might be taken as an indication that the distinction between at-issue and not-at-issue status is *gradient* rather than categorical.[2]

Above, we used the Direct Response Test to detect the information status of NAs with different shapes and in different positions. Recall that in Chapter 2 we discussed other potential diagnostics for information status. According to one proposed diagnostic, the Answerability Test, only at-issue content can answer questions. I rejected this diagnostic by arguing that appositives can in general address questions. However, I also noted that when appositives are not at-issue, they provide less than perfect means of addressing questions.

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[2]See Schlenker (ms), where a similar claim is made about the information status of ARCs.

This was explained by the fact that, in such situations, the person asking the question cannot directly disagree with the answer provided by the addressee.

It is then expected that NAs, which we assumed as invariably not at-issue, can marginally well address questions. This prediction is borne out, as demonstrated by the following examples.

(10)　　a.　　A:　What does Jon Stewart do for a living and which show did he appear on last night?

　　　　　　　　B:　? Jon Stewart, <u>a comedian</u>, appeared on Larry King Live.

　　　　b.　　A:　Which famous guy did Bill's wife have dinner with and what is he doing for a living?

　　　　　　　　B:　? Bill's wife had dinner with Jon Stewart, <u>a comedian</u>.

(11)　　a.　　A:　What kind of instrument does Chick Corea play and what are his religious beliefs?

　　　　　　　　B:　? Chick Corea, <u>a very influential piano player</u>, is a scientologist.

　　　　b.　　A:　Which famous musician did Mia record a tune with and what instrument does he play?

　　　　　　　　B:　? Mia recorded a tune with Chick Corea, <u>a very influential piano player</u>.

We seem to find evidence that NAs, regardless of form and position, retain not-at-issue status.

2.2 Projection properties

In Chapter 4, I argued that ARCs project in the strongest possible sense, i.e. they cannot be interpreted in the scope of operators placed elsewhere in the sentence. This property is illustrated in (12), where the negation or attitude verb has no effect on the way the ARC is interpreted.

(12)　　a.　　The organizers did**n't** invite Dick, <u>who is an expert on Austin</u>.

　　　　b.　　I **doubt** that Dick, <u>who is an expert on Austin</u>, loves the Bonzo Dog Band.

The same facts hold for NAs, as (13) demonstrates.

(13)   a.   The crowd did**n't** greet Vladimir, <u>a hockey player</u>.

           b.   I **doubt** that Vladimir, <u>a hockey player</u>, arrived at the press conference.

In those sentences the appositive content is entailed despite the fact that its trigger, the NA, is in the syntactic scope of a higher entailment-canceling operator. The speaker cannot sincerely assert (13a) or (13b) if she does not believe that Vladimir is a hockey player but instead thinks that he is, say, a football player.

In Chapter 5, we discussed three types of claimed exceptions to appositive projection. The first type involved appositives whose perspective is shifted away from the speaker (see Thompson 1971, Amaral et al. 2007, Harris & Potts 2009). I argued that this perspective shift does not arise through semantic embedding under an operator but is due to anaphora to a secondary speech context. Secondary speech contexts are introduced by attitude predicates or through a pragmatic inference. If the appositive content is attributed to the agent of this secondary speech, it undergoes perspective shift.

NAs, similarly to ARCs, can undergo perspective shift.[3] In (14), the information that Sid's homework is a complete waste of time can be attributed to the speaker's roommate.

(14)   My brother Sid hates school.
          He says that he puts off his homework, <u>a complete waste of time</u>, to the last minute.
                                              (Harris & Potts 2009)

The same arguments that were given for ARCs can be used here in order to demonstrate that NAs as in (14) are *not* interpreted in the scope of the attitude verb. First, a negative embedding predicate has no effect on the interpretation of the NA. In (15), the unaffected appositive content (that the imaginary chip is a stunning piece of modern engineering) is attributed to the attitude holder (Joan).

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[3]It is also important to ask whether the possibility or ease of perspective shift is contingent upon the syntactic form of the appositive. For example, are NAs more likely or less likely to shift than ARCs are?

(15) *Joan is crazy. She's hallucinating that some geniuses in Silicon Valley have in-*
vented a new brain chip that's been installed in her left temporal lobe and permits
her to speak any of a number of languages she's never studied. She is now worried
about the battery life of her chip.

Joan **doubts**/does**n't** believe that her chip, a stunning piece of modern engineering,
will last for another year.

Also, NA shift is more difficult though still possible in the absence of an attitude predicate.

(16) My brother Sid hates school.
He puts off his homework, a complete waste of time, to the last minute.

(Harris & Potts 2009)

The second type of seeming exceptions to appositive projection involved the orientation
of appositives in downward-entailing intensional contexts. According to Sæbø (2011), in
such contexts NAs preferably receive a semantically embedded interpretation. For example,
the appositive content in (17) can be attributed to the attitude holder, i.e. projection is
seemingly blocked.

(18) Mary was **surprised** that John, a Laestadian, wears a necktie.

(Sæbø 2011, slightly modified)

On the basis of corresponding examples involving ARCs, I argued in Chapter 5 that the
appositive content in such examples actually projects. The story I told there about ARCs
can be repeated for the case of NAs. My claim is that the NAs in both (17) and (18) are
speaker-oriented. However, in (17) the appositive content is also attributed to the attitude
holder. This fact results from a pragmatic inference triggered by the particular rhetorical
relation that holds between the NA and the remaining sentence. In this example, the ap-
positive content serves as Explanation for the surprise. Hence, it is reasonable to assume
that the attitude holder believes it. In (18), the appositive content cannot assume such a
discourse role: if anything, the appositive content would clear the surprise away. Thus, in
this latter sentence the pragmatic inference is blocked and the NA is only speaker-oriented.

Finally, Schlenker (2009, ms) discusses various cases in which ARCs can be interpreted
in the scope of modal operators. In Chapter 5, I argued that such examples are special in

that they require eventive predicates and potentially contribute to the temporal structure of discourse. NAs can, in certain cases, be interpreted in the scope of modal operators too (see below). However, since NAs typically express stative predicates, such interpretations do not seem to hinge on their contribution to temporal structure.

So far, NAs and ARCs seem to exhibit similar projection behavior. However, there are claims in the literature that NAs project less strongly than ARCs: there are environments in which NAs can be semantically embedded while ARCs cannot (see Wang et al. 2006, Nouwen to appear). For example, the NAs in (19) can be interpretated under the scope of various modal operators while the ARCs in (20) cannot.

(19)   a.   **If** a professor, <u>a famous one (that is)</u>, publishes a book, he will make a lot of money.

         b.   John **believes** that a professor, <u>a quite famous one</u>, published a new book.

         c.   Mary **wants** to marry an Italian, <u>a rich one</u>.
                                                                      (all examples from Wang et al. 2006)

(20)   a.   **If** a professor, <u>who is famous</u>, publishes a book, he will make a lot of money.   (Nouwen to appear)

         b.   John **believes** that a professor, <u>who is quite famous</u>, published a new book.
                                                                      (Wang et al. 2006)

         c.   Mary **wants** to marry an Italian, <u>who is rich</u>.

Since the NAs in (19) have 'one' as their main noun, I will dub them 'ONE'-APPOSITIVES.

Hirschberg (2011) and Nouwen (to appear) call 'one'-appositives "restrictive", thus alluding to the distinction between restrictive and nonrestrictive relative clauses (I refer to the latter as ARCs). This characterization seems too weak. Although it is true that 'one'-appositives restrict the denotation of their anchor, they do so in a very specific way, i.e. by denoting a particular subset of it. Assuming that 'one' is anaphoric to the NP contained in the appositive anchor, we might take this fact as a first clue to the unexpected embedded interpretations of 'one'-appositives. 'One'-appositives illustrate a SUBSECTIVE USE of NAs, one that renders the anchor redundant because its semantic import is retained and

further specified in the following appositive. Thus, (19a)-(19c) seem equivalent in meaning to (21a)-(21c), respectively.

(21)   a.   If a famous professor publishes a book, he will make a lot of money.
        b.   John believes that a quite famous professor published a new book.
        c.   Mary wants to marry a rich Italian.

Appositives with subsective uses suggest that the speaker is correcting herself by asking the hearer to substitute the anchor with the following appositive.[4] If this analysis is on the right track, one might claim that what we called 'one'-appositives are not appositives at all but are rather instances of a related yet different construction. Below, I suggest that it not so much the form of the appositive as its semantic relationship to the anchor that facilitates such correction uses.

Subsective appositives show empirical properties that, in some intuitive sense, go back to their semantic relationship to the anchor. First, such appositives project as high as their anchor. In (22), the anchor and the 'one'-appositive are interpreted either both *de re* or both *de dicto*: mixed readings are not available.

(22)   Mary wants to marry an Italian, <u>a rich one</u>.   (Wang et al. 2006)

Second, subsective appositives share the information status of their anchors. Unlike regular NAs, the 'one'-appositive below is open to direct rejections, i.e. is at-issue.

(23)   A: John bought a car, <u>a red one</u>.
        B: That's not true. The car he bought was blue.

Note that subsective uses of appositives are not limited to 'one'-appositives. Other NAs can exemplify such uses too. For example, since red Ferraris are cars, the appositive in (24) can be interpreted in the scope of the intensional predicate.[5]

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[4]Nouwen (to appear) credits this idea to Katja Jasinskaja. However, he argues against it.

[5]This line of thought suggests that if a NA is *not* used subsectively, it cannot receive semantically embedded readings. This prediction appears to be borne out. For example, since pieces of stunning Italian

(24)   John wants to buy a car, <u>a red Ferrari</u>.

The fact that other types of NAs can be used subsectively suggests that it is not the *form* of the NA as much as the semantic relation to its anchor (characterized by the subset relation) that forces it to lose its not-at-issue and projective characteristics. 'One'-appositives require a subsective use by virtue of their syntactic form. Other NAs, however, can acquire the same status if they bear the right relationship to the anchor.

2.3   Two possible analyses

We have presented evidence that NAs cannot easily shift their information status to at-issue, even when occurring at the end of the sentence. We also saw that NAs robustly project, except in cases in which they are subsective with respect to their anchor.

There are at least two possible analyses of the invariably not-at-issue status of NAs. First, one might assume that NAs, just as ARCs, introduce proposals. Since NAs, unlike ARCs, are always locally attached to their anchors, the proposals they introduce get automatically accepted before the entire sentence is processed.[6] A logical representation for (25) that follows this idea is given in (25a).[7] Alternatively, one could take the fairly robust not-at-issue status of NAs as an indication that such constructions are grammatically specified to represent not-at-issue content. A logical representation for (25) that follows this second idea is provided in (25b). Here, the appositive content is relativized to $\mathbf{cs}(k)$ and thus narrows down the context set directly, i.e. by virtue of its interpretation.[8]

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engineering are not necessarily cars, a *de dicto* interpretation of the NA in (i) is not easily available.

(i)   John wants to buy a car, <u>a stunning piece of Italian engineering</u>.

[6]Recall the discourse constraints on deciding proposals specified in Chapter 2.

[7]As in previous chapters, the contribution of the appositive is underlined and the locus of the automatic acceptance of proposals is doubly underlined.

[8]This second alternative builds on the analysis in AnderBois et al. (2010), summarized in Chapter 2, Section 2.5. Although those authors do not distinguish between different types of appositives, ironically, their data only involves ARCs, i.e. exactly the appositive type that—due to its flexible at-issue/not-at-issue

(25)   The crowd greeted Vladimir, <u>a famous hockey player</u>.

   a. $\exists p \wedge \exists u \wedge crowd_p\{u\} \wedge \exists v \wedge v = vlad \wedge greet_p\{u,v\} \wedge$
        $\underline{\exists q \wedge famous.hockey.player_q\{v\} \wedge \mathbf{dc_{sp}}(k) \subseteq q \wedge \underline{\underline{\mathbf{cs}(k) \subseteq q}} \wedge}$
        $\mathbf{dc_{sp}}(k) \subseteq p$

   b. $\exists p \wedge \exists u \wedge crowd_p\{u\} \wedge \exists v \wedge v = vlad \wedge greet_p\{u,v\} \wedge$
        $\underline{famous.hockey.player_{\mathbf{cs}(k)}\{v\}} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

Instead of choosing between those two analyses of NAs, I would like to point out the strengths each of them has. The "direct update" analysis in (25b) captures in a simple and elegant way the semantic properties of NAs. At the same time, it introduces an additional mechanism to explaining not-at-issue content from the one independently motivated for ARCs. The "automatic acceptance" analysis in (25a) relies on specific assumptions about the attachment site of NAs. It also needs to provide support for the view that NAs, albeit non-clausal, can introduce own proposals. At the same time, this analysis offers a unified approach to information status that cuts across different appositive types and is thus preferable on theoretical grounds.

The fact that NAs project can be accounted for on either approach as follows. Since the proposition to which the lexical content of the NA is relativized is *different* (under both analyses) from the proposal introduced by the main clause, operators have no effect on the way the NA is interpreted. That is, the appositive content will necessarily project. This is illustrated in (26) for negation.[9]

(26)   The crowd did**n't** greet Vladimir, <u>a famous hockey player</u>.

   a. $\exists p \wedge \mathbf{not}_p^r(\exists u \wedge crowd_r\{u\} \wedge \exists v \wedge v = vlad \wedge$
        $\underline{\exists q \wedge famous.hockey.player_q\{v\} \wedge \mathbf{dc_{sp}}(k) \subseteq q \wedge \underline{\underline{\mathbf{cs}(k) \subseteq q}} \wedge}$
        $greet_r\{u,v\}) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

   b. $\exists p \wedge \mathbf{not}_p^r(\exists u \wedge crowd_r\{u\} \wedge \exists v \wedge v = vlad \wedge$
        $\underline{famous.hockey.player_{\mathbf{cs}(k)}\{v\}} \wedge greet_r\{u,v\}) \wedge \mathbf{dc_{sp}}(k) \subseteq p$

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status—seems least suitable for such an analysis.
   [9]The technical explanation in (26) closely follows the explanation given for similar sentences with ARCs in Chapter 4. The reader shall be reminded that $\mathbf{not}_p^r(\phi)$ abbreviates $\exists r \wedge \phi \wedge p \oslash \mathbf{max}(r)$, where $\oslash$ expresses set-theoretic non-overlap.

What about the readings obtained for subsective uses of NAs? Either of the two analyses would incorrectly predict that the appositive content projects. I exemplify this for the "direct update" analysis of (25b)-(26b). The logical representation for (27) in (27a) says that any Italian who Mary marries in her 'want'-worlds has a counterpart in the context set worlds who is a rich Italian. This sentence is thus predicted to imply that rich Italians exist. Instead, what seems to be needed is a translation as in (27b), which requires that the object of Mary's desires be a rich Italian in Mary's 'want'-worlds only.

(27) Mary **wants** to marry an Italian, <u>a rich one</u>.

    a. $\exists p \wedge \exists u \wedge u = mary \wedge \exists q \wedge \exists v \wedge italian_q\{v\} \wedge \underline{rich_{\mathbf{cs}(k)}\{v\} \wedge italian_{\mathbf{cs}(k)}\{v\}} \wedge$
        $marry_q\{u,v\} \wedge want_p\{u,q\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

    b. $\exists p \wedge \exists u \wedge u = mary \wedge \exists q \wedge \exists v \wedge italian_q\{v\} \wedge \underline{rich_q\{v\} \wedge italian_q\{v\}} \wedge$
        $marry_q\{u,v\} \wedge want_p\{u,q\} \wedge \mathbf{dc_{sp}}(k) \subseteq p$

Although it is intuitive to claim that this case of non-projecting NAs has something to do with their semantic relationship to their anchors, it is not clear how to account for the data without a stipulation. I leave the issue to further research.

3 Slifting parentheticals

This section is devoted to SLIFTING PARENTHETICALS. The main goal of it is not to offer a precise analysis of those constructions but rather to give a sense of the vast interpretational differences that exist between this type of parenthetical expressions and appositives.

Before starting, let us agree on the following terminology, illustrated on the sample sentence given below.[10]

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[10]My terminology primarily follows Ross (1973), who dubbed this phenomenon "slifting" for "sentence lifting". Also, some of the terminology comes from Grimshaw (2011). The labels used are not meant to imply a particular grammatical analysis of sentences with slifting parentheticals.

(28) The dean, <u>Susan said</u>, flirted with the secretary.
SLIFTING PARENTHETICAL: 'Susan said'
SLIFTING PREDICATE: 'said'
SLIFTED CLAUSE: 'The dean flirted with the secretary'
EMBEDDED COUNTERPART: 'Susan said that the dean flirted with the secretary'

Following the literature, I will refer to the underlined part in (28) as a SLIFTING PAREN-THETICAL. Grammatically, slifting parentheticals are clauses consisting of a subject and a SLIFTING PREDICATE that is missing a clausal complement. The logical argument of the slifting parenthetical will be called the SLIFTED CLAUSE. Since slifting parentheticals typically do not occur in subordinate clauses (see Section 3.3 below), the slifted clause is usually the entire sentence with the parenthetical removed from it. Given a sentence with a slifting parenthetical, a minimally different sentence in which the slifted clause occurs as the complement of the slifting parenthetical will be called the EMBEDDED COUNTERPART.

I view sentences with slifting parentheticals as grammatical devices to promote slifted clauses to at-issue status while lending to the slifting parenthetical the role of describing the grounds for uttering the slifted clause. Both of those ideas—that the slifted clause plays a central discourse role and that slifting parentheticals provide support for the slifted clause—are in agreement with much of the literature (see Urmson 1952, Hooper 1975, Asher 2000, Rooryck 2001, Jayez & Rossari 2004, Simons 2007, Scheffler 2009). In what follows, I will try to make these ideas a bit more precise and hint at how they could explain the various properties slifting sentences exhibit.

3.1 Assertion strength

It is typically observed that sentences with slifting parentheticals are associated with two propositions: one expressed by the slifted clause and another expressed by the embedded counterpart. In this section, I discuss the strength with which each of those propositions is implied.

A first observation is that while the content of the slifted clause can be doubted by the

speaker, the content of the embedded counterpart cannot.

(29)   a.   Jack, <u>Susan said</u>, is married to a nurse, (?) but I'm sure he isn't.

           b.   Jack, <u>Susan said</u>, is married to a nurse, # but I'm sure she didn't.

This is similar to minimally different examples that include embedded clauses, as shown below.[11]

(30)   a.   Susan said that Jack is married to a nurse, but I'm sure he isn't.

           b.   Susan said that Jack is married to a nurse, # but I'm sure she didn't.

It sometimes appears that the proposition expressed by the slifted clause cannot be denied, and thus must be strongly implied. This is claimed in Jackendoff (1972) on the basis of the following examples.

(31)   a.   John is a fink, Helen thinks (* but he isn't).

           b.   Myrtle will come tomorrow, Margaret believes (* but she actually came yesterday).   (both examples from Jackendoff 1972)

What such examples rather show is that the speaker cannot utter a sentence with a slifting parenthetical if she believes the slifted clause to be false. The speaker has to consider the slifted clause at least a possibility. Thus, although the slifted clause cannot be straightforwardly denied, it can be doubted. This was already demonstrated in (29a) and is further supported by the data in (32).

(32)   a.   John is a fink, <u>Helen thinks</u>, yet I doubt he is that bad.

           b.   Myrtle will come tomorrow, <u>Margaret believes</u>, although she might as well arrive today.

A second observation is that the strength of the implication of the slifted clause varies depending on the lexical semantics of the slifting predicate. While 'say' or 'think' give rise to a weakly implied slifted clause (see (29a) and (32a) above), the implication of slifted clauses associated with semi-factive slifting predicates like 'discover' is very strong.

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[11]I thank David Beaver for this observation.

(33)   # Jack, <u>Susan discovered</u>, is married to a nurse, but I'm sure he isn't.

Clearly, sentences with slifting parentheticals call for a very different analysis than the one proposed for sentences with appositives. While appositives do not weaken the main clause assertion, a slifting parenthetical determines the strength with which the slifted clause is implied.

3.2 Information status

Next, I discuss the information status of the propositions associated with the slifted sentence and the embedded counterpart. The data below demonstrates that both propositions can be directly rejected. This holds independently of the linear position of the slifting parenthetical.

(34)   A: Lady Gaga, <u>the MTV executive told us</u>, is a talented singer.
      B: No she isn't—she is always off pitch.
      B′: No he didn't—the MTV executive didn't say that.

(35)   A: Lady Gaga is a talented singer, <u>the MTV executive told us</u>.
      B: No she isn't—she is always off pitch.
      B′: (?) No he didn't—the MTV executive didn't say that.

Then, according to the Direct Response Test (see Chapter 2), both the slifted clause and the embedded counterpart are at-issue.[12]

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[12]Given the results of this test, it is somewhat surprising that the slifted clause but not the embedded counterpart can address questions (recall the Answerability Test, discussed in Chapter 2).

(i)   Q: Why is Fred not here?
      A: He has quit his job, <u>the secretary told me</u>.

(ii)   Q: What happened next?
      A: ?? Everybody at the party was a jerk, <u>she announced</u>.

A pragmatic explanation for why (ii) is degraded seems viable, though. The answerer is promoting the slifted clause to an at-issue status but for no good reason: the question is answered by the embedded counterpart.

This fact, when combined with the finding in the previous section that the slifted clause can be weakly implied, is theoretically significant because it points at a richer notion of asserted content. So far, we have associated at-issue content with asserted content, and it is widely accepted that asserted content cannot be denied without a contradiction. Slifted clauses buck this generalization: when weakly implied they can be denied, but are nevertheless at-issue.

3.3 Projection properties

It is very difficult to interpret slifting parentheticals in the scope of operators. If a slifting parenthetical is syntactically embedded under an operator, the result is typically an ungrammatical sentence. Consider (36a), and the way it contrasts with (36b).

(36) a. # John thinks that Mary, <u>the vocal coach said</u>, is a talented singer.
    b. John thinks that the vocal coach said that Mary is a talented singer.

(36a) also demonstrates that slifting parentheticals are necessarily interpreted as modifying the clause they are syntactically construed with. In particular, this sentence lacks a reading under which the parenthetical is construed with the main clause. That is, the reading 'The vocal coach said John thinks that Mary is a talented singer' is ruled out.

There are some exceptions to the generalization that slifting parentheticals cannot be semantically embedded. In both sentences in (37), the slifting parenthetical can be interpreted in the scope of an attitude verb.

(37) a. The zombie **muttered** that there wasn't enough mayo on his pastrami, <u>it seemed to him</u>.   ('mutter' > 'seem'; Ross 1973)
    b. Sarah **told** me that Will, <u>she thinks</u>, has strong qualifications.
                        ('tell' > 'think')

Interestingly, such examples are special in the following sense. The perspective under the verbs of saying in (37) is that of the attitude holder, and the slifting parentheticals recreates or "copies" that same perspective. If the parenthetical creates a perspective that is *different*

from that of the attitude holder, the embedded readings seem to vanish. In (38a), the entire sentence has to be interpreted in the scope of the parenthetical.[13] In (38b), an embedded reading of the parenthetical is almost impossible. Those judgments are on a par with that in (36a).

(38)   a.   The zombie muttered that there wasn't enough mayo on his pastrami, <u>it seemed to George</u>.   ('seem' > 'mutter')

             b.   ?? Sarah told me that Will, <u>his boss thinks</u>, has strong qualifications.

The projection behavior of slifting parentheticals is then very different from that of appositives. Appositives routinely occur in embedded syntactic environments but demonstrate a fairly robust projection behavior (see Chapter 4 and Section 2 of the current chapter). Slifting parentheticals can be syntactically embedded too (recall (37)). However, in such environments they can receive an interpretation only if they recreate the perspective of the embedding predicate.

3.4   The slifting predicate

There is one additional characteristic of slifting parentheticals that merits further mentioning. Jackendoff (1972), Ross (1973), Hooper (1975), and Scheffler (2009) notice that the slifting predicate needs to create a "positive", "affirmative" or, in more technical terms, an upward-entailing environment. If this requirement is not met, the sentence becomes ungrammatical, as (39a) demonstrates. Note that there is no such requirement on embedded counterparts (39b).

(39)   a.   * John is, <u>I don't think/I doubt</u>, a fink.   (Jackendoff 1972)

             b.   I don't think/I doubt John is a fink.

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[13]This is only possible because of the sentence-final position of the parenthetical, which thus can be syntactically construed with the embedded clause or the root sentence.

The same restriction holds for sentences expressing speech acts other than assertions, e.g. questions.

(40)   Which of your friends, <u>Mary asked/* Mary didn't ask</u>, should we invite?

It is quite clear that this is a *semantic* requirement, not a syntactic one. If a downward-entailing predicate in a slifting parenthetical is negated, the sentence becomes grammatical again.

(41)   a.   Mushrooms are great on diets, <u>I do**n't** doubt</u>.   (Ross 1973)
      b.   It's a long shot, <u>I do**n't** deny</u>.   (Hooper 1975)

    The generalization that slifting predicates create upward-entailing environments seems well supported. Yet, the data is richer than it might appear at first. "Citation" readings as in (42), where the argument gap in the slifting parenthetical is filled by a 'so' anaphor, and "negative concord" readings as in (43), where a negation in the slifted clause licenses a negation in the slifting parenthetical, allow slifting parentheticals to create downward-entailing environments.

(42)   Mushrooms are great on diets, <u>I don't think **so**</u>.

(43)   Matt does**n't** like phonology, <u>I do**n't** think</u>.

Though such cases could be ascribed to independent mechanisms, a more serious wrinkle with the above generalization is that predicates like 'possible', 'likely', or 'probable' are upward-entailing but disallow slifting.

(44)   a.   * He wants to hire a woman, <u>it's possible</u>.
      b.   * Many of the applicants are women, <u>it's likely</u>.
      c.   * Factivity is important in other constructions as well, <u>it's probable</u>.
                           (all examples from Hooper 1975)

Yet, one cannot claim that the problem with such deviant cases lies in the different syntactic category of the slifting predicate, i.e. an adjective vs. a verb. This is because upward-

entailing adjectives like 'sure' or 'clear' do allow slifting.[14]

(45)   Mary, I'm sure/it's clear, is a talented singer.   (Grimshaw 2011)

A possible explanation for the contrast between (44) and (45) could run as follows. Let us assume that adjectival predicates are generally allowed in slifting parentheticals. Even so, predicates like 'possible', 'likely', 'probable' as in (44) express a very low degree of speaker certainty and thus are too weak support for the truth of the slifted clause. In contrast, predicates like 'sure' and 'clear' as in (45) convey a much stronger certainty on part of the speaker and thus can vouch for the truth of the slifted clause.

It is important to point out that such polarity restrictions on predicates are peculiar to certain parenthetical expressions only.[15] For example, there is no such restriction on predicates in appositives. This is yet another point on which slifting parentheticals and appositives differ.

3.5   Towards an account

I have presented evidence for the following four properties of slifting sentences: (i) the implication strength of the slifted clause depends on the lexical meaning of the slifting predicate; (ii) both the slifted clause and the embedded counterpart are at-issue; (iii) when syntactically embedded under an operator, a slifting parenthetical can receive an interpretation only if it recreates the perspective of the embedding operator; (iv) slifting predicates necessarily create an upward-entailing environment. In this section, I sketch an account

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[14]Roger Schwarzschild (p.c.) notes that the examples in (44) improve if the parenthetical occurs sentence-medially, and the example in (45) gets worse if the parentheticals occur sentence-finally. I am not sure what might be causing this sensitivity to linear position.

[15]The requirement of upward-entailingness is not limited to slifting parentheticals. As Szabolcsi & Zwarts (1993) and Potts (2002) observe, 'as'-parentheticals have to obey it too.

(i)   a.   John is our hero, as you know.

        b.   * John is our hero, as no one knows.   (both examples from Szabolcsi & Zwarts 1993)

that could potentially explain all four properties of slifting sentences.

I will assume that slifted clauses are main clauses and slifting parentheticals are adjuncts.[16] The former claim is supported by the fact that slifted clauses have the grammatical attributes of main clauses. For example, slifted clauses need to be finite, they cannot be introduced by complementizers, and subject-auxiliary inversion is required in interrogative slifted clauses (see Grimshaw 2011). The latter claim is based on the observation that slifting parentheticals can occur in roughly the same positions as other adverbials.[17]

Semantically, slifting parentheticals have a crucial effect on the way the entire sentence is interpreted. A slifting sentence makes three semantic contributions. First, the embedded counterpart is flat-out asserted and has at-issue status. Second, the slifted clause is weakly asserted. This can be modeled as either assuming that it is asserted in a modalized form (see Jayez & Rossari 2004) or that it is asserted against a lowered epistemic threshold (see Davis et al. 2007, Scheffler 2009).[18] Either way, the strength of the asserted slifted clause needs to be made sensitive to the lexical semantics of the slifting predicate. Third, there is an implication to the effect that the embedded counterpart provides *grounds* for uttering the slifted clause.[19] This implication could explain the upward-entailingness requirement for slifting predicates: if upward-entailing/downward-entailing predicates are typically associated with a high/low degree of certainty, respectively, the upward-entailingness requirement follows.[20] Finally, what about the restriction that syntactically embedded slifting parentheticals need to recreate the perspective of the embedding predicate? This restriction

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[16]This assumption follows Jackendoff (1972) and Grimshaw (2011) and is contra Ross (1973) and Rooryck (2001).

[17]One prominent exception is that slifting parentheticals cannot appear at the beginning of the sentence.

[18]The latter idea that slifted clauses are asserted against a lowered epistemic threshold could more straightforwardly explain why the *unaltered* slifted clause proposition is at-issue, not a modalized form of it.

[19]In the literature, it is typically stated that the embedded counterpart serves an *evidential* function, i.e. specifies the source of the information given (see Urmson 1952, Asher 2000, Rooryck 2001, Jayez & Rossari 2004, Simons 2007, Scheffler 2009). However, it is hard to imagine how this idea could be extended to slifting parentheticals such as 'Bill promised', 'I wonder', or 'it is clear'. This is why I prefer to talk about "grounds" for the speech act associated with the slifted clause.

[20]This line of explanation seems to be suggested in Scheffler (2009).

might be due to the fact that the same clause cannot be simultaneously presented from two different perspectives. That is, if the slifting parenthetical is allowed to switch the perspective, the embedded clause would be presented from the point of view of the two different agents denoted by the matrix subject and the slifting parenthetical subject.

Putting those ideas together, the three implications associated with the slifting sentence in (28), repeated from above, are specified as p, q, and r (respectively).

(28) The dean, <u>Susan said</u>, flirted with the secretary.
  $p =$ 'Susan said that the dean flirted with the secretary'
  $q =$ 'It is very likely that p'
  $r =$ 'p provides grounds for uttering q'

Overall, slifting parentheticals are treated as adjuncts, similarly to appositives. However, they actively interact with the rest of the sentence. Unlike appositives, which do not weaken the assertion of the main clause, slifting parentheticals determine the assertion strength of the slifted clause. One could speculate that this is due to the fact that slifting parentheticals modify the entire slifted clause, and do not just provide additional information about one of its parts, as appositives do.

4 Summary

In this chapter, we looked into the interpretational properties of two further parenthetical expressions: NAs and slifting parentheticals. We discovered that NAs exhibit properties very similar to those of ARCs. Still, we found that sentence-final NAs cannot shift to at-issue status and that NAs lose their not-at-issue status and projection behavior if used subsectively. Despite those minor differences and pending further research, we suggested that NAs can be given an analysis similar to that developed for ARCs in previous chapters. Slifting parentheticals, on the other hand, seem to vastly differ in interpretational properties from appositives. They actively interact with the rest of the sentence and determine the strength with which the slifted clause is implied. It thus remains to be seen whether the

theoretical ideas developed in this dissertation can be employed to also shed light on those types of parenthetical constructions.

Bibliography

[1]   Altshuler, Daniel (2012). "Aspectual meaning meets discourse coherence: A look at the Russian imperfective." *Journal of Semantics* 29(1): 39–108.

[2]   Amaral, Patricia, Craige Roberts, & E. Allyn Smith (2007). "Review of *The Logic of Conventional Implicatures* by Chris Potts." *Linguistics and Philosophy* 30: 707–749.

[3]   Anand, Pranav (2006). *De De Se*. Ph.D. dissertation, MIT.

[4]   Anand, Pranav & Andrew Nevins (2004). "Shifty operators in changing contexts." *Semantics and Linguistic Theory* 14: 20–37.

[5]   AnderBois, Scott, Adrian Brasoveanu, & Robert Henderson (2010). "Crossing the appositive/at-issue meaning boundary." *Semantics and Linguistic Theory* 20: 328–346.

[6]   Aristar Dry, Helen (1983). "The movement of narrative time." *The Journal of Literary Semantics* 12(2): 19–54.

[7]   Arnold, Doug (2007). "Non-restrictive relatives are not orphans." *Journal of Linguistics* 43: 271–309.

[8]   Asher, Nicholas (2000). "Truth conditional discourse semantics for parentheticals." *Journal of Semantics* 17: 31–50.

[9]   Asher, Nicholas & Alex Lascarides (2003). *Logics of Conversation*. Cambridge: Cambridge University Press.

[10]   Bach, Kent (1999). "The myth of conventional implicature." *Linguistics and Philosophy* 22: 327–366.

[11]   Banfield, Ann (1982). *Unspeakable Sentences: Narration and Representation in the Language of Fiction*. Boston: Routledge & Kegan Paul.

[12]   Beaver, David I. (1997). "Presupposition." In Johan van Bethem & Alice ter Meulen (eds.). *The Handbook of Logic and Language*, 939–1008. Cambridge, Massachu- setts: MIT Press.

[13] Beaver, David I. (2001). *Presupposition and Assertion in Dynamic Semantics*. Stanford: CSLI Publications.

[14] Berckmans, Paul (1994). "Demonstration, apposition and direct reference." *Communication and Cognition* 27(4): 499–512.

[15] Barwise, Jon (1987). "Noun phrases, generalized quantifiers and anaphora." In Peter Gärdenfors (ed.). *Generalized Quantifiers*, 1–29. Dordrecht: Kluwer.

[16] Bittner, Maria (2008). "Aspectual universals of temporal anaphora." In Susan Rothstein (ed.). *Theoretical and Crosslinguistic Approaches to the Semantics of Aspect*, 349–385. Amsterdam: John Benjamins.

[17] Bittner, Maria (2011). "Time and modality without tenses or modals." In Renate Musan & Monika Rathert (eds.). *Tense across Languages*, 147–188. Tbingen: Niemeyer.

[18] Bittner, Maria (2012). "Perspectival discourse referents for indexicals." *Semantics of Under-Represented Languages in the Americas* 7.

[19] Blutner, Reinhard (2000). "Some aspects of optimality in natural language interpretation." *Journal of Semantics* 17: 189–216.

[20] Böer, Steven & William Lycan (1976). *The Myth of Semantic Presupposition*. Bloomington: Indiana University Linguistics Club.

[21] Brasoveanu, Adrian (2010). "Structured anaphora to quantifier domains." *Information & Computation* 208 (2010): 450–473.

[22] Büring, Daniel (2003). "On d-trees, beans, and b-accents." *Linguistics and Philosophy* 26: 511–545.

[23] Carden, Guy (1982). "Backwards anaphora in discourse context." *Linguistics* 18: 361–387.

[24] Chierchia, Gennaro (1995). *Dynamics of Meaning*. Chicago: University of Chicago Press.

[25] Chierchia, Gennaro & Sally McConnell-Ginet (2000). *Meaning and Grammar: An Introduction to Semantics*. Cambridge, Massachusetts: MIT Press, Second edition.

[26] Cinque, Guglielmo (1999). *Adverbs and Functional Heads: A Crosslinguistic Perspective*. New York/Oxford: Oxford University Press.

[27] Citko, Barbara (2008). "An argument against assimilating appositive relatives to coordinate structures." *Linguistic Inquiry* 39(4): 633–655.

[28] Clements, George N. (1975). "The logophoric pronoun in Ewe: Its role in discourse." *Journal of West African Languages* 10(2): 141–177.

[29] Condoravdi, Cleo & Jean Mark Gawron (1996). "The context dependency of implicit arguments." In Makoto Kanazawa, Christopher Piñón, & Henriëtte de Swart (eds.). *Quantifiers, Deduction, and Context*, 1–32. Stanford: CSLI.

[30] Cornilescu, Alexandra (1981). "Non-restrictive relative clauses, An essay in semantic description." *Revue Roumaine de Linguistique* 26: 41–67.

[31] Davies, Mark (2008–). *The Corpus of Contemporary American English: 450 million words, 1990–present*. Available online at http://corpus.byu.edu/coca/.

[32] Davis, Christopher, Christopher Potts, & Margaret Speas (2007). "The pragmatic values of evidential sentences." *Semantics and Linguistic Theory* 17: 71–88.

[33] Dehé, Nicole (2009). "Clausal parentheticals, intonational phrasing, and prosodic theory." *Journal of Linguistics* 45: 569–615.

[34] Del Gobbo, Francesca (2003). *Appositives at the Interface*. Ph.D. dissertation, UC Irvine.

[35] Del Gobbo, Francesca (2007). "On the syntax and semantics of appositive relative clauses." In Nicole Dehé & Yordanka Kavalova (eds.). *Parentheticals*, 173–201. Amsterdam/Philadelphia: John Benjamins.

[36] Demirdache, Hamida Khadiga (1991). *Resumptive Chains in Restrictive Relatives, Appositives and Dislocation Structures*. Ph.D. dissertation, MIT.

[37] Depraetere, Ilse (1996). "Foregrounding in English relative clauses." *Linguistics* 34: 699–731.

[38] Dever, Josh (2001). "Complex demonstratives." *Linguistics and Philosophy* 24: 271–330.

[39] Doron, Edit (1991). "Point of view as a factor of content." *Semantics and Linguistic Theory* 1: 51–64.

[40] Dowty, David (1986). "The effects of aspectual class on the temporal structure of discourse: Semantics or pragmatics?" *Linguistics and Philosophy* 9: 37–61.

[41] Dowty, David R., Robert E. Wall, & Stanley Peters (1981). *Introduction to Montague Semantics*. Dordrecht: Reidel.

[42] Dry, Helen (1981). "Sentence aspect and the movement of narrative time." *Text* 1(3): 233–240.

[43] Emonds, Joseph (1979). "Appositive relatives have no properties." *Linguistic Inquiry* 10(2): 211–243.

[44] Elbourne, Paul (2005). *Situations and Individuals*. Cambridge, Massachusetts: MIT Press.

[45] Fabb, Nigel (1990). "The difference between English restrictive and non-restrictive relative clauses." *Journal of Linguistics* 26: 57–78.

[46] Faller, Martina (2002). *Semantics and Pragmatics of Evidentials in Cuzco Quechua*. Ph.D. dissertation, Stanford University.

[47] Farkas, Donka & Kim B. Bruce (2010). "On reacting to assertions and polar questions." *Journal of Semantics* 27: 81–118.

[48] Farkas, Donka F. & Floris Roelofsen (ms). "Polar initiatives and polarity particle responses in an inquisitive discourse model." Available online at https://sites.google.com/site/inquisitivesemantics/documents/polar-initiatives-july15.pdf?attredirects=0.

[49] Frank, Anette & Hans Kamp (1997). "On context dependence in modal constructions." *Semantics and Linguistic Theory* 7: 151–168.

[50] Frege, Gottlob (1892/1980). "On sense and reference." In Peter Geach & Max Black (eds. and trans.). *Translations from the Philosophical Writings of Gottlob Frege*. Oxford: Blackwell, Third edition.

[51] von Fintel, Kai (2004). "Would you believe it? The king of France is back! (Presuppositions and truth-value intuitions)." In Anne Bezuidenhout & Marga Reimer (eds.). *Descriptions and Beyond*, 315–341. Oxford: Oxford University Press.

[52] von Fintel, Kai & Anthony Gillies (2007). "An opinionated guide to epistemic modality." In Tamar Szabó Gendler & John Hawthorne (eds). *Oxford Studies in Epistemology* 2, 32–62. Oxford: Oxford University Press.

[53] Gazdar, Gerald (1979). *Pragmatics: Implicature, Presupposition, and Logical Form*. London: Academic Press.

[54] Geurts, Bart (1999). *Presuppositions and Pronouns*. Amsterdam: Elsevier.

[55] Ginzburg, Jonathan (1996). "Interrogatives: Questions, facts, and dialogue." In Shalom Lappin (ed.). *The Handbook of Contemporary Semantic Theory*, 385–422. Oxford: Blackwell.

[56] Grice, Paul (1975). "Logic and conversation." In Paul Grice (1989). *Studies in the Way of Words*, 22–40. Cambridge, Massachusetts: Harvard University Press.

[57] Grimshaw, Jane (2011). "The place of slifting in the English complement system." *Generative Initiatives in Syntactic Theory* 3, Handout. Available online at https://docs.google.com/file/d/0B1DtOqeuIhA3Nzg2NDNmNzEtMmFkZC00N2VjLThjYmUtNmM0MTA1MzUxMWNj/edit?hl=en_US.

[58] Glasbey, Sheila R. (1993). "Distinguishing between events and times: Some evidence from the semantics of then." *Natural Language Semantics* 1(3): 285–312.

[59] Groenendijk, Jeroen & Floris Roelofsen (2009). "Inquisitive semantics and pragmatics." *Stanford Workshop on Language, Communication and Rational Agency*. Available online at http://www.google.de/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&ved=0CDEQFjAA&url=http%3A%2F%2Fdare.uva.nl%2Fdocument%2F131043&ei=LHMgUoK_NInUswa3uYGoDw&usg=AFQjCNGMh563fK9tOyOdlFD1FWDpTpNqhA.

[60] Groenendijk, Jeroen & Martin Stokhof (1984). "On the semantics of questions and the pragmatics of answers." In Jeroen Groenendijk & Martin Stokhof. *Studies on the Semantics of Questions and the Pragmatics of Answers*. Ph.D. dissertation, University of Amsterdam.

[61] Groenendijk, Jeroen & Martin Stokhof (1991). "Dynamic predicate logic." *Linguistics and Philosophy* 14(1): 39–100.

[62] Groenendijk, Jeroen, Martin Stokhof, & Frank Veltman (1996). "Coreference and modality." In Shalom Lappin (ed.). *Handbook of Contemporary Semantic Theory*, 179–213. Oxford: Blackwell.

[63] Gunlogson, Christine (2001). *True to Form: Rising and Falling Declaratives as Questions in English*. Ph.D. dissertation, UC Santa Cruz.

[64] Hamblin, Charles (1973). "Questions in Montague English." *Foundations of Language* 10: 41–53.

[65] Harris, Jesse & Christopher Potts (2009). "Perspective-shifting with appositives and expressives." *Linguistics and Philosophy* 32: 523–552.

[66] Heim, Irene (1982). *The Semantics of Definite and Indefinite Noun Phrases*. Ph.D. dissertation, MIT.

[67] Heim, Irene (1983). "On the projection problem for presuppositions." *West Coast Conference on Formal Linguistics* 1: 114–125.

[68] Heim, Irene (1990). "E-type pronouns and donkey anaphora." *Linguistics and Philosophy* 13: 137–177.

[69] Heim, Irene (1992). "Presupposition projection and the semantics of attitude verbs." *Journal of Semantics* 9: 183–221.

[70] Hinrichs, Erhard (1986). "Temporal anaphora in discourses of English." *Linguistics and Philosophy* 9: 63–82.

[71] Hintikka, Jaakko (1969). "Semantics for propositional attitudes." In J.W. Davis, D.J. Hockney, & W.K. Wilson (eds.). *Philosophical Logic*, 21–45. Dordrecht: Reidel.

[72] Hirschberg, Tim (2011). *Semantisch-pragmatische Eigenschaften von nicht-restrik- tiven Relativsätzen*. M.A. thesis, Goethe University Frankfurt.

[73] Holler, Anke (2005). *Empirische und theoretische Aspekte der Grammatik weiterfhrende Relativstze*. Ph.D. dissertation, University of Tübingen.

[74] Hooper, Joan B. (1975). "On assertive predicates." In John Kimball (ed.). *Syntax and Semantics* 4, 91–124. New York: Academic Press.

[75] Hopper, Paul J. (1979). "Aspect and foregrounding in discourse." In Talmy Givón (ed.). *Syntax and Semantics* 12: *Discourse and Syntax*, 213–241. New York: Academic Press.

[76] Izvorski, Roumyana (1997). "The present perfect as an epistemic modal." *Semantics and Linguistic Theory* 7: 222–239.

[77] Jackendoff, Ray (1972). *Semantic Interpretation in Generative Grammar*. Cambridge, Massachusetts: MIT Press.

[78] Jackendoff, Ray (1977). *X-bar Theory: A Theory of Phrase Structure*. Cambridge, Massachusetts: MIT Press.

[79] Jayez, Jacques & Corinne Rossari (2004). "Parentheticals as conventional implicatures." In Francis Corblin & Henritte de Swart (eds.). *Handbook of French Semantics*, 211–229. Stanford: CSLI.

[80] Jespersen, Otto (1924). *The Philosophy of Grammar*. London: George Allen & Unwin.

[81] Jespersen, Otto (1964). *A Modern English Grammar on Historical Principles* III. London: Allen & Unwin.

[82] Kamp, Hans (1979). "Events, instants and temporal reference." In Rainer Buerle, Urs Egli, & Arnim von Stechow (eds.). *Semantics from Different Points of View*, 131–175. Berlin: Springer.

[83] Kamp, Hans, Josef van Genabith, & Uwe Reyle (2011). "Discourse representation theory." *Handbook of Philosophical Logic* 15: 125–394.

[84] Kamp, Hans & Uwe Reyle (1993). *From Discourse to Logic: Introduction to Modeltheoretic Semantics of Natural Language, Formal Logic and Discourse Representation Theory*. Dordrecht: Kluwer.

[85] Kamp, Hans & Christian Rohrer (1983). "Tense in text." In Rainer Bäuerle, Cristoph Schwartze, & Arnim von Stechow (eds.). *Meaning, Use and Interpretation in Language*, 250–269. Berlin: de Gruyter.

[86] Kaplan, David (1989). 'Demonstratives." In Joseph Almog, John Perry, & Howard Wettstein (eds.). *Themes from Kaplan*, 481–563. Oxford: Oxford University Press.

[87] Karttunen, Lauri (1973). "Presupposition of compound sentences." *Linguistic Inquiry* 4(2): 169–193.

[88] Karttunen, Lauri (1974). "Presupposition and linguistic context." *Theoretical Linguistics* 1: 181–194.

[89] Karttunen, Lauri (1976). "Discourse referents." In McCawley, James D. (ed.). *Syntax and Semantics* 7: *Notes from the Linguistic Underground*, 363–385. New York: Academic Press.

[90] Karttunen, Lauri (1977). "Syntax and semantics of questions." *Linguistics and Philosophy* 1: 3–44.

[91] Karttunen, Lauri & Stanley Peters (1979). "Conventional implicature." In Choon-Kyu Oh & David A. Dinneen (eds.). *Syntax and Semantics* 11: *Presupposition*. London: Academic Press, 1–56.

[92] Kayne, Richard S. (1994). *The Antisymmetry of Syntax*. Cambridge, Massachusetts: MIT Press.

[93] Keenan, Edward L. (1971). "Two kinds of presupposition in natural language." In Charles J. Fillmore & D. Terence Langendoen (eds.). *Studies in Linguistic Semantics*, 45–54. New York: Holt, Rinehart, & Winston.

[94] Kehler, Andrew (2002). *Coherence, Reference, and the Theory of Grammar*. Stanford: CSLI.

[95] Kempson, Ruth (2003). "Nonrestrictive relatives and growth of Logical Form." *West Coast Conference on Formal Linguistics* 22: 301–314.

[96] Keshet, Ezra (2010). "Situation economy." *Natural Language Semantics* 18: 385–434.

[97] Klein, Wolfgang (1994). *Time in Language*. London/New York: Routledge.

[98] Koev, Todor (2011). "Evidentiality and temporal distance learning." *Semantics and Linguistic Theory* 21: 115–134.

[99] Koev, Todor (2012). "On the information status of appositive relative clauses." *Amsterdam Colloquium* 18: 401–410. Berlin: Springer.

[100] Koev, Todor (to appear). "Two puzzles about appositives: Projection and perspective shift." *Sinn und Bedeutung* 18.

[101] Kratzer, Angelika (1991). "Modality." In: Arnim von Stechow & Dieter Wunderlich (eds.). *Semantik: Ein internationales Handbuch der zeitgenössischen Forschung*, 639–650. Berlin/New York: de Gruyter.

[102] Kratzer, Angelika (1999). "Beyond Ouch and Oops. How descriptive and expressive meaning interact." *Cornell Conference on Theories of Context Dependency*, March, 1999.

[103] Krifka, Manfred (2001). "Quantifying into question acts." *Natural Language Semantics* 9: 1–40.

[104]   Krifka, Manfred (to appear). "Negated polarity questions as denegations of asser-
tions." In Ferenc Kiefer & Chungmin Lee (eds.). *Contrastiveness and Scalar Im-
plicatures*. Berlin: Springer.

[105]   Lascarides, Alex & Nicholas Asher (1993). "Temporal interpretation, discourse
relations and common sense entailment." *Linguistics and Philosophy* 16: 437–493.

[106]   Lewis, David (1973). *Counterfactuals*. Oxford: Blackwell.

[107]   Loock, Rudy (2007). "Appositive relative clauses and their functions in discourse."
Journal of Pragmatics 39: 336–362.

[108]   Lyons, John (1977). *Semantics* 2. Cambridge: Cambridge University Press.

[109]   Maier, Emar (ms). "Quotation and unquotation in free indirect dis-
course." Available online at http://dl.dropbox.com/u/109312/pub/
emar-maier-2012-free-indirect-discourse-draft.pdf.

[110]   Matthewson, Lisa, Henry Davis, & Hotze Rullmann (2007). "Evidentials as epis-
temic modals: Evidence from St'át'imcets." *Linguistic Variation Yearbook* 7: 201–
254.

[111]   May, Robert (1977). *The Grammar of Quantification*. Ph.D. dissertation, MIT.

[112]   May, Robert (1985). *Logical Form: Its Structure and Derivation*. Cambridge, Mas-
sachusetts: MIT Press.

[113]   McCawley, James (1982). "Parentheticals and discontinuous constituent structure."
Linguistic Inquiry 13(1): 91–106.

[114]   McCawley, James (1988). *The Syntactic Phenomena of English* 2. Chicago: Uni-
versity of Chicago Press.

[115]   Moens, Marc & Mark Steedman (1988). "Temporal ontology and temporal refer-
ence." *Computational Linguistics* 14(2): 15–28.

[116]   Montague, Richard (1973). "The proper treatment of quantification in ordinary En-
glish." In Jaakko Hintikka, Julius Moravcsik, & Patrick Suppes (eds.). *Approaches
to Natural Language*, 221–242. Dordrecht: Kluwer.

[117]   Murray, Sarah (2010). *Evidentiality and the Structure of Speech Acts*. Ph.D. disser-
tation, Rutgers University.

[118]   Muskens, Reinhard (1995). "Tense and the logic of change." In Urs Egli, Peter E.
Pause, Christoph Schwarze, Arnim von Stechow, & Götz Wienold (eds.). *Lexical
Knowledge in the Organization of Language*, 147–183. Amsterdam: Benjamins.

[119]   Muskens, Reinhard (1996). "Combining Montague semantics and discourse repre-
sentation." *Linguistics and Philosophy* 19:143–186.

[120]   Nespor, Marina & Irene Vogel (1986). *Prosodic Phology*. Dordrecht: Foris.

[121] Nouwen, Rick (2007). "On appositives and dynamic binding." *Research on Language and Computation* 5(1): 87–102.

[122] Nouwen, Rick (to appear). "A note on the projection of nominal appositives." In Eric McCready, Katsuhiko Yabushita, & Kei Yoshimoto (eds). *Formal Approaches to Semantics and Pragmatics: Japanese and Beyond*. Berlin: Springer.

[123] Papafragou, Anna (2000). *Modality: Issues in the Semantics-Pragmatics Interface*. Amsterdam: Elsevier.

[124] Papafragou, Anna (2006). "Epistemic modality and truth conditions." *Lingua* 116: 1688–1702.

[125] Parsons, Terence (2002). "Eventualities and narrative progression." *Linguistics and Philosophy* 25: 681–699.

[126] Partee, Barbara (1984). 'Nominal and temporal anaphora." *Linguistics and Philosophy* 7: 243–286.

[127] Partee, Barbara (1989). "Binding implicit variables in quantified contexts." *Chicago Linguistics Society* 25: 342–356.

[128] Pearson, Hazel (2010). "A modification of the "Hey, Wait a Minute" test." *Snippets* 22: 7–8.

[129] Percus, Orin (2000). "Constraints on some other variables in syntax." *Natural Language Semantics* 8: 173–229.

[130] Peterson, Peter (2004). "Non-restrictive relatives and other non-syntagmatic relations in a Lexical-Functional framework." *Lexical Functional Grammar* 2004. Stanford: CSLI.

[131] Platzack, Christer (1997). "A representational account of restric- tive and non-restrictive relatives: The case of Swedish." *Working Papers in Scandinavian Syntax* 59: 65–95.

[132] Potts, Christopher (2002). "The lexical semantics of parenthetical-*as* and appositive-*which*." *Syntax* 5(1): 55–88.

[133] Potts, Christopher (2005). *The Logic of Conventional Implicatures*. Oxford: Oxford University Press.

[134] Potts, Christopher (2007). "The expressive dimension." *Theoretical Linguistics* 33-2: 165–198.

[135] Prince, Alan & Paul Smolensky (1993/2004). *Optimality Theory: Constraint Interaction in Generative Grammar*. Oxford: Blackwell.

[136] Reese, Brian (2007). *Bias in Questions*. Ph.D. dissertation, University of Texas at Austin.

[137] Reese, Brian & Nicholas Asher (2007). "Prosody and interpretation of tag questions." *Sinn und Bedeutung* 11: 448–462.

[138] Reichenbach, Hans (1947). "The tenses of verbs." In *The Elements of Symbolic Logic*, 287–298. New York: Macmillan Co.

[139] Reinhart, Tanya (1983). *Anaphora and Semantic Interpretation*. London: Croom Helm.

[140] Reinhart, Tanya (1984). "Principles of gestalt perception in the temporal organization of narrative texts." *Linguistics* 22: 779–809.

[141] Rice, Keren (1986). "Some remarks on direct and indirect discourse in Slave (Northern Athapaskan)." In Florian Coulmas (ed.). *Direct and Indirect Speech*, 47–76. Berlin: de Gruyter.

[142] Rizzi, Luigi (1997). "The fine structure of the left periphery." In Liliane Haegeman (ed.). *Elements of Grammar*, 281–337. Dordrecht: Kluwer.

[143] Rizzi, Luigi (2004). "Locality and left periphery." In Adriana Belletti (ed.). *Structures and Beyond. The Cartographic Syntactic Structure* 3, 223–251. New York: Oxford University Press.

[144] Roberts, Craige (1989). "Modal subordination and pronominal anaphora in discourse." *Linguistics and Philosophy* 12: 683–721.

[145] Roberts, Craige (1996). "Information structure: Towards an integrated formal theory of pragmatics." In Jae-Hak Yoon & Andreas Kathol (eds.). *Ohio State University Working Papers in Linguistics* 49: *Papers in Semantics*: 91–136.

[146] Roberts, Craige, Mandy Simons, David Beaver, & Judith Tonhauser (2009). "Presupposition, conventional implicature, and beyond: A uniform account of projection." *Workshop on New Directions in the Theory of Presupposition*, ESSLLI 2009.

[147] Rodman, Robert (1976). "Scope phenomenon, movement transformations and relative clauses." In Barbara Partee (ed.). *Montague Grammar*, 165–176. New York: Academic Press.

[148] Rooryck, Johan (2001). "Evidentiality I." *Glot International* 5(4): 25–133.

[149] Ross, John R. (1967). *Constraints on Variables in Syntax*. Ph.D. dissertation, MIT.

[150] Ross, John R. (1973). "Slifting." *The Formal Analysis of Natural Language* 1: 133–169. The Hague: Mouton.

[151] Rossdeutscher, Antje (2005). " 'On-line'-inferences in the semantics of dann and then." *Sinn und Bedeutung* 9: 325–339.

[152] Sæbø, Kjell J. (2011). "Appositives in modal contexts." *Sinn und Bedeutung* 15: 79–100.

[153]   Safir, Ken (1986). "Relative clauses in a theory of binding and levels." *Linguistic Inquiry* 17(4): 663–698.

[154]   van der Sandt, Rob (1992). "Presupposition projection as anaphora resolution." *Journal of Semantics* 9: 333–377.

[155]   Sauerland, Uli & Mathias Schenner (2007). "Embedded evidentials in Bulgarian." *Sinn und Bedeutung* 11: 495–509.

[156]   Scheffler, Tatjana (2009). "Evidentiality and German attitude verbs." *Penn Linguistics Colloquium* 32: 183–192.

[157]   Schlenker, Philippe (2003). "A plea for monsters." *Linguistics and Philosophy* 26: 29–120.

[158]   Schlenker, Philippe (2004). "Context of thought and context of utterance: A note on free indirect discourse and the historical present." *Mind & Language* 19(3): 279–304.

[159]   Schlenker, Philippe (2007). "Anti-dynamics: Presupposition projection without dynamic semantics." *Journal of Logic, Language and Information* 16: 325–356.

[160]   Schlenker, Philippe (2009). "Local contexts." *Semantics & Pragmatics* 2: 1–78.

[161]   Schlenker, Philippe (2009). "Supplements within a unidimensional semantics." Amsterdam Colloquium: 62–70. Berlin/Heidelberg: Springer.

[162]   Schlenker, Philippe (ms). "Supplements without bidimensionalism." Available online at http://www.semanticsarchive.net/Archive/jgwMjNmM/Supplements_without_Bidimensionalism.pdf.

[163]   Schiffrin, Deborah (1992). "Anaphoric then: Aspectual, textual, and epistemic meaning." *Linguistics* 30(4): 753–792.

[164]   Schwarz, Florian (2012). "Situation pronouns in Determiner Phrases." *Natural Language Semantics* 20: 431–475.

[165]   Selkirk, Lisa (2005). "Comments on intonational phrasing in English." In Sónia Frota, Marina C. Vigário, & Maria J. Freitas (eds.). *Prosodies: Selected papers from the Phonetics and Phonology in Iberia Conference*, 11–58. New York: de Gruyter.

[166]   Sells, Peter (1985). "Restrictive and non-restrictive modification." CSLI-85-28.

[167]   Shanon, Benny (1976). "On the two kinds of presupposition in natural language." *Foundations of Language* 14(2): 247–249.

[168]   Sharvit, Yael (2004). "Free indirect discourse and 'de re' pronouns." *Semantics and Linguistic Theory* 14: 305–322.

[169] Sharvit, Yael (2008). "The puzzle of free indirect discourse." *Linguistics and Philosophy* 31: 353–395.

[170] Simons, Mandy (2007). "Observations on embedding verbs, evidentiality, and presupposition." *Lingua* 117: 1034–1056.

[171] Simons, Mandy, Judith Tonhauser, David Beaver, & Craige Roberts (2010). "What projects and why." *Semantics and Linguistic Theory* 20: 309–327.

[172] Smirnova, Anastasia (2012). "Evidentiality in Bulgarian: Temporality, epistemic modality, and information source." *Journal of Semantics*.

[173] Smith, Carlota S. (1964). "Determiners and relative clauses in a Generative Grammar of English." *Language* 40(1): 37–52.

[174] Speas, Margaret (1999). "Person and point of view in Navajo direct discourse complements." *University of Massachusetts Occasional Papers in Linguistics* 24: 259–273.

[175] Spejewski, Beverly & Greg Carlson (1993). "Modification of event relations." *North Eastern Linguistics Society* 23: 479–493.

[176] Stalnaker, Robert (1973). "Presuppositions." *Journal of Philosophical Logic* 2(4): 447–457.

[177] Stalnaker, Robert (1974). "Pragmatic presuppositions." In Milton K. Munitz, & Peter Unger (eds.). *Semantics and Philosophy*, 197–213. New York: New York University Press.

[178] Stalnaker, Robert (1978). "Assertion." In Peter Cole (ed.). *Syntax and Semantics* 9: *Pragmatics*, 315–332. New York: Academic Press.

[179] Stalnaker, Robert (1999). "On the representation of context." In *Content and Context: Essays on Intentionality in Speech and Thought*, 96–113. Oxford: Oxford University Press.

[180] Stalnaker, Robert (2002). "Common ground." *Linguistics and Philosophy* 25: 701–721.

[181] Stenius, Erik (1967). "Mood and language-game." *Synthese* 17: 254–274.

[182] Stone, Matthew (1997). "The anaphoric parallel between modality and tense." IRCS Report 97-06.

[183] Stone, Matthew (1999). "Reference to possible worlds." RuCCS TR 49.

[184] Stone, Matthew & Daniel Hardt (1999). "Dynamic discourse referents for tense and modals." In Harry C. Bunt & Reinhard Muskens (eds.). *Computing Meaning* I, 301–319. Dordrecht: Kluwer.

[185] Strawson, Peter F. (1950). "On referring." *Mind* 59(235): 320–344.

[186] Syrett, Kristen, Todor Koev, Nicholas Angelides, & Maxwell Kramer (ms). "Experimental evidence for the truth conditional contribution and shifting information status of appositives." Available online at http://ruccs.rutgers.edu/~k-syrett/publications/Syrett%20et%20al_appositives_12.pdf.

[187] Szabolcsi, Anna & Frans Zwarts (1993). "Weak islands and an algebraic semantics for scope taking." *Natural Language Semantics* 1: 235–284.

[188] Thompson, Ellen (1999). "The temporal structure of discourse: The syntax and semantics of temporal then." *Natural Language and Linguistic Theory* 17(1): 123–160.

[189] Thompson, Sandra A. (1971). "The deep structure of relative clauses." In Charles J. Fillmore & D. Terence Langendoen (eds.). *Studies in Linguistic Semantics*, 79–96. New York: Holt, Rinehart & Winston.

[190] Thorne, James P. (1972). "On nonrestrictive relative clauses." *Linguistic Inquiry* 3(4): 552–556.

[191] Tomlin, Russell (1985). "Foreground-background information and the syntax of subordination." *Text* 5: 85–122.

[192] Tonhauser, Judith (2012). "Diagnosing (not-)at-issue content." *Semantics of Under-Represented Languages of the Americas* 6: 239–254.

[193] Truckenbrodt, Hubert (2005). "A short report on intonation phrase boundaries in German." *Linguistische Berichte* 203: 273–296.

[194] Urmson, James O. (1952). "Parenthetical verbs." *Mind* 61(244): 480–496.

[195] Veltman, Frank (1996). "Defaults in update semantics." *Journal of Philosophical Logic* 25: 221-261.

[196] de Vries, Mark (2002). *The Syntax of Relativization*. Ph.D. dissertation, Utrecht University.

[197] de Vries, Mark (2006). "The syntax of appositive relativization." *Linguistic Inquiry* 37(2): 229–270.

[198] Wang, Linton, Eric McCready, & Brian Reese (2006). "Nominal appositives in context." *Western Conference on Linguistics* 33: 411–423.

[199] Webber, Bonnie (1988). "Tense as discourse anaphor." *Computational Linguistics* 14(2): 61–73.

[200] Zeevat, Henk (1999). "Demonstratives in discourse." *Journal of Semantics* 16(4): 279–313.