This book is an important and innovative contribution to the literature on time, aspect and discourse structure. By carefully probing into the different uses of a single word (the English adverb `now') and into the various theories that have been put forward to account for those uses, Altshuler succeeds in throwing new light on the intriguing interactions between temporal reference, event structure and rhetorical relations.

The insights of Part I are put to excellent use in Part II, where they are applied to two notorious puzzles from the tense and aspect literature, cessation and double access. As Altshuler shows convincingly, only a penetrating analysis of the interaction between temporal, aspectual and rhetorical relations will lead to a solution of these puzzles.

(Hans Kamp)

Daniel Altshuler,

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AN ESSAY ON NARRATIVE DISCOURSE IN ENGLISH

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Daniel Altshuler
Events, States and Times
An essay on narrative discourse in English
Winner of the Emerging Scholar Monograph Competition

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Managing Editor: Katarzyna Grzegorek

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Dedicated to my parents, Lev and Dina, for their unconditional love.

Contents

Part II: **Semantics and pragmatics of tense: The nuts and bolts**

Acknowledgments

My interest in narrative discourse began in 2003, in a seminar at UCLA on neo-Davidsonian event semantics, taught by Terry Parsons, my first semantics teacher, who inspired me to think about the distinction between events, states and times. Terry's influence on me will no doubt be found throughout this monograph, not only in the title, but, perhaps most noticeably, in Chapter 2, which argues that states are not reducible to mere temporal intervals.

My views on narrative discourse have developed a lot since my time at UCLA, and, indeed, since my dissertation at Rutgers. I have many people to thank for this. First and foremost, thanks to Roger Schwarzschild – my Doktorvater – whose guidance not only made this work possible, but it inspires me in all my academic and personal pursuits. Thanks also to my collaborators: Corien Bary, Valentine Hacquard, Thomas Roberts, Roger Schwarzschild, Una Stojnić, Károly Varasdi and Aaron White. As outlined in Chapter 1, the analysis of narrative discourse that is developed in the monograph synthesizes and builds on our prior research. In respect of our collaborations, I often use "we" rather than "I" throughout.

Special thanks to Hans Kamp for both commenting on this monograph and laying its foundations, with the seminal "Formal properties of 'now'" as the starting point. Thirty-five years later, the sentence in (1) still has not received an adequate analysis. I hope this monograph offers a reasonable attempt.

(1) I learned last week that there would now be an earthquake. (Kamp 1971, 229)

In addition, I would like to thank Maria Bittner for shaping my views on temporality and for teaching me the fruits of dynamic semantics and centering theory (even though I didn't employ these frameworks here as much as she would have). Thanks to Barbara Partee for opening her doors to me on Hobart Lane ever since I was a graduate student, and for providing a sense of understanding about how to place my research within the context of prior work. Thanks to Matthew Stone for making me realize the importance of discourse coherence to the study of narrative discourse (and semantics more generally) and to Jerry Hobbs for both inspiring and teaching me how to apply coherence principles to discourses of different genres. Thanks to Julie Hunter for her comments on material related to Chapter 2 and for opening my eyes to work on discourse structure. Thanks to Sam Cumming for commenting on the material in Chapter 3 and for inspiring me to think outside the box. Thanks to Hana Filip for sharpening my views on aspect found in Chapter 6, and – as a colleague and friend – ensuring that I have the freedom and support to pursue new research questions. Thanks to Atle Grønn and Guillaume Thomas for helpful feedback; sometimes as reviewers, always as critical friends. Thanks to Andy Kehler, Gillian Ramchand and Robert Truswell for helping me seek a connection between discourse relations and event structure (much work remains!). Thanks to Dorit Abusch, Seth Cable, Philippe Schlenker, Tim

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Last, but certainly not least, thanks to Susanna Melkonian for her love, passion, devotion, and appreciation. This monograph was written during a truly amazing, three years in Düsseldorf. Suzo: I am so fortunate that I experienced this time with you.

Part I: **Narrative progression: From discourse connectivity to event partitivity**

1 Preliminary thoughts: Narrative discourse

Narrative discourse is appealing because it constitutes "an author's invitation to the readers to a mutual imagining, to delight and instruct, by the creation of a possible world and possible characters striving towards goals, told in a way that directly reflects our own experience as we plan our way towards our goals in a world that denies us so much of what we desire" (Hobbs 1990, 40). It should come as no surprise that there are many lenses through which one can study a topic so rich. This monograph investigates the *temporal interpretation* of narrative discourse through the lens of a *formal semanticist*. The best way that I know how to begin is to provide a case study that motivates what I take to be the core phenomena: *prominence*, *coherence* and, crucially, how the interaction of these two phenomena factors in the semantic analysis of linguistic expressions.

Chapter 2 is a case study that builds on my collaborative research with Una Stojnić (Altshuler and Stojnić 2015a,b). It investigates the meaning of the adverb 'now' and its relation to the meaning of tense. Along the way, we illustrate how *prominence* is influenced by principles of *coherence*. This illustration relies on an ontological distinction between *events*, *states* and *times*, which is motivated by anaphoric constraints imposed by 'now'.

Chapter 3 provides a formally explicit characterization of two coherence principles, NARRATION and RESULT, which not only play a key role in our analysis of 'now', but they are also the backbone of temporal anaphora and narrative progression. Building on my collaborative research with Károly Varasdi (Altshuler and Varasdi 2015), Chapter 3 proposes a new method for testing the definitional adequacy of these discourse relations, namely by an *abductive argument*. This contribution opens a new way of thinking about how eventive and stative descriptions contribute to the perceived narrative progression in a discourse.

Chapter 4 provides a formally explicit characterization of tense by considering its interpretation in complements of propositional attitudes. In this way, we build on our informal analysis of tense in Chapter 2, employing the tools and insight developed in my collaborative research with Roger Schwarzschild (Altshuler and Schwarzschild 2012, 2013) and Corien Bary (Bary and Altshuler 2014). In addition, based on my collaborative research with Valentine Hacquard, Thomas Roberts and Aaron White (Altshuler et al. 2015), Chapter 4 provides a corpus study that provides a glimpse of how tense semantics interacts with Gricean principles and parentheticality.

Chapter 5 explores some cross-linguistic predictions of the analysis proposed in Chapter 4 and recasts our analysis in light of previous work on embedded tense, focusing particularly on the *Sequence of Tense* phenomenon and the *Upper Limit Constraint*.

Finally, Chapter 6 synthesizes the main claims of the monograph by providing a hypothesis about how tense meanings compose with meanings of temporal adverbs

and verb phrases. I then briefly explore some implications of the hypothesis by looking at the semantics of viewpoint aspect.

Questions raised by 'now'

At the heart of the case study in Chapter 2 is Hans Kamp's celebrated example noted in the preface:

(1) I learned last week that there would now be an earthquake. (Kamp 1971, 229)

Notice that the earthquake is understood to be temporally located with respect to the utterance time even though there is no present tense in the sentence. Moreover, (1) is truth-conditionally distinct from its counterpart lacking 'now'. That counterpart is intuitively true as long as the earthquake occurred after the learning, including before/after the utterance of (2):

(2) I learned last week that there would be an earthquake.

When we look at the broader discourse context, we see that our intuitions about (1) change:

(3) Victoria began to look nervous, thought Jenya. She was shaking and paced back and forth. Poor thing! **She learned last week that there would now be an earthquake**.

Intuitively, the truth of (3) requires the earthquake to take place in the past and not at the time (3) was uttered. Why should this be? What is it about the additional bit of discourse in (3) that changes the referent of 'now'? And what exactly *is* the referent of 'now'?

To see the complexity of these questions, consider the data below:

(4) Look at the pies below. How many $\frac{1}{6}^{th}$ slices fit into a $\frac{1}{2}$ slice? [Picture of pies] Now you can see that $\frac{1}{2}$ divided by $\frac{1}{6}$ really is 3! (Hunter 2012)

(5) Shawn is just an angel. Now that brother of hers, he's something else entirely. (Hunter 2012)

What is the referent of 'now' in these discourses? And how does this use of 'now' differ from the other usages?

In addition to answering these questions, an analysis of 'now' should explain the fact that the use of 'now' often leads to infelicity:

(6) #I hit him because he now hit me. (Hunter 2012, 15)

(7) ??Bill had come home at seven. Now he wrote a letter. (Kamp and Reyle 1993, 596)

(8) #Whenever I'm in Hadley, I'm happy now.

What is wrong with 'now' in (6)-(8)? That is, why does 'now' fail to refer to some *prominent* entity in these discourses but succeeds in (1), (3), (4) and (5)?

Main claims of Chapter 2

We argue that 'now' refers to the most prominent state – not time! – which holds throughout the time encoded by the tense. But not any prominent state will do. To satisfy the anaphoric constraints imposed by 'now', the state must be understood as resulting from a prominent event. In effect, our proposed contribution of 'now' can be paraphrased as follows: *with this having happened*.

Our proposed analysis has two important consequences for semantic theorizing: (i) states are not reducible to mere temporal intervals and (ii) anaphora resolution is sensitive to the distinction between events, states and times. For example, we claim that the discourses below, which are 'now'-less counterparts of (3), (4) and (6) respectively,

(9) Victoria began to look nervous, thought Jenya. She was shaking and paced back and forth. Poor thing! She learned last week that there would be an earthquake.

(10) Look at the pies below. How many $\frac{1}{6}^{th}$ slices fit into a $\frac{1}{2}$ slice? [Picture of pies] You can see that $\frac{1}{2}$ divided by $\frac{1}{6}$ really is 3!

(11) I hit him because he hit me.

involve *time anaphora*, while all discourses involving 'now' (e.g. (1), (3), (4) and (5)) involve *event anaphora*, *state anaphora* and *time anaphora*.

At the end of Chapter 2, we explore a way of retaining the classic view that 'now' is a pure indexical, i.e. the interpretation of 'now' is determined fully as a function of context (Kaplan 1989 and Kamp 1971). To make such a story work, one needs a theory of how *eventualities* (events and states) interact with principles of discourse coherence. Observe that we infer in (11) that one hitting event is used to *explain* why another hitting event occurred and this is key to understanding why 'now' fails to refer in (6). We will argue that this observation is related to the following contrast from Hobbs (1979):

(12) John took a train from Paris to Istanbul. He has family there.

(13) #John took a train from Paris to Istanbul. He likes spinach.

There is a stark contrast between (12) and (13). While the former is a perfectly acceptable discourse, the latter sounds bad. Why is this? To answer this question, note that (12) does not merely list two random facts about John. Rather, a hearer normally understands (12) as conveying that John took a train from Paris to Istanbul because he has family there. Understanding that there is this explanatory connection between

these two pieces of discourse is necessary for fully understanding the speaker's contribution in (12). And by contrast, the failure to carry out the interpretive task by establishing a coherent connection between the two sentences in (13) results in infelicity. The interlocutors are left with the feeling that they have not fully comprehended the contribution of the speaker (they are left searching for an explanatory connection – is Istanbul famous for its spinach? Or do they serve spinach on trains to Istanbul? Or does Paris have bad spinach?).

Discourse relations and pronoun resolution

Coherence theorists materialize these observations by positing *discourse relations* in the logical form of a given discourse. Discourse relations encode possible ways that ideas could be associated and according to which a discourse is organized, i.e., a discourse is coherent because it is organized by particular discourse relations. We assume that the associate principles underlying the establishment of discourse relations are psychological in nature:

(14) It is tempting to speculate that these coherence relations are instantiations in discourse comprehension of more general principles of coherence that we apply in attempting to make sense out of the world we find ourselves in, principles that rest ultimately on some notion of cognitive economy. [...] Recognizing coherence relations may thus be just one way of using very general principles for simplifying our view of the world (Hobbs 1990, 10).[1]

Hobbs's insight has led to the hypothesis below, which has been the subject of investigation in several psycholinguistic studies.[2]

(15) Coherence and anaphora:
Establishing discourse relations and resolving the interpretation of an anaphoric expression are correlated and mutually constraining tasks.

This hypothesis has been motivated – for the most part – by looking at pronoun resolution. For example, the starting point of Kehler et al.'s (2008) research is a well-known claim that pronoun resolution involves (at least) two kinds of preferences: (i) parallel grammatical subjects and (ii) parallel thematic roles. Motivation for this claim comes (in part) from the contrasts such as the one in (16):

1 For alternative views of discourse relations, see Longacre 1983, Mann and Thompson 1987, Martin 1992, Sanders et al. 1992 and references therein.

2 See, e.g. Wolf et al. 2004, Kertz and Elman 2006, Kehler et al. 2008, Rohde and Kehler 2008, Kaiser 2011, Rohde and Horton 2014.

(16) a. Bush narrowly defeated Kerry, and special interests promptly began lobbying him. [=Bush]
b. Kerry was narrowly defeated by Bush, and special interests promptly began lobbying him [=Kerry].[3] (Kehler et al. 2008, 6)

According Kehler et al., the pronoun in (16-a) refers to Bush, while the pronoun in (16-b) refers to Kerry. Why should this be, given that (16-a)–(16-b) only differ in voice? The natural answer is that pronoun resolution involves a bias for parallel grammatical subjects.

Further evidence for this hypothesis comes from (17-a).

(17) a. John seized the comic from Bill. He_____.
b. John passed the comic to Bill. He_____. (Kehler et al. 2008, 7)

Kehler et al. cite Stevenson et al. (1994) as reporting – based on experiments – that participants were considerably more likely to complete (17-a) in a way that requires 'he' to refer to John rather than Bill. Notice that 'John' is both the subject and the Goal of the sentence. With this in mind, compare (17-a) with (17-b), where 'John' is a subject that fills the Source role and 'Bill' is a non-subject that fills the Goal role. Interestingly, Stevenson et al. report that "Goal continuations, that is those which correspond to a Goal interpretation for the pronoun, occurred about as frequently as Source continuations (a 49-51% split) (cited in Kehler et al. 2008, 23)."

One possible hypothesis that explains these results is that there is both a subject assignment strategy and a Goal preference at work, agreeing on a referent in (17-a), but disagreeing on a referent in (17-b). Kehler et al., however, pursue the hypothesis in (15) above. In particular, they pursue the idea that the discourse relation OCCASION, defined below and discussed at length in Chapter 3, gives rise to a Goal preference.

Definition 1 (OCCASION)**.** Given two discourse units σ_1, σ_2, OCCASION(σ_1, σ_2) holds iff

1. A change of state can be inferred from the assertion of σ_1, whose final state can be inferred from σ_2.
2. A change of state can be inferred from the assertion of σ_2, whose initial state can be inferred from σ_1 (Kehler (2002, 22), citing Hobbs (1985, 10)).

To test this hypothesis, Kehler et al. ran an experiment in which passages such as (18-a) below (resembling (17-b)) were compared to the minimal pair in (18-b), differing solely in that the verb in the initial sentence is in the progressive.

3 As noted by Kehler et al. (2008), the preference for Kerry "may rely to some degree on the hearer knowing that he is a US Senator, and thus, like Bush, is able to be lobbied."

(18) a. John handed a book to Bill. He_____.
b. John was handing a book to Bill. He_____. (Kehler et al. 2008, 24)

Notice that (18-a) and (18-b) have the same thematic structure. However, they crucially differ in that only (18-a) entails a change of state: Bill went from not having a book in his possession, to having a book in his possession. Therefore, while "thematic role preference predicts a similar distribution of Source and Goal interpretations between the two conditions…the event-structure hypothesis predicts a greater percentage of Source interpretations in [(18-b)] than in [(18-a)] (ibid, 24)."

Leaving the experimental details aside (see, ibid, 24-25), the results indicate that pronoun interpretation is sensitive to aspect. Kehler et al. report that the progressive context yielded significantly more Source interpretations (70%) than the simple past context. They thus concluded that the "the Goal bias is at least in part an epiphenomenon of a bias towards focusing on the end state of the previous eventuality" (ibid, 25). In turn, they argued that the end-state bias is an epiphenomenon of establishing OCCASION. This argument was supported by corpus research showing that discourses which have an unambiguous Goal interpretation are annotated as exemplifying OCCASION significantly more often than any other relation.

In sum, Kehler et al. provide experimental evidence which establish that event-structure biases are involved in the interpretation of pronouns. Crucially, these biases are argued to be an epiphenomenon of establishing OCCASION, thereby supporting (15).

Temporal anaphora

In this monograph, we explore (15) from the standpoint of *temporal anaphora*, a notion that was coined by Partee (1984) to characterize the parallels between tenses and pronouns (Partee 1973, Kratzer 1998). Temporal anaphora has to do with the resolution of tense, a phenomenon that is correlated with the establishment of discourse relations much in the same way as pronoun resolution (Webber 1988). To see this, compare the following two discourses:

(19) a. Phil tickled Stanley.
b. Liz poked him. (Smyth 1994)

(20) a. Stanley screamed with pain in his eyes.
b. Liz poked him.

One can understand (19) as comparing and contrasting two events that happened to Stanley (that is, as harboring the discourse relation of PARALLEL), or as describing what happened as a result of the event described by the first sentence (i.e. as harboring the discourse relation of RESULT). Crucially though, the choice of the discourse relation is correlated with the resolution of the pronoun 'him'. In particular, Kehler

et al. (2008) report that if (19) is understood as harboring PARALLEL, 'him' is interpreted as referring to Stanley, and if it is understood as harboring RESULT, 'him' refers to Phil.

Likewise, the choice of the discourse relation is correlated with the resolution of the past tense in (20-b). In particular, if (20) is understood as harboring EXPLANATION, the prominent time in (20-b) is understood to be *prior* to Stanley's scream. In other words, on the EXPLANATION reading, (20-b) asserts what led Stanley to scream. If, however, (20) is understood as harboring RESULT, then the prominent time in (20-b) is understood to be *after* Stanley's scream. In other words, on the RESULT reading, (20-b) asserts how Liz responded to Stanley's scream.

Defining discourse relations

We have been assuming thus far that there are distinct discourse relations and their difference is linguistically relevant. It is therefore surprising that few linguistic diagnostics have been provided to differentiate these relations. Moreover, discourse relations are rarely defined. Definition 1 of OCCASION is one notable exception. Instead, discourse relations are typically characterized in terms of their import. For example, consider the following characterization of two discourse relations which are related to OCCASION and which are often seen as the backbone of temporal anaphora:

(21) Given two discourse units σ_1, σ_2, NARRATION(σ_1, σ_2) holds if the event described in σ_2 is a consequence of (but not strictly speaking caused by) the event described in σ_1 (Lascarides and Asher, 1993, 2).

(22) Given two discourse units σ_1, σ_2, RESULT(σ_1, σ_2) holds if the event described in σ_1 caused the event or state described in σ_2 (Lascarides and Asher, 1993, 2).

These relations are characterized in terms of their causal import, with particular constraints on how events and states factor into the causal chain. How can we test whether these characterizations are correct? And, how can we identify which discourse relation holds when? Indeed, many semanticists are hesitant to incorporate discourse relations into their framework precisely because questions of this kind are so difficult to answer.

Main claims of Chapter 3

Chapter 3 of this monograph offers a novel method for testing the definitional adequacy of NARRATION and RESULT, namely via an *abductive argument*. This argument is fueled by the following two hypotheses which we aim to motivate:

(23) NARRATION and RESULT are defined in terms of enthymematic entailment, with reference to eventualities.

(24) RESULT asymmetrically entails NARRATION.

Given (23) and (24), we derive general constraints pertaining to possible discourse units – defined in terms of the event components described in Definition 1 above. We verify the plausibility of our derived discourse units by showing that they correspond to well attested English sentences. Since the discourse units are plausible, we therefore conclude that we have reached definitional adequacy of NARRATION and RESULT.

Chapter 3, then, transitions into a series of appendices. Appendix A outlines possible avenues to pursue in the future. In particular, we ask what sort of concatenations of discourse units we predict to give rise to RESULT and NARRATION. We explore one prediction in particular, namely that eventive, but not stative descriptions move the narrative time forward – a view that goes back to Jespersen (1924), but is considered to be quite controversial. Appendix B provides some derivations that are implicit in Chapter 3.

Aim of Part II

This, then, is the outline for Part I of the monograph. Part II brings us back the analysis of 'now' proposed in Chapter 2. Recall that the hypothesis we aim to defend is that 'now' refers to the most prominent state (resulting from a prominent event) which holds throughout the time encoded by the tense. But we have said very little about tense so far! This is the aim of Part II.

Cessation

An observation that fuels the proposed analysis of tense is that some discourses lead to an inference that no state of the kind described currently holds. For example, imagine you are at a bar and a man shows you a picture of a woman in her late 60s, proceeding to say:

(25) a. This is my mom.
b. She was Armenian.

You would likely infer that the speaker's mom is dead. This inference is called *Lifetime Effects* by Enç (1987). It is dependent on another inference, which we call *cessation*, namely that the mother is not Armenian at the time (25) was uttered, along with knowledge that people do not change ethnicities over a life time.

Main claims of Chapter 4

In Chapter 4, we claim that cessation (and the lack thereof) sometimes has to do with tense choice and we explore this claim in detail, offering an analysis that treats the present and past tenses as being *scalar alternatives*. This view is motivated by adopt-

ing the hypothesis in (26) which concerns stative predication and which itself is motivated by well-known philosophical problems concerning changes of state and first moments:

(26) The Temporal Profile of Statives:
For any tenseless stative clause ϕ, if a moment m is in $[\![\phi]\!]$, then there is a moment m' preceding m and a moment m'' following m such that m' and m'' are in $[\![\phi]\!]$.

Our analysis of tense is first tailored to matrix clauses, before being extended to complement clauses of propositional attitudes, where cessation also arises:

(27) We were at the party last night and got to discussing nationalities. John proclaimed proudly that his mother is American and **his dad was Dutch**.

Analogous to (25), (27) exemplifies Lifetime Effects, i.e. that John's father is no longer alive. Moreover, as before, these effects begin with a chain of reasoning that starts with a cessation inference. From the past tense on 'was Dutch' we infer that John's father is no longer Dutch. Assuming that being Dutch is for life, we deduce that John's father must have died.

On our analysis, deriving cessation in (27) involves considering an alternative in which you have a present tense clausal complement of a past tensed attitude:

(28) We were at the party last night and got to discussing nationalities. John proclaimed proudly that his mother is American and **his dad is Dutch**.

Such a construction is known to give rise to the *double access* reading, which is quite tricky to analyze. Despite its complexity, it tells us a lot about the meaning of the present tense. In fact, much of Chapter 4 is devoted to this reading.[4] Based on this reading, we propose that the present tense in English involves universal quantification and is an amalgam of both a relative and an absolute present. Moreover, we claim that tense domain restriction is intensional (properties of times, not times themselves) and call this restriction: *Reference Time Concept*. The time described by a given Reference Time Concept corresponds to the prominent time established in the discourse context.

Main claims of Chapter 5

An important implication for our analysis of tense is the generalization below:

4 It is a golden nugget for a linguist working on tense in much the same way that negative polarity has proved to be a golden nugget for linguists working on negation and quantification.

(29) Cessation Generalization:
Cessation arises with PAST-ϕ when the Reference Time Concept does not – by itself – trigger a presupposition failure with PRES-ϕ.

In Chapter 5, we show how (29) may be correlated to what is often called a "simultaneous reading": the intuition that the time of the eventuality described in the embedded clause is simultaneous with the time of the attitude described in the matrix clause. For example, in (30) below, one has an intuition that the state of being Dutch is simultaneous with the time of the saying.

(30) I met a musician last night. He had a cool accent. He said **his father was Dutch** and that affected his speech.

This alleged reading is a challenge to the semantics of the past tense that we propose and often forms the basis for a distinct analysis that usually goes by the name "Sequence of Tense". We offer the conjecture below

(31) Simultaneity Conjecture:
It is the perception of the absence of a cessation implicature that is reported as 'simultaneity' for past tensed statives embedded under attitude predicates.

and show how it not only explains intuitions about English, but also about contrasting data in Russian and Hebrew, where the putative simultaneous reading does not arise with a past tense that is embedded under a propositional attitude. We end the chapter by discussing evidence for and against Sequence of Tense.

Main claims of Chapter 6

Finally, Chapter 6 considers two approaches to viewpoint aspect – that of Emmon Bach/Manfred Krifka (Bach 1986, Krifka 1992) and that of Wolfgang Klein (Klein 1994) – in light of a hypothesis about how meanings for temporal locating adverbs (proposed in Chapter 2) and tenses (proposed in Chapter 4 and Chapter 5) interact. I look at the empirical phenomena below to point out various consequences of adopting one approach to viewpoint aspect versus the other.

- aspectual stacking in English and Russian
- reference time fixing with temporal locating adverbs and the progressive aspect in English
- the imperfective paradox and non-culminating accomplishments in English, Hindi and other languages

The hope is that this discussion fuels future research on how tense, temporal locating adverbs and VPs interact with viewpoint aspect to mediate between events, states and times.

2 Prominence: A look at 'now'

2.1 Challenges to Kamp's principle

Since the work of Kaplan (1989) and Kamp (1971), the philosophical and linguistic tradition has treated 'now' like 'I', that is, as a *pure indexical* – an expression whose linguistic meaning fully determines the referent on an occasion of use. All you have to know in order to know what 'I' refers to is who is speaking. Similarly, all you need to know in order to know what 'now' refers to is when the speech act occurs.

The most compelling evidence for this view comes from Kamp's (1971) contrast below, introduced in Chapter 1:

(1) I learned last week that there would now be an earthquake.

(2) I learned last week that there would be an earthquake.

Kamp (1971, 229) notes:

(3) Obviously there could be circumstances under which I would make a true statement if I uttered the first sentence, but false if I uttered the second...the function of the word 'now' in (1) is clearly to make the clause to which it applies – i.e., 'there would be an earthquake' – refer to the moment of utterance of (1), and *not* to the moment, or moments, (indicated by other temporal modifiers that occur in the sentence) to which the clause would refer (as it does in (2)) if the word 'now' were absent. A little reflection shows that this principle correctly describes the function of the word 'now' in all of its occurrences.

We can restate Kamp's principle noted in (3) as an elaboration on the idea that 'now' is a pure indexical:

(4) Kamp's principle: 'Now' is a *pure indexical* – its referent (**the moment of speech**) is fully determined by its linguistic meaning as a function of context.

This principle not only accounts for our intuitions about (1) and (2), but it also explains why *prima facie*, 'now' – like 'I'– cannot easily refer anaphorically to some prominent time introduced (explicitly or otherwise) earlier in the discourse, as demonstrated by the infelicity of (5):

(5) #The sun now stood above the hippodrome.

The explanation is this. While the sentence describes a state of affairs located in the past, 'now' attempts to pick out the moment of utterance of (5) (in a similar fashion to what occurs in (1)). This results in an incoherent interpretation given the semantics of the past tense, which is why (5) is judged infelicitous.

While such data certainly speak in favor of Kamp's principle, the contrast below provides a serious challenge.[1] Notice that (6-a) asserts that the introducing will take place *right after* the time of utterance. This is not the case in (6-b), which does not have 'now'.

(6) a. I will now introduce you to the gentleman who is in charge of your transportation and whom you have to obey. (*The Man who Disappeared* (*Amerika*), F. Kafka)
b. I will introduce you to the gentleman who is in charge of your transportation and whom you have to obey.

This suggests that 'now' does not, in fact, pick out the moment of utterance.

One possibility is to say that 'now' picks out an interval that surrounds the moment of utterance. This idea, however, gives rise to the following question:

- Does the interval picked up by 'now' have a different length on different occasions of use and, if so, does this disqualify 'now' as being a pure indexical?

We can address this question by offering the following revision of Kamp's principle:

(7) Kamp's principle (1st revision): 'Now' is a *pure indexical* – its referent (**a *short* interval that includes the moment of utterance**) is fully determined by its linguistic meaning as a function of context.

The problem with this revision is that we can no longer account for the infelicity of (5). That is, if 'now' were to pick out a *short* interval surrounding the moment of utterance, why can't (5) have a reading that is the mirror image of (6-a)? That is, why can't (5) have the reading in (8)?

(8) Just now, the sun stood above the hippodrome.

Without a straightforward answer to this question, we are forced to revise Kamp's principle once more, as follows:

(9) Kamp's principle (2nd revision): 'Now' is a *pure indexical* – its referent (**a *short* interval that begins at moment of utterance**) is fully determined by its linguistic meaning as a function of context.

However, even this revised principle cannot be maintained. In fact, regardless of which version of Kamp's principle we adopt the problem is that, (1), (5) and (6) notwithstanding, 'now', unlike 'I', does, in fact, allow for the range of anaphoric interpretations where, intuitively, 'now' seems to pick out an interval which does *not* over-

1 Thanks to David Boylan for bringing such data to my attention.

lap the moment of utterance (Hamburger 1973, Dry 1979, Kamp and Rohrer 1983). To wit, note that (5) becomes felicitous once appropriately embedded within a larger discourse, as the example below, from M. Bulgakov's *The Master and Margarita*, demonstrates:

(10) Pilate raised his martyred eyes to the prisoner and **saw how high the sun now stood above the hippodrome**, how a ray had penetrated the arcade, had crept toward Yeshua's patched sandals and how the man moved aside from the sunlight.

In (10), 'now' naturally occurs with the past tense[2] and is interpreted with respect to what is previously mentioned in the discourse. In particular, the truth of (10) requires that the sun stood high above the hippodrome when Pilate raised his eyes, and not when (10) is uttered. Consequently, the infelicity that we saw in (5) disappears.

Similarly, (1), when appropriately embedded, can also be interpreted in such a way so that 'now' is understood anaphorically, rather than as referencing the moment of utterance. Below is an example, first mentioned in Chapter 1, in which (1) is embedded within a discourse.

(11) Victoria began to look nervous. She was shaking and paced back and forth. **She learned last week that there would now be an earthquake**.

Intuitively, the truth of (11) requires the earthquake to take place in the past and not at the moment that (11) was uttered. Kamp's principle, then, faces a problem in explaining why the attested anaphoric readings should arise. If 'now' as a matter of its linguistic meaning just automatically picks out the moment of utterance (or a short interval that overlaps the moment of utterance), then one cannot make sense of the examples in (10) and (11). With respect to these examples, it seems, Kamp's principle yields incorrect predictions. The question is, then: What determines an anaphoric interpretation on a given occasion? That is, why is the only available reading in some cases the one according to which 'now' refers to the moment of utterance (or the interval including the time of utterance), while in other cases, a distinct reading is forced?

According to Hamburger (1973), the function of 'now' in past-oriented discourses is to fictionalize events. As noted by Dry (1979), this hypothesis has given rise to the view that the past tense use of 'now' is restricted to passages of Free Indirect Discourse

2 According to Lee (2010), 'now' most frequently occurs with the past tense in the British National Corpus.

(FID), which convey points of view of the characters in the story.[3] An especially clear case of this comes from the following passage from Virginia Woolf's *Mrs. Dalloway*:

(12) She was at a High School, at the inarticulate stage last time he was over, a round-eyed, pale-faced girl, with nothing of her mother in her, a silent stolid creature, who took it all as a matter of course, let her mother make a fuss of her, and then said "May I go now?" like a child of four; going off, Clarissa explained, with that mixture of amusement and pride which Dalloway himself seemed to rouse in her, to play hockey. **And now Elizabeth was 'out,' presumably**; thought him an old fogy, laughed at her mother's friends. Ah well, so be it. The compensation of growing old, Peter Walsh thought, coming out of Regent's Park, and holding his hat in hand, was simply this; that the passions remain as strong as ever...

Here the described thoughts are understood to be Peter Walsh's. 'Now' aides in this interpretation, as we understand this adverb to refer to Peter Walsh's *now*.[4]

To account for this interpretation, we could say that the effects of FID are such that the relevant context of evaluation has been shifted to the past.[5] While such an analysis would allow us to maintain the view that 'now' is a pure indexical (in the sense of (4), (7) or (9)) whose context can be shifted, it would also raise the question of whether, e.g. (10) and (11) exemplify FID in the same way that (12) does. And, related to this question: how can we tell?

Sharvit (2008) addresses the latter question head on, distinguishing Direct Discourse (DD), Standard Indirect Discourse (SID) and Free Indirect Discourse (FID) by the minimal triplet below:

(13) As he looked at my picture, John thought: "Yes, I want to marry her today." (DD)

(14) As he looked at my picture, John thought that he wanted to marry me that day. (SID)

3 Here is a more detailed description of FID from Eckardt (2015):

(i) Free indirect discourse is a way of reporting a person's thoughts as if one could listen to their inner monologue. The effect is achieved by the use of perspective indicating elements in the sentences as if the sentence was uttered by a particular protagonist.

4 According to Curry 2010, things are actually more complex. Although we may think that this adverb to refers to Peter Walsh's *now*, it is actually the narrator's *now*; the narrator *pretends* to be Peter Walsh and in so doing, forces the reader to *reenact*, giving rise to an experience of being inside Peter Walsh's mind.

5 Ever since Doron's (1991) pioneering work, FID has often been analyzed by making reference to two contexts of evaluation: one reflecting the point of view of the character and the other reflecting the point of view of the narrator. See, e.g. Schlenker 2004a, Sharvit 2008, Eckardt 2015, Maier 2015 and Roberts 2015 for more discussion and implementations of this idea. See also Curry 2010, discussed in Footnote 4, for a critical assessment of this view.

(15) John looked at my picture. Yes (, he thought,) he wanted to marry me today. (FID)

Notice the parenthetical "he thought" in (15). We can naturally add such a parenthetical to (11), yielding:

(16) Victoria began to look nervous (, thought Jenya). She was shaking and paced back and forth. **She learned last week that there would now be an earthquake**.

Moreover, we can add an exclamative like "Poor thing!" to mirror the "Ah well, so be it" in (12):

(17) Victoria began to look nervous (, thought Jenya). She was shaking and paced back and forth. Poor thing! **She learned last week that there would now be an earthquake**.

In the end, we seem to have created a discourse that exemplifies FID, told from Jenya's point of view.

Things are less clear, however, with respect to (10), repeated below:

(10) Pilate raised his martyred eyes to the prisoner and **saw how high the sun now stood above the hippodrome**, how a ray had penetrated the arcade, had crept toward Yeshua's patched sandals and how the man moved aside from the sunlight.

Here, there is no natural way to insert a parenthetical or a remark like "Ah well, so be it". On the basis of this observation, it is tempting to conclude that (10) does not exemplify FID, in which case Kamp's principle would come under scrutiny once more.

Dry's (1979) discourse below provides a further blow to Kamp's principle:

(18) An education at Oxford appealed to a new class of rich and well-to-do men who wished to use it to improve the prospects of their sons. **The Colleges were now therefore able to charge fees** proportionate to the social advantages likely to accrue. (Darlington, *Encounter*, 1967)

Dry observes that 'now' is used with the past tense even though it is a historical narrative which "possesses neither characters nor any linguistic characteristics of free indirect style" (ibid., 60). This point was more recently reiterated by Hunter (2010), who claimed, based on discourses such as (10) and (18), that any analysis of 'now' which solely relies on the effects of free indirect discourse "cannot possibly do justice to the full range of behavior exhibited by 'now'. They may very well shed light on certain aspects of particular literary styles…but we must look beyond them to construct a full semantic account for 'now'. The real shortcoming of all of these views…is that 'now'

can pick up on a time other than the time of actual utterance even outside of…free indirect discourse" (ibid., p. 56).

Based on Dry's and Hunter's criticism, it is tempting to say that 'now' simply refers to some prominent time – call this *the time prominence account of 'now'*.[6] Essentially, 'now' would be analogous with 'he'. The linguistic meaning of 'he' (its character, in the sense of Kaplan 1989), is roughly something like the most prominent, singular male in the context. However, for the referent to be determined on an occasion of use, we need to know what makes an individual "the most prominent" one. This is a notoriously difficult question, and the received wisdom is that the account of prominence will be a pragmatic one, going beyond the rules of language. According to this *pragmatic view of prominence*, 'now' would not be treated as a pure indexical since its linguistic meaning would not determine the referent on an occasion of use. In order to determine its referent, we would appeal to pragmatic rules of anaphora resolution in addition to its linguistic meaning.

In the next section (§ 2.2), we show that a particular version of *the time prominence account of 'now'* can capture a broad range of data. Key to this analysis is the idea that anaphora resolution and establishing discourse relations are two mutually correlated tasks (Hobbs 1979 and Kehler et al. 2008). In this way, the analysis is importantly compatible with Hunter's (2012) idea that 'now' is an anaphoric expression that interacts with discourse relations. However, unlike Hunter's analysis, the analysis pursued here does not posit syntactic attachment properties of discourse relations directly into the meaning of 'now' (*subordinating* or *coordinating* in the sense Asher and Lascarides 2003). We show that doing so leads to an incorrect prediction about narrative progression.

Unfortunately, our *time prominence account of 'now'* will also face several problems. The biggest problem is that it fails to explain the truth conditional contributions of 'now'. Accordingly, we offer a novel analysis in § 2.3 that builds on Altshuler 2009. We propose that the linguistic meaning of 'now' – Kaplanean character, if you like – is not a time! Rather, 'now' picks out the most prominent state, which holds throughout the time specified by the tense. But not any state will do. To satisfy the anaphoric constraints imposed by 'now', the state must be understood as resulting from a prominent event. We show how this explains the seeming *atemporal* uses of 'now' (Hunter 2012) and sheds light on the oft-cited intuition that the use of 'now' leads to a change-of-state inference (Recanati 2004, Hunter 2010).

In sum, the analysis proposed in § 2.3 advances the following two ideas: (i) event, state and time anaphora operate independently and (ii) the meaning of 'now' relates these three processes. § 2.4 explores two consequences of these ideas. The first conse-

6 There are various implementations of this idea, some of which we discuss later in this chapter (see, e.g. Kamp and Rohrer 1983, Kamp and Reyle 1993, Predelli 1998, Recanati 2004, Asher and Hunter 2005, Lee and Choi 2009, Hunter 2012, 2010, 2013).

quence is that we do *not* treat 'now' as a pure indexical. This is a reflex of adopting the *pragmatic view of prominence* noted above. But what if we adopt a semantic view? We briefly outline such an approach and, in light of recent work by Stojnić et al. (2013), Stone et al. (2014) and Stojnić (2016), we suggest that 'now' may very well be a pure indexical after all.

The other consequence that we briefly explore is that – regardless of what account of prominence one adopts (semantic or pragmatic) – our proposal indirectly contributes to an ongoing debate about the linguistic reality of underlying states (see Parsons 2000 versus Katz 2003). If correct, our analysis shows that in addition to times and events, states are ontological primitives in semantic theorizing; they are not reducible to mere temporal intervals.

2.2 Time prominence account of 'now'

One natural reaction to many of the examples discussed in the previous section is to revise Kamp's principle in the following way. Instead of taking the meaning of 'now' to be, roughly, the moment of utterance (or an interval that surrounds the moment of utterance), rather, we should take 'now' to mean, roughly, the most prominent time in the context that is compatible with the contribution of tense. We called this the *time prominence account of 'now'*.

In what follows, we consider this view in detail, starting with a discussion of *prominence*. Our discussion is motivated – in part – by the contrast below, mentioned in Chapter 1:

(19) a. I hit him because he hit me.
b. #I hit him because he now hit me.

As first noted by Hunter (2012), such a contrast shows that a proper analysis of 'now' requires a discussion of mechanisms that are at play in establishing discourse coherence. We believe that these mechanisms affect *prominence* and it is to these mechanisms that we now turn.

2.2.1 Coherence and temporal anaphora

2.2.1.1 Nut and bolts

As noted in Chapter 1, the key observation that drives coherence theorists is that a discourse is more than a random sequence of unconnected sentences. To illustrate, recall the following example from Hobbs (1979):

(20) John took a train from Paris to Istanbul. He has family there.

(21) #John took a train from Paris to Istanbul. He likes spinach.

There is a stark contrast between (20) and (21). While the former is a perfectly acceptable discourse, the latter sounds bad. In (20), a hearer normally understands that John took a train from Paris to Istanbul because he has family there. Understanding that there is this explanatory connection between these two pieces of discourse is necessary for fully understanding the speaker's contribution in (20). And by contrast, the failure to carry out the interpretive task by establishing a coherent connection between the two sentences in (21) results in infelicity. Coherence theorists materialize these observations by positing discourse relations – in our particular example the relation of EXPLANATION – in the logical form of a discourse like (20), requiring that the two bits of this discourse are related by EXPLANATION (in particular, that the second sentence provides an explanation of the event described in the first).

Now, what is important for our purposes is that the establishment of discourse relations and the resolution of ambiguities are correlated tasks.[7] Recall that in (22),

(22) a. Phil tickled Stanley.
b. Liz poked him.

the choice of the discourse relation is correlated with the resolution of the pronoun 'him'. In particular, Kehler et al. (2008) report that if (22) is understood as harboring PARALLEL, 'him' is interpreted as referring to Stanley, and if it is understood as harboring RESULT, 'him' refers to Phil.

What we would like to do now is to model this interaction between anaphora resolution and discourse coherence. However, we do not want to diverge too far from our ultimate goal, namely provide a semantic analysis of 'now'. Therefore, in what follows, we provide only an informal characterization of how anaphora resolution and discourse coherence interact. A formal treatment of various aspects of the characterization will be provided in the subsequent chapters. Moreover, in what follows, we focus on the interaction between discourse coherence and *temporal anaphora*, which has to do with the resolution of tense and, as we saw briefly in Chapter 1, is correlated with the establishment of discourse relations much in the same way as pronoun resolution. Recall that analogous to (22), the choice of the discourse relation in (23) is correlated with the resolution of the past tense in (23-b).

(23) a. Stanley screamed with pain in his eyes.
b. Liz poked him.

If (23) is understood as harboring EXPLANATION, the prominent time in (23-b) is understood to be *prior* to Stanley's scream. In other words, on the EXPLANATION reading, (23-b) asserts what led Stanley to scream. If, however, (23) is understood as harboring RESULT, then the prominent time in (23-b) is understood to be *after* Stanley's scream.

7 As noted in Chapter 1, the hypothesis that establishing discourse relations and resolving pronouns are two mutually correlated tasks has been verified by a number of psycholinguistic studies.

In other words, on the RESULT reading, (23-b) asserts what Liz did as a result of Stanley's scream.

Notice that in describing the ambiguity, we mentioned *prominent times*. In what follows, we call such times *reference times*.[8] In the context of a narrative, a reference time is the time to where a story has thus far developed (Kamp and Rohrer 1983). This builds on Karttunen's (1976) idea that grammatical elements (in this cases, tenses) can introduce abstract objects, namely discourse referents (DREFS) (in this case, reference times), whose 'lifespan' determines how long they can serve as antecedents for anaphoric expressions later in the discourse. A DREF can be thought of as a variable under an assignment function that stands for an entity introduced in the discourse (Kamp 1981, Kamp and Reyle 1993).[9]

Assuming this notion of a reference time, the orthodoxy has been that the semantic function of the past tense is to seek a reference time that is prior to the utterance time (cf. 'she' seeks an individual antecedent that is 3^{rd} person, singular, female). In turn, the reference time is related to the time of the eventuality. In other words, the reference time mediates between the utterance time and the eventuality time. This idea, first proposed by Reichenbach (1947), has often been referred to as the *two-dimensional* analysis of tense (Kamp 2013).

There have been many influential proposals for how exactly the reference time mediates between the utterance time and the eventuality time, starting with Kamp and Rohrer (1983).[10] Below, we provide our toy proposal. As illustrated below, in (24), our treatment of tense strictly follows Reichenbach (1947): it encodes a relation between the reference time, the utterance time and the eventuality time.[11] Assumption 1 outlines the interaction between reference time resolution and discourse coherence.

8 In Part II of the monograph, we will extend the notion of a reference time to a *Reference Time Concept* in order to capture its intensional import in attitude reports.

9 See also Muskens 1995, Muskens 1996, where a DREF is treated as a function that takes an information state as an argument and returns an object in that state.

10 See Bary 2009 and Altshuler 2010, 2012 for an overview.

11 In this way we go against Klein 1994 and subsequent work, where the tense encodes the relationship between the reference time (or *topic time* in his terms) and the utterance time, while it is the aspect that encodes the relationship between the eventuality time and the reference time. A discussion of Klein's proposal is provided in Chapter 6.

(24) Utterance time, eventuality time and reference time (Tense Rule) [12]
The truth conditions for a past tensed sentence ϕ require there to be an eventuality v described by ϕ and a reference time t such that:
a. $t \prec$ utterance time
b. $t \bigcirc \tau(v)$

Assumption 1 (Determining reference time t). The value of t is determined by the temporal import of one or more discourse relations that hold between ϕ and some other discourse unit.

Note that the rules above do not distinguish between eventive and stative VPs – making reference to the general notion of an *eventuality*. We return to this observation in § 2.4.1 and Appendix A. Moreover, as noted in the previous section, the received wisdom is that the account of prominence goes beyond the rules of language. As such, Assumption 1 is generally taken to be pragmatic in nature. This is the view that we will assume here, even though the data that we consider does not force us to do so. We come back to this point in § 2.4.1, where we provide reasons for thinking that Assumption 1 may, in fact, be semantic in nature.

To get a feel for the Tense Rule and Assumption 1, lets apply them to (25), from Kamp et al. (2011), where we infer *narrative progression*: the events are understood to occur in the order in which they are described.

(25) a. Josef turned around.
b. The man pulled his gun from his holster.
c. Josef took a step back.

We first consider the interpretation of (25-a):

(26) Applying (24) to (25-a)
There is a reference time t and a turning around event e such that:
a. $t \prec$ utterance time
b. $t \bigcirc \tau(e)$

In (26), the Tense Rule ensures that the reference time is prior to the utterance time and that the run time of the turning around event overlaps the reference time. What counts as the reference time is tricky in this case since we don't have any preceding discourse and so Assumption 1 does not apply here. We shall assume, however, for the purposes

12 Note that '$\prec$' is the precedence relation,'$\bigcirc$' is the overlap relation and 'τ' is a function from eventualities to their run times (Link 1987; see Gyarmathy 2015 for discussion and refinement).

of illustration that (25-a) is not a discourse initial utterance; there is some temporal anchor established earlier – in accordance with Assumption 1 – which serves as the reference time.[13]

Let us now proceed to look at how the rules apply to (25-b):

(27) Applying (24) to (25-b)
There is a reference time t and a pulling-gun-from-holster event e such that:

a. $t \prec$ utterance time
b. $t \mathrel{O} \tau(e)$

The key difference between (26) and (27) is that we can say something substantial about the reference time t in (27). To that end, we turn to Assumption 1, which – applied to the discourse in question – requires us to identify the discourse relation(s) that connect (25-a) and (25-b). This, of course, presupposes that we have diagnostics for distinguishing one relation from another. In fact, we already presupposed as much, when we introduced coherence theory at the opening of this subsection. While there are some well-known diagnostics – often involving the insertion of discourse particles (see Kehler 2002, Asher and Lascarides 2003) – much work remains in this area of research. We return to this issue in Chapter 3. For the current purposes, the reader will be asked to trust that we have identified the correct discourse relation(s) and have adequately characterized its temporal import, as is required by Assumption 1.

Before identifying the discourse relation connecting (25-a) and (25-b), it is important to say a few words about discourse structure. While none of the points we want to make in this chapter hinge on a particular theory, let us – for concreteness – adopt one such theory, *Segmented Discourse Representation Theory* (SDRT, Asher and Lascarides 2003). SDRT models discourse structure as a labeled directed graph over discourse units (DUs), which come in two types: elementary discourse units (EDUs), which are the "atoms" of discourse structure, and complex discourse units (CDUs), which are built out of EDUs and may include only two or three EDUs or correspond to several paragraphs or even multiple pages of text. SDRT does not provide an official definition of EDUs, but Afantenos et al. (2012, 2729) loosely describe them as "mostly clauses, appositions, some adverbials" and mention that "each EDU contains at least one eventuality description, and often only one". For our purposes, we will take each of (25-a) and (25-b) to be an EDU, which we represent with subscripted σ's (e.g. (25-a) as σ_1 and (25-b) as σ_2).

As was just mentioned, SDRT takes a discourse structure to be a graph. The nodes of this graph are the DUs and the edges express discourse relations between the DUs.

13 Kamp and Reyle (1993, 529) note that "While it is a convention of narrative fiction that the first sentence need not be anchored to some specific reference time, the first sentence of a discourse concerning the affairs of this world, in particular when it concerns our daily lives, is in general not free of this constraint . . ." We return to this observation at the end of § 2.3.

For example, Asher and Lascarides (henceforth: A&L) characterize the discourse relation NARRATION as follows:

(28) Characterization of NARRATION:
NARRATION(σ_1, σ_2): The event described in σ_2 is a consequence of (but not strictly speaking caused by) the event described in σ_1 (Lascarides and Asher, 1993, 2).

This relation is a natural fit for (25-a)–(25-b) since we understand that the man pulling his gun from his holster was a consequence of (but not strictly speaking caused by) Josef turning around. We will try to sharpen such intuitions in Chapter 3. What is important for our purposes here is that the temporal import of NARRATION can be characterized as follows:

(29) Temporal import of NARRATION:
NARRATION(σ_1, σ_2) $\Rightarrow$ $\tau(e_{\sigma_1}) \prec \tau(e_{\sigma_2})$
("If NARRATION holds between discourse units σ_1 and σ_2, then the run time of the event described by σ_1 precedes the run time of the event described by σ_2")

Applying (29) to Assumption 1, we know that the reference time relevant in the interpretation of (25-b) is a time after the turning around event described in (25-a). Being a bit more explicit, we can say that the reference time is the time *just after* the turning around, as in Partee 1984. As noted by Dowty (1986, 47), the notion of a time *just after* is intentionally vague. The temporal distance is "determined by the hearer's understanding of the nature of events being described in a narrative, the overall degree of detail in which events are being described, and common knowledge about the usual temporal relationships among events...each successive sentence presents the very next event that transpires that is important enough to merit the speaker's describing it to the hearer, given the purpose of the narration."

With this analysis in mind, we get the following pragmatically enriched truth conditions of (25-b):

(30) Pragmatically enriched truth conditions of (25-b)
There is time t' that is prior to the utterance time of (25-b) and *just after* the turning around event described in (25-a) such that the run time of the pulling-gun-from-holster event described by (25-b) overlaps t' **(by (24), Assumption 1 and (29))**.

In (31)–(36) below, we provide a step–by–step derivation:

(31) Applying (24) to (25-a): There is a reference time t and a turning around event e such that:

a. $t \prec$ utterance time
b. $t \circ \tau(e)$

(32) Applying (24) to (25-b): There is a reference time t' and a pulling-gun-from-holster event e' such that:

a. $t' \prec$ utterance time
b. $t \circ \tau(e')$

(33) Assumption: NARRATION holds between (25-a)–(25-b). Given (29), this means that $\tau(e) \prec \tau(e')$.

(34) Given (33) and Assumption 1: t' is resolved to a time after e (e.g. a time *just after*, viz. Partee 1984).

(35) Therefore: $\tau(e) \prec t' \wedge t' \circ \tau(e') \prec$ utterance time

(36) Therefore: $\tau(e) \prec \tau(e') \prec$ utterance time

In a similar fashion, we derive the following truth conditions of (25-c), capturing the narrative progression in (25):

(37) Pragmatically enriched truth conditions of (25-c)
There is time t'' that is prior to the utterance time of (25-c) and *just after* the pulling-gun-from-holster event described in (25-b) such that the run time of the stepping back event described by (25-c) overlaps t'' **(by (24), Assumption 1 and (29))**.

With this in mind, let us now turn to discourses with 'now'.

2.2.1.2 Discourses with 'now'

The most straightforward way of extending the toy analysis just considered to discourses with 'now' is to say, simply, that 'now' picks out the prominent time in the context that is compatible with the semantics of tense. This was hypothesis stated at the outset of § 2.2, which we can rephrase as follows:

(38) Semantic requirement of 'now' (to be revised):
'Now' picks out the reference time that is encoded by the tense.

There are two important predictions of this hypothesis: (i) 'now' can occur with all tenses and (ii) 'now' does not alter the truth-conditions of a given sentence. The first prediction has already been validated with respect to the present, past and future tenses.[14] With respect to the second prediction, we have already seen data that falsify it, e.g. the aforementioned contrast below:

14 For those that think that the perfect is also a tense, note that it often occurs with 'now', as the following two discourses from Franz Kafka illustrate:

(19) a. I hit him because he hit me.
b. #I hit him because he now hit me.

Before seeing exactly how (19) disproves the hypothesis in (38) and considering possible ways of revising (38), it is first important to see the fruits of this hypothesis. Therefore, in what follows, we will apply our toy theory to several discourses where 'now' does not alter the truth-conditions of a given sentence. Doing so will allow us to continue to develop our toolkit that we will presuppose in § 2.3, where our positive proposal is provided.

Recall the past narrative below, first mentioned in § 2.1:

(10) Pilate raised his martyred eyes to the prisoner and **saw how high the sun now stood above the hippodrome**, how a ray had penetrated the arcade, had crept toward Yeshua's patched sandals and how the man moved aside from the sunlight.

To see how our toy analysis extends to this discourse, let us consider only the initial part of (10), which we simplify as follows:

(39) a. Pilate raised his martyred eyes to the prisoner.
b. The sun now stood high above the hippodrome.

We assume that the discourse relation that holds between (39-a) and (39-b) is BACKGROUND:

(40) Characterization of BACKGROUND:
BACKGROUND(σ_1, σ_2): The state described by σ_2 is the backdrop or circumstance under which an event described by σ_1 occurred. (Lascarides and Asher, 1993, 2).

This is a natural assumption if we take σ_1 to correspond to (39-a) and σ_2 to correspond to (39-b): the sun standing high above the hippodrome is the backdrop or circumstance under which Pilate raised his martyred eyes to the prisoner. Now, as before, what is important for our purposes is the temporal import of a discourse relation. With respect to BACKGROUND, its temporal import can be characterized as follows:

(i) a. For the laws are very ancient; their interpretation has been the work of centuries, and has itself doubtless acquired the status of law; and though there is still a possible freedom of interpretation left, **it has now become very restricted** ("The problem of our laws", from *The Basic Kafka*).
b. K., still distracted and uneasy after the conversation with the landlady, began to excuse himself for not having visited the teacher; it was as if he assumed that the teacher had become impatient over his failure to appear and **had now called on him instead** (*The Castle*).

(41) Temporal import of BACKGROUND:
BACKGROUND(σ_1, σ_2) $\Rightarrow$ $\tau(e_{\sigma_1})$ O $\tau(s_{\sigma_1})$
("If BACKGROUND holds between discourse units σ_1 and σ_2, then the run time of the event described by σ_1 overlaps the run time of the state described by σ_2")

Applying (41) to Assumption 1, we know that the reference time relevant in the interpretation of (39-b) is the time of (rather than the time *just after*) the eye raising described in (39-a). This allows us to get the following pragmatically enriched truth conditions of (39):

(42) Pragmatically enriched truth conditions of (39)
The run time t of the eye raising event described in (39-a) is prior to the utterance time of (39-b) and the run time of the state of the sun standing described by (39-b) overlaps t **(by (24), Assumption 1 and (41))**.

In (43)–(48) below, we provide a step–by–step derivation:

(43) Applying (24) to (39-a): There is a reference time t and an eye raising event e such that:

a. $t \prec$ utterance time
b. t O $\tau(e)$

(44) Applying (24) to (39-b): There is a reference time t' and a sun standing state s such that:

a. $t' \prec$ utterance time
b. t' O $\tau(s)$

(45) Assumption: BACKGROUND holds between (39-a)–(39-b). Given (41), this means that $\tau(e)$ O $\tau(s)$.

(46) Given (45) and Assumption 1: t' is resolved to the run time of e.

(47) Therefore: $\tau(e) \approx t' \wedge t'$ O $\tau(s) \prec$ utterance time

(48) Therefore: $\tau(e)$ O $\tau(s) \prec$ utterance time

In this way, we capture the temporal interpretation of this discourse: *The sun stood high above the hippodrome when Pilate raised his martyred eyes to the prisoner.*

As previewed above, 'now' does not contribute anything to the truth-conditions. In the discourse at hand, this is exactly what we want since, if 'now' were to be removed from (39), no truth-conditional differences are detected:

(49) a. Pilate raised his martyred eyes to the prisoner.
b. The sun stood above the hippodrome .

The same can be said for 'now' in narrative progression contexts:[15]

(50) Within a couple of minutes a huge male tiger – later to be identified as 'Budha Bapp' – emerged from behind some rocks and bushes and lay down in a clearing close beside her. **The tigress now got up again** as if in a half daze, walked up to him, pushed against his shoulders and head and lay down right in front of him. (*Wild experiences*, P. Gupta)

This discourse would have an analysis on a par with (25) considered in the previous subsection. That is, as a series of past tensed clauses linked via NARRATION. As was the case in our analysis of (39), 'now' would not contribute to the truth-conditions of (50). And, once again, this is the desired result since (50) is truth-conditionally equivalent to (51):

(51) Within a couple of minutes a huge male tiger – later to be identified as 'Budha Bapp' – emerged from behind some rocks and bushes and lay down in a clearing close beside her. **The tigress got up again** as if in a half daze, walked up to him, pushed against his shoulders and head and lay down right in front of him.

Now consider the discourse initial sentence in (52), which is also truth-conditionally equivalent to (53):[16]

(52) Anna is happy now.

(53) Anna is happy.

To analyze the parallel between (52) and (53), let us add the contribution of the present tense to our Tense Rule:

15 Kamp and Reyle's (1993) analysis rules out the occurrence of 'now' in such contexts. They argue that 'now' is only compatible with state descriptions. This claim was shown to be empirically false by Lee and Choi (2009), who provided many naturally occurring discourses in which 'now' co-occurs with an eventive VP, such as (50) (and other discourses discussed later in this chapter, see, e.g. (71)). Interestingly, 'currently' is an adverb that only occurs with stative predication (Altshuler 2011, 2014b), an observation that we come back to in § 2.4.

16 Native speakers do report that (52) carries an inference that Anna was not happy prior to the utterance time, which is something not found in (53). We come back to this point in § 2.3.

(54) Utterance time, eventuality time and reference time (Tense Rule)

a. The truth conditions for a past tensed sentence ϕ require there to be an eventuality v described by ϕ and a reference time t such that:
i. $t \prec$ utterance time
ii. $t \bigcirc \tau(v)$

b. The truth conditions for a present tensed sentence ϕ require there to be an eventuality v described by ϕ and a reference time t such that:
i. $t \approx$ utterance time
ii. $t \bigcirc \tau(v)$

Notice the present tense identifies the reference time with the utterance time. From this it follows that Assumption 1 plays a lesser role in the temporal interpretation of discourses with the present tense. That is, by identifying the reference time with the utterance time, the present tense restricts the possible discourse relations that are possible. In (52) and (53), however, this point is moot since these data are discourse initial; our rules correctly predict that Anna is understood to be happy at the utterance time in both (52) and (53).

In sum, there are two reasons to like the time prominence account of 'now': it explains why this adverb can be used with different tenses and why it often does not contribute to the truth-conditions of the sentence that it occurs in. However, as we have seen, 'now' does contribute to the truth-conditions of certain discourses, as witnessed by the contrast below:

(55) a. I hit him because
b. he hit me.

(56) a. I hit him because
b. #he now hit me.

To see why this contrast is problematic for the analysis developed thus far, let us assume that the two past tensed clauses in (55) form a CDU that harbors EXPLANATION, which is often triggered by the word 'because'. The temporal import of this relation is the opposite of NARRATION:

(57) Temporal import of EXPLANATION:
$\text{EXPLANATION}(\sigma_1, \sigma_2) \Rightarrow \tau(e_{\sigma_2}) \prec \tau(e_{\sigma_1})$
(If EXPLANATION holds between discourse units σ_2 and σ_1, then the run time of the event described by σ_2 precedes the run time of the event described by σ_1)

We can then represent the pragmatically enriched truth-conditions of (55-b):

(58) Pragmatically enriched truth conditions of (55-b)
There is time t' that is prior to the utterance time of (55-b) and is before the hitting event described in (55-a) such that the run time of the hitting event described by (55-b) overlaps t' **(by (24), Assumption 1, (57))**.

In (59)–(64) below, we provide a step–by–step derivation:

(59) Applying (24) to (55-a): There is a reference time t and a hitting event e such that:

a. $t \prec$ utterance time
b. $t \mathrel{O} \tau(e)$

(60) Applying (24) to (55-b): There is a reference time t' and a hitting event e' such that:

a. $t' \prec$ utterance time
b. $t' \mathrel{O} \tau(e')$

(61) Assumption: EXPLANATION holds between (55-a)–(55-b). Given (57), this means that $\tau(e') \prec \tau(e)$.

(62) Given (61) and Assumption 1: t' is resolved to a time before e.

(63) Therefore: $t' \prec \tau(e) \wedge t' \mathrel{O} \tau(e') \prec$ utterance time

(64) Therefore: $\tau(e') \prec \tau(e) \prec$ utterance time

Given this analysis, let us now ask the following question: what prevents us from analyzing the infelicitous discourse in (56) in the same way? The problem is that whatever the resolution strategy is employed in (55), there is nothing in our proposed 'now' rule that would prevent the same strategy being employed in (56). Therefore, our toy theory wrongly predicts (56) to be felicitous. In the next subsection, we consider a possible solution to this problem from Hunter (2012) before presenting our own solution in § 2.3.

2.2.2 Beyond the time prominence account of 'now'

In this subsection, we would like to take a look at Hunter's (2012) innovative proposal about how discourse coherence and the meaning of 'now' interact. Looking at Hunter's proposal will help us motivate our analysis in § 2.3.

In line with the analysis developed in the previous two subsections, Hunter abandons the classic view that 'now' is a pure indexical (calling it a *presuppositional indexical* instead) and proposes the following rule:

(65) Hunter's 'now' rule: Given a pair of EDUs: σ_1 and σ_2, if 'now' occurs in σ_2 and picks out a reference time in σ_1, then (a) and (b) hold:

a. σ_1 is superordinate to σ_2.
b. The eventualities described by σ_1 and σ_2 overlap in time.

Note that the term *superordinate* found in (65-a) follows the proposal of Asher and Lascarides (2003), where subordination is a property of only certain discourse relations. For a subordinating relation SUB(σ_1, σ_2), σ_2 provides more information about σ_1; for example, σ_2 might explain, comment on or elaborate on σ_1 or provide background information about σ_1. Because σ_2 makes the discourse linger on σ_1, in virtue of providing more information about σ_1, σ_2 is subordinate to σ_1 (and σ_1 is superordinate to σ_2).

The motivation for this dichotomy comes from continuations in a discourse: if a clause σ_2 explains, comments on, elaborates on, etc. another clause σ_1 (i.e. if SUB(σ_1, σ_2) holds), then two kinds of continuations are possible:

- We can continue the explanation, comment, elaboration, etc., i.e. we can add on to σ_2 (either with a subordinating or coordinating relation).
- We can go back to σ_1.

As an illustration, consider the following two discourses:

(66) [John doesn't trust Mary](σ_1) because [she lied to him once](σ_2) and [it was about something really important](σ_3).

(67) [John doesn't trust Mary](σ_1) because [she lied to him once](σ_2), so [he's not going to let her babysit his kids.](σ_3)

In (66) we have two subordinating relations, namely EXPLANATION(σ_1, σ_2) and ELABORATION(σ_2, σ_3). In (67), however, we have the subordinating relation EXPLANATION(σ_1, σ_2) and the coordinating relation RESULT(σ_1, σ_3).[17] This difference gives rise to distinct continuation possibilities. In (66), continuing the discussion from σ_2 does not block a return to σ_1. This is shown in (68) below.

(68) [John doesn't trust Mary](σ_1) because [she lied to him once](σ_2) and [it was about something really important](σ_3). So [he's not going to let her babysit his kids.](σ_4)

In (67), however, a return to σ_1 blocks any further discussion of σ_2, as shown in (69).

17 RESULT is intimately related to NARRATION though differs in some important respects. See Chapter 3 for more discussion.

(69) [John doesn't trust Mary](σ_1) because [she lied to him once](σ_2). So [he's not going to let her babysit his kids.](σ_3) [#It/the lie was about something really important.](σ_4)

In this sense, σ_1 seems to be a kind of topic for σ_2. Lingering on σ_2 is a way of keeping σ_1 alive in the discourse. Building on σ_1, though, kills off σ_2. That is, by building on σ_1 (rather than lingering on σ_2), σ_2 loses its discourse purpose of keeping σ_1 alive.

With this in mind, consider the discourses below:

(56) a. I hit him because
b. #he now hit me. (Hunter 2012)

(70) a. The young prince had showered and changed since she had last seen him.
b. He wore red now. (Hunter 2010)

As noted in the previous subsection, if (56) were to exemplify any relation it would be EXPLANATION.[18] While EXPLANATION is a subordinating relation, the problem, according to Hunter, is that this relation does not allow temporal overlap between the described hitting events: the first hitting incident ended before the second hitting incident began. As such (65-b) is violated.[19]

Let us now move on to consider (70). Here, (70-b) provides an elaboration for (70-a). Therefore, (70-a) is superordinate to (70-b). As such, given (65-a), 'now' can pick out a reference time in (70-a). As for (65-b), this condition is also satisfied since, by definition, elaboration involves two DUs which make reference to the same eventuality (Lascarides and Asher 1993).[20] Given that both definitions are satisfied, the discourse is correctly predicted to be felicitous, unlike (56).

While Hunter's (2012) analysis accounts for the discourses above as well as many others that she discusses, we nevertheless see several problems. The most obvious – and one which concerns Hunter's account directly – comes from the observation that 'now' often occurs in discourses exemplifying NARRATION, which is known to be a coordinating relation (Asher and Lascarides 2003, Asher and Vieu 2005). We have already seen such a discourse in (50), repeated below.

(50) Within a couple of minutes a huge male tiger – later to be identified as 'Budha Bapp' – emerged from behind some rocks and bushes and lay down in a clearing close beside her. **The tigress now got up again** as if in a half daze, walked up to him, pushed against his shoulders and head and lay down right in front of him.

18 Recall that EXPLANATION is inferred if 'now' were removed from (56).

19 Note that Hunter's version of (65-b) allows for abutment of the described eventualities (i.e. one eventuality is instantiated once the other has ceased to hold or has culminated). However, we do not infer the hitting events in this way in (56).

20 See § 2.3 and Appendix A for more discussion of elaborative discourses.

Moreover, as shown below, 'now' can occur with imperative statements that harbor NARRATION, such as those found in mathematical proofs and cooking directions.[21]

(71) Suppose we are given a finite poset $(P,\sqsubseteq)$, then for each element p in P we determine the indegree, i.e., the number of elements q with $q \sqsubseteq p$. While there are vertices in P with indegree 0, pick one of them, say q, and set ord(q) to be the smallest value in {1, . . . , n} which is not yet an image of some point. **Now remove q from P and lower all the indegrees of the neighbors of q by 1.**[22]

(72) First we take a saucepan, and on a low heat we melt our butter or margarine, next add the flour a little at a time, **we now mix the two ingredients together**, and what we have now, is called a roux. (*Cook like mum*, M. Darracott)

To her credit, Hunter aims to explain why 'now' is okay with a particular antecedent and not why it chooses the particular antecedent that it does. Nevertheless, we think the discourses above raise some skepticism for her analysis. We also note that Hunter's analysis does not help us explain the data below, which we think is challenging for any time-prominence account:

(6) a. I will now introduce you to the gentleman who is in charge of your transportation and whom you have to obey (*The Man who Disappeared (America)*, F. Kafka).

b. I will introduce you to the gentleman who is in charge of your transportation and whom you have to obey.

(73) Look at the pies below. How many $\frac{1}{6}^{th}$ slices fit into a $\frac{1}{2}$ slice? [Picture of pies] Now you can see that $\frac{1}{2}$ divided by $\frac{1}{6}$ really is 3! (Hunter 2012)

(74) Shawn is just an angel. Now that brother of hers, he's something else entirely. (Hunter 2012)

Recall the interpretative difference in (6): only the sentence with 'now' asserts that the introduction will take place *right after* the time of utterance. On a revised version of Kamp's principle considered in § 2.1, this was explained by saying that 'now' picks out a *short* interval that has to include the moment of utterance. But how does a time prominence account, which does not treat 'now' as being indexical, explain the interpretative difference? The problem is that, according to the account, whatever the prominent time is in 'I will introduce you', it should also be the prominent time in 'I will introduce you now'.

With respect to (73) and (74), Hunter sets these examples aside for future research. The challenge is that "...there is no particular time introduced by the content of the discourse that *now* aims to pick out" (Hunter 2012, 22). This is clearly a challenge for

21 Thanks to Julian Schlöder for bringing examples such as (71) to our attention.

22 http://www.win.tue.nl/$\sim$hansc/dw/notes.pdf

a time prominence account. In fact, we suggest in the next section, that the problem with such an account, even one that recognizes coherence as an essential component, is that it is a mistake to think of 'now' as picking out a time in the first place! What it does, instead, perhaps surprisingly, is pick out the most prominent state. But not any prominent state will do. We argue that to satisfy the anaphoric properties of 'now', the state must be understood as resulting from a prominent event. We proceed to provide an account along these lines and show that when we think of 'now' as seeking a prominent state of the kind described, we do not need to subscribe to Hunter's idea that the meaning of 'now' distinguishes between particular kinds of coherence relations, namely those that are *subordinating* and *coordinating*.[23]

2.3 'Now' seeks prominent final states

The goal of this section is to defend the view that 'now' picks out the most prominent state which is understood to result from a prominent event. The idea that 'now' makes reference to both eventualities which are intimately connected in this way was first proposed by Altshuler (2009).[24] However, our proposal is different in several respects. Altshuler (2009, Footnote 3) assumed that 'now' is lexically ambiguous between a 'now' that only modifies stative descriptions (cf. Kamp and Reyle 1993) and a 'now' that can modify eventive descriptions.[25] The goal was to explain *why* the former 'now' cannot combine with eventive descriptions. The proposal was that this 'now' seeks a prominent event and requires that the state resulting from this event be in the extension of the VP that it combines with. Given certain assumptions about narrative progression, this proposal derived an incompatibility between 'now' and eventive descriptions.

Our analysis, on the other hand, proposes a single, uniform meaning for 'now'. Moreover, on our analysis, the event and state that 'now' seeks are independent of the eventuality described by the VP that 'now' modifies. Below, we show how our analysis accounts for a wide range of data, including the kind of data that fueled Altshuler's (2009) account.

The idea that 'now' picks out a state that results from an event (henceforth: *final state*) is perhaps least surprising when we consider the discourses below:

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23 This is not to suggest that the difference between subordinating and coordinating relations might not be important for other aspects of interpretation; it clearly is, as we have seen. We merely claim that 'now' is not sensitive directly to this distinction in the way Hunter claims.

24 This idea was also recently explored by Ritz and Schultze-Berndt (2015) in connection to the clitic '=biyang' in Jaminjung, which is translated as 'now' in some contexts.

25 A relevant cross-linguistic fact worthy of note is that these two uses of 'now' are morphologically distinguished in Russian (cf. 'sejčas' vs. 'teper" (Mel'chuk 1985)) and Korean (cf. 'cikum' and 'icey' (Lee and Choi 2009)).

(75) It finally dawned on me that what she had was irreversible. As she started to recover from her hip injury, we discovered she had lost the capacity to speak properly. **She was now able to emit only a series of sounds** mixed with the occasional word. Her frustration was tangible. She cried for her lost voice.[26]

(76) I could've located this place even without the brilliance of the falling snow, for this spot, razed by fire, was where I'd ended the life of my companion of twenty-five years. **Now, snow covered and erased all the clues that might have been interpreted as signature**, proving that Allah concurred with Bihzad and me on the issue of style and signature.(*My Name is Red*, O. Pamuk)

Notice the underlined pluperfect descriptions in (75) and (76): 'had lost the capacity to speak properly' and 'I'd ended the life of my companion' respectively. This is significant if we assume that the semantic function of the perfect (at least on some of its uses) is to describe an event's final state (Dowty 1979, Moens and Steedman 1988, Parsons 1990, Higginbotham 2008, Kamp et al. 2016).[27] In (75), 'had lost the capacity to speak properly' describes the final state – i.e. unable to speak properly – of the event of losing the capacity to speak properly. Similarly, in (76), 'I'd ended the life of my companion' describes the final state – i.e. the companion's death – of the event of the narrator killing his companion. We propose that 'now' picks out these final states in (75) and (76) respectively; they serve as the location for the eventualities that are described by the verb phrases that 'now' modifies (i.e. emitting a series of sounds in (75) and erasing the clues in (76)). In effect, then, our proposed contribution of 'now' can be paraphrased as follows: *with this having happened*.[28]

It is important to note that some final states may be temporary (e.g. unable to speak properly in (75)), while others last forever (e.g. the companion's death in (76)).[29] As we shall propose shortly, 'now' requires the resolved final state to overlap the reference time. We do not believe that the grammar specifies which part of the final state overlaps the reference time. Hence, the distinction between temporary and permanent states is not relevant for our purposes.[30] We extend Dowty's (1986) insight about Partee's time *just after* discussed in § 2.2.1.1 to final states. In particular, we assume that the part of the final state that is understood to overlap the reference time depends on

26 http://www.dailymail.co.uk/tvshowbiz/article-1307015/Her-misery-deep-existence-shallow\T1\textendashI-wanted-grab-pillow-smother-her.html, cited in Hunter 2010.

27 See Chapter 6 for another way of analyzing the perfect.

28 This paraphrase was suggested to us by Matthew Stone (p.c.).

29 See Parsons's (1990) distinction between *target states* and *resultant states*.

30 However, this is not to say that this distinction is not linguistically relevant. See Kratzer 2000, Anagnostopoulou 2003 and Maienborn 2009 for analyses of natural language phenomena that rely on the distinction. See also Baglini 2012 for an alternative view, on which the distinction is derived from auxiliary factors. We will have much more to say about final states in the next chapter.

"the hearer's understanding of the nature of events being described in a narrative, the overall degree of detail in which events are being described, and common knowledge about the usual temporal relationships among events…"

It is also important to note that we don't claim that the final state that 'now' requires must be made prominent by the pluperfect. In fact, prior to this section, the felicitous discourses with 'now' that we considered did not involve the pluperfect. In such discourses, we claim that an event's final state is nevertheless prominent. For example, recall the discourse below:

(50) Within a couple of minutes a huge male tiger – later to be identified as 'Budha Bapp' – emerged from behind some rocks and bushes and lay down in a clearing close beside her. **The tigress now got up again** as if in a half daze, walked up to him, pushed against his shoulders and head and lay down right in front of him.

Consider the underlined description 'a huge male tiger lay down in a clearing close beside her'. This description entails that a huge male tiger had positioned himself in a clearing besides the tigress. In other words, the description entails a final state of a laying down event. And, as we would expect given our proposed analysis, 'now' picks out this final state. That is, we understand that the tigress got up *when* this final state held.

Before going on to show how our analysis extends to other discourses with 'now', including infelicitous discourses, it is a good time to make the analysis more explicit. Below, we offer our proposed rules. Note that we repeat our Tense Rule in (77) for the sake of convenience. The new rules come in (78) and in Assumption 2, which include the notions of *reference event* and *reference state*, in addition to a *reference time*.

(77) Utterance time, eventuality time and reference time (Tense Rule)

a. The truth conditions for a past tensed sentence ϕ require there to be an eventuality v described by ϕ and a reference time t such that:
i. $t \prec$ utterance time
ii. $t \circ \tau(v)$

b. The truth conditions for a present tensed sentence ϕ require there to be an eventuality v described by ϕ and a reference time t such that:
i. $t \approx$ utterance time
ii. $t \circ \tau(v)$

(78) Semantic requirement of 'now' (final version):
The truth conditions for a 'now'-sentence ϕ require there to be a reference state s and a reference event e, such that: s is the final state of e and $\tau(s)$ ○ t, where t is the reference time encoded by the tense.[31]

Assumption 2 (Determining reference event e, state s and time t). The values of e, s and t are determined by the temporal import of one or more discourse relations that hold between ϕ and some other discourse unit.

To see the fruits of the new rules, it is helpful to consider the infelicitous discourse below, which we discussed at length in the previous section. In what follows, we would like to show how the 'now' rule in (78) conspires with the tense rule in (77-a) to rule out the usage of 'now' in (79-b):

(79) a. I hit him because
b. #he now hit me.

Recall from § 2.2.1.2 that if (79) were to exemplify any discourse relation, it would be EXPLANATION. A good reason to think this is that (79) contains 'because', which often signals EXPLANATION. This is clear in (80), which is the 'now'-less version of (79):

(80) a. I hit him because
b. he now hit me.

The consequence of assuming that EXPLANATION holds in (79) is that the reference time in (79-b) must be resolved to a time before the hitting described in (79-a). While this consequence is harmless on its own, how do we resolve the reference state that is required by 'now'? Let's assume that both (79-a) and (79-b) describe finals states of the respective hitting events (i.e. the states of having been hit). The final state of the hitting event described by (79-a) is not a possible antecedent for 'now' since, given (78), this final state would be required to overlap the reference time, which we just determined to be *prior* to the hitting described in (79-a). On the other hand, the final state of the hitting event described in (79-b) is compatible with the just mentioned reference time. However, if 'now' were to locate the hitting event described in (79-b) within the final state of the hitting event described in (79-b), this would lead to the absurd prediction that the hitting event occurred within its own final state.

In sum, (79) is infelicitous because there is no possible way to resolve the reference time and the reference state given the temporal import of EXPLANATION. In turn, we predict that 'now' could be used in an explanatory discourse on a par with (79) if the

31 See Chapter 6 for a compositional rendition of this rule.

reference state were resolved to a final state mentioned earlier in the discourse. This prediction is borne out in the discourse below:

(81) We recruited three real bargirls who dance in the bar scenes and have a few lines. As we wrapped, one of them came to say goodbye, and started to cry. She said that it was the first time that she had been treated with respect and was able to do a job that she didn't have to be ashamed of. **She was crying because she now had to return to working in the bar**.[32]

Notice the description 'As we wrapped' underlined above, which describes the completion of a film scene that was being shot. We understand that some state of the film shooting had been reached, when a bar girl came to say goodbye and began crying. Let us assume that the necessity to return to work, which is described by the 'now' sentence, held during this state of the film shooting. From this, it follows that the necessity to return to work held *prior* to the crying, explaining why 'because' is used.

In sum, the new rules allow us to account for infelicitous uses of 'now' in explanatory discourses with 'before' clauses – something that our time prominence account could not do. The reason our new account fairs better is that it distinguishes time anaphora from state and event anaphora. In particular, according to our analysis, the 'now'-less discourse in (80) is felicitous because only time anaphora is involved. With 'now' in the 'before' clause, however, there is no way to resolve the reference time and the reference state given the requirement imposed by 'now', namely that the time and state overlap, while also respecting the temporal import of EXPLANATION. Such a resolution is only possible in a discourse like (81), where a state is made prominent earlier in the discourse, outside the 'before' clause.

Let us now make sure that our new rules are consistent with the results of the time prominence account. To do so, let us apply the new rules to a discourse that we have already analyzed, namely (50), repeated below.

(50) Within a couple of minutes a huge male tiger – later to be identified as 'Budha Bapp' – emerged from behind some rocks and bushes and lay down in a clearing close beside her. **The tigress now got up again** as if in a half daze, walked up to him, pushed against his shoulders and head and lay down right in front of him.

Recall that the coherence structure in (50) is relatively straightforward: the clauses are connected via a series of NARRATIONS, which fix the reference time in the 'now'-sentence as the time after the male tiger lay down near the tigress. Since according to our 'now' rule, the reference state must overlap the reference time and must be the

32 http://twitchfilm.com/2005/04/paul-spurrier-talks-thailand-ghosts-and-p.html

final state of the reference event, the only possible resolutions are as follows:

Resolution in the 'now'-sentence in (50)[33]

- Reference event: the male tiger lay down near the tigress
- Reference state: the male was near the tigress
- Reference time: the time after the male tiger lay down near the tigress

This resolution strategy is consistent with our rules in (77) and (78), accounting for the following inference: *the eventuality described in the 'now'-sentence (the tigress getting up) took place after the male tiger lay down near the tigress*. Thus, we are able to replicate the fruits of the time prominence account with our new proposal.

It is important to note that while (50) describes a perfectly coherent chain of events, some discourses exemplifying NARRATION are less coherent. For this reason, NARRATION is often thought to be *gradient* (Asher and Lascarides 2003). To see this, consider the discourse below, which is incoherent even though the temporal location of the two events is specified.

(82) #Jesus was born a long time ago and today Fortuna won the match.

With this in mind, consider the oft-cited example below, which is more coherent than (82), but less coherent than (50):

(83) ??Bill had come home at seven. Now he wrote a letter (Kamp and Reyle 1993, 596)

This example opens with a pluperfect description that entails a final state of Bill's coming home. However, as shown by the oddity of this discourse, 'now' cannot pick out this final state. The question is why?[34] Here, we follow Hunter (2010, 62), who observes that (83) "is not a particularly good example even without *now*...While it may be acceptable, it begs for extra scene-setting from the context."

In sum, the data above reveals that describing an event's final state is not enough to license the use of 'now'. The final state must be *prominent*, which means that the state contributes to establishing one or more discourse relations. With respect to NARRATION, because it is gradient, things are somewhat murky as to what counts as a *prominent enough* final state. Ultimately, we would like to have a theory that removes

33 As noted by Marie-Eve Ritz (p.c.) the fact that the reference time and reference state are so intimately related (i.e. the run time of reference state *is* the reference time) may explain why replacing 'now' with 'then' in (50) preserves the intended interpretation. And, more generally, the intimate relation between the reference time and reference state may be used to model when the meanings of 'now' and 'then' converge.

34 The answer that Kamp and Reyle (1993) provide is that 'now' is only compatible with state descriptions. However, as noted in Footnote 15 and as we have seen, this claim is empirically inadequate.

such murkiness and the next chapter is an attempt to make some headway.[35] In the remainder of this chapter, we will try to side step this issue. When we consider felicitous discourses with 'now', we will assume that they are felicitous because they describe a *prominent enough* final state. And when we consider infelicitous discourses with 'now', we will assume that they are infelicitous for independent reasons.

With this in mind, consider the discourse in (84) and its various continuations in (84-a)-(84-c):

(84) His room, a regular human bedroom, only rather too small, lay quiet between the four familiar walls. Above the table on which a collection of cloth samples was unpacked and spread out hung the picture of a lady, with a fur cap on and a fur stole, sitting upright and holding out to the spectator a huge fur muff…(*The Metamorphosis*, F. Kafka)

a. …Gregor was alarmed by this lady.
b. …#Gregor was now alarmed by this lady.
c. …??Suddenly, the lady dropped the muff and took off her cap. Gregor was (now) alarmed by this lady.
d. …Suddenly, the lady dropped the muff and took off her cap. Gregor (now) became alarmed by this lady.

Notice that (84) contains a series of stative descriptions. Moreover, whereas the continuation in (84-a) is natural, the one in (84-b) is odd. Altshuler (2009, 184) uses a similar contrast to argue that 'now' requires an event antecedent; a state antecedent won't do. This insight is in line with our current proposal. We think that (84-b) is odd because 'now' requires both a prominent event and a prominent state, and only the latter requirement is satisfied in (84-b).

What is *prima facie* surprising is that the continuation in (84-c) is odd. The eventive descriptions in 'the lady dropped the muff and took off her cap' entail final states (i.e. the woman having dropped the muff and having taken off her cap) and, given what we have said thus far, this should license the use of 'now'. However, note that (84-c) is degraded as a follow-up even without 'now'. The reason for this differs from what we said about (83), where the NARRATION is exemplified. In (84-c), the relevant relation is RESULT (Lascarides and Asher 1993, Kehler 2002), which is encodes *causal* inferences: Gregor's state of being alarmed was caused by the lady dropping the muff and taking off her cap. As we will see in the next chapter, such inferences are often hard to get with stative descriptions. In fact, we will argue that the arguments of RESULT are never stative descriptions. To that end, notice that (84-c) improves in (84-d),

35 See also the *Common Topic Constraint* proposed by Asher and Lascarides (2003) to address this issue. See also more recent work by Hunter and Abrusán (2016) and Roberts (2016) which attempts to formalize topicality constraints imposed by discourse relations in terms of their interaction with Questions Under Discussion (QUDs).

where we have the eventive description '(now) became intrigued by this lady'. We propose that in this case RESULT is a possible discourse relation, which in turn determines the resolution of 'now'.

Having accounted for several infelicitous uses of 'now', let us revisit the felicitous use of 'now' in imperative discourses, which exemplify NARRATION:

(71) Suppose we are given a finite poset $(P,\sqsubseteq)$, then for each element p in P we determine the indegree, i.e., the number of elements q with $q \sqsubseteq p$. While there are vertices in P with indegree 0, pick one of them, say q, and set ord(q) to be the smallest value in {1, . . . , n} which is not yet an image of some point. **Now remove q from P and lower all the indegrees of the neighbors of q by 1.**

(72) First we take a saucepan, and on a low heat we melt our butter or margarine, next add the flour a little at a time, **we now mix the two ingredients together**, and what we have now, is called a roux. (*Cook like mum*, M. Darracott)

These discourses are interesting because imperative statements like 'set ord(q) to be the smallest value in {1, . . . , n}' and 'add the flour a little at a time' do not seem to entail any sort of final state. However, note that mathematical proofs and cooking instructions are narratives precisely because we are asked to *imagine* that a given instruction is satisfied. And only once we imagine the instruction to be satisfied can we proceed in our proof or cooking. We would like to suggest that this satisfaction is, in fact, a final state – one that need not be instantiated in the actual world. For example, the satisfaction of an order of setting ord(q) to be the smallest value in {1, . . . , n} is the state of ord(q) being set as the smallest value in {1, . . . , n} in some possible world. Similarly, the satisfaction of an order of adding flour to a dish is the state of there being flour in the dish in some possible world. On this line of thinking, the fact that final states need not be instantiated in the actual world does not prevent them from being prominent in the discourse.[36] And, as a result, the anaphoric constraints of 'now' are satisfied[37] analogous to the tiger discourse in (50) and any other discourse that exemplifies NARRATION.

The toy analysis just sketched out allows to make sense of discourses that exemplify what Hunter (2012) called the *atemporal* uses of 'now'. Recall the following data:

(73) Look at the pies below. How many $\frac{1}{6}^{th}$ slices fit into a $\frac{1}{2}$ slice? [Picture of pies] Now you can see that $\frac{1}{2}$ divided by $\frac{1}{6}$ really is 3!

36 Cf. Work on modal subordination (Roberts 1989, Stone 1999).

37 The resolution for the 'now'-sentence in (71) would be the following:

- Reference event: setting ord(q) to be the smallest value in {1, . . . , n}
- Reference state: ord(q) is set to be the smallest value in {1, . . . , n}
- Reference time: the time after ord(q) is set to be the smallest value in {1, . . . , n}

(74) Shawn is just an angel. Now that brother of hers, he's something else entirely.

We think that (73) is not so different from (71) and (72). The picture of the pies presents an instruction to have a look, as prompted by the question 'How many $\frac{1}{6}^{th}$ slices fit into a slice?'. Satisfying this instruction is simply to see the pies. We take this to be the prominent final state that serves as the antecedent to 'now'. What differentiates (73) from (71) and (72) is that the 'now' clause in (73) elaborates on what it is that is seen, namely that $\frac{1}{2}$ divided by $\frac{1}{6}$ is 3. In other words, while NARRATION determines the resolution in (71) and (72), ELABORATION determines the resolution in (73). As such, it is misleading to call the use of 'now' in (73) *atemporal*. Although there is no narrative progression, 'now' nevertheless picks out a state which has a temporal extent. What may lead one to think that the usage is atemporal is that the state that 'now' picks out is the very same state that is then elaborated upon.

Now, we think that it is also misleading to call (74) an atemporal use of 'now'. This discourse is, however, importantly different from the others that we have considered thus far. The opening contains a simple stative description without any reference to a prior event. As such, there is no reading of (74) on which the state of being an angel is understood as a final state. But if that's the case, what licenses the use of 'now' in the next clause?

Recall our proposed paraphrase for the contribution of 'now': *with this having happened*. With this in mind, we can rephrase the question above as: what is it that has happened that licenses the use of 'now'? We propose that that the thing that has happened in (74) is that the speaker has uttered "Shawn is just an angel" and 'now' is picking out the final state of this speech event (i.e. the event of uttering 'Shawn is just an angel'). This use of 'now' is common, as witnessed by the opening line of the previous paragraph, where 'now' reinforces the indentation; it signals that the core idea in the previous paragraph has come to an end and that it is time to consider a new idea. It is well known from work on dialogue that is there an intricate discourse structure at the speech act level, in addition to the level of what is said.[38] And we believe that 'now' can operate on both levels.[39]

Further evidence for this claim comes from (6), repeated below:

(6) I will now introduce you to the gentleman who is in charge of your transportation and whom you have to obey (*The Man who Disappeared* (*Amerika*), F. Kafka).

Observe that (6) can be paraphrased as: *As soon as I am done talking, I will introduce you to the gentleman who is in charge of your transportation and whom you have to*

38 See, e.g., Asher and Lascarides 2003, 2013, Lascarides and Asher 2009, Lücking et al. 2006.

39 Interestingly, the Ancient Greek '*νυν*' seems to only pick out final states of speech acts. Not surprisingly, it is often translated as 'now' (Rutger Allan, p.c.).

obey. Given our proposal, this paraphrase is expected: analogous to (74) above, 'now' is picking out the final state of the speech event in (6).[40] This explains why when 'now' is not present in (6), we no longer infer that an introduction will be made right after the speech event. Moreover, we explain why the combination of 'now' + 'will' always results in a felicitous utterance discourse initially[41], while the combination of 'now' and the past tense never does. For example, neither the past tensed counterpart of (6) nor the example from § 2.1, repeated below in (5), felicitous discourse initially:

(85) #I now introduced you to the gentleman who is in charge of your transportation and whom you have to obey.

(5) #The sun now stood above the hippodrome.[42]

The final state of the speech event could not be picked out by 'now' in (85) or (5) because the past tense is incompatible with such a resolution. And with no other final state prominent in the discourse, (85) and (5) are odd without further context.[43]

Finally, we come full circle and consider (52), repeated below:

(52) Anna is happy now.

Given our proposed analysis, a natural hypothesis would be to say that 'now' is picking out some antecedent final state that continues to hold during the utterance time, given the semantic requirement of the present tense. Such an analysis sheds light on Recanati's (2004) change of state inference, i.e. the intuition that Anna was not happy prior to the utterance of (52). That is, if we accommodate the final state of the event

40 See Zeevat 1999, Bittner 2007, Hunter 2010, 2013, who build on Stalnaker 1978 and propose that as soon as someone speaks up, various DREFs are introduced into the discourse context. Crucially, the speech event is a DREF that is available for anaphoric pick up. See also van Eijck and Kamp 1996 for discussion.

41 In non-discourse-initial contexts, the combination of 'now' + 'will' is often used in narratives analogous to the way 'now' is used with the past tense:

(i) To start using the Estimator system select Start, Programs, Masterbill, Estimator (or your alternative location if you chose one). You do not need to register to use the trial system so select Demo Version, **you will now be presented with the Estimator Project Manager screen** and the Estimator Assistant (*Laxton's Building Price Book 2002: Major and Small Works*, V.B. Johnson).

42 Cf. 'The sun will now stand above the hippodrome', which is perfectly fine.

43 As noted in § 2.1, (85) and (5) could be made felicitous by adding 'just':

(i) Just now I introduced you to the gentleman who is in charge of your transportation and whom you have to obey.

(ii) Just now the sun stood above the hippodrome.

that leads up to Anna's happiness, we can further deduce that she was not happy prior to that event (whatever it may be). This further inference is aided by the fact that the default stress falls on 'now' in (52) (viz. Cinque's (1998) Nuclear Stress Rule) and this invokes contrastive focus. Similarly, in (86), we infer that Anna is happy on the day of the utterance rather than some other day due to the nuclear stress on 'today':

(86) Anna is happy today.

In (87), however, there is no change of state inference since this example does not contain 'now' or any other temporal locating adverb.

(87) Anna is happy.

In sum, our proposal is that present tensed sentences with 'now' are felicitous when you can accommodate a final state. As we have seen, this is possible when the Nuclear Stress Rule in English aides the accommodation. In contrast, (88) below is infelicitous when the nuclear stress falls on 'happy'. In this case, one gets the feeling that (88) is embedded within a narrative, without an actual narrative provided. Hence the infelicity.

(88) Now Anna is happy.

On the other hand, with nuclear stress on 'now', (88) can be used discourse initially. In such a case, the sentence would have the same interpretation as (52).

It is important to note that our proposed analysis differs from Recanati's (2004) hypothesis that 'now' "can pick up on a past time just as long as this time is contrasted with another time". For Recanati, the central function of 'now' is to establish a contrast. Hunter (2010) builds on this idea, providing an impressive collection of discourses in which 'now' appears to establish a contrast. Then, based on these discourses, she proposes a semantics for 'now' that includes the following constraint: given a set of events P whose run times overlap a time t, 'now' requires that the run times of the P-events did not overlap or will not overlap some time immediately in the past or immediately in the future of t, where t is either the time of utterance or a time introduced in discourse (Hunter 2010, 70).

In subsequent work, Hunter (2012) dismisses this analysis, proposing the alternative analysis discussed in § 2.2.2. What's interesting to note is Hunter's reason for dismissing her earlier analysis. She provides the following example,

(89) But Rokiroki, exerting all his strength, gripped the stranger's wrists so that he could not draw his hatchet. And now he called again to his little daughter, who stood trembling on the bank above.

observing that although 'now' "signals a change from one eventuality to another…this is not a reason to argue that *now* requires a contrast between two times…*now* could be

replaced by *next* or and *then* and the discourse would have the same effect of signaling a shift from one eventuality to another. But…we would not want to argue that *next* or *then* requires a contrast" (Hunter 2012, 19).

We not only agree with Hunter on this point but also explain the genesis of her concern: 'now' requires a prominent final state which, by definition, signals a change of state. In some discourses this aides in establishing a contrast. In others, where we simply observe a narrative progression, as in (71) below, no contrast is established.

(71) Suppose we are given a finite poset $(P,\sqsubseteq)$, then for each element p in P we determine the indegree, i.e., the number of elements q with $q \sqsubseteq p$. While there are vertices in P with indegree 0, pick one of them, say q, and set ord(q) to be the smallest value in {1, . . . , n} which is not yet an image of some point. **Now remove q from P and lower all the indegrees of the neighbors of q by 1.**

Ultimately, to have a better idea about when a contrast is established with 'now', we would have to say more about information structure. This is outside the scope of this chapter, though we hope that the data provided spurs a careful study which controls intonation and placement of 'now' within the clause.

We end this section by reconsidering Hans Kamp's celebrated discourse below:

(1) I learned last week that there would now be an earthquake.

Since 'now' occurs in the complement clause of a propositional attitude, we should say a bit about such a construction. Following Afantenos et al. (2012), we will assume that attitude verbs such as 'learned' introduce ATTRIBUTION, a discourse relation that holds between the clause with the attitude verb and the clause with the content of the attitude. This relation, however, does not have any temporal import.[44] As such, we must look to other discourse relations – with temporal import – to figure out possible reference time and reference state candidates. One relation that comes to mind, given the semantics of 'would', is NARRATION. In particular, the semantics of 'would' requires the reference time to be future relative to a past anchor, which in this case is the time of the learning. Hence, the time after the learning seems like a natural candidate for the reference time. Moreover, given this resolution, we could say that the reference state is the final state of the learning, i.e. the speaker having knowledge, which is entailed by (1). The reference event, of course, would then be the learning event itself. In this way, we would analyze (1) on a par with (50) and the other narratives considered thus far.

Note, however, that positing NARRATION would lead to an odd interpretation: the learning (i.e. the mental state) is what enabled (or caused) the earthquake. Since mental states are not magical in this way, world knowledge rules out NARRATION as a pos-

44 It does, however, have intensional import and this directly effects the interpretation of the embedded tense. We return to this point in Chapter 4 and Chapter 5.

sible discourse relation, despite the fact that there is a resolution strategy that is compatible with its temporal import. But if NARRATION does not hold, what then? Instead of answering this question directly, notice that the only state (besides the final state of the learning) that could satisfy the semantic restrictions of 'now', is the final state of the speech event. The reference event, in turn, would be resolved to the speech event. As such, we understand the earthquake to be intimately connected to the actual utterance of (1). In fact, if our analysis is correct, (1) should be synonymous with:

(90) Here is what I learned last week: there will now be an earthquake.

If that's right, then we can shed some light on why – when 'now' is not present in (1) – we no longer infer that the earthquake is intimately connected with the utterance of (1).[45] Without 'now', there is no state or event anaphora, so the speech event and its final state are no longer candidates for resolution. There is, however, time anaphora associated with the tense, so the question becomes: why isn't the time of of utterance necessarily chosen? Put differently: why is the interpretation of (2) below simply that there will be some time in the future of the learning during which the earthquake will take place?

(2) I learned last week that there would be an earthquake.

Why the reference time can remain unspecified in this case is not clear. However, note that this is quite common in English, as the following examples demonstrate:[46]

(91) Seth went to Swarthmore.

(92) Betty will go to Hampshire College.

(93) My father was born in Burlington, VT.

(94) My child will be born in that big hospital around the corner.

(95) God's children were born evil.

Following Bäuerle (1977, 1979), we could analyze such data as involving covert temporal locating adverbs, including an adverb of quantification in (95). Such an analysis would serve as an extension of an observation made by Smith (1977, 637):

(96) "There is an important difference between the syntax and semantics of temporal specification. Tense is the only temporal expression that is necessary in a sentence that is syntactically well formed; but for a sentence to be seman-

45 Hans Kamp (p.c.) notes that (1) can be uttered in a context in which the earthquake is actually taking place, i.e. at the time that (1) was uttered rather than soon thereafter. Indeed, this is how he conceived his original example. If this is right, then (1) is not synonymous with (90), though (90) is clearly a possible interpretation of (1).

46 The examples in (91) and (93) were provided by Barbara Partee (p.c).

tically well-formed, from the temporal point of view, it must have both tense and a time adverbial."

We leave it open for further research about how to best implement this observation. However, see Chapter 6 for some preliminary steps and Altshuler (2014b) for a proposal.

2.4 Two consequences of the proposal

In sum, this chapter proposed that (i) 'now' refers to the most prominent final state which holds at the reference time and (ii) prominence is further pragmatically constrained by principles of discourse coherence. In the next two subsections, we explore two consequences of our analysis that have to do with indexicality and stativity.

2.4.1 Is 'now' a pure indexical?

The first consequence of our analysis is that we do *not* treat 'now' as a pure indexical. That is, the interpretation of 'now' – on our account – is *not* fully determined by its linguistic meaning as a function of context. This conclusion is supported by Recanati (2004) and Maier (2009), who suggest, based on the anaphoric properties of 'now', that this adverb should be jettisoned from the class of indexical expressions altogether. In response, Hunter (2013) shows that other indexical expressions such as 'actually' and 'here' also have anaphoric interpretations:[47]

(97) And what would terrify the right, of course, is the likelihood that genuine socialized medicine would **actually** win that competition.

(98) All over England folk began to hear of the wonderful saint who lived alone in the desert island…He was like some famous doctor to whom sick folk come; and no doctor ever cured bodies so skillfully as he cured souls and hearts and troubled minds. He built a house by the landing-place on the island for his visitors to stay in, **and here**, too, his monks would come on festivals to have a talk with him.

Hunter reasons: "Were we to jettison these expressions from the class of indexicals…we would be left with a funny lot. We would have, perhaps, the English 'I', and some temporal indexicals. This looks like a far less interesting class semantically than the original set of indexicals" (Hunter 2013, 401). What makes indexicals unique, according to Hunter, is their perspectival nature: "they bring with them a certain 'per-

47 See also Cresswell 1990 for a discussion of anaphoric uses of 'actually' .

spective' that is not found with many other kinds of expressions. Even when used anaphorically, indexicals have the effect of centering the discourse, bringing the addressee/reader somehow 'closer' to the event or state being described (Hunter 2013, 410-411)."

Exactly how to cash out the fact that indexicals bring about a certain perspective is not clear. Recall the mistake in Recanati's (2004) and Hunter's (2010) work on 'now', namely to try to account for the change of state inference by positing a complex semantics for 'now', rather than seeing this inference as being epiphenomenal, following from the anaphoric requirement of 'now' that, in turn, aides in establishing a contrast. In light of this mistake, it is worthwhile to ask whether the seeming perspectival nature of indexical expressions (including 'now') is also epiphenomenal.

For the sake of argument, let us assume that we can and should encode some representation of *perspective* into the lexical entry of 'now'. In particular, let us adopt Kamp and Reyle's (1993) idea that 'now' refers to the "perspective time"[48] – a notion that Kamp and Reyle motivate on independent grounds on the basis of the extended flashback below:

(99) Fred arrived at 10. He had got up at 5; he had taken a long shower, had got dressed and had eaten a leisurely breakfast. He had left the house at 6:30. (Kamp and Reyle 1993, 594)

In the discourse above, the past perfect clauses use the time of the arriving as their "reference time". However, these clauses also form a narrative progression and, therefore, each clause also provides a "reference time" for the clause following it – a time which the eventuality described by the second clause must follow or overlap. Based on these observations, Kamp and Reyle conclude that "Reichenbach went astray when he wanted his notion of reference point to do too many things at once" (Kamp and Reyle 1993, 594). They propose to use the term "reference time" for the time that is necessary to model the narrative progression in a text and the term "perspective time" for the time with respect to which the described eventualities are oriented into the past, present and future.[49]

Now, what is especially important for our purposes is that perspective times are – according to Kamp and Reyle – encoded by the tense. As such, we if wanted to adopt

48 This assumption is also made by Recanati (2004).

49 On this view, the perspective time can simply be the utterance time; it can be a past time, as in the case of (99), where the perspective time is the time of Fred's arrival; or it can be a future time, as in the case of the futurate counterpart of (99) below, where the perspective time is (once again) the time of Fred's arrival:

(i) Fred will arrive at 10. He will have gotten up at 5; he will have taken a long shower, will have gotten dressed and will have eaten a leisurely breakfast. He will have left the house at 6:30.

the idea that 'now' refers to perspective times, rather than reference times, we could revise our 'now'-rule as follows:

(100) Semantic requirement of 'now' (Kamp and Reyle 1993 inspired version): The truth conditions for a 'now'-sentence ϕ require there to be a reference state s and a reference event e, such that: s is the final state of e and $\tau(s)$ ○ t, where t is the **perspective time** encoded by the tense.

The problem is that in the discourses that we have considered, the temporal referent of 'now' seems to be a reference time and not a perspective time. This is especially clear in discourses with narrative progression:

(50) Within a couple of minutes a huge male tiger – later to be identified as 'Budha Bapp' – emerged from behind some rocks and bushes and lay down in a clearing close beside her. **The tigress now got up again** as if in a half daze, walked up to him, pushed against his shoulders and head and lay down right in front of him.

(71) Suppose we are given a finite poset $(P,\sqsubseteq)$, then for each element p in P we determine the indegree, i.e., the number of elements q with $q \sqsubseteq p$. While there are vertices in P with indegree 0, pick one of them, say q, and set ord(q) to be the smallest value in {1, . . . , n} which is not yet an image of some point. **Now remove q from P and lower all the indegrees of the neighbors of q by 1.**

The temporal referents of 'now' in these discourses are not analogous to the time of Fred's arrival in (99), but rather to the times *just after* the eventualities described by the perfect clauses in (99). We take this to be evidence for the 'now' rule that we proposed in the previous section:

(78) Semantic requirement of 'now' (final version):
The truth conditions for a 'now'-sentence ϕ require there to be a reference state s and a reference event e, such that: s is the final state of e and $\tau(s)$ ○ t, where t is **the reference time** encoded by the tense.

In rejecting (100) in favor of (78), we should ask whether there is another sense of *perspective* that captures Hunter's (2013) intuition noted above, namely that indexicals have the effect of bringing the addressee/reader somehow 'closer' to the event or state being described. While we do not pursue an answer to this question here[50], we would like to briefly explore a more radical version of Hunter's (2013) view – one that

50 One promising view worth pursuing comes from Roberts (2015), whose proposal below offers a new way of accounting for a variety of puzzles that are related to the perspectival nature of indexicals.

(i) An indexical is an expression whose interpretation conventionally presupposes a relation to the doxastic point of view of a contextually available discourse center, its anchor.

is the direct opposite of Recanati's (2004) and Maier's (2009): not only is 'now' an indexical, but it is, in fact, a pure indexical. That is, we would like to propose a research program that seeks to revise Kamp's principle – discussed at the outset – in light of our proposed analysis. We note that our failure to treat 'now' as a pure indexical is a reflex of adopting a *pragmatic view of prominence* according to which prominence is determined by principles that go beyond the rules of language. But what if we adopted the following hypothesis, where prominence is defined in *semantic* terms?

(101) Hypothesis about 'now': 'Now' is a *pure indexical* – its referent (**a prominent final state**) is fully determined by its linguistic meaning as a function of context.

In what follows, we would like to outline how we could make sense of (101) given recent work by Stojnić et al. (2013), Stone et al. (2014) and Stojnić (2016) (henceforth: Stojnić et al). The theory of Stojnić et al. builds on dynamic centering theories (cf. Dekker 1994, Bittner 2001, 2003, 2007), which hypothesize that candidate referents for anaphora resolution in a discourse are ranked according to their relative prominence. Moreover, Stojnić et al. argue that this ranking is maintained through a set of linguistic mechanisms that govern shifts in prominence. To simplify, suppose we let a ranking of possible reference events, states and times be a feature of the discourse context. Let this ranking track the relative prominence of candidate reference events, states and times within a discourse. Then, we can identify linguistic mechanisms that affect this prominence ranking in such a way so that they *determine* the interpretation of a given anaphoric expression.

As an illustration of this idea, let us consider Jespersen's (1924) famous claim that the aorist (or past perfective) and the imperfect (or past imperfective) aspect "correspond to the two meanings of E. 'then', (1) 'next after that', as in 'then he went to France'…and (2) 'at that time' as in 'then he lived in France'. While the aorist carries the narrative on, it tells us what happened next, the imperfect lingers over the conditions as they were at that time…" (ibid, 276). To see what Jespersen had in mind, compare the discourse in (102), discussed in § 2.2.1, with the one in (103):

(102) a. Josef turned around.
b. The man pulled his gun from his holster.
c. Josef took a step back. (Kamp et al. 2011)

(103) a. Josef turned around.
b. The man had a gun in his holster.
c. Josef took a step back. (Kamp et al. 2011)

For other recent research on perspective, though not in relation to 'now' and indexicality per se, see, e.g. Keysar and Barr 2013, Pearson 2013, 2015, Zeman 2014 and Barr 2015.

The only difference between (102) and (103) is the b-sentence. Whereas the former discourse contains the eventive VP 'pulled a gun', the latter discourse contains the stative VP 'had a gun'. This impacts how we understand the ordering of the described eventualities. The discourse in (102) exemplifies Jespersen's claim about the aorist since we infer narrative progression: the events are understood to occur in the order in which they are described. The discourse in (103), however, is more complicated. Although we infer narrative progression between (103-a) and (103-c), the state described in (103-b) exemplifies Jespersen's claim about the imperfect since the described state is understood to hold at the time that Josef turned around, i.e. the state of having a gun "lingers over the conditions" of the turning around by Josef "as they were at that time."

Such intuitions suggest that aspectual distinctions (*eventive* versus *stative*) play a significant role in determining narrative progression. Indeed, most theories of temporal anaphora in the 1980s (that we know of), relied on this distinction.[51] This is something that we have disregarded in our analysis of narrative progression thus far (though see discussion of (84) in § 2.3) because things are far more complicated than Jespersen's quote suggests. For example, there appear to be cases in which statives, like eventives, move the narrative forward. Observe that (104) seems to exemplify narrative progression, but (105) does not, even though (104-b) and (105-b) have the same stative sentence.[52]

(104) a. Max turned off the light.
b. The room was pitch dark. (Lascarides and Asher 1993)

(105) a. Max opened the door.
b. The room was pitch dark.

On the other hand, notice that (106) below has a similar structure to (104), and yet (106) does not exemplify narrative progression. Instead, we infer that the barn was red at the time of the painting. Why should this be?

(106) a. I painted the barn.
b. It was red.

We discuss these data in Appendix A of Chapter 3, where we show how Jespersen's position could be defended. For the time being, let us consider how we could model the fact that there are linguistic mechanisms – such as aspect – that semantically gov-

51 See, e.g. Dry 1981, Kamp and Rohrer 1983, Hinrichs 1986, Partee 1984, Dowty 1986.

52 Note that (104) is a modified version of the discourse below, from Hinrichs (1986), also discussed by Partee (1984) and Kehler (2002):

(i) Jameson entered the room, shut the door carefully and switched off the light. It was pitch dark around him, because the Venetian blinds were closed.

ern the prominence ranking of a candidate referent (a reference event, a reference state, a reference time, etc.). One idea, following the insight of Kamp (1981) and dynamic theories thereafter, is to say that utterances are interpreted as updates to the conversational context, which track the introduction and constraining of candidate referents. This allows us to define aspectual expressions as updates, i.e. relations between contexts, where *context* is a sequence of DREFs – e.g. reference events, reference states, reference times, etc. – ranked according to their relative prominence.[53]

This rich notion of context would not only allow us to model how aspect semantically governs the prominence ranking of a reference events, reference states and reference times, but it can also shed light on how discourse relations affect prominence ranking, something that is clearly at play in the contrast between (104) and (105).[54] Building on Kehler et al. 2008, Stojnić et al. argue that the processes of establishing discourse relations and resolving the interpretation of a pronoun are not merely correlated and mutually constraining, but that moreover the choice of the discourse relation indeed *determines* the resolution of the subsequent pronoun.[55] Crucially, Stojnić et al. propose that discourse relations determine the resolution of pronouns because they are updates that affect the prominence ranking of candidate referents. In this way, discourse relations are not pragmatic in nature; they affect prominence as a linguistic mechanism just like aspect.

While providing the details of Stojnić et al.'s analysis would take us too far afield, let us consider the sort of data that Stojnić et al. (2013) use to argue that discourse relations are linguistic conventions. Consider the two different ways of continuing (107), in (107-a) and (107-b):

(107) The city council denied the demonstrators a permit.
  a. They feared violence.
  b. They advocated violence. (Winograd 1972)

Notice that both (107-a) and (107-b) are related to (107) via EXPLANATION. However, there appears to be a qualitative difference in the two explanations. As noted by Stojnić et al. (2013), in (107-b) "the council's decision about the demonstrators can be explained on the basis of the former's beliefs about the latter: the relevant explanation is that it is because the demonstrators are potentially violent, or at least believed to be by the city council, that the council has denied them a permit." On the other hand, in (107-a), "the council's decision about the demonstrators can be explained based on (other aspects of) the council's attitudes: it is because the council feared violence that they decided to deny the demonstrators a permit."

53 Formally, this is just an assignment function.

54 According to Lascarides and Asher (1993), (104) exemplifies RESULT, whereas (105) exemplifies BACKGROUND. We return to this claim in Appendix A of Chapter 3.

55 This is something that we have assumed throughout, see Assumption 2 in § 2.3.

Based on these intuitions, Stojnić et al. (2013) propose that, as a matter of language, EXPLANATION affects the prominence in both cases, promoting one or the other of the DREFs in (107) to the top ranked position, i.e. either the city council (subject) or the demonstrators (object) are made prominent.[56] Stojnić et al. (2013) conclude that English is a language that distinguishes EXPLANATION by subject and EXPLANATION by object grammatically. That is, it is only because English has special update rules (encoded by EXPLANATION) that it is able to exhibit the contrast in the data above.[57]

Note that Stojnić et al.'s (2013) analysis of discourse relations is based on their effect on the resolution of pronouns. In more recent work, Stojnić (2016) argues that the effect of discourse relations is not isolated to the resolution of pronouns, but that it determines the resolution of context-sensitive expressions generally, in a similar fashion, by affecting the prominence ranking within a discourse context. The analysis of 'now' proposed in this chapter can thus serve as a test case for Stojnić's claim since we find the effects of discourse relations on the interpretation of 'now', which we have treated as a context-sensitive expression that is looking for the most prominent final state.

The data below[58] provides some initial support this idea:

(108) Mary returned to her biography of Lincoln. Where was she?

a. Oh right, Lincoln was now ready to deliver the Gettysburg Address.

b. Oh right, she was now at the bottom of page 178.

Notice that both (108-a) and (108-b) are related to (108) via ELABORATION: they elaborate on the place to which Mary returned. However, there is a qualitative difference in the two elaborations. In (108-a), the point of return concerns the story world. In (108-b), however, the point of return concerns Mary's world. Based on this ambiguity, we can hypothesize that English is a language that distinguishes the two types of ELABORATIONs grammatically. That is, it is only because English has special update rules (encoded by ELABORATION) that it is able to exhibit the contrast in the data above. Crucially, notice that we base this hypothesis on the context sensitivity of 'now'. If we treat discourse relations as linguistic mechanisms that conspire with aspect (along with other linguistic mechanisms) to *determine* its referent on a given occasion of use, then 'now' is a pure indexical after all.

56 This effect of EXPLANATION can be thought of as *re-centering* and could potentially explain Hunter's (2013) intuition that when used anaphorically, indexicals have the effect of centering the discourse, bringing the addressee/reader 'closer' to the eventuality being described.

57 As noted by Dag Haug (p.c.), one could question this conclusion by noting that the anaphoric resolutions in (107-a) and (107-b) seem to rely on cultural facts, viz. that demonstrators are more likely to be violent than city councils. If we imagine (107) reporting on a city council meeting in Kiev just before the Maidan square atrocities, we could get the opposite preferences.

58 Thanks to Sam Carter for helping me construct this example and for discussing the context sensitivity of 'now'.

2.4.2 Times versus states

Because our analysis crucially commits us to the idea that 'now' is picking out reference states, we endorse the idea of underlying states which are not reducible to mere temporal intervals. In other words, if our analysis is right, then the anaphoric behavior of 'now' provides evidence for states being ontological primitives in semantic theorizing. We end the chapter by noting one of the most compelling arguments against this idea from Katz (2003). Katz hypothesizes that some adverbs "select against stative verbs and for eventive verbs", but "there do not seem to be adverbs that select for stative verbs and against eventive verbs." Katz calls this generalization the "Stative Adverb Gap":

(109) Stative Adverb Gap:
"if an adverb can felicitously modify a stative verb, then it can also felicitously modify an eventive verb, but not the other way around" (Katz (2003, 2)).

Katz uses this hypothesis as evidence for the view that stative predication involves reference to a set of times, without any mention of underlying states. Katz applies this analysis to adverbs, grammatical aspect and other temporal domains which have been traditionally thought to involve stative prediction.

Recently, however, Altshuler (2014b) has provided data that weaken Katz's argument. In particular, the discourses below suggest that the adverb 'currently' can only occur with stative predication. That is, 'currently' is precisely the adverb that fills Katz's gap.

(110) In messages on 3 December, the British and French Governments noted that an effective United Nations Force {#currently arrived/was currently ready to arrive/was currently arriving}.

(111) He developed the Boston Road projects for CVS, Big Y and Red Robin, and {#currently built/was currently building} a Hampton Inn and Suites at Founders Plaza.

In (110), 'currently' can felicitously occur with 'ready to arrive' and 'was arriving', but it cannot occur with 'arrived'. Similarly, in (111), 'currently' can felicitously occur with 'was building', but not 'build'.[59]

While these data show that the Stative Adverb Gap is empirically inaccurate, they do not in themselves tell us very much about whether there are, in fact, underlying states. It only points to the fact that an argument used to rule them out is not sound. As such, we come back to the question noted at the outset of this subsection: what evidence is there for or against the view that there are underlying states?

59 The idea that the progressive is a predicate of states is discussed in § 5.3.

This question is highly non-trivial.[60] As argued by Maienborn (2003, 2016), one should distinguish Davidsonian states from Kimian states and tropes (see also Moltmann 2015). This view, however, has been met with some resistance, (see e.g. Rothstein 2005, Mittwoch 2005 and Ramchand 2005) and the debate is still ongoing. In what follows, we will not attempt to enter this debate since it is not clear that 'now' has anything to add. Instead, what we would like to do is to consider an argument from Parsons (2000) for the existence of underlying states. Doing so will help to illustrate another method for arguing in favor of underlying states, even if the argument faces serious objections.

Parsons considers a story in which Socrates, at high noon on the Ides of March, 452 BC, is sitting outside the city walls talking with Parmenides. A month later, driven to distraction by the metaphysical conundrums of that conversation, he stumbles into a time warp. He emerges from the time warp a year before he stumbled into it. He ponders his discussion with Parmenides for several months, and here he is again on the Ides of March, lying down in the marketplace, cursing the Gods.

How are we to describe what takes place at noon on the Ides of March, 452 BC?'. (112-a) and (112-b) are two of the many possibilities that Parsons considers. Crucially, these two possibilities seem to lead to the conclusion in (112-c):

(112) a. Socrates is sitting.
b. Socrates is in the marketplace.
c. Therefore, Socrates is sitting in the marketplace.

Intuitively, this argument is invalid since in our story, Socrates was sitting outside the city wall and laying in the marketplace. What are we to do? One possibility is to reject time travel, something that Parsons wants to avoid. Another possibility, is to say that Socrates is simultaneously in two different states:

(113) a. State 1: sitting outside the city walls, talking with Parmenides.
b. State 2: lying in the marketplace.

Parsons concludes that either time travel is not possible or states are ontological primitives in semantic theorizing.

Of course, the validity of drawing this conclusion rests on there being only two possible reasons why the conclusion in (112) does not follow from the premises. However, one could object by saying that the instances of "Socrates" in (112-a) and (112-b)

60 Note that many frameworks adopt the distinction between events and states, sometimes by using distinct variables to represent these entities. However, this is often done for formal elegance (e.g. Kamp and Reyle 1993) or sometimes for pedagogical purposes (Altshuler and Schwarzschild 2016). In other cases, an ontological distinction is assumed but is not explicitly argued for (see, e.g. Bittner 2007, 2008, 2014).

do not have the same referent, so collapsing them is what makes (112) invalid. Parsons considers this objection and writes:

(114) Obviously, people aware of Socrates in the marketplace and of Socrates outside the city walls, and unaware of the fact of time travel, would assume that these are two distinct but similar people, both named Socrates. But they would be wrong. There is only one person, Socrates. We are exploring the consequences of a hypothesis, and the hypothesis is that Socrates time-traveled, that is, Socrates entered a time warp and he emerged from it a year earlier. The hypothesis is not that some person very like Socrates emerged from the time warp a year earlier; the hypothesis is that he did. The hypothesis of time-travel entails that the very same person who entered the warp emerged from it at a time at which he already existed. And so, for a year, he overlapped himself in time.

A possibly worry with this response is that reference is timeline–dependent. The Socrates that time traveled has different experiences, different memories, and a potentially different personality. There may be only one person, as Parsons argues, but that person is still in two distinct stages that we can refer to in the given context: 'future Socrates' vs 'present Socrates', 'this Socrates' vs 'that one', 'the Socrates who traveled back in time' vs 'the Socrates who has yet to do so'.

This idea, of course, would require postulating temporal stages for Socrates and this is a complex affair; a simple time index is no longer sufficient. There must be at least two time indices – one common with Parmenides and the outside world in general, and the other being defined by Socrates' internal clock, so to speak.[61]

Another observation that weakens the force of Parsons' argument was made by Itamar Fracez (p.c). He proposes that (112) is invalid because Socrates was sitting at a time branch $\langle w, t \rangle$ but he was lying at $\langle w', t \rangle$, i.e. at a different branch that diverged from the original at some point. Therefore, there is no index at which he is both lying and sitting. Note that this proposal is based on the idea that the same world is not involved in the description of (112-a) and (112-b). This seems reasonable since, if one wanted to maintain that the same world is involved, as Parsons seems to assume, one would have to allow that the past is not settled. That seems rather linguistically unattractive.

In sum, Parsons' attempt at arguing for the existence of underlying states demonstrates how difficult this task is. If our analysis of 'now' is correct, then it provides the first clear evidence for endorsing a view according to which states are semantic primitives. But we can still ask the question of whether we could find more direct linguistic evidence for this view, and what such evidence looks like. One possible type

61 Note that it is generally possible to associate sets of temporal stages of individuals with specific worlds/eras in such a way that they never overlap. See Rooryck and Wyngaerd (2011), where it is argued that temporal stages are necessary to model the difference between simplex and complex reflexives in Dutch ('zich' vs. 'zichzelf').

of evidence would be if we could find cases of quantification over states. Coming up with clear examples is difficult. If one adopts the view that 'now' is a pure indexical, as suggested in the previous subsection, then this should not be surprising, viz. the first person indexical 'I' resists binding. To that end, note that 'now' cannot be bound by a temporal quantifier:

(115) #Whenever I am in Düsseldorf, I'm happy now.

Nevertheless, we do think that quantification over states is possible and offer the following example:

(116) Every artist reaches that point, where he is now ready for his masterpiece.

In (116), we understand the referent of 'now' to co-vary with each final state of an artist having reached that point. If this is right, that is, if English really allows for quantification over states, then this is further support for the idea of taking states as ontological primitives.

3 Coherence: A look at NARRATION and RESULT

3.1 Delimiting the task

In Chapter 2, we assumed that anaphora resolution is guided by principles of discourse coherence. However, we did not provide a formal analysis of anaphora resolution, which is especially difficult to model, but – as we hope to have shown – is "an essential part of natural language meaning and inference" (Beaver 1999; see also Bittner 2007 and Muskens 2011). Indeed, we hope that Chapter 2 has shed some light on what such a theory should be like.[1] In particular, we hope to have shown the role that discourse relations play in the resolution of anaphoric expressions. Recall that we assumed that a particular relation holds in a given discourse and then, based on its temporal import, determined the prominent event, state and time. While this allowed us to get an analysis of 'now' off the ground, it should nevertheless make the reader uneasy since we did not address any of the questions below:

(1) How many discourse relations are there?

(2) What goes into the definition of a discourse relation?

(3) How do we identify a given discourse relation?

(4) How do we test and justify the definition of a given discourse relation?

Hobbs (1985, 1990) addressed the question in (1) by extending David Hume's proposal about idea association to the domain of discourse coherence. In particular, he proposed that the general principles of coherence can be reduced to three ways in which ideas can be connected (or associated): Resemblance, Contiguity and Cause/Effect. This view was adopted and explored by Kehler (2002), who cites the following passage from Hume:

(5) Though it be too obvious to escape observation that different ideas are connected together, I do not find that any philosopher has attempted to enumerate or class all the principles of association – a subject, however, that seems worthy of curiosity. To me there appear to be only three principles of connection among ideas, namely *Resemblance*, *Continuity* in time or place, and *Cause* or *Effect*. (Hume, 1748, 32)

Building on Hobbs (1985, 1990), Kehler proposes that there are four discourse relations in the Humean Cause/Effect category: EXPLANATION, RESULT, VIOLATED EXPEC-

1 For a promising proposal – one that is very much in the spirit of the views expressed thus far – see Haug's (2013) PCDRT, and Altshuler and Haug 2015 for an application of PCDRT to temporal anaphora and cataphora.

TATION and DENIAL OF PREVENTER. He defines these relations in terms of two logical connectives, → and ¬, thereby directly addressing the question in (2) above. Moreover, by defining each relation in this way, he is able to explore the logical connections between the various discourse relations:

(6) a. EXPLANATION: Infer P from the assertion of S_1 and Q from the assertion of S_2, where normally $Q \rightarrow P$.
b. I hope it snows this weekend. I love building snowmen. (Kehler 2016)

(7) a. RESULT: Infer P from the assertion of S_1 and Q from the assertion of S_2, where normally $P \rightarrow Q$.
b. I love building snowmen. I hope it snows this weekend. (Kehler 2016)

(8) a. VIOLATED EXPECTATION: Infer P from the assertion of S_1 and Q from the assertion of S_2, where normally $P \rightarrow \neg Q$.
b. I love building snowmen, but I hope it does not snow this weekend. (Kehler 2016)

(9) a. DENIAL OF PREVENTER: Infer P from the assertion of S_1 and Q from the assertion of S_2, where normally $Q \rightarrow \neg P$.
b. I hope it does not snow this weekend, even though I love building snowmen. (Kehler 2016)

Several comments are in order. The first is that, according to Kehler, discourse relations are relations between *segments*, S_1 and S_2. This is a term of art that is borrowed from Hobbs and which is not defined. However, in what follows, the reader should simply think of *discourse segments* as *discourse units* (DUs), which were discussed in Chapter 2. The second thing to notice is that the relations above are defined in terms of unspecified, *propositional content* that is *inferred*. As we shall now see, other relations are more specific with respect to the kind of propositional content that is inferred.

Kehler proposes that there are four "positive" discourse relations in the Humean Resemblance category: PARALLEL, EXEMPLIFICATION, GENERALIZATION, ELABORATION.[2] Their definitions are taken from Hobbs (1990):

(10) a. PARALLEL: Infer $p(a_1, a_2, \ldots)$ from the assertion of S_1 and $p(b_1, b_2, \ldots)$ from the assertion of S_2, for a common p and similar a_i and b_i.
b. Jill built a snowman, and Sue made snow angels. (Kehler 2016)

2 Kehler also considers CONTRAST and EXCEPTION to be resemblance relations. In particular, they are the negated versions of PARALLEL and EXEMPLIFICATION respectively. In this way, Kehler preserves the positive/negative dichotomy that we saw with the Cause/Effect relations.

(11) a. EXEMPLIFICATION: Infer $p(a_1, a_2, \ldots)$ from the assertion of S_1 and $p(b_1, b_2, \ldots)$ from the assertion of S_2, where b_i is a member or subset of a_i for some i.
b. Children love to play in the snow after the storm. Today, Jill built a snowman. (Kehler 2016)

(12) a. GENERALIZATION: Infer $p(a_1, a_2, \ldots)$ from the assertion of S_1 and $p(b_1, b_2, \ldots)$ from the assertion of S_2, where a_i is a member or subset of b_i for some i.
b. Today, Jill built a snowman. Children love to play in the snow after the storm. (Kehler 2016)

(13) a. ELABORATION: Infer $p(a_1, a_2, \ldots)$ from the assertions of S_1 and S_2.
b. Today, Jill built a snowman. She piled three snowballs on top of one another, and decorated it with button eyes, a carrot nose, a pipe, and a scarf. (Kehler 2016)

Notice that, once again, the relations are defined in terms of *propositional content* that is *inferred*. However, the Resemblance relations differ from the Cause/Effect relations in two important respects. The first is that the definitions are more explicit, making use of the predicate/argument configuration. What makes a discourse relation one of *resemblance* is that the inferred predicates must be the same, whereas the arguments must have some property in common. Moreover, Resemblance relations, according to Kehler, require a COMMON TOPIC. For example, Kehler observes that (10-b) can be paraphrased as *the things X did in the snow today*. Kehler adds: "In this sense, clauses participating in a Parallel relation can be seen as providing partial answers to a (usually implicit) questions-under-discussion (Roberts 1996), e.g. *What did the girls do in the snow today?*"[3]

3 Kehler (2002, 2004) further argues that the COMMON TOPIC requirement explains why exceptions to the *Coordinate Structure Constraint* (Ross 1967) with Resemblance relations are always of the across-the-board variety (see (i)). However, exceptions to the CSC with Cause/Effect and Contiguity relations involve extraction from a single conjunct (see (ii)-(iii)).

(i) a. What book did John buy and Bill read?
b. *What book did John buy and read the magazine?
c. *What magazine did John buy the book and read?

(ii) a. *What store did he go to and buy whiskey?
b. What did he go to the store and buy?

(iii) a. Which dish is it that people always order here and then they get sick?
b. *How sick do people order that chili dish here and then get?

Interestingly, the contrast in (ii) and (iii) suggests that Cause/Effect and Contiguity relations impose different constraints on extraction possibilities. Why this should be is not clear, though see Kehler

Unlike the other Humean categories, Kehler proposes that there is only a single discourse relation that belongs in the Contiguity category, namely OCCASION.[4] We note that this relation is intended to play a similar role to NARRATION, which was instrumental in our analysis of temporal anaphora in Chapter 2. Recall that the definition of NARRATION made reference to eventualities. The same can be said about the definition of OCCASION, fist mentioned in Chapter 1 and repeated below.[5]

Definition 2 (OCCASION)**.** Given two discourse units σ_1, σ_2, OCCASION(σ_1, σ_2) holds iff

1. A change of state can be inferred from the assertion of σ_1, whose final state can be inferred from σ_2.
2. A change of state can be inferred from the assertion of σ_2, whose initial state can be inferred from σ_1 (Kehler (2002, 22), citing Hobbs (1985, 10)).

In sum, Kehler grounds discourse relations within Humean psychological primitives. The discourse relations can be distinguished by whether they make reference to propositional content that is associated via: (i) implication (Cause/Effect), (ii) particular predicate/argument configuration that is *similar* (Resemblance), or (iii) event structure (Contiguity). The relations within (i) and (ii) can be further distinguished by the presence of negation in the formulations.

In what follows, we build on two key insights of Kehler's proposal:

- Some discourse relations are logically related.
- Some discourse relations are defined with reference to an event structure.

In particular, we motivate (14) and (15) in the next section:

(14) NARRATION and RESULT are defined in terms of enthymematic entailment, with reference to eventualities.

(15) RESULT asymmetrically entails NARRATION.

We motivate (14) and (15) by considering Definition 2 in more detail and arguing that: (i) NARRATION can, and should, be extracted from this definition, while (ii) RESULT

(2002, §5) for some discussion, noting that such data are directly relevant to the question in (3) and require further research.

4 Kehler does note that "there are a variety of relationships that plausibly fall in to this category (e.g., enablement, figure-ground, etc.)", though opts to capture these with a single relation.

5 In more recent work, Kehler collapses the disjunctive definition into a single clause: *infer a change of state for a system of entities from the assertion of S_2, establishing the initial state for this system from the final/state of assertion of S_1* (Kehler 2016). In what follows, we propose a distinct way of collapsing the definition into a single clause.

can, and should, be built on a refined version of Kehler's (2002) definition noted at the beginning of this section (see (7)). This is the core of § 3.2.

We note that our motivation for (14) and (15) is contingent on us adequately classifying a particular discourse as exemplifying NARRATION versus RESULT. As noted above, this should make the reader nervous since the question in (3), repeated below, remains unanswered.[6]

(16) How do we identify a given discourse relation?

Despite lacking a strong empirical base, we nevertheless think that our arguments for (14) and (15) in the next section are instructive and, crucially, they provide the means for addressing the question in (4), which we repeat below:

(17) How do we test and justify the definition of a discourse relation?

Indeed, the main contribution of Chapter 3 is a methodological one: we offer a new method for testing the definitional adequacy of discourse relations. We hope that providing such a test brings us one step closer to our ultimate goal, namely having a formal theory of anaphora resolution – a task that we leave for a future occasion.

Our new method for testing definitional adequacy of discourse relations comes in the shape of an abductive argument in § 3.3, which proceeds as follows. Given our analysis in (14) and (15), we derive general constraints pertaining to possible EDUs – defined in terms of the event components described in Definition 2 above. We verify the plausibility of our derived EDUs by showing that they correspond to well attested English sentences. Since the EDUs are plausible, we therefore conclude that we have reached definitional adequacy of NARRATION and RESULT.

3.2 NARRATION and RESULT

3.2.1 Hobbs (1985) on OCCASION

Hobbs (1985) considers several discourses that he claims exemplify OCCASION. One such discourse involves giving directions:

(18) a. Walk out the door of this building.
b. Turn left.
c. Go to the corner.

6 See Footnote 3 for one possible empirical test that differentiates these relations. See also Asher and Vieu 2005, where it is argued that while NARRATION is always a coordinating relation (recall the discussion in § 2.2.2), RESULT also has a subordinating usage, though it is quite rare. Finally, see recent work by Holladay (2016), who provides the following test for English (inspired by fieldwork on Yup'ik):
(i) The plane was late! (That's why) Gabby didn't make her connection.
(ii) She knelt down, and (#that's why) she tied her shoe.

Below, in Table 3.1 we replicated the table in Hobbs (1985) that describes the relevant states and state transitions that occur in discourse (18). The column named "Type" specifies which of the two clauses in Definition 2, repeated below in Definition 2, is applicable; l_1, l_2 and a_1, a_2 symbolize two kinds of states: the *location* and the *angle* of the spatial orientation that the addressee assumes after performing the directions (18-a), (18-b), and (18-c). Finally, the ordered pairs describe a *change of state* entailed by the performance of the event described in the respective EDUs (18-a), (18-b), and (18-c).

Table 3.1. The relevant states and changes of state in discourse (18)

Type	(18-a)	(18-b)	(18-c)
1	$\langle l_1, l_2 \rangle$	l_2	
2		l_2	$\langle l_2, l_3 \rangle$
2	a_1	$\langle a_1, a_2 \rangle$	
1		$\langle a_1, a_2 \rangle$	a_2

Observe that in performing the event in (18-a), the spatial location of the addressee changes from being l_1 to being l_2, while the angle of her orientation is a_1. Performing (18-b) does not change the state of location of the addressee, but it changes her angle of orientation, and so on.

Moreover, observe that while performing (18-a) entails the change of state $\langle l_1, l_2 \rangle$, what is crucial with respect to OCCASION is the inference that the addressee is now in location l_2, which is a *sine qua non* condition for performing (18-c). Put differently, the fact that (18-a) has been completed entails state l_2 which is the same state that is entailed by the fact that (18-c) has been initiated. Let us call this state l_2 a *pivotal state*. The difference between the Type 1 and the Type 2 conditions in the characterization of OCCASION concerns the role that the pivotal state plays: we find the Type 1 pattern when the pivotal state is a final state, and we find the Type 2 pattern when it is an initial state.

Let us introduce the symbols $\lfloor s$ and $s \rceil$ to denote initial states and final states, respectively. With these symbols we can represent the two patterns in Hobbs 1985 as shown below, in Figure 3.1 and Figure 3.2. Note that the arrows represent entailment ("inference") between (the assertion of the) units and (the occurrence of) the respective states.

A minimal generalization of the disjunctive patterns

We propose a minimal *generalization* of the two patterns used by Hobbs (1985) that subsumes both patterns under appropriate conditions. The pattern that we propose is in Figure 3.3.

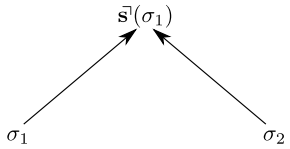

Fig. 3.1. First pattern in Hobbs 1985

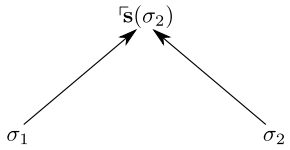

Fig. 3.2. Second pattern in Hobbs 1985

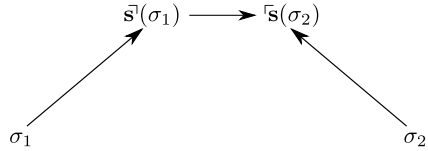

Fig. 3.3. The two patterns generalized

As can be seen, we suggest inserting a link of implication between the final state $\bar{s}(\sigma_1)$ of the first unit and the initial state $\lfloor s(\sigma_2)$ of the second unit. The two patterns in Hobbs (1985) are then subcases of this more general pattern obtainable by the identification of $\lfloor s(\sigma_2)$ with $\bar{s}(\sigma_1)$ (Type 1 pattern) or by the identification of $\bar{s}(\sigma_1)$ with $\lfloor s(\sigma_2)$ (Type 2 pattern).

Of course, Figure 3.3 is not the only possibility to generalize the patterns in Hobbs (1985). Indeed, we could choose the inverse direction of entailment as in Figure 3.4 below and still have a perfectly viable generalization. However, in Appendix B we show that the direction of entailment in Figure 3.4 is *not* a viable option, because it has consequences that are inconsistent with English data and therefore cannot be endorsed.

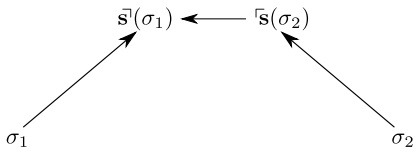

Fig. 3.4. A different generalization

3.2.2 The definition of NARRATION

Based on the discussion in the previous section, we offer the following informal definition of NARRATION:

Definition 3 (NARRATION – informal)**.** NARRATION holds between two DUs σ_1 and σ_2 if the occurrence of the final state of σ_1 entails the occurrence of the initial state of σ_2 (see Figure 3.3).

Before making Definition 3 more explicit, we need to make some further assumptions. Notice the definite description in Definition 3 (and, indeed, in Definition 2). It denotes the final state and the initial state. This raises the question of how to identify *the* final state and *the* initial state that Definition 3 (and Definition 2) refers to. After all, any event, say, going in front of the building (as in Hobbs's (1985) example) has infinitely many ramifications and infinitely many initial conditions that are required to hold in order for the event to be able to start. Which subsets of these infinite sets should we take into account?

We assume that the *linguistically relevant* final states of a discourse unit are what Moens and Steedman (1988) call a "consequent state." According to Moens and Steedman, a consequent state of an event "does not necessarily include *all* events that are objectively and in fact consequences. It rather includes only those consequences that the speaker *views* as contingently related to other events that are under discussion." For example, we take that (19-b) describes a consequent state of (19-a):

(19) a. John went into the shop.
b. John was in the shop.

(19-b) is indeed a consequence of (19-a), i.e., whenever (19-a) is true, then (19-b) is also true, but not any causal or logical consequence of an event counts as a consequent state. In particular, Moens and Steedman argue that the English perfect relies on the successful identification of a consequent state without which it is not felicitous; their example is

(20) #The star has twinkled,

where "the hearer cannot identify *any* relevant consequences," and the perfect is infelicitous. Note that this argument also provides a kind of linguistic diagnostic for final states.

As for initial states, however, the situation is different. For example, consider (21) below, which intuitively exemplifies NARRATION:

(21) a. John went into the shop.
b. He bought a Coke.

Here, we assume that the linguistically relevant final state entailed by (21-a) is that John is in the shop. This condition entails – in the sense of entailment that we will clarify below – another set of conditions such as that John is within reach of bottles of Coke, he is close enough to the personnel selling the things in the shop, etc. Since these are all conditions that are required for the event in (21-b) to get started, the conditions of NARRATION are satisfied.

However, as it stands, Definition 3 is threatened by being vacuously satisfiable in almost every case. For example, John's buying a Coke requires that John exists, and John's being in the shop entails that John exists, so the linguistically relevant final state of (21-a), i.e., that John is in the shop, trivially entails a precondition of (21-b). This pattern is so general that it makes Definition 3 useless.

Non-trivial preconditions

In order to overcome this problem, we refine Definition 3 above as follows. We propose that NARRATION holds between two DUs if the occurrence of the final state of the first unit entails a *non-trivial precondition* of the second. We readily admit that presently we cannot offer a theoretically satisfying set of criteria to separate trivial and non-trivial preconditions, let alone a linguistic diagnostic for them. But we can characterize the difference informally by saying that preconditions that belong to many different types of events count as more trivial than conditions that belong to a small and specific set. For example, if we confine our attention to the actions of human beings, the condition that the agent of the event is alive conveys very little information about the event performed by the agent, since all actions done by humans require this. Therefore, even though (21-b) entails the precondition that John was alive, we dismiss it as trivial and irrelevant. In contrast, the condition that, for example, John has some money on him is required as a precondition by most everyday commercial transaction events which, however, constitute a relatively small subset of all the events that people may participate in as an agent. Notice that Hobbs's (1985) characterization of OCCASION also relies implicitly on such a distinction without which it could be trivially satisfied.[7]

7 See also AI research on planning, which relies on such a distinction. AI planning theorists often appeal to initial states to model the coherence of dialogs (see e.g., Litman and Allen 1987). Moreover, they appeal to initial states to account for indirect speech act recognition, e.g., one interprets the question "Do you know the time?" as a request rather than yes-no question by way of an inference from an enabling pre-condition to the event itself (see, e.g., Perrault and Allen 1980). Finally, initial states have been used to explain particular cases of pragmatic enrichment, e.g., why from "John went to the store and bought milk" one gets the enrichment that the milk was bought at the store, whereas the inference is not required as an answer to the question "What did John do today?". Thanks to Andy Kehler (p.c) for directing us to this research.

Enthymematic entailment

Having gone into a shop entails having been in the shop, but the latter does not entail *per se* that the initial state of buying a Coke holds. It is possible that the shop does not sell Coke or that the sales clerks have just decided to go on strike. These conditions would make it impossible for John to buy a Coke, even though he is in the shop. In view of such counterexamples, we might be inclined to conclude that the connection between the final state of the first DU and the initial state of the second DU cannot be entailment.

However, while it is true that logical entailment means that there is no possible world in which the premise is true and the conclusion is false, the word "entailment" (just like the word "inference" in Hobbs 1985) has a more flexible meaning. Proposition ϕ is said to *enthymematically entail* proposition ψ if there is a nonempty set of propositions Φ such that $\Phi \cup \{\phi\}$ logically entails ψ. Thus, while being in the shop does not entail in a deductively valid way the conclusion that a non-trivial precondition of buying a Coke holds, it may entail it if an appropriate set of background propositions Φ is also taken into account.

These propositions may come from a wide variety of sources. For example, they may come from knowledge about how a normal shop is run: normally, the staff is at the counter and not on strike, normally, a shop sells a variety of common goods, and so on. Other propositions may come from the discourse itself: for example, we can infer from (21) that the shop mentioned in the discourse sells, among others, Coke, and we can add to our stock of propositions this fact and whatever else it involves.[8] Also, it is asserted that John *bought* and not *stole* the Coke which, again, allows us to add certain propositions to our set of (hidden) premises (e.g., that John gave some money to the clerk, John legally came into the possession of a drink, etc.).

Support Theories

We propose that the entailment from the occurrence of the final state of the first DU to the occurrence of the initial state of the second DU is of the enthymematic type that we just described above, and we would like to connect it now with an issue that has been well known in theories of conditionals for a long time.

Bennett (2003) discusses what he calls "Support Theories" of the subjunctive conditional, originating with Goodman (1947), according to which a counterfactual conditional such as (22) below presupposes a huge set of tacitly assumed contingently true propositions such as "there is sufficient amount of oxygen around," "the air is still," "the match is dry enough," "you strike the match with sufficient force," "the matchbox is coated with enough phosphorus," etc. The conditional in (22) is true if this set of

8 This is not much in the present case, but consider a shop in which John buys a considerable amount of pesticide for his farm – such shops are run very differently from a plain grocery store.

propositions, which Bennett (2003) calls *Support*, taken in conjunction with another set of propositions which Bennett calls *Laws* and which contains the causal laws and other relevant regularities reigning at the actual world, conjoined with the antecedent of the conditional *validly entail* the consequent of the conditional.

(22) If you struck that match, it would light.

Notice that even though Goodman's (1947) proposal concerns counterfactual conditionals in the first place, the theory can be applied in the case of a simple indicative conditional as well, *cf.*:

(23) If you strike that match, it will light.

Arguably, the same background propositions can be assumed in this case as those assumed in the case of (22).

It is important that all the propositions in this tacitly assumed set *Support* are *true*. For example, the truth of the following conditional,

(24) If you make a noise, the guard will wake up.

requires, among others, the truth of the proposition "the guard is not deaf." If the world in which (24) is evaluated does not satisfy this condition, then (24) will not be true in the evaluation world. In other words, the truth of the conditional depends both on the set of the tacit propositions introduced by the conditional *and* on what is actually the case in the world of evaluation.

As we will see shortly, the Support Theory of conditionals is very well suited to our goals in the present chapter.[9] To that end, we assume that a discourse $\sigma_1; \sigma_2$ determines a set of (true) propositions $S_N(\sigma_1; \sigma_2)$, where the subscript N is there to mark this set apart from a different support set that we will introduce later on. The discourse relation between σ_1 and σ_2 is NARRATION just in case the proposition that the final state of the change of state inferable from the assertion of σ_1 occurs – taken together with the set of background propositions $S_N(\sigma_1; \sigma_2)$ and the set of relevant laws and regularities L – entails the proposition that the initial state of the change of state inferable from the assertion of σ_2 occurs.

This idea is spelled out below, in Formula (3.1), where the predicate constant $\mathsf{occ}(\cdot)$ applies to a term that denotes an eventuality, and the resulting atomic formula expresses the proposition that the eventuality in question occurs in the world of evalu-

9 The Support Theory of conditionals is known to have problems which makes it an unlikely candidate for being the theory of conditionals in general. For example, the problem of identifying the propositions that are co-tenable with the antecedent of a counterfactual conditional is usually seen as involving a potentially vicious circularity (see Bennett 2003, but the problem was recognized already by Goodman (1947)). However, we will see in § 3.3.1 that we apply the theory in a tightly controlled way only to derive certain constraints.

ation.

$$S_N(\sigma_1;\sigma_2) \cup L \cup \{\mathsf{occ}(\vec{s}(\sigma_1))\} \models \mathsf{occ}(\underline{s}(\sigma_2)). \tag{3.1}$$

Applying the deduction theorem to (3.1), we get:

$$S_N(\sigma_1;\sigma_2) \cup L \models \mathsf{occ}(\vec{s}(\sigma_1)) \Rightarrow \mathsf{occ}(\underline{s}(\sigma_2)). \tag{3.2}$$

And now, we are in position to define NARRATION as follows:

Definition 4 (NARRATION – final version)**.**

$$\boxed{\text{NARRATION}(\sigma_1,\sigma_2) \overset{\text{def}}{\Longleftrightarrow} S_N(\sigma_1;\sigma_2) \cup L \models \mathsf{occ}(\vec{s}(\sigma_1)) \Rightarrow \mathsf{occ}(\underline{s}(\sigma_2))}$$

In the next subsection, we extend this analysis to RESULT, which we propose is a relation that involves changes inferred from the DUs.

3.2.3 The definition of RESULT

Most of the discourses that Hobbs (1985) uses to exemplify OCCASION are instances of what we call NARRATION. Here is the lone exception:

(25) a. He noticed the broken connection in the control mechanism, and
b. he took it to his workshop to fix.

Hobbs explains discourse (25) by saying "The first clause asserts a change in knowledge that results in the action described in the second clause."

Indeed, (25-a) asserts a change $\mathsf{c}(\sigma_1)$ in the epistemic state of the agent (from not knowing that the device was faulty to knowing that it was faulty), and (25-b) asserts a change $\mathsf{c}(\sigma_2)$ initiated by the agent concerning the spatial position of the device (from not being at the workshop to being at the workshop), and the two changes stand in a relationship that Hobbs informally describes as "result." The task of this subsection is to find an appropriate characterization of this notion of "result." Subsequently, in the subsections that follow, we discuss a few empirical tests that distinguish RESULT from NARRATION and then provide some evidence to think that there is a strict logical relation between them.

To take a simpler example, consider the following discourse (26) from Lascarides and Asher (1993):

(26) a. John pushed Max.
b. Max fell.

Here we have a clear intuition that the change described in (26-a) *triggered* somehow the change described in (26-b): the pushing by John *resulted* in the falling of Max.

Now consider the discourse (27), which we take to be on a par with (26):

(27) a. John struck the match.
b. It lit.

Notice that this discourse is closely related to sentence (23), repeated below:

(23) If you strike that match, it will light.

We are going to capitalize on this connection below. Briefly, what we claim is that a discourse exemplifying RESULT can be interpreted as involving an enthymematic entailment, just like discourses with NARRATION, with one important caveat: the entailment with RESULT does not involve initial and final states but, rather, it involves the changes themselves that are inferred from the DUs.

In other words, what we propose is not very different from what we have already seen in Kehler's (2002) definition of RESULT in § 3.1, which we repeat below:

Definition 5 (RESULT by Kehler)**.** Given DUs σ_1, σ_2, RESULT(σ_1, σ_2) holds iff P can be inferred from the assertion of σ_1 and Q from σ_2, where normally $P \rightarrow Q$.

However, we also draw upon Hobbs's (1985) definition in that we preserve Hobbs's notion of change and use it to specify the propositional variables P and Q in Kehler's definition, and let the background propositions take care of the modifier "normally" in the definition above. In particular, we assume (as before) that a discourse determines a support set of contingently true propositions which we denote by $\mathsf{S}_R(\sigma_1;\sigma_2)$, where the subscript R indicates that this set is relevant to the evaluation of RESULT. The discourse relation between σ_1 and σ_2 is RESULT just in case the proposition that the change $\mathsf{c}(\sigma_1)$ inferable from the assertion of σ_1 occurs, *taken in conjunction with Support* $\mathsf{S}_R(\sigma_1;\sigma_2)$ *and the relevant laws* L, entails the proposition that the change $\mathsf{c}(\sigma_2)$ inferable from the assertion of σ_2 occurs.

Formally:

$$\mathsf{S}_R(\sigma_1;\sigma_2) \cup L \cup \{\mathsf{occ}(\mathsf{c}(\sigma_1))\} \models \mathsf{occ}(\mathsf{c}(\sigma_2)). \tag{3.3}$$

And, again by an application of the deduction theorem, we get:

$$\mathsf{S}_R(\sigma_1;\sigma_2) \cup L \models \mathsf{occ}(\mathsf{c}(\sigma_1)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma_2)). \tag{3.4}$$

Finally, on the basis of formula (3.4), we define RESULT as follows:

Definition 6 (RESULT – final version)**.**

$$\boxed{\textsc{result}(\sigma_1,\sigma_2) \overset{\text{def}}{\Longleftrightarrow} \mathsf{S}_R(\sigma_1;\sigma_2) \cup L \models \mathsf{occ}(\mathsf{c}(\sigma_1)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma_2))}$$

To end this section, let us consider briefly the role of the background assumptions in more detail. Consider the following example, inspired by Aristotle's *Poetics*, cited in Cumming (2015):

(28) a. A man murdered king Mitys.
b. Shortly after, a statue of Mitys fell on the murderer, killing him instantly.

When asked to interpret (28), most people perceive narrative progression, but not RESULT, between the two DUs. We may explain this as follows. For RESULT to hold between (28-a) and (28-b), the world needs to be such a place where, roughly, the gods or the laws of nature ensure that such a murder will not go unpunished (besides other propositions such as murdering a king is a crime, imposing death upon somebody by dropping a statute on his or her head is a punishment, etc.). The reason why we do not perceive (28) as an example of RESULT is that we do not take this proposition to be a law of our world and, therefore, we cannot derive (28-b) from (28-a) and the facts and laws in our world.

However, if we assumed that the world was one in which the gods or the laws of nature ensured that a murder could not go unpunished, then we would likely perceive the relationship of (28-a) and (28-b) as one of RESULT:

(29) The statue fell on the murderer's head, killing him instantly, because he murdered king Mytis.

Nevertheless, given that we know that crime and punishment in our world is not connected in this way, we may wonder what makes (28) coherent. In our opinion, the likely reason that we view (28) to be coherent is the parallel that is established: both (28-a) and (28-b) describe a killing event, and the agent and the patient of the two events is the same individual.[10]

3.2.4 A minimal ontology

Similarly to Hobbs's (1985) definitions, our definitions also refer to "changes," "initial states," and "final states" that are "inferable from the assertion" of a DU. This suggests an underlying ontology which minimally contains two ontological types: states and changes.

States are usually construed as non-dynamic situations that may hold at just a moment but can also persist for an indefinitely long time. We connect states with propositions through the notion of a state occurring at some time interval in some possible world.

As opposed to states, changes are characterized by dynamicity. But similarly to states, changes can also occur at a moment or happen throughout an extended interval. And, as with states, we connect changes and propositions through the notion of a change occurring at some time interval in some possible world.

Hobbs (1985) refers to the initial and final state of a change (inferable from the assertion of a DU). This suggests a tripartite schematic event structure, $\langle \underline{\ }s(\sigma), \mathsf{c}(\sigma), \bar{s}(\sigma)\rangle$, where $\underline{\ }s(\sigma)$ is the initial state of the change $\mathsf{c}(\sigma)$ inferable from the assertion of DU σ,

10 Such an analysis of (28) was suggested to us by Jerry Hobbs (p.c).

and $\bar{s}^{\rceil}(\sigma)$ is the final state thereof.[11] From an ontological point of view, both $\underline{s}(\sigma)$ and $\bar{s}^{\rceil}(\sigma)$ are simply states, and they are only called "initial state" or "final state" on account of standing in a particular relation to the change $\mathsf{c}(\sigma)$. But what is this relation?

We propose that an initial state of a change is an arbitrary state whose occurrence is a non-trivial precondition for the occurrence of the change. In this way, we can connect the concepts of preconditions and initial states that we have used so far in an intuitive sense, without making their relationship explicit. And as for final states, we have proposed in § 3.2.2 that their relation to the change component is what Moens and Steedman (1988) call a consequent state.

At this point, we would like to point out that we do not claim that the structure $\langle \underline{s}(\sigma), \mathsf{c}(\sigma), \bar{s}^{\rceil}(\sigma) \rangle$ is the event structure that underlies natural language event semantics. Our goal is more modest: we only claim that in order to analyze RESULT and NARRATION along the lines of Hobbs (1985) and Kehler (2002), minimally this particular structure must be assumed. We do not believe that this simple structure is sufficient when more discourse relations or the fine-grained event semantic properties of DUs come to be considered. However, that is not our present concern because our goal is only to understand and formally explore the consequences of the particular definitions of RESULT and NARRATION that we adopt in this chapter.

Finally, let us consider a question of parsimony. In the ontology we have just suggested there are states and changes. Could we not simplify it by reducing changes to transitions between states? Then the resulting ontology would be utterly simple, consisting only of various states.

This is indeed a possibility which may be worth considering in future research. However, since it is tangential to the immediate interests of the present chapter, we put aside the issue of further reducing the ontology that we have suggested above and proceed to summarize our ontological claims:

Assumption 3 (Minimal ontology for DUs). The interpretation of an arbitrary DU σ is a triple of the form $\langle \underline{s}(\sigma), \mathsf{c}(\sigma), \bar{s}^{\rceil}(\sigma) \rangle$, where $\underline{s}(\sigma)$ and $\bar{s}^{\rceil}(\sigma)$ are states, and $\mathsf{c}(\sigma)$ is a change.

Crucially, we do not require that all three components be present in the interpretation of every DU. On the contrary, even though at first we will assume that every logical combination is available to fill in the places for the components, in § 3.3.2 we will derive various constraints that narrow down the eight a priori possibilities to three.

11 Using ordered triples is somewhat arbitrary, and we could have used a set-based representation like $\{\underline{s}(\sigma), \mathsf{c}(\sigma), \bar{s}^{\rceil}(\sigma)\}$ instead. However, if one wants to allow for the possibility that in some cases $\underline{s}(\sigma)$ and $\bar{s}^{\rceil}(\sigma)$ may be the same state, this will lead to the use of multisets instead of standard sets. For the sake of simplicity, we have chosen the ordered triple notation.

3.2.5 The relationship between NARRATION and RESULT

Consider the discourses in (30) and (32) and a particular transformation thereof (henceforth: "ability explanation") involving the insertion of the modal expression 'be able to' and a 'because'-clause in (31) and (33):

(30) Josef walked to the window. He opened it.

(31) Josef was able to open the window because he walked up to it.

(32) Josef picked up a book from the floor. He turned to pg. 20.

(33) Josef was able to turn to pg. 20 because he picked up a book from the floor.

We consider the discourses in (30) and (32) to exemplify NARRATION, and it appears that such discourses can always be used in an ability explanation. This is expected on our definition of NARRATION since this relation involves bringing about the non-trivial preconditions that allow for the change entailed by the second DU, and ability attribution presupposes that such a possibility is available.

Importantly, discourses exemplifying RESULT can also be used in an ability explanation:[12]

(34) John pushed the brake with all his force and stopped the car right at the edge of the precipice.

(35) John was able to stop the car right at the edge of the precipice because he pushed the brake with all his force.

(36) The red marble hit the white marble hard, and the white marble pushed the green marble off the table.

(37) The white marble was able to push the green marble off the table because the red marble had hit it hard.

Why should RESULT discourses entail an ability explanation that is characteristic of NARRATION? We propose to explain this pattern by saying that whenever RESULT holds between two DUs σ_1 and σ_2, then, provided that 'be able to' can felicitously be inserted in σ_2 (see Footnote 12 in this chapter), σ_1 and σ_2 can be used in an ability explana-

12 However, unlike NARRATION discourses, RESULT discourses cannot always be transformed into an ability explanation:

(i) John pushed Max. Max fell.

(ii) ??Max was able to fall because John pushed him.

Notice, however, that 'Max was able to fall' is quite odd on its own, so the infelicity is expected. This is probably a consequence of the fact that abilities are hard to attribute to non-agentive participants that simply undergo the event but do not control it.

tion because NARRATION holds between σ_1 and σ_2 as well. Put briefly, RESULT entails NARRATION.

Assumption 4 (RESULT and NARRATION). For any discourse $\sigma_1; \sigma_2$,

$$\boxed{\text{if } \textsc{result}(\sigma_1; \sigma_2), \text{ then } \textsc{narration}(\sigma_1; \sigma_2).}$$

This assumption will play a pivotal role in the next section, where we derive constraints on possible EDUs via an abductive argument.

We end this section by noting that the entailment between RESULT and NARRATION is asymmetrical. Evidence for this comes from the observation that, unlike discourses exemplifying RESULT, discourses exemplifying NARRATION cannot usually be used in explanations without explicit reference to ability. For example, (30) cannot be transformed into (38) (cf. (31)):

(30) Josef walked to the window. He opened it.

(38) #Josef opened the window because he walked up to it.

Note that the oddness of (38) is not rooted in the incompatibility of either DU in an explanation. As the following examples show, both DUs can perfectly appear in the relevant position of a 'because'-clause:

(39) a. Josef opened the window because Mary asked him to.
b. Josef startled the bird in the cage because he walked up to it.

The most reasonable explanation for the oddness of (38) is, therefore, that NARRATION between two DUs does not guarantee that RESULT also holds between them.

3.3 Abducing structural constraints on EDUs

We are now in position to make the main contribution of this chapter, namely to derive general constraints pertaining to the admissible interpretations of EDUs – defined in terms of the ontology introduced in § 3.2.4 – by a formal, abductive argument. We verify the plausibility of our derived EDUs by showing that they correspond to well attested English sentences.

3.3.1 Structural laws

Given our proposed definitions of RESULT and NARRATION, the assumption that RESULT asymmetrically entails NARRATION (see Assumption 4) is equivalent to the fol-

lowing claim:

$$\text{If } \mathsf{S_R}(\sigma_1;\sigma_2) \cup L \models \mathsf{occ}(\mathsf{c}(\sigma_1)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma_2)), \text{ then } S_N(\sigma_1;\sigma_2) \cup L \models \mathsf{occ}(\bar{s}(\sigma_1)) \Rightarrow \mathsf{occ}(\underline{s}(\sigma_2)). \quad (3.5)$$

Notice that there is no guarantee whatsoever that $\mathsf{S_R}(\sigma_1;\sigma_2)$ is the same set of propositions as $S_N(\sigma_1;\sigma_2)$ because the conditionals that determine these sets are different themselves, i.e., these support sets may change from discourse to discourse. Therefore, we can only guarantee the general validity of this entailment by relying on the set of laws L present in both definitions. In other words, we can ensure (3.5) and, by the same token, Assumption 4, if we assume that there is a set of special laws, or regularities, $\Delta \subseteq L$ such that formula (3.6) holds.

$$\Delta \cup \{\mathsf{occ}(\mathsf{c}(\sigma_1)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma_2))\} \models \mathsf{occ}(\bar{s}(\sigma_1)) \Rightarrow \mathsf{occ}(\underline{s}(\sigma_2)) \quad (3.6)$$

This set Δ of special laws pertains to the possible ways $\underline{s}$, $\bar{s}$ and c may combine in the event structures associated with various DUs, given the limiting condition in (3.5). Therefore, in order to ensure Assumption 4, we need to find a set Δ of appropriate propositions that satisfies the entailment in formula (3.6).

Constraints on Δ

Without imposing further constraints on Δ, however, we would have infinitely many trivial or uninteresting solutions for Δ, e.g., $\Delta = \{\mathsf{occ}(\mathsf{c}(\sigma_1)) \wedge \neg\, \mathsf{occ}(\mathsf{c}(\sigma_1))\}$ or $\Delta = \{\mathsf{occ}(\bar{s}(\sigma_1)) \Rightarrow \mathsf{occ}(\underline{s}(\sigma_2))\}$, which would be of no use. To avoid this, we place the following constraints on the set of formulas Δ with respect to every discourse $\sigma_1;\sigma_2$:

1. Non-triviality: $\Delta \not\models \mathsf{occ}(\bar{s}(\sigma_1)) \Rightarrow \mathsf{occ}(\underline{s}(\sigma_2))$.
2. Δ must be minimal in the sense that

   $$\{\mathsf{occ}(\mathsf{c}(\sigma_1)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma_2))\} \cup \Delta \models \mathsf{occ}(\bar{s}(\sigma_1)) \Rightarrow \mathsf{occ}(\underline{s}(\sigma_2)),$$

   but for all $\Delta' \subset \Delta$,

   $$\{\mathsf{occ}(\mathsf{c}(\sigma_1)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma_2))\} \cup \Delta' \not\models \mathsf{occ}(\bar{s}(\sigma_1)) \Rightarrow \mathsf{occ}(\underline{s}(\sigma_2)).$$

3. The elements of Δ must be homogeneous in the following sense: for any $\phi \in \Delta$, all occurrences of the variable σ in ϕ must have the same index (i.e., either all of them must be '1', or all of them must be '2').
4. If $\phi \in \Delta$, then ϕ is not a literal (an atomic formula or its negation).

Constraint 1 says that Δ in itself should not be sufficient to ensure the conclusion; without this constraint, NARRATION would automatically follow from the general background assumptions Δ, which would trivialize the relation. The Minimality Constraint

in 2 is self-explanatory. Constraints 3 and 4, however, are not trivial and deserve a more detailed explanation.

The reason why we add Constraint 3 to the set of constraints is closely related to the general goals of the present research, which is the formal derivation of principled connections between discourse relations and the underlying event structure. One way to turn this general idea into a specific research plan is to ask the following question: what kind of regularities do discourse relations require to obtain between the various components of an eventuality? By demanding that Δ be homogeneous in the sense explained in Constraint 3 above, we limit our attention to the structural regularities that are internal to the eventualities inferable from the assertion of a DU.

The rationale behind Constraint 4 is also related to the general goals that we described above. The language that we use to formulate our definitions contains only one predicate constant, namely $\mathsf{occ}(\cdot)$, that can be applied to a term that denotes a state or a change, and the resulting atomic formula expresses the proposition that the eventuality in question occurs in the world of evaluation. Since Δ contains propositions that are assumed about the event structure in any discourse whatsoever, including such an atomic proposition (or its negation) in Δ would be equivalent to elevating the occurrence (or non-occurrence) of some state or change to the level of law like, necessary truths. But this would be absurd: for example, if Δ contained the proposition $\mathsf{occ}(\bar{s}(\sigma))$, then the hearer would be justified to infer already from the general background knowledge that the final state related to the DUs that he or she is interpreting holds. This would trivialize the role played by Δ, so we exclude this possibility in Constraint 4.

Interpreting Δ

In Appendix B we show that the only candidate for the role of Δ that satisfies the Constraints 1–4 is the following:

$$\Delta = \{\mathsf{occ}(\mathsf{c}(\sigma)) \Rightarrow \mathsf{occ}(\underline{s}(\sigma)), \mathsf{occ}(\bar{s}(\sigma)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma))\}. \qquad (\Delta)$$

Let us discuss these two formulas in turn. The first formula says that if the occurrence of a change of state $\mathsf{c}(\sigma)$ can be inferred from the assertion of a DU, then the occurrence of a state $\underline{s}(\sigma)$ can also be inferred from it; that is, the occurrence of this state is a precondition of the occurrence of the change.

At this point, the reader might suspect a vicious circularity lurking beneath the surface, and it is important to allay this suspicion, reminding the reader of the special nature of this investigation. Note that even though we have informally characterized an initial state as the situation whose occurrence is a (non-trivial) precondition of the change inferable from the unit, we have never incorporated this into the formal system which only consists of the two definitions and the assumption concerning the logical relationship between them. The fact that the symbol '$\underline{s}(\sigma)$' must denote an initial state has fallen out of our definitions of RESULT and NARRATION and the constraint

that the former must entail the latter as a result of a purely formal manipulation of these postulates. In other words, this information about the general constitution of event structures is implicit in the concepts of RESULT and NARRATION suggested by Hobbs (1985) and Kehler (2002), and what we have done is make it explicit through conceptual analysis.

Turning to the second formula in Δ, we can paraphrase it as saying that the occurrence of the state $\bar{s}^{\urcorner}(\sigma)$ inferable from σ implies the occurrence of a change $\mathsf{c}(\sigma)$ inferable from σ. Note that this claim is weaker than what our informal characterization of $\bar{s}^{\urcorner}(\sigma)$ involves. Recall that when we informally introduced $\bar{s}^{\urcorner}(\sigma)$, we intended it to be the (linguistically relevant) final state of a change of states inferable from a unit σ. The set of postulates consisting of our definitions and the relationship between them is not strong enough to justify this – we have only established a weaker result, namely, that $\bar{s}^{\urcorner}(\sigma)$ cannot occur without a change $\mathsf{c}(\sigma)$ occurring. Even though this is compatible with the interpretation according to which $\bar{s}^{\urcorner}(\sigma)$ is the final state of the change in question, it does not, strictly speaking, entail that interpretation without additional postulates. We will not attempt to derive such postulates in the present paper but, rather, turn to the question of how the propositions in Δ constrain the possible event structures that serve as the interpretations of DUs.

3.3.2 Possibilities for EDUs

The status of the derived propositions

The previous subsection discussed the results of our abductive argument, namely the following derived set of propositions:

$$\Delta = \{\mathsf{occ}(\mathsf{c}(\sigma)) \Rightarrow \mathsf{occ}(\lfloor s(\sigma)), \mathsf{occ}(\bar{s}^{\urcorner}(\sigma)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma))\}.$$

The propositions in Δ contain a DU variable σ that is bound by an implicit universal quantifier. Given our definitions of RESULT and NARRATION, for the entailment from $\textsc{result}(\sigma_1, \sigma_2)$ to $\textsc{narration}(\sigma_1, \sigma_2)$ to be valid, all DUs σ must observe the constraints in Δ. In § 3.2.4 we argued that the interpretation of DUs is of the general form $\langle \lfloor s(\sigma), \mathsf{c}(\sigma), \bar{s}^{\urcorner}(\sigma) \rangle$ (see Assumption 3); therefore, the propositions in Δ express constraints with respect to the possibilities to fill in this schematic form.

Table 3.2 shows the possible structures that our analysis of RESULT and NARRATION forces us to postulate, given the constraints in Δ. Table 3.2 also makes reference to the English examples in (40)-(42), which we think correspond to these possible structures.[13] Below, we discuss these examples in light of the admissible structures. Recall, that our abductive argument has the following shape: if we can show that the examples do, in fact, correspond to the admissible structures forced upon us by RESULT and

13 Although it does not have linguistic relevance, we have included the structure $\langle -, -, - \rangle$ in Table 3.2 because our constraints do not exclude it from the possibilities.

Table 3.2. Admissible EDU structures

Structure	Admissible?	Example
$\langle -, -, - \rangle$	yes	–
$\langle \underline{\lfloor} s, -, - \rangle$	yes	(40)
$\langle \underline{\lfloor} s, \mathrm{c}, - \rangle$	yes	(41-a),(41-b)
$\langle \underline{\lfloor} s, \mathrm{c}, \bar{s}\rceil \rangle$	yes	(42-a), (42-b)
$\langle -, \mathrm{c}, - \rangle$	no	–
$\langle -, \mathrm{c}, \bar{s}\rceil \rangle$	no	–
$\langle -, -, \bar{s}\rceil \rangle$	no	–
$\langle \underline{\lfloor} s, -, \bar{s}\rceil \rangle$	no	–

NARRATION and that these examples are representative of the typology of eventuality descriptions, then we can conclude that our definitions of RESULT and NARRATION are adequate.

Evaluating the derived structures

Notice that the possible structures that we have derived from RESULT and NARRATION are too coarse-grained to differentiate between the subtypes of EDUs falling under the same abstract structure. Nevertheless, we can show that these possibilities are plausible (albeit too coarse-grained). To that end, let us consider how we matched each admissible EDU shown in Table 3.2 to an actual sentence of English, shown below, in (40)–(42).

(40) The door is locked.

(41) a. Tim walked in the park yesterday morning.
b. Bill winked.

(42) a. Last year, Mary built a house.
b. John arrived a few minutes ago.

The sentence in (40) expresses a state of the door. We associate the structure $\langle \underline{\lfloor} s, -, - \rangle$ with stative EDUs. In order to see why, let us consider how to interpret this representation. Recall that we have assumed in § 3.2.4 that the interpretation of a DU is an ordered sequence of ontological kinds. However, ordering makes sense only if there are at least two things to order. So while, e.g., $\langle \underline{\lfloor} s, \mathrm{c}, - \rangle$ makes perfect sense, what does $\langle \underline{\lfloor} s, -, - \rangle$ mean? How is it different from $\langle -, -, \bar{s}\rceil \rangle$? Recall that initial states and final states are not two different kinds of states but simply states: the only difference between them is where they occur in the structure. But if there is no other element in the structure, then we have hardly more than a structure consisting of a single state simpliciter. Hence, we could, in principle, say that $\langle \underline{\lfloor} s, -, - \rangle$ or $\langle -, -, \bar{s}\rceil \rangle$ corresponds

to the stative description in (40). However, given that $\langle -, -, \overline{s}\rangle$ is ruled out, $\langle \underline{s}, -, -\rangle$ is the way we represent stative descriptions.

As for (41-a), here we infer the occurrence of a series of changes in Tim's spatial position. This this kind of inference is always available with activities. Indeed, since Dowty (1979), activities have been analyzed as describing a process that is decomposed into a series of smaller changes. We could model this idea by thinking of our change component $\mathbf{c}(\sigma)$ as being a set (or series) of changes. As we shall now see, this is something we need to assume on independent grounds, namely to model the difference between accomplishments and achievements.

With respect to (41-b), we can infer from it that there was a change, and also that it had some non-trivial preconditions (such as that Bill's eye was open), but we cannot infer any linguistically relevant postconditions. Note that the analysis of (41-a) and (41-b) are parallel, except that (41-b) has a single associated change whereas (41-a) has a series of such changes (cf. Rothstein 2004).

The sentences in (42) contain accomplishments and achievements, respectively. While there is plenty of empirical evidence that there are linguistically relevant distinctions between these kinds of predicates, and presumably an event structure should reflect these differences, recall that our goal is to simply show that our derived DUs are plausible. To that end, it is plausible that the truth of a DU like (42-a) depends on some non-trivial precondition (e.g., the architect drew out the plan), and a change component, which (as noted above with respect to activities) corresponds to series of changes, as well as a final state, namely the house being built; this state is entailed by (42-a). The same analysis is plausible for (42-b) with one caveat: (42-b) differs from (42-a) in describing a single change (cf. Bittner 2008).

In sum, the possible structures that we derive for EDUs are quite plausible. We therefore conclude that we have reached definitional adequacy of NARRATION and RESULT.

Appendices

A Narrative progression with statives?

At the end of Chapter 3, we derived possible event structures for EDUs and assessed the plausibility of these structures in terms of whether they correspond to sentences of English. As a future research project, we would like to assess the plausibility of the derived event structures in terms of being arguments of RESULT and NARRATION. In what follows, we would like to preview the importance of such a project by considering EDUs containing stative predicates. Such predicates are especially revealing since: (a) they do not involve a change component (Vendler, 1967; Verkuyl, 1972) and (b) on our analysis, RESULT requires that both of its arguments refer to a change, while NARRATION requires that its first argument describes a final state, which itself entails a change (see Table 3.2). Given (a) and (b), we make the following prediction:

(1) Prediction with statives
For any DU σ that has a stative description α, σ is never an argument of RESULT or NARRATION unless σ is a CDU, containing an EDU which describes a change linked to the state described by α.

To get a feel for this prediction, consider the discourse below, noticing that we infer that changes occurred in (2-a) and (2-c), but not in (2-b), which contains a stative description:

(2) a. Because of the heavy rains
b. the ground was saturated with moisture.
c. Hence the landslide. (Hans Kamp, p.c.)

From (2-a)–(2-b), we infer that the ground being saturated with moisture is the final state of the heavy rains. That is, the 'because' clause links the change (no rain to rain) and the state (ground saturated with moisture). As such, we have the following CDU:[1]

(3) EXPLANATION((2-b), (2-a))

This CDU is in the ideal position to be connected to another EDU via RESULT because (to repeat) RESULT requires a change component and the CDU in (3) encodes this component. And, indeed, the CDU in (3) is connected to the EDU in (2-c) via RESULT with

1 Here we assume, without argumentation, that EXPLANATION can take stative descriptions as arguments. At first blush, this may seem counterintuitive since one may think that RESULT and EXPLANATION are inverse relations. This, however, is not the case. As shown by Asher and Lascarides (2003) and Asher and Vieu (2005), RESULT is a coordinating relation, while EXPLANATION is subordinating. In turn, it's worth noting that subordinating relations are typically assumed to be compatible with stative descriptions. With this in mind, we can generalize the prediction in (1) as follows: stative descriptions can be arguments of subordinate, but not coordinate discourse relations, unless the stative description is complex in the way described.

the help of 'Hence': *the landslide is a change that was the result of another change, i.e. the heavy rains, whose final state is the moisture in the ground*:

(4) RESULT(EXPLANATION((2-b), (2-a)), (2-c))

Now it's important to see how (4) relates to the prediction in (1). There is a stative predicate in (2-b) which, along with (2-c), one may think is an argument of RESULT. It is natural to think this given the discourse below:

(5) a. The ground was saturated with moisture.
b. Hence the landslide.

However, the prediction in (1) bans (2-b) from being an argument of RESULT. The only way this can come about is if (2-b) is part of a larger discourse unit that describes a change component. This, as we have just argued, is the role of (2-a).

But what about (5)? How do we analyze this discourse? We return to this question later in this section, along with the question of how to analyze the discourse below, mentioned in § 2.4.1, which also poses a challenge for the prediction in (1).

(6) a. Max turned off the light.
b. The room was pitch dark. (Lascarides and Asher 1993)

Let us first consider some discourses which provide clear evidence for the prediction in (1). We begin with (7):

(7) a. John walked up to the door.
b. It was made of glass.

A plausible analysis of this discourse is that it exemplifies BACKGROUND, discussed in § 2.2.1.2 and repeated below:

(8) BACKGROUND(σ_1, σ_2): The state described by σ_1 is the backdrop or circumstance under which an event described by σ_2 occurred. (Lascarides and Asher 1993)

Another possibility, though less salient, is that (7) exemplifies EXPLANATION: the reason that John walked up to the door was because it was made of glass. Now, what is important for our purposes is that it would be counter-intuitive to argue that (7) exemplifies RESULT or NARRATION. This is expected since the state described in (7-b) involves no change component.

However, compare (7) with (9) below, where a stative description opens the discourse:

(9) a. The door was made of glass.
b. John noticed a bright light ahead.

On the face of it, it may seem that (9-a) and (9-b) are connected via NARRATION since, intuitively, the door being made of glass is a non-trivial precondition for John to notice the bright light ahead. Had the door been made of wood, John would not have been able to see anything but the door itself.

But analyzing (9) as exemplifying NARRATION would go against our definition of this relation! One possibility would be to say that the door being made of glass is a final state of some implicit change. But what change? We just convinced ourselves that the stative predication in (7-b) does not describe a change!

As a future research project, we would like to be able to give an analysis of this discourse in terms of some relation distinct from NARRATION. In what follows, we would like to provide some thoughts about what such an analysis might be like and then extend this analysis to (5) and (6).

One possibility would be to say that (9) exemplifies BACKGROUND analogous to (7), discussed in the previous subsection. Such an analysis seems unsatisfactory, however, since BACKGROUND is quite general and does not explain our intuition that the door being made of glass is what enabled John to see the bright light ahead. We nevertheless would like to keep this option open for further research. We think it would be fruitful to investigate whether the definition of BACKGROUND could be extended in such a way that it adequately accounts for both (7) and (9).

Another possibility is to say that (9) exemplifies ELABORATION, whose characterization from § 2.2.1.2 is repeated below:

(10) ELABORATION(σ_1, σ_2): The event described by σ_2 is part of the event described by σ_1 (perhaps by being the preparatory phase). (Lascarides and Asher 1993)

Notice the notions part and preparatory phase in (10). If we allow ourselves to reverse the order of σ_1 and σ_2, we could relate these notions to the terminology used in Chapter 3 as follows: the first EDU in (9) describes a state of being made of glass and the second EDU in (9) elaborates on the first, asserting that this state is the initial state (or the non-trivial precondition) of John seeing the light ahead.[2]

Let us now return to the discourse below:

(11) a. The ground was saturated with moisture.
b. Hence the landslide.

Recall that this discourse raises a problem for the prediction in (1) since we have a stative predicate in (11-a) and yet (11) seems to exemplify RESULT. However, given our discussion of (9), it would be interesting to explore whether (11) could be analyzed along the same lines. For example, one possible analysis is to say that the first EDU in (11-a) describes a state of being saturated with moisture and the second EDU in (11-b)

2 We leave it open for further research whether reversing the order of the EDUs in this way is fruitful, suggesting either that cataphora is involved, or perhaps that ELABORATION is more general.

elaborates on the first, asserting that this state is the initial state (or the non-trivial precondition) of the landslide. That is, a possible analysis is to say that (11-a) and (11-b) are related by ELABORATION.

Now reconsider the discourse below:

(12) a. Max turned off the light.
b. The room was pitch dark. (Lascarides and Asher 1993)

Notice that the stative description in (12-b) appears to move the narrative time forward, i.e. we understand the room being pitch dark as holding after Max turned off the light. Asher and Lascarides proposed that the narrative progression is due to RESULT holding between (12-a) and (12-b). This analysis, however, is problematic given our definition of RESULT. The only way that (12) could exemplify this relation, on our definition, is if (12-b) described a change. In light of this observation, we could simply stipulate that there is an implicit change component in (12-b), modeled by a Dowty-like BECOME operator in the logical form of this EDU. This analysis would then be compatible with our definition of RESULT and our prediction in (1).

We think, however, that a more plausible analysis exists. This analysis would be based on the observation that (12) has an interpretation in which (12-b) describes a state, and no change whatsoever; it is on a par with the noted elaboration interpretation of (9) and (11) with the following caveat: instead of elaborating on an event's initial state, we think that (12-b) can be used to elaborate on an event's final state. In particular, note that (12-a) entails that it became darker in Max's proximal location.[3] This state of being darker is the final state of the turning-the-light-off event. (12-b), then, elaborates on the intensity of the darkness, asserting that the room (which we now take to be Max's location) is very dark, indeed pitch black.[4]

Evidence for such an analysis comes from comparing (12) with (13) below. Notice that although (13) seems to have a similar structure to (12), (13) does not exemplify narrative progression. Instead, we infer that the barn was red at the time of the painting.[5]

3 As noted by Kai von Fintel (p.c.), remote controls can be used to turn things off in far-away locations. Therefore, the entailment is something weaker, namely that it became dark in whatever location that Max was targeting.

4 One may object to this analysis by saying that the adjective 'pitch' can be removed from (12-b) and the narrative progression remains. Note, however, that (12-a) does not entail that it became dark, only that it became darker. And even if (12-a) implicates that it became dark, we would nevertheless take (12) to be a case of an elaboration, cf. 'I have three kids. Exactly three kids' exemplifies an elaboration even though 'I have three kids' implicates that the speaker has exactly three kids. Thanks to Zsófia Gyarmathy for discussing this point with us. See Benz et al. 2013 and references therein for more discussion about how implicatures and coherence principles interact.

5 Another example of this sort comes from Una Stojnić (p.c.), who notes that in 'John shot Bill. He was dead', we understand Bill to be dead when John shot him (and not that John killed Bill).

(13) a. I painted the barn.
b. It was red.

Given the lack of narrative progression, RESULT could not be involved here. Note, however, that if one were to analyze (12) as a case of RESULT, what in the analysis would prevent (13) from being analyzed in the same way? This seems like a question that is incredibly difficult to answer, suggesting that treating (12) as a case of RESULT is not the way to go. In contrast, our elaboration analysis of (12) can be extended to explain the difference with (13). In (13), 'it was red' elaborates on the color of the barn during the painting. That is, while the painting was going on, the barn was red – and, presumably, its color changed after the painting was completed.[6] Note, that the redness of the barn must not be analyzed as the initial state of the painting event since being red is not a precondition for painting. Rather, the elaboration here seems to target the process of the painting, showing us the flexibility of ELABORATION. In particular, we have arguably now seen that ELABORATION is compatible with all parts of our assumed event structure: the initial state in (9) and (11), the final state in (12), and the change (or more accurately: a series of changes constituting a process) in (13).[7] Of course, a holistic analysis would need to say why the particular part is being elaborated on in each discourse. We leave this task for future research, noting that (12-a) contains an achievement VP, 'turn off the light', so there is no process to be elaborated on. (13-a), however, contains an accomplishment VP ('paint the barn'), so elaborating on a process is a real possibility.

If an elaboration analysis of this kind is on the right track, then we can come back to (12) and ask whether it does, in fact, exemplify narrative progression. While it is true that the darkness is understood to follow the turning off of the light, does (12) exemplify narrative progression if (12-a) describes both of these eventualities? We would hesitate to give a 'yes' answer because we would then be forced to say that any clause describing a change and a final state (e.g., "John walked into my house") would exemplify narrative progression (first John walked through the door of my house, then he was inside inside my house).

The question of whether, e.g. "John walked into my house" exemplifies narrative progression is really a question about whether we want to define *narrative progression* in a very loose sense. I don't think this is an interesting question. What is interesting, however, is the following, related question:

- Are internal relations between sub-eventualities in an event decomposition the same as discourse relations such as RESULT and NARRATION?

6 Such an interpretation can also trigger an explanation: the reason that the barn was painted was because it was red.

7 Cf. the discussion of 'when'-clauses by Moens and Steedman (1988), where a similar conclusion about ELABORATION is reached.

I don't know the answer to this question. However, Gillian Ramchand (p.c.) notes that internal to an eventuality description one can assert that a state causes some other state or event:

(14) The fact that house prices were high decided the issue for the young investors.

On the face of it, such data suggests that at least some internal relations between sub-eventualities in an event decomposition may be different from discourse relations. This conclusion, however, should be taken with a grain of salt. There have been many analyses of internal relations between sub-eventualities – at least as many as analyses of discourse relations.[8] Unfortunately, these two bodies of research have rarely addressed one another. I think it's vital that they begin to do so.[9]

I would like to end this appendix by noting something that has been left implicit throughout: our analysis of RESULT and NARRATION supports Jespersen's (1924) original insight, discussed in § 2.4.1, that narrative progression is tied to the aspectual profile of VPs, i.e., eventive but not stative VPs trigger narrative progression. As such, it is worthwhile to ask:

- What does Jespersen's (1924) hypothesis mean for our analysis in Chapter 2?

Recall our Tense Rule and assumption about the resolution of events, states and times in Chapter 2:

(15) Utterance time, eventuality time and reference time (Tense Rule)

a. The truth conditions for a past tensed sentence ϕ require there to be an eventuality v described by ϕ and a reference time t such that:
i. $t \prec$ utterance time
ii. $t \bigcirc \tau(v)$

b. The truth conditions for a present tensed sentence ϕ require there to be an eventuality v described by ϕ and a reference time t such that:
i. $t \approx$ utterance time
ii. $t \bigcirc \tau(v)$

Assumption 5 (Determining reference event e, state s and time t). The values of e, s and t are determined by the temporal import of one or more discourse relations that hold between ϕ and some other discourse unit.

8 See, e.g. Dowty 1979, Pustejovsky 1991, Goldberg 1995, Travis 2000, Borer 2005, Ramchand 2008 and references therein.

9 See Kehler 2016 for some strides in this respect.

The crucial thing to note is that our Tense Rule does not discriminate between events and states. This may seem problematic in light of Jespersen's hypothesis, which we have implicitly endorsed. Indeed, Kamp and colleagues (Kamp and Reyle 1993; Kamp et al. 2011) have proposed DRS construction rules in which tense provides distinct constraints on DREFs depending on whether the VP is stative or eventive.[10] However, this is unnecessary in our analysis for the following reason. If we define discourse relations in terms of events and states – as we have done for RESULT and NARRATION – then, given Assumption 5, any CDU (consisting of eventive and/or stative descriptions) will automatically eliminate various discourse relations from consideration in the resolution of tense. Only those that are viable candidates will come in to play, as dictated by Assumption 5. For example, if we have a CDU consisting of two stative EDUs, or if we have an eventive and a stative EDU, then neither RESULT or NARRATION are viable candidates. As such, there would be no available resolution strategy that would allow for narrative progression. This accounts for Jespersen's hypothesis.

10 See de Swart 1998 for an application of this idea to French, and Bary 2009, Altshuler 2010 for discussion.

B Derivations

B.1 Deriving Δ

Let us transform the conjunction of the premise $\mathsf{occ}(\mathsf{c}(\sigma_1)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma_2))$ and the negation of the conclusion $\neg(\mathsf{occ}(\bar{s}(\sigma_1)) \Rightarrow \mathsf{occ}(\underline{s}(\sigma_2)))$ into disjunctive normal form, yielding $(\neg\,\mathsf{occ}(\mathsf{c}(\sigma_1)) \wedge \mathsf{occ}(\bar{s}(\sigma_1)) \wedge \neg\,\mathsf{occ}(\underline{s}(\sigma_2))) \vee (\mathsf{occ}(\mathsf{c}(\sigma_2)) \wedge \mathsf{occ}(\bar{s}(\sigma_1)) \wedge \neg\,\mathsf{occ}(\underline{s}(\sigma_2)))$. We can make this formula contradictory by falsifying the disjuncts at the same time, which is the condition expressed by $(\mathsf{occ}(\mathsf{c}(\sigma_1)) \vee \neg\,\mathsf{occ}(\bar{s}(\sigma_1)) \vee \mathsf{occ}(\underline{s}(\sigma_2))) \wedge (\neg\,\mathsf{occ}(\mathsf{c}(\sigma_2)) \vee \neg\,\mathsf{occ}(\bar{s}(\sigma_1)) \vee \mathsf{occ}(\underline{s}(\sigma_2)))$. But we are only interested in homogeneous, non-literal solutions, which leaves $(\mathsf{occ}(\mathsf{c}(\sigma_1)) \vee \neg\,\mathsf{occ}(\bar{s}(\sigma_1))) \wedge (\neg\,\mathsf{occ}(\mathsf{c}(\sigma_2)) \vee \mathsf{occ}(\underline{s}(\sigma_2)))$, i.e., $(\mathsf{occ}(\bar{s}(\sigma_1)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma_1))) \wedge (\mathsf{occ}(\mathsf{c}(\sigma_2)) \Rightarrow \mathsf{occ}(\underline{s}(\sigma_2)))$. This yields the set Δ of structural regularities pertaining to all possible σ:

$$\Delta = \{\mathsf{occ}(\mathsf{c}(\sigma)) \Rightarrow \mathsf{occ}(\underline{s}(\sigma)), \mathsf{occ}(\bar{s}(\sigma)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma))\}.$$

Proof that Δ is a solution

1	$\mathsf{occ}(\bar{s}(\sigma_1)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma_1))$	
2	$\mathsf{occ}(\mathsf{c}(\sigma_2)) \Rightarrow \mathsf{occ}(\underline{s}(\sigma_2))$	
3	$\mathsf{occ}(\mathsf{c}(\sigma_1)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma_2))$	
4	$\quad \mathsf{occ}(\bar{s}(\sigma_1))$	Assumption
5	$\quad \mathsf{occ}(\mathsf{c}(\sigma_1))$	$\Rightarrow$Elim, 1, 4
6	$\quad \mathsf{occ}(\mathsf{c}(\sigma_2))$	$\Rightarrow$Elim, 3, 5
7	$\quad \mathsf{occ}(\underline{s}(\sigma_2))$	$\Rightarrow$Elim, 2, 6
8	$\mathsf{occ}(\bar{s}(\sigma_1)) \Rightarrow \mathsf{occ}(\underline{s}(\sigma_2))$	$\Rightarrow$Intro, 4–7

B.2 Absurd consequences

We show that the generalization of Hobbs's (1985) in Figure 3.4 leads to unacceptable consequences. As a first step, we want to find a set of formulas X satisfying all the constraints discussed in § 3.3.1 such that

$$X \cup \{\mathsf{occ}(\mathsf{c}(\sigma_1)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma_2))\} \models \mathsf{occ}(\underline{s}(\sigma_2)) \Rightarrow \mathsf{occ}(\bar{s}(\sigma_1)),$$

and then check if the structural regularities that can be abstracted from X represent plausible structural constraints on event structure or not. Therefore, let us transform

the conjunction of the premise $\mathsf{occ}(\mathsf{c}(\sigma_1)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma_2))$ and the negation of the conclusion $\neg(\mathsf{occ}(\underline{\sqsubseteq}s(\sigma_2)) \Rightarrow \mathsf{occ}(\bar{s}^{!}(\sigma_1)))$ into disjunctive normal form, which is $(\neg\, \mathsf{occ}(\mathsf{c}(\sigma_1)) \wedge \neg\, \mathsf{occ}(\bar{s}^{!}(\sigma_1)) \wedge \mathsf{occ}(\underline{\sqsubseteq}s(\sigma_2))) \vee (\mathsf{occ}(\mathsf{c}(\sigma_2)) \wedge \mathsf{occ}(\underline{\sqsubseteq}s(\sigma_2)) \wedge \neg\, \mathsf{occ}(\bar{s}^{!}(\sigma_1)))$. To make this contradictory, we need to falsify both disjuncts at the same time, which is the condition that $(\mathsf{occ}(\mathsf{c}(\sigma_1)) \vee \mathsf{occ}(\bar{s}^{!}(\sigma_1)) \vee \neg(\mathsf{occ}(\underline{\sqsubseteq}s(\sigma_2)))) \wedge (\neg\, \mathsf{occ}(\mathsf{c}(\sigma_2)) \vee \neg\, \mathsf{occ}(\underline{\sqsubseteq}s(\sigma_2)) \vee \mathsf{occ}(\bar{s}^{!}(\sigma_1)))$. Again, we are only interested in formulas that satisfy constraints C-1–C-4, which leads to the following set of structural regularities:

$$\{\neg\, \mathsf{occ}(\bar{s}^{!}(\sigma)) \Rightarrow \mathsf{occ}(\mathsf{c}(\sigma)),\ \mathsf{occ}(\mathsf{c}(\sigma)) \Rightarrow \neg\, \mathsf{occ}(\underline{\sqsubseteq}s(\sigma))\}.$$

The first formula says that if the occurrence of the final state is not inferable from σ, then the occurrence of the change is, nevertheless, inferable from σ. In other words, the first formula says that one must infer a change component when there is no final state. This is absurd since many events that do not reach a final state do not thereby involve a change component. For example, my planning to build a house does not involve a final state of me building a house, yet this does not thereby commit me to any change in the house building; I may continue to plan forever, without any changes in the plan or any changes in the house building itself.

The second formula says that if the occurrence of a change is inferable from σ, then the occurrence of the initial condition is not inferable from σ. In other words, the second formula says that one must not infer an initial state when a change component is inferred. This is also absurd since it is often the case that we infer an initial state when a change component occurs. For example, it is surely inferable from my laying down a brick to build a house that I have some sort of plan for how the house will be built.

Part II: **Semantics and pragmatics of tense: The nuts and bolts**

4 Cessation and double access

4.1 Temporal implicatures and temporal profile of statives

Imagine you are at a bar and a woman shows you a picture of a woman in her late 60s, proceeding to say:

(1) a. This is my mom.
b. She was Armenian.

You would likely infer that the speaker's mom is dead. This inference is called *Lifetime Effects* by Enç (1987). It is dependent on another inference, which we call *cessation*, namely that the mother is not Armenian at the time (1) was uttered, along with knowledge that people do not change ethnicities over a life time.[1]

This contrasts with what happens in the discourse below from Klein (1994) in which a judge poses the question in (2) to a witness, who then replies with (2-b)-(2-c):

(2) a. What did you notice when you looked in the room?
b. The light was on. There was a book on the table.
c. It was in Russian.

According to Klein, the judge fixes a definite period of time and the witness is meant to talk about what happened at that time and that time only. The truthfulness of the testimony is not affected by whether or not the light was on before or after the time period fixed by the judge. The same goes for the book's being on the table. As for being in Russian, Klein stresses that the book, if it still exists, is most likely still in Russian and nothing the witness says contravenes this. In other words, no cessation implicature is triggered by the past tensed (2-c).

1 Lifetime effects and cessation are nicely demonstrated by the following dialogue in the movie "No Country For Old Men", based on the novel by Cormac McCarthy:

(i) a. Tommy Lee Jones: The motel in del Rio?
b. Officer: Yes sir. None of the three had ID on them, but they are telling me that all three is Mexicans. Was Mexicans.
c. Tommy Lee Jones: There's a question, whether they stopped being and when.
d. Officer: Yes sir.

Here, the officer is reporting on a killing that took place in a motel. His use of the present tense in 'is Mexicans' implies that the people in question are still alive. The officer then corrects himself with the past tensed counterpart. Tommy Lee Jones cleverly comments on this correction by noting that the relevant question is whether the people in question stopped being Mexican, which can only happen if they are dead.

Klein is right in pointing out that the witness's remarks do not say anything about the current state of things. Nevertheless, it is true that if the room survey occurred far enough in the past, listeners are likely to conclude that the light has gone off and on in the meantime. In other words, the state of the light being on referred to in (2-b) has most likely ended. Tonhauser (2007), calls this inference *change of state* – which we discussed in Chapter 2 in connection to 'now' (see § 2.3). It is an inference that the described state has ended, while cessation means that not only has that state ended, no state of the kind described holds currently. It is important to keep these two types of inferences separate. Also notice that the change of state inference just discussed (the light went from being on to off) arose not from a choice of tense, but from ideas about how the world works (i.e. that lights are generally not kept on for long periods of time). Cessation implicatures may arise in this way as well. For example, if I am telling you about my previous trip to Kenya and utter 'I was standing on an elephant', you would likely conclude that I am not currently standing on an elephant because elephant standing is a rare state of affairs.

We will not have any more to say about change of state and in what follows, we focus on cases like (1-b) and (2-c) above, where we claim that cessation (and the lack thereof) has to do with tense choice. In particular, we would like to suggest that 'She is Armenian' entails the proposition expressed by (1-b), for if 'She be Armenian' is true at the moment of utterance, then, by the hypothesis below, 'She be Armenian' is true at some moment m' prior to the moment of utterance and the truth of 'She be Armenian' at that prior moment verifies the past tensed 'She was Armenian'. The entailment from PRES ϕ to PAST ϕ is asymmetric; PAST ϕ does not entail PRES ϕ since if 'She was Armenian' is true at a moment m that is prior to the utterance, then, by the hypothesis below, 'She was Armenian' is true at some moment m' after m. However, there is no guarantee that m' is the moment of utterance. Hence, the truth of 'She was Armenian' at m' need not verify the present tensed 'She be Armenian'.

(3) The Temporal Profile of Statives:
For any tenseless stative clause ϕ, if a moment m is in $[\![\phi]\!]$, then there is a moment m' preceding m and a moment m'' following m such that m' and m'' are in $[\![\phi]\!]$.

With this analysis in hand, we can advance to a calculation supporting a Gricean quantity implicature. The daughter chose to utter (1-b) when she could have used the stronger statement 'She is Armenian'. She must have avoided the stronger statement because it is false, assuming she possessed all the relevant information, which is plausible in this case. So the use of (1-b) implicates that the mother is no longer Armenian. That this is an implication, i.e. cessation, explains why the inference in question can

be canceled, as in the following discourse, which is like (1), except it has been continued with (4-c).[2]

(4) a. That's my mom.
b. She was Armenian.
c. She continues to be Armenian and will always be Armenian.

Note that our proposed analysis of (1-b) is in the spirit of Musan (1995); it differs from Musan (1997) and subsequent work (e.g. Magri 2009, 2011, Thomas 2012), where a straightforward Gricean calculation is rejected. The rejection is based on the refusal to believe that PRES ϕ entails PAST ϕ.[3] This, in turn, has to do with the implicit rejection of the hypothesis in (3) above. Indeed, on the first reading of (3), one may be tempted to reject it. Here is a common misconception: (3) leads to an infinite regress. This is not true. (3) says that no isolated moments can be in the denotation of tenseless statives: there are always infinitely many points in the denotation of a tenseless stative if it is not empty. This, of course, is not a problem since infinitely many points can be packed into a finite interval. For example, if we have a densely ordered set. Or, if we subscribe to the principle below:

(5) Principle 1: The ordered set of time moments is order-isomorphic to the ordered set of real numbers.

In fact, (5) can be used to derive (3). To see this, consider the two principles below, where (6) is the well known principle of *homogeneity* and (7) is a further hypothesis about statives:

(6) Principle 2: For any tenseless stative clause ϕ, if an interval i is in $[\![\phi]\!]$, then any subinterval of i and any moment m within i are also in $[\![\phi]\!]$.

2 For a naturally occurring example, consider the opening of the famous Russian poem, 'I loved you', by Alexander Pushkin. Below is a translation by Vladimir Nabokov, where cessation in the opening statement (that the narrator no longer loves the addressee) is subsequently canceled.

(i) I loved you: love, perfect, is yet not quite extinguished in my soul; but let it trouble you no more; with nothing do I wish to sadden you.

3 Thomas (2012) considers the sentences below and claims: "…the present tense sentence in (i) is not stronger than the past tense sentence in (ii). Rather, the two sentences are logically independent." Thomas concludes: "If the present sentence is not stronger than the past sentence, it cannot be negated by exploiting the maxim of quantity according to Gricean reasoning" (Thomas 2012, 47-48).

(i) John is a graduate student.

(ii) John was a graduate student.

(7) Principle 3: Given a tenseless stative clause ϕ, $[\![\phi]\!]$ is a set of (non-zero-length) open intervals or points.

Now, if an interval i is in $[\![\phi]\!]$, then i is open (by (7)). But then, by (6), any moment m in i is also in $[\![\phi]\!]$. Since i is non-zero-length open interval, and m is an internal point of it, and since time is ordered like the set of real numbers, we can always find a point m' that precedes m and a point m'' that follows m such that m' and m'' are themselves internal points of i.[4] And that is exactly what (3) claims.

Notice that this proof starts out by supposing that a stative is true at an interval. But what if it is true at a single moment? For this, we need another hypothesis about statives that is closely related to (3):

(8) Principle 4: Given a tenseless stative clause ϕ, if a moment m is in $[\![\phi]\!]$, then there is always an (arbitrarily small but not empty) open interval i surrounding m (i.e. an open interval such that one of its internal points is m) such that i is in $[\![\phi]\!]$.

This principle makes a shortcut between points and intervals, connecting them in such a way that the proof above is automatically extended to cover moments: whenever you have a moment in $[\![\phi]\!]$, you have a containing interval as well, and we have already covered the case of intervals in the proof above. The connection between (8) and (3) is that in both cases we have infinitely many moments in $[\![\phi]\!]$ (if any at all), but in (8), they take the form of convex sets (i.e., intervals). Tenseless statives, then, are true at moments as well as (open) intervals.

In reflecting on the proof just provided, one may wonder whether (7) and (8) are more *basic* and/or more *intuitive* than (3). We leave this question open to the reader with the hope that the proof leads to a better understanding of (3). In what follows, we don't offer any independent support for (7) and (8). We simply treat (3) as an axiom. We think this is warranted because denying it is problematic, as we demonstrate below. Moreover, what would an alternative to (3) be like? We don't see any promising answer to this question.[5]

The goal of the remainder of this chapter is to be more precise about how cessation arises because the grammar is as the hypothesis in (3) claims. Before doing so, we would like to briefly go over a case that denies (3). We hope that this will serve as a helpful review of the last few pages. Assume that John was anxious for an hour yesterday. Well, then for any moment during his anxiety, 'John be anxious' was true and for moments before the anxiety, 'John be anxious' was false. So surely there must have

4 This is where (5) turns out to be important: for any real number x in an open interval of real numbers i, it is always possible to find real numbers y and z in the same interval i such that $y < x < z$.

5 Note that in raising this question are assuming the real line topology. If one were to assume a discrete or a countable topology, then we can have first and last moments for all eventualities, without overlap of an event and its final state. Thanks to Nicholas Asher for discussing this possibility.

been a first moment at which 'John be anxious' was true but before which it was false. Surely not! For all we know, there might have been a lower bounding moment *m* such that 'John be anxious' was true for any moment after *m* until the anxiety ended and 'John be anxious' was false at *m* and at moments prior to *m*. In that case, there was no first moment at which 'John be anxious' was true. Our experience of John's anxiety or even John's experience of it is of no help here. Whether or not there was a first moment, it would have been too small for us to perceive (Hamblin 1971). But in that case, why should one think that the correctness or incorrectness of the hypothesis in (3) is something semanticists should even consider? In fact, whenever reference is made to first and last moments in semantic theorizing, the hypothesis in (3) is considered and denied, often implicitly.[6]

We end this section with a very old conundrum for the benefit of those who still resist (3) because they cherish the idea that any state that begins and ends must be a state that has a first moment and a last moment. Consider the following quote from Sorabji (1976), describing Aristotle's views on the instant of change:[7]

(9) 'The train leaves at noon', says the announcer. But can it? If so, when is the last instant of rest, and when the first instant of motion? If these are the same instant, or if the first instant of motion precedes the last instant of rest, the train seems to be both in motion and at rest at the same time, and is not this a contradiction? On the other hand, if the last instant of rest precedes the first instant of motion, the train seems to be in neither state during the intervening period, and how can this be? Finally, to say there is a last instant of rest, but not a first instant of motion, or vice-versa, appears arbitrary. What are we to do?

It should be pointed out that Sorabji and the sources he relies on are, for the most part, interested in the states themselves; theirs is a metaphysical question about the temporal properties of states (see Strobach 1998 for more discussion). By contrast, the hypothesis in (3) is a linguistic hypothesis. The two are of course related, but not

6 In addition to Musan (1997) and subsequent work already noted, (3) is implicitly denied by de Swart (2000) in her formulation of the BOUND operator, as well as by Condoravdi (2010) and Sharvit (2014) in their formulation of the EARLIEST operator. In contrast, Bennett and Partee's (1972) analysis of the progressive, which we return to in Chapter 5, could be construed as an implicit endorsement of (3). Consider their remark below, which is part of an explanation of why 'John is walking' entails 'John has walked since yesterday'.

(i) Suppose 'John walks' is true at p. Then there exists an interval I such that $p \in I$, p is not an endpoint for I, and John walks is true at I.

If one adopts the idea that the progressive is a stativizer (cf. Parsons 1990, 234), Bennett and Partee's 'not an endpoint' requirement could be understood as a reflex of the fact that the grammar adheres to (3). If $p \in I$ and p is not an endpoint for I, then there is a p' before p and one after p which are in I and are not endpoints for I. In other words, the stative 'John be walking' comports with (3).

7 See also Landman 1991 for related discussion.

identical. It is possible for a state to have a first moment at which it holds but for a sentence radical describing that type of state to be false or undefined at that moment.

4.2 Semantics of tense: First pass

Let us return to (2-c), repeated below, where cessation is absent.

(2) a. What did you notice when you looked in the room?
b. The light was on. The book was on the table.
c. It was in Russian.

We follow Musan (1997) in explaining the absence of cessation in terms of an implicit domain restriction on the past tense. When used in this discourse, 'It was in Russian' is true if there is a time *t* before the utterance time, *t* is within the interval during which the witness was looking in the room and it-be-in-Russian is true at *t*.[8] The present tense alternative maintains the implicit domain restriction and so it amounts to: there is a time *t*, *t* includes the utterance time, *t* is within the interval during which the witness was looking in the room and it-be-in-Russian is true at *t*. Given that the interval during which the witness was looking in the room wholly precedes the utterance time, these conditions could not be met regardless of the book's properties – so negating this alternative adds nothing and no contentful implicature is generated.

We embrace this explanation of (2-c), differing from Musan in that we take tense domain restrictions to be intensional: properties of times, not times themselves. We call these restrictions *reference time concepts* (henceforth: RTCs). (10) illustrates the intuition that leads to this move:

(10) Everyone was unusually friendly at the 6th Annual Rowers Meeting. Jack thought that the punch was spiked. Jill thought that the brownies were loaded. In fact, the air was artificially oxygenated.

Every instance of be in this discourse is "about" the same time. Intuitively the following descriptive restriction applies to each past time:

(11) $\lambda w \lambda t$. *t* is during the 6th Annual Rower's Meeting in *w*.

This restrictor, we claim, is embedded under the propositional attitude verbs in (10). The actual interval of time that the concept picks out will depend on Jack's and Jill's belief states.

8 Here and in what follows we will talk about *times* rather than *moments*. This choice is not substantive. It reflects our desire to be on a par with the literature on tense that we discuss.

These, then, are the ingredients for a cessation inference:[9]

(12) Ingredients for a cessation inference
  a. A sentence ϕ with a stative verb in the past tense.
  b. A present tensed alternative to ϕ that shares a common RTC is not false.

With these ingredients in mind, consider the following meaning for (2-c) above, noting that a tense is adjoined to the domain restriction variable RTC_1, whose meaning is spelled out in (14). Unlike in (10), we assume that the RTC in (2-c) is implicit (i.e. 'when I was in the room'). Moreover, we assume here and throughout the chapter that w^* refers to the world of the context; t_0 and w_0 are the time and world of evaluation respectively.

(13) $\lambda t_0 \lambda w_0.\ \exists t'(t' \prec t_0 \wedge t' \in \text{RTC}_1(w^*, t_0) \wedge \textit{be.in.Russian}(w_0, t'))$

(14) $g(\text{RTC}_1) = \lambda w \lambda t.$ t is included in the interval during which the witness was looking in the room in w.

We take the meaning of an assertion to be given by the application of (13) to the utterance time s* (Ogihara 1995, fn26:8), resulting in:

(15) $\lambda w_0.\exists t\ (t \prec s^* \wedge t \in \text{RTC}_1(w^*, s^*) \wedge \textit{be.in.Russian}(w_0, t, \textit{book}))$[10]

Let us now turn to derive the absence of cessation in (2). To do so, we consider the PRES alternative[11] of (2-c), where the time quantified over by the tense is identified with the utterance time:

(16) It is in Russian.

(17) $\lambda w_0.\ \exists t\ (t \approx s^* \wedge t \in \text{RTC}_1(w^*, s^*) \wedge \textit{be.in.Russian}(w_0, t, \textit{book}))$

Given the way RTC_1 is set in this discourse, recorded in (14) above, it follows that $t \in \text{RTC}_1(w, t_0)$ is false in (17): in the worlds of the context there is no time during the

9 One may object to the falsity requirement in (12-b) by claiming that the present tensed counterpart of (2-c) is not false, but rather pragmatically deviant. We share this intuition and will ultimately account for it as a presupposition failure later in the chapter.

10 Understanding of subsequent discussion may be facilitated if the reader mentally applies (15) to w^* (the speech world). We refrain from doing so in order that we have a proposition on which we can consider entailment relations. In what follows, we will assume that the relevant values for w_0 in the matrix are those worlds that, for all the interlocutors know, could be the actual world.

11 We follow Sauerland (2004) and Russell (2012) in defining a scalar alternative as follows: Given a pair of sentences ϕ_α and ϕ_β, ϕ_α is a scalar alternative of ϕ_β if and only if: (i) ϕ_α is identical to ϕ_β except that in one place where ϕ_α has α, ϕ_β has β, (ii) α and β are members of the same Horn-Set and (iii) ϕ_α asymmetrically entails ϕ_β. In this way we differ from Thomas (2012), who also treats PRES and PAST as scalar alternatives, but since he denies the entailment relation from PRES ϕ to PAST ϕ, he adopts a more intricate analysis in which scalar alternatives are not defined in terms of strength, but according to their syntactic structure (Katzir 2007, Fox and Katzir 2009).

room-looking interval that includes the courtroom utterance time. This means that regardless of what state the book is in at t, (17) is false. Therefore, a hearer may conclude that the witness chose the past tensed (2-c) over the present tensed (16) because it is false. But that tells him nothing about the current state of the book and so there is no cessation implicature. Cessation implication is obviated in this case because the RTC excludes the utterance time. This observation, we believe, is what crucially distinguishes (1-b) and (2-c).

Below, we spell out the semantics of (1-b) and its PRES alternative to make this comparison apparent.

(18) a. She was Armenian.
b. $\lambda w_0.\ \exists t\ (t \prec s^\star \wedge t \in \text{RTC}_1(w,t_0) \wedge \textit{she.be.Armenian}(w_0, t))$

(19) a. She is Armenian.
b. $\lambda w_0.\ \exists t\ (t \approx s^\star \wedge t \in \text{RTC}_1(w,t_0) \wedge \textit{she.be.Armenian}(w_0, t))$

(20) $g(\text{RTC}_1) = \lambda w \lambda t.\ t$ is included in the period surrounding $g(t_0)$ in w.

What is crucial is that the RTC in (20) *picks out a* time that surrounds $g(t_0)$, which is identified with the utterance time (formally captured by applying the meanings to $s^\star$). This is justified given the discourse considered. Recall that the speaker in (1) begins with 'This *is* my mom':

(1) a. This is my mom.
b. She was Armenian.

Thus we understand the response in (1-b) to have an implicit extended 'now' in the same way that (2-c) has an implicit 'when'-clause. And as result of the RTC describing a time that surrounds the utterance time, $t \in \text{RTC}_1(w, t_0)$ is true in (18) and (19). Hence, whereas the RTC in (20) allows us to advance the Gricean reasoning to conclusions about the mom's state of ethnicity, the RTC in (14) prevents similar inferencing. This confirms our previous generalization, repeated below:

(21) A cessation implicature arises with PAST-ϕ when the RTC does not – by itself – make PRES-ϕ false.

In what follows, we would like to argue that (21) sheds significant light on the interpretation of tense in embedded contexts, where cessation also arises. For example, consider the discourse below:

(22) We were at the party last night and got to discussing nationalities. John proclaimed proudly that his mother is American and **his dad was Dutch**.

Analogous to (1), (22) exemplifies Lifetime Effects, i.e. that John's father is no longer alive. Moreover, as before, these effects begin with a chain of reasoning that starts with a cessation inference. From the past tense on 'was Dutch' we infer that John's father is

no longer Dutch. Assuming that being Dutch is for life, we deduce that John's father must have died. However, notice that in this case the past tense sentence that triggers cessation, 'his father was Dutch', is embedded. So if the cessation inference involves consideration of a present tense alternative, as we have proposed, it would have to be an alternative in which you have a present tense clausal complement of a past tensed verb:

(23) We were at the party last night and got to discussing nationalities. John proclaimed proudly that his mother is American and **his dad is Dutch**.

Such a construction is known to give rise to the *Double Access* reading, which is quite tricky to analyze. We will discuss *Double Access* in the next section, with the ultimate goal of giving an analysis of the cessation inference in (23), at the end of the chapter. Along the way, we will change much of what we have said so far about the semantics of the present tense in English. In particular, we will propose that the present tense in English involves universal quantification and is an amalgam of both a relative and an absolute present. More concretely, the English present poses presuppositional constraints on the RTC which demand truth throughout the *the local evaluation time and at or after the utterance time*. Such an analysis, of course, will have implications for the calculation of cessation. In particular, given (21) above, we will predict that the choice between an absolute versus a relative present tense in an embedded clause affects whether a cessation inference is found with an embedded past tense.

4.3 Double access

A key intuition, going back to Carlota Smith's work in the seventies, is that a sentence such as (24) makes reference to two times. Hence the name *Double Access* used to describe the interpretation of (24).

(24) John said that Mary is pregnant.

Intuitively, the two relevant times are:

Toy Analysis (to be revised)

1. the time of the saying
2. the utterance time

As for the first time, the time of the saying, note that if Mary's pregnancy is entirely in the future of this time, a proper report could be (25) or (26) below, but not (24):

(25) John said that Mary would be pregnant.

(26) John said that Mary will be pregnant.

And similarly, if Mary's pregnancy is entirely in the past of John's saying, a proper report could be (27) or (28), but again it cannot be (24).

(27) John said that Mary was pregnant.

(28) John said that Mary had been pregnant.

In sum, (24) can only be used if the time of the pregnancy includes the time of John's saying. But the utterance time is relevant too! The use of a present tense in (24) is infelicitous if the pregnancy does not include the utterance time of the sentence. This observation, which goes back to Smith 1978, is independent of whether the pregnancy includes the time of John's saying. To see this, consider a situation in which the pregnancy only includes the time of John's saying and not the utterance time. In such a case, a past tense in the embedded clause (viz. sentence (27)) would be used instead of the present.[12]

As first noted by Enç (1987, 637), the claim that (24) involves reference to both the time of the saying and the utterance time allows one to explain the oddity of (29):

(29) #John said two years ago that Mary is pregnant.

In order for (29) to be true, the pregnancy would have to include both the time of the saying, which is two years ago, and the utterance time. However, since human pregnancy cannot possibly cover a time span of two years, (29) is odd.[13]

Although the toy analysis captures what is going on in (24) and (29) at an intuitive level, it has turned out that serious complications arise when these intuitions are made more precise and incorporated into a general theory of tense and attitude reports involving mistaken time scenarios. We will discuss these complications in § 4.3.2 in light of von Stechow's, Abusch's and Ogihara's pioneering work.[14] We will see that much of what we said in this section has to be either refined or revised. Then, in § 4.3.3, we will introduce Heim's (1994) reformulation of Abusch's (1997) account of double access, which was designed to deal with these complications. We point to some further complications involving a particular kind of a mistaken-time scenario and this leads to an amendment in § 4.3.4. The amendment, we argue, follows from a refined semantics of the present tense that we propose in § 4.3.4.

Before pursing this route, it is important to go on a tangent and consider further felicity conditions of using an embedded present tense in an indirect report. Observe that it is quite easy to construct a minimal pair of the following sort:

(24) John said that Mary is pregnant.

12 Here we disregard the usage of an embedded historical present, which would yield an interpretation on a par with (27) rather than double access. We discuss such cases later in this chapter.

13 Again, we disregard the usage of the historical present here.

14 See von Stechow 1982, Abusch 1988 and Ogihara 1989.

(30) ??John believed that Mary is pregnant.

While the oddity in reports like (30) has been noted, the contrast between (24) and (30) has never been explained. Work on double access has either disregarded the oddity of (30) (e.g. Abusch 1997, 39) or treated it as a reflex of a particular dialect. For example, Kratzer (1998, 14) writes that sentences of the (24) and (30) variety "are in fact ungrammatical or marginal for many speakers". However, "there are enough speakers who like them, and this has to be explained."

Similarly, English grammars and manuals generally prohibit constructions like (24) and (30). For example, http://www.englishpractice.com provides the following rule, sometimes referred to as *Sequence of Tense*: "If the tense in the principal clause is in the past tense, the tense in the subordinate clause will be in the corresponding past tense."[15] We will discuss this rule in some detail in the next chapter. For the time being, it is worthy to point out that the website notes that "there are a few exceptions to this rule: A past tense in the main clause may be followed by a present tense in the subordinate clause when the subordinate clause expresses some universal truth." The following examples are provided:

(31) Copernicus proved that the earth moves round the sun.

(32) The teacher told us that honesty is the best policy.

(33) He told me that the Hindus burn their dead.

Notice, however, that (24) does not express a universal truth in the way that the examples above do. Moreover, this "universal truth" intuition does not explain the contrast in (24) and (30).

In the next subsection we ask whether double access arises in naturalistic settings and if so, what conditions its appearance. Based on a corpus study we argue that a sentence which has a present tense embedded under a past tense (henceforth: present-under-past) is grammatical, modulated by two, interacting pragmatic phenomena: *cessation* and *parentheticality*.

15 The examples below are provided to show cases in which the rule is followed.

(i) a. He said that he would come.
b. He told me that he had been ill.
c. I knew that he would not pass.
d. We noticed that the fan had stopped.

4.3.1 Cessation and parentheticality

4.3.1.1 Pragmatic clash

Imagine the scenario below:

(34) a. Conversation at 10am in the mall. Sue to John: How is Mary today? John to Sue: Mary is pregnant!
b. Conversation at 3pm on the same day at the beach. Bill to Sue: How is Mary today? Sue to Bill: **John said that she is pregnant**.

Notice that the *literal* content of Sue's bolded response in (34-b) is not a felicitous answer to Bill's question (about how Mary is doing). However, Sue's answer is felicitous with a *parenthetical reading* (Urmson, 1952; Hooper, 1975), which allows Sue to offer the content expressed by the complement clause as a possible answer to Bill's question. According to Simons (2007), with such parenthetical uses, the complement carries the *main point* of the utterance while the matrix clause gets demoted to parenthetical status and plays an evidential function, indicating the source of evidence for the proffered content.

Although attitude reports can be used in this way, they, of course, need not be. In (35-b) below, the matrix clause is what is at issue – i.e. it carries the main point – given Sue's question to Bill.

(35) a. Sue to Bill: What did John just do?
b. He said that Mary is pregnant.

We propose that a pragmatic conflict between parentheticality and cessation triggers infelicity in examples like the following, which differs solely from (34), in that (36-b) has 'believed' rather than 'said':

(36) a. Conversation at 10am in the mall. Sue to John: How is Mary today? John to Sue: Mary is pregnant!
b. Conversation at 3pm on the same day at the beach. Bill to Sue: How is Mary today? Sue to Bill: **#John believed that she is pregnant**.

To see this, assume once again that the matrix in the bolded report is parenthetical, serving as evidence for the content of the complement clause. Moreover, notice that John would be understood to no longer hold the described belief at the time that the belief report was uttered. That is, the matrix clause would exemplify cessation. Recall from § 4.1 that cessation arises with a past tensed stative when the present tensed alternative could have been used, but was not. This condition is satisfied in the bolded report above since the question under discussion – *How is Mary today*? – concerns the utterance time and, as such, Sue could have responded 'John *believes* that Mary is pregnant', but chose not to. Given Gricean reasoning, Bill would likely deduce that the reason for this is that John no longer holds the described belief. This results in a *prag-*

matic clash: on the one hand, Sue uses John's past belief as evidence for the suggestion that Mary is pregnant; on the other, John's belief cannot be taken to be evidence since Sue implies that it currently does not hold.

In sum, we propose that what explains the oddity of sentences like the bolded report in (34-b) is a pragmatic clash between cessation and parentheticality. The prediction is that present-under-past sentences should be acceptable, unless the attitude report is interpreted parenthetically *and* there is a cessation implicature. Given that cessation only applies to stative predicates, we might expect more double access sentences with embedding eventive attitudes, such as 'said' in (34-b). The bolded report in (34-b) is good precisely because it is eventive.

In the next section, we present corpus results showing that double access does occur in naturalistic settings and that it is more frequent with eventive embedders. Subsequently, we look at some naturally occurring discourses, to see how parentheticality and cessation interact.

4.3.1.2 Corpus study

In this section, we establish two properties of the distribution of matrix and embedded tense in English as a means for investigating double access. First, we show that present-under-past tense configurations, which we take as an index of double access, are not only attested but more prevalent than past-under-present configurations. This is important because we take it that the grammaticality of past-under-present is undisputed. Second, we establish that a verb's showing up in present-under-past configurations is conditioned by its eventivity: present-under-past is more common with eventives than with statives.

Data set

Data about the distribution of matrix-embedded tense configurations were extracted from the Parsed UK Web as Corpus (PukWaC) corpus (Baroni et al., 2009). PukWaC is the part-of-speech (POS) tagged and dependency parsed version of ukWaC, which is an approximately two billion word web scrape of the `uk` domain. To create PukWaC, ukWaC was lemmatized and POS tagged using TreeTagger (Schmid, 1994) and dependency parsed using MaltParser (Nivre et al., 2007).

Besides the fact that it has annotations useful for extracting tense sequence information, this corpus was chosen because it is large and has wide coverage – i.e. many different genres of text are represented. This wide coverage is useful since, in contrast to purely newswire-based parsed corpora, which will tend to include many quotations masquerading as double access – e.g. (37) – there is likely to be more instances of informal, non-quotative text, such as that found in forums and blogs.

(37) The minister said, "the bill will not come to a vote."

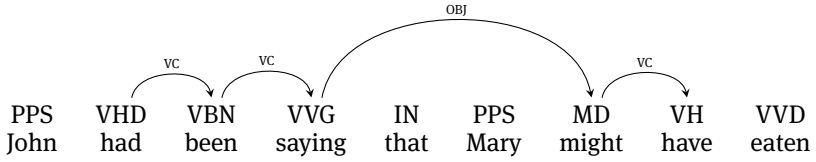

Fig. 4.1. Example of dependency parse arrows relevant to dataset extraction.

To begin, all cases of clausal embedding were extracted. This was done by extracting sentences in which a word whose tag matched the regular expression `VV[Z|D|G|P]?` had as an OBJ dependent a word whose tag matched the regular expression `[MD|V[B|H|V][Z|D|G|P]?]`.[16] An example of the relevant dependency structure is exemplified by the arrow labeled OBJ in Figure 4.1.

If the embedding verb was a VC dependent of an auxiliary verb or modal, the auxiliary chain was traced back until a non-VC dependency was found. An example of such a chain can be seen in the matrix clause of Figure 4.1. Each member of this chain along with its tense (if any) was recorded. If the embedded verb was an auxiliary that was an immediate VC parent of 'have' – as is true of the embedded clause in Figure 4.1 – this was also recorded.

Tense sequence data were then constructed in the following manner: if the highest element in a clause was a nonmodal, the tense encoded in its POS tag was mapped to the corresponding tense (past or present). Otherwise, it was mapped to present unless the modal was 'could' or 'would' or had a VC dependent with POS tag `VH` – e.g. 'might have', 'may have', etc. Two exceptions to the rule regarding 'have' were 'will (have)' and 'shall (have)', which were always mapped to present.

After this initial extraction, a crude filtering was applied to remove sentences that involve quotation by filtering any sentence containing a verb+"+ character. This is necessary to remove cases, like (37), which occur frequently in the newswire portions of ukWaC and which would be labeled present-under-past despite not involving double access.

Given the above criteria, a total of 180,847 sentences were extracted. These sentences were then further filtered to remove cases of nonfinite embedding – e.g. small clauses (38-a) and various infinitival complements (38-b).[17] Such cases were frequent in our sample of sentences, and this filtering step reduced the total number of sentences under consideration to 62,178.

16 `MD` refers to a modal auxiliary. Any tag beginning with `V` refers to a verb: `VB` (*be*), `VH` (*have*), `VV` (other). The tags final letter specifies tense/aspect: `Z` (third person present tense), `D` (past tense), `G` (gerund), `P` (past participle), or the empty string (root form).

17 This was carried out by searching for dependents of the highest embedded verb that were POS tagged with `TO`. Small clauses are harder to filter. One method we employed was to check whether the embedded subject was a pronoun with accusative case.

(38) a. John saw Mary go to the store.
b. John wanted (Mary) to go to the store.

Next, sentences with matrix verbs not in the 100 most common were filtered. Lower-frequency verbs, many of which were *hapax legomena*, were determined by manual analysis to be highly likely to be misparses, including non-embedding verbs, non-verbs, and non-words. The sample of 100 verbs was enough to capture a large portion of the corpus, while still being a manageable number of verbs to evaluate individually for traits like eventivity. After this step, 44,808 sentences remained.

Since discussions of double access tend to focus solely on declarative complements, we also removed all question complements, yielding 40,512 sentences. Finally, the 100 verbs were then checked for whether they all at least allow a finite nonquestion complement. Two – 'wonder' and 'examine' – were determined to allow only embedded question complements, and so any sentences (erroneously) marked as taking declarative complements were further removed. This brought the final number of datapoints to 40,382 and the final number of verbs to 98.

Results: Attesting Double Access

To establish that double access is attested, we begin by assessing how often each tense sequence occurs in our dataset. Table 4.1 below gives the joint relative frequency of each tense sequence – i.e. the proportion of times each sequence occurs in the dataset with respect to all of the others – along with 95% confidence intervals of that relative frequency calculated using a simple nonparametric bootstrap with 10000 replicates. We see here that, far from being unattested, present-under-past (0.103) occurs almost as often as past-under-present (0.114). This is interesting for the fact that there is no dispute that past-under-present is grammatical.

Table 4.1. Relative frequency of each tense sequence. Confidence intervals were calculated using a nonparametric bootstrap with 10000 replicates.

MATRIX TENSE	EMBEDDED TENSE	RELATIVE FREQ	95% CI
past	*past*	0.264	(0.260, 0.268)
past	***present***	**0.104**	**(0.101, 0.107)**
present	*past*	0.114	(0.111, 0.117)
present	*present*	0.518	(0.513, 0.523)

Indeed, while mismatching tense sequences (present-under-past and past-under-present) are less frequent than matching tense sequences (past-under-past and present-under-present) overall, among matrix past tense sentences, embedded present tense is more frequent (0.300) than embedded past tense among matrix

present tense sentences (0.181).[18] That is, we find more tense mismatching given that the matrix tense is past than given that it is present. This result is corroborated by a Fisher's exact test ($p < 0.001$).

This apparent preference for present-under-past could, however, have the uninteresting explanations (i) that a small number of high frequency verbs – maybe a single verb like 'say' – allows present-under-past exceptionally; or (ii) that a few large documents containing many present-under-past – e.g. newswire text that did not place quotes around quotations – inflate the present-under-past proportions. To address these possibilities, we employ a mixed effects logistic regression with TENSE MATCH (MATRIX=EMBEDDED, MATRIX≠ EMBEDDED) as the dependent variable, MATRIX TENSE (*past*, *present*) as a fixed effect, and VERB and DOCUMENT as grouping factors for random intercepts and random slopes for MATRIX TENSE. The fixed effect term explains differing prevalence of TENSE MATCH given MATRIX TENSE, averaging across VERB and DOCUMENT, and the random effect terms explain verb-specific and document-specific effects. Thus, if the fixed effect term is significant even in the presence of the random effects, this suggests that the apparent difference between the prevalence of present-under-past and the prevalence of past-under-present cited above is not driven by a few highly frequent verbs or large documents.

To test the significance of MATRIX TENSE, we utilize a likelihood ratio test, comparing a model with MATRIX TENSE as a predictor to one without it. Under this test, the fixed effect of MATRIX TENSE is significant ($\chi^2(1) = 31.89$, $p < 0.001$) and goes in the expected direction: tense mismatch is more common with matrix past tense than with matrix present, even controlling for verb-specific effects. (The increase in the log-odds of a tense mismatch when the matrix tense is present is approximately 0.912.) The upshot of this is that, if one accepts that past-under-present is indisputably grammatical but would like to explain away the apparent existence of present-under-past, it will be difficult to do so as a purely verb-specific or document-specific effect.

This, however, should not be taken to mean that verbs show no variability in their ability to occur with present-under-past. Indeed, the above model puts the (marginal) predicted probability of embedded present given matrix past at about 0.271 (estimated log-odds: -0.987), but it furthermore predicts that 95% of verbs will fall in the quite large interval [0.045, 0.745] (estimated standard deviation of the verb random intercept: 1.050). Thus, there is actually quite a bit of variability among verbs that might be explained by particular properties of those verbs. In light of the preceding discussion, one such property that seems likely to be relevant is a verb's eventivity.

We investigate this possibility more fully in the next section, but suggestive evidence can be seen in Figure 4.2 below. This figure shows the Best Linear Unbiased

18 This is a consequence of matrix present tense being more frequent overall. While matrix past tense constitutes about 37% of the data, matrix present tense constitutes about 63%. Thus, nearly equivalent joint relative frequencies for the tense mismatch cases are converted to quite different conditional relative frequencies given matrix tense.

Predictors (BLUPs) of the verb random effects – roughly, how much the model believes each particular verb deviates from the mean across all verbs.[19] On the *y*-axis is the log-odds of embedded present (v. embedded past) given matrix past, and on the *x*-axis is the log-odds of embedded present (v. embedded past) given matrix present. Being higher on the *y*-axis thus means showing higher preference for present-under-past compared to past-under-past. The color of each point shows the eventivity value of the corresponding verb, as determined by the annotation procedure described in the next section. As can be seen from the fact that there are more orange points toward the top of the graph and more blue toward the bottom, eventives tend to prefer present-under-past more than statives. The question we address in the next section is whether this trend is reliable.

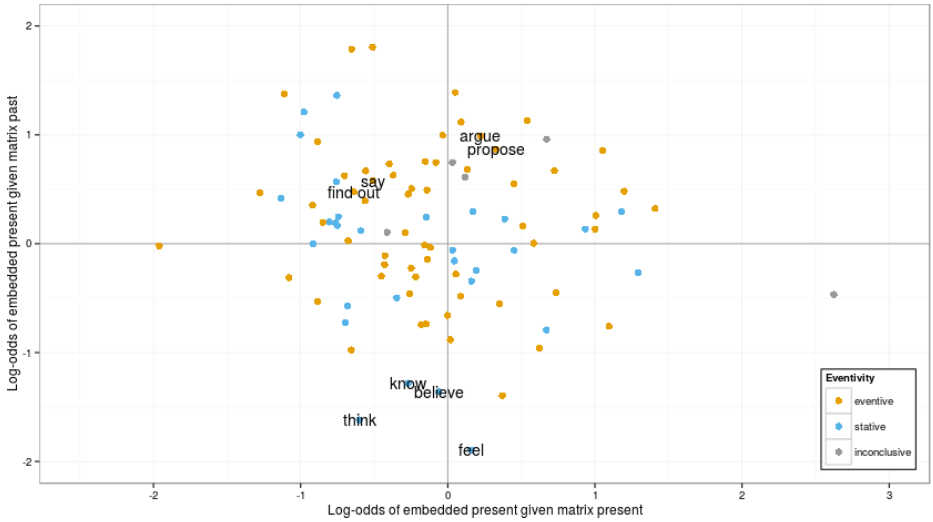

Fig. 4.2. Best Linear Unbiased Predictors for verb random effects

Eventivity annotation

Altshuler and Roberts annotated the 98 verbs in the final dataset for whether they were eventive or stative when used with declarative complements. To do this, both annotators individually applied each of the following five tests for stativity.

(39) a. The bare present form of the verb yields a nonhabitual interpretation
b. The verb may not be used in the imperative.
c. The verb may not be the complement of force.
d. The verb may not be in the complement of a pseudocleft.
e. The verb may not be used with progressive aspect.

19 In fact, these are not the BLUPs themselves, but rather linear combinations thereof. The 0s on the axes correspond to the estimated population means for each cell of the regression design.

For each test, the verb was marked as *stative*, *eventive*, or *inconclusive*.[20] Inter-annotator agreement was high (Cohen's κ=0.698). Cases where the annotators disagreed were resolved jointly by both annotators. After this resolution, verbs were mapped to *eventive* or *stative* based on plurality vote over the tests. When plurality vote did not resolve to *stative* or *eventive*, either because there was no plurality or because the plurality was *inconclusive*, the verb was mapped to *inconclusive*. Five verbs were mapped to this value: 'show', 'ensure', 'demonstrate', 'prove', and 'establish' (grey dots in Figure 4.2). These *inconclusive* verbs are addressed in the analysis in two ways: (i) by removing them from consideration; and (ii) by retaining them and imputing their value.

Analysis

As in the previous analysis, we begin by investigating the relative frequencies of the values of EVENTIVITY, MATRIX TENSE, and EMBEDDED TENSE. For this initial analysis, the five inconclusive verbs were removed from consideration. Figure 4.3 shows the conditional relative frequency of embedded present tense given matrix tense and eventivity. Fisher's exact tests suggest a reliable nonindependence between EVENTIVITY and EMBEDDED TENSE among matrix past sentences ($p < 0.001$) but not among matrix present sentences ($p = 0.117$). As such, we focus on only the matrix past sentences for the remainder of this section.

As before, this effect could be a consequence of verb- or document-specific effects. To test the reliability of the EVENTIVITY effect among matrix past tense sentences, controlling for VERB and DOCUMENT, we again utilize a mixed effects logistic regression – this time with MATRIX TENSE as the dependent variable, a fixed effect of EVENTIVITY, and random intercepts for VERB and DOCUMENT. This model was compared against one without the fixed effect of EVENTIVITY in a likelihood ratio test. Consonant with the Fisher's exact test, EVENTIVITY comes out as a significant predictor of EMBEDDED TENSE ($\chi^2(1) = 5.66$, $p < 0.05$), and it goes in the expected direction: eventives are more likely (estimated increase in log-odds: 1.043) than statives to take embedded present tense given that the matrix tense is past.

One worry that remains here is that, by removing the five verbs marked *inconclusive*, we may have underestimated the uncertainty regarding the eventive preference for present-under-past. To remedy this, we utilize random regression imputation (cf. Gelman and Hill, 2006, Ch. 25). A random effects logistic regression with EVENTIVITY

20 Certain verbs, particularly verbs of communication, were noted to differ in eventivity based upon the animacy of their subject (see Anand and Hacquard 2014 for discussion of this correlation). Because such verbs occur in the corpus more frequently with animate subjects, these verbs' eventivity values were resolved to whatever value was associated with their behavior with animate subjects. This judgment is based on an evaluation carried out by Hacquard and Roberts of all subjects of matrix 'say', the most frequent attitude verb. These subjects were overwhelmingly animate.

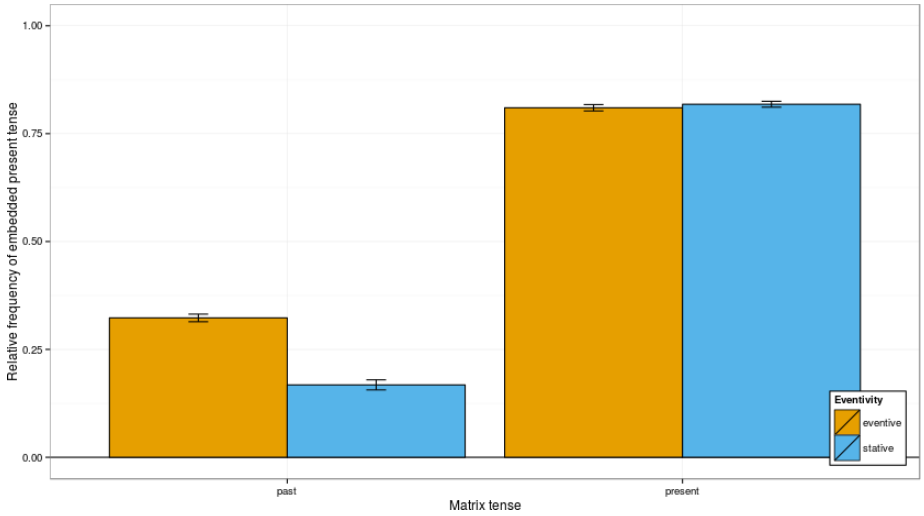

Fig. 4.3. Conditional relative frequency of embedded tense given matrix tense and eventivity. Error bars give 95% confidence intervals computed by a nonparametric bootstrap with 10000 replicates

as the dependent variable and random intercepts for DOCUMENT was fit to the data, excluding the *inconclusive* verbs. This model was then used to predict the probability of a particular EVENTIVITY value (*eventive* or *stative*) for each instance of the *inconclusive* verbs, using the fixed intercept estimate and the DOCUMENT random intercept BLUPs. If a document only contained *inconclusive* verbs in our dataset, the values for verbs in that document were set to the probability corresponding to the fixed intercept (estimate log-odds of *eventive*: 0.260).

These predicted probability were then used as the basis for a parametric bootstrap. In each replicate of this bootstrap, a value (*eventive* or *stative*) was sampled for each instance of an *inconclusive* verb based on that instance's predicted probability. For each of 10000 replicates of this parametric bootstrap, a nonparametric bootstrap was conducted on the dataset excluding the *inconclusive* verbs – i.e. the same resampling procedure that generated the confidence intervals in Figure 4.3 was repeated for each parametric replicate. These parametric and nonparametric replicates were then combined, and mean and confidence intervals computed. Of interest here, the mean relative frequency of embedded present for eventives with matrix past remains the same to three significant figures (0.323) as does the 95% confidence interval [0.314, 0.332]; in contrast, the mean relative frequency of embedded present for statives with matrix past rises slightly (from 0.168 to 0.176) and the 95% confidence interval concomitantly shifts upward without a change in size (from [0.156, 0.180] to [0.164, 0.187]). Nonetheless, controlling for matrix tense, the prevalence of present-under-past is still much higher with eventives than statives.

Using this same method, we also assessed whether the EVENTIVITY effect was reliable when controlling for effects of VERB and DOCUMENT. The full eventivity model described above was fit to each of 1000 new replicates, and the coefficient for EVENTIVITY extracted. Consonant with the earlier likelihood ratio test, the distribution of this coefficient shows a reliable increase of present-under-past for eventives compared to statives among matrix past sentences (mean increase in log-odds: 0.456, 95% CI: [0.016, 0.900]).

4.3.1.3 Cessation and parentheticality in our corpus

Our proposal predicts that double access should only be ruled out when parentheticality clashes with cessation. We thus expect to find double access sentences with stative embedders, so long as they involve either no cessation, or if cessation, then no parentheticality. In other words, we expect to find three sorts of examples in our corpus:

(40) a. no cessation, no parentheticality
b. no cessation, parentheticality
c. cessation, no parentheticality
d. #cessation, parentheticality

To test (40), we inspected a small sample of past matrix sentences under the statives 'think', 'believe', 'feel', and 'know'.[21] We observed that most cases had neither cessation nor parentheticality (40-a). We found a handful of cases of no cessation with parentheticality (40-b) and cessation with no parentheticality (40-c), but no cases of cessation and parentheticality (40-d). Below, we provide an instance of each kind, leading to some discussion about why (40-b) and (40-c) were relatively rare.

We begin with the discourse below, where we have bolded the attitude report under consideration:

(41) The response on the subject of the current student numbers and the government's aim of achieving a graduate population of 50% was mixed. **A number of responses felt that there are currently excessive numbers of students and courses.** However it was also communicated that to maintain a stable and diverse society there should be a varied range of courses and equal opportunities for students to benefit from a university education.

We note that there is no cessation implicature in the bolded report: the discourse conveys nothing about current feelings. This is likely due to the fact that the reference time for 'felt' is a time that is set prior to the utterance time by the past tensed 'was

21 Twenty random instances of past-under-past, and twenty instances of present-under-past for each of these verbs, and of the eventives 'say' and 'tell'.

mixed'. Moreover, there is no parentheticality: the report elaborates on the fact that the results were mixed; what is at issue here is how different respondents felt.

Example (42) is a case of cessation with no parentheticality:

(42) Researchers lead by a team at the UK's Wellcome Trust Sanger Institute have published a detailed analysis of the human X-chromosome. An accompanying study uncovered the surprise finding that women have two active copies of many X-chromosome genes. **Previously, scientists believed that one of the two X-chromosomes present in every cell of a female embryo is effectively 'shut down' early in development**.[22]

The presence of 'previously' makes cessation clear. We infer that scientists had a certain belief prior to the discovery, which they no longer hold, given this discovery. As in (41), (42) does not exemplify parentheticality because the report establishes a contrast between what is known now and what the scientists used to believe.

Example (43) involves no cessation, but it arguably exemplifies parentheticality:

(43) Following consultation among colleagues, it has been agreed to hold a contacts conference on 18th April 2002 at Scarman House, Warwick University. The conference is intended for departmental contacts or for a representative if the contact is not free on that day. **We felt that Warwick is fairly central, and is within easy reach of Birmingham International for colleagues who fly in from Scotland or Northern Ireland**.[23]

The discourse conveys nothing about how the author currently feels (no cessation). This is likely due to the mention of a consultation that occurred in the past, setting the reference time for 'felt' at the time of the consultation. As for parentheticality, one may argue that what is at issue is the location of the conference. In this case, the main point would be carried by the complement clause, which establishes that Warwick is central and accessible to all.

A much clearer case of parentheticality and no cessation is given in (44), which involves an eventive matrix verb (which cannot trigger cessation) and *S-lifting* (Ross, 1973), where the complement clause precedes the matrix (which triggers parentheticality):

(44) "Obviously we are very troubled by the Russians' decision. … The move has serious implications for U.S. security interests and those of our friends and allies in the Middle East."**Between now and Dec. 1, Washington hopes to persuade Russian officials to retract their decision to break the deal, U.S. officials said**.[24]

22 http://www.bionews.org.uk/page_12293.asphttp://www.bionews.org.uk/page_12293.asp

23 http://escalate.ac.uk/1248

24 http://www.casi.org.uk/discuss/2000/msg01208.html

In sum, both parentheticality and cessation are found in our corpus. However, both are rare with past tensed, stative attitudes. This may be, in part, an artifact of our choice of corpus: we suspect that both cessation and parentheticality might be more frequent in spoken corpora. The rarity of *cessation* with statives, for instance, may stem from the fact that many of our sentences are embedded within a past narrative, where the reference times do not overlap the utterance time. As for *parentheticality*, while such uses were rare with statives, they were relatively frequent with eventives like 'say' or 'tell'. This asymmetry echoes Hooper's (1975) intuition that parenthetical readings are easier to get with the past tense *strong assertives* (e.g. 'say', 'report') than with *weak assertives* (e.g. 'think', 'believe'); see Anand and Hacquard 2014 for more discussion of the strong vs. weak contrast.

Finally, it is important to note that our corpus extractions revealed that even when the conditions on cessation and parentheticality were satisfied, there are interpretations of present-under-past that are distinct from double access. For example, we found several examples of the following variety:

(45) Rusev said that his heart only belongs to him. They then made out until Ryback walked out. He said that this is not Teen Wolf, but rather Monday Night RAW. **He also said that he is hungry and then started a feed me more chant.**[25]

(46) I called him and he said **he is on his way and will be at my place by 7 PM**. He never came.[26]

In (45) we see the embedded present tensed 'he is hungry' get a purely relative interpretation. Nothing is said about how Ryback feels at the time that (45) was uttered. Similarly, in (46), we see the embedded present tensed 'he is on his way' get a purely relative interpretation. The speaker shifts the perspective to her now, when some salient male was supposedly on his way. Nothing is said about this male's whereabouts when (46) was uttered. This is especially clear given the final sentence in the discourse 'He never came'.

What are we to make of such discourses? One could argue that this is a case of an embedded historical present (Bary and Altshuler, 2014), yielding an interpretation of the embedded present that is found in Russian and Hebrew present-under-past reports (Schlenker 1999, Sharvit 2003). We come back to English discourses of this type in § 4.3.4, where we present our analysis of double access. We also discuss Russian and Hebrew discourses that exemplify readings similar to (45) and (46) in Chapter 5.

Does cessation and parentheticality always clash?

Consider the following discourse (Guillaume Thomas p.c.):

25 http://wrestling-edge.com/wwe-monday-night-raw-live-play-by-play-coverage-7

26 https://khalidraza9.wordpress.com/2015/04/13/why-should-you-never-buy-at-reliance-digital/

(47) a. Where is the Holy Grail hidden?
b. The esteemed and late professor von Klech believed that it is buried under Notre Dame de Paris.

At first blush, one may wonder why this discourse is acceptable even though the matrix in (47-b) is clearly parenthetical (given the question in (47-a)) and clearly exemplifies cessation (since the attitude holder is understood to be dead). Note, however, that the death of the professor is not a good reason to doubt its validity as a reliable source of information. Hence there is no pragmatic clash. In other words, cessation and parentheticality does not automatically result in a pragmatic clash if the cessation does not entail that the attitude holder has changed her mind.

Addressing previous claims

This subsection addressed two questions: Does double access arise in naturalistic settings? And what conditions its appearance? Aided by a corpus study, we have argued that double access is not a fringe phenomenon, but that its acceptability is modulated by two pragmatic factors: cessation and parentheticality.

We hope that our argument has shed light on disagreement in previous literature about acceptability of double access. We think the root of this disagreement was (i) not controlling for cessation and parentheticality and (ii) not considering a wide range of data.

With respect to (i), we believe that a pragmatic clash between cessation and parentheticality may have led to the queasiness that some linguists felt towards Abusch's classic example 'John believed that Mary is pregnant' in a context in which we are discussing Mary's recent weight gain. This context makes the complement clause at issue (parentheticality), but the past tense on 'believe' triggers cessation.

With respect to (ii), much more remains to be said. Recall that in the pedagogical literature, the consensus seems to be that double access is only possible when the embedded clause expresses a generic statement. However, when looking at naturally occurring data, we saw that genericity is not a necessary condition for double access. So, what brings about the pedagog's intuition? To answer this question, it is helpful to see what happens with the embedded *past tense* in generic statements such as the one in (48):

(48) Bill said that eight was an odd number.

Notice that (48) is not so good in the following discourse:

(49) Bill is an idiot! #He said that eight was an odd number.

The RTC in the embedded clause of the infelicitous sentence picks out a time that overlaps the utterance time; the use of the present tense in the initial statement ('Bill is an

idiot!') makes this resolution strategy highly plausible. As a result, (49) exemplifies cessation: the present tense could have been used, but wasn't leading to the inference that eight is no longer an odd number. This, of course, is odd since generic states cannot cease to hold by their very definition. This point is nicely brought about by the following exchange:

(50) a. Bill is an idiot! He said that eight was an odd number.
b. Haha. You mean he thinks that it somehow changed? Once odd and now even? He is an idiot indeed.

If cessation is, in fact, what makes the embedded past tense odd in generic statements, then we can make some sense of the intuition expressed by the pedagogs: the embedded present tense is frequently used in generic statements because the past tensed counterpart is often not possible.[27]

Past-under-past

We have argued that present-under-past can lead to infelicity when cessation and parentheticality clash. However, this clash is not specific to present-under-past *per se*: any attitude report, including past-under-past, should be infelicitous when parentheticality and cessation conflict.[28] This appears to be the case. Consider Sue's response below. It is odd and would be much more felicitous with a present tense on 'believe' or with 'said' instead.

(51) a. Conversation at 10am in the mall
Sue to John: Why didn't Mary come to the show last night?
John to Sue: She was sick.
b. Conversation at 3pm on the same day at the beach
Bill to Sue: Why didn't Mary come to the show last night?
Sue to Bill: **#John believed that she was sick**.

We return to past-under-past reports in Chapter 5. In what follows, we discuss double access further, noting some well-known challenges involving temporal *de re* and temporal *de se* that lead us to revise our semantics for the present tense developed in § 4.2.

27 We also predict that generic statements in the past tense like (48) to be felicitous when cessation does not arise. This prediction is borne out in the discourse below, where the RTC picks out a past time that does not overlap with the utterance time.

(i) John looked at the exam closely. One question seemed quite difficult. He didn't know the answer. Though he did recall his teacher saying once that **eight was an odd number**.

28 Thanks to Maribel Romero and Todor Koev for raising this point.

4.3.2 Two complications

4.3.2.1 Temporal *de se*

Recall our intuition, outlined at the outset of § 4.3, that (24) makes reference to two times:

(24) John said that Mary is pregnant.

Toy Analysis (to be revised)

1. the time of the saying
2. the utterance time

The first complication for this toy analysis concerns the first time parameter of our toy analysis: the time of John's saying. It has been known for some decennia now that – unlike what our intuitions lead us to believe – there is, in fact, no direct link between the time of the event described in the complement of an attitude verb (here the pregnancy) and the time of the attitude itself (von Stechow 1982, von Stechow 1995). We see this in situations where the attitude holder, John, is mistaken about the time.

Imagine that John thinks it is 10am when it is really 9am. In such a scenario, (52), when uttered at 9am, is true.

(52) John thinks that it is 10am.

However, as noted by von Stechow, if we were to let the present tense refer to the time of John's thinking, namely 9am, and assume that the object of belief is a set of possible worlds (Hintikka 1962), we would derive that John believes that 9am is 10am, which is a contradiction. As a consequence, he would believe in the empty set of possible worlds, which means that he would believe literally everything. In other words, we would ascribe to John a belief that is absurd whereas, in fact, he is simply mistaken about the time, something that happens to us all the time.[29]

To solve this puzzle, von Stechow proposed that the present tense refers to the time John *thinks* it is (at the time of his reported thinking), rather than to the actual time at which his thinking takes place. In other words, what is relevant is where the attitude holder locates himself on a time line at the time of his thinking (*the attitude holder's now*) and not where he really is. Combined with Lewis's (1979) reinterpretation of belief as the self-ascription of properties (rather than a propositional operator), we get that John ascribes the time where he locates himself the property of being 10am, which is a natural interpretation of (52). This discussion leads us to

29 See Bary and Maier (2009) for a discussion of the analogy between this argument and a similar argument in the nominal domain.

the first modification of our toy analysis: When we interpret the present tense in the complement of an attitude verb we have to relate that to the attitude holder's now, rather than to the time of the attitude itself:

The event described in the complement includes: **FIRST MODIFICATION**

1. **the attitude holder's now**
2. the utterance time

4.3.2.2 Temporal *de re*

The second complication concerns the utterance time. Here the question is not whether it plays a role, but what role it plays.

We shall begin with the observation that (24), repeated below, describes what the world looks like *according to John*.

(24) John said that Mary is pregnant.

As observed by Abusch (1997, 40), (24) can be true even if Mary was never pregnant in the real world. Abusch provides evidence for this claim by observing that a report like (53) is not contradictory:

(53) John said that Mary is pregnant but she is simply overeating.

In light of these data, Abusch concludes that whatever the correct semantic analysis of (24) is like, it should not entail actual pregnancy of Mary (in the past, present or future).

But the sentence is not entirely a description of the world *according to John*. When he made a claim about Mary, John was not making a prediction about the utterance time. That is, John was not making a prediction about a time that would be future from his point of view. He was just making a claim about how things were at his time. This means that although the sentence does describe John's attitude and although the sentence is about the utterance time (and therefore that time does, in fact, play a role in the semantics of the sentence), that time need not necessarily have played a role in John's mind. Based on this intuition, Abusch proposes that in addition to a *de se* component, the interpretation of the present tense in (24) also has a *de re* component.[30] As a result we get:

30 It should be noted that there have been arguments put forth that Abusch's intuitions do not warrant a *de re* analysis of the present tense (Gennari 2003, Smirnova 2009 and Klecha 2016). We do not take a stance on this issue here, though ultimately we propose an analysis in which the present tense is not interpreted *de re*. Until then, we will continue to talk about the *de re* component in the interpretation of the present tense since it is vital in Abusch's analysis.

the **believed** event described in the complement includes:		**FINAL VERSION**
1. the attitude holder's		*de se*
2. the utterance time	but not necessarily in John's mind	*de re*

This remarkable combination of *de se* and *de re* interpretation forms a true challenge for a semantic analysis of double access. In the next section, we outline Heim's (1994) reformulation of Abusch's (1997) analysis that attempts to meet this challenge.

4.3.3 Abusch's account of double access Heim-style

Abusch argues that a semantic analysis of double access sentences requires acquaintance relations about times. Here, we follow Heim's (1994) reformulation of Abusch's (1997) account who uses the term *time concepts*. She describes time concepts as "the meanings of descriptions by which a thinker might represent a time to herself" (Heim, 1994, 155). Technically, a time concept is a function from world time pairs to times. Here are two examples:

- the time concept of 'today' is a function that maps each $\langle w, t\rangle$ to the day of t
- the time concept of 'the last time the lights went out' is a function that maps each $\langle w, t\rangle$ to the last $t' \prec t$ such that the lights went out at t' in w

In order to account for the observations that we discussed in the previous section, Heim proposes that (24) is uttered felicitously only if the context provides a time concept f that satisfies the following two constraints:

(54) Heim Constraints

a. f evaluated with respect to the attitude holder's world and now (at the time of his attitude) should not follow the attitude holder's now completely
b. f evaluated with respect to the actual world and the time of the attitude should overlap with the utterance time

And if the felicity conditions are fulfilled, the sentence is true iff in all worlds w' and times t' compatible with John's beliefs in the actual world at the time of the attitude, the time where John locates himself has the property of being a Mary-is-pregnant time in w' at t'.

We shall now examine how this yields what we have labelled as **FINAL VERSION** in the previous section. The first constraint in (54-a) captures the *de se* component: it requires that the time-concept implies non-futurity *for John*. (We will later come back to why the implication is non-futurity and not presentness). The second constraint in (54-b) captures the *de re* component. The attitude holder has a time concept in mind and this time concept happens to yield the actual utterance time (when evaluated with

respect to the actual world and time of the attitude), but the fact that it yields this time is not because the attitude encodes it.

We will now consider a concrete example from Abusch and discussed by Heim. Imagine that John sees Mary having a big belly and thinks that Mary is pregnant while the cause for the right now visible big belly lasts. This prompts his claim about her condition. Then *f*, the time concept, is the meaning of the description 'while the cause for her right now visible big belly lasts'. This is a function that maps each $\langle w, t \rangle$ to the maximal interval that includes t during which the cause of her big belly holds. The constraints in (54) now make predictions about the felicity conditions of the report in (24), given this time concept. The first constraint is satisfied trivially: we feed the function corresponding to the time concept with the attitude holder's world and now. Since the function returns an interval that includes the time of the input, i.e. the attitude holder's now, it is a *fortiori* an interval that is not entirely in the future for John. The second constraint is satisfied only if whatever it was that caused the state of Mary's big belly at the time of the attitude still holds at the time of the utterance, or put simpler, if Mary still has a big belly at the utterance time. In this way, Abusch and Heim, on the one hand, account for the intuition that the pregnancy has to include the actual utterance time and, on the other hand, avoid that the semantics assigned to the sentence entails any actual pregnancy for Mary.[31]

Assuming the attitude holder is not mistaken about the time, Heim's constraints also explain why (29), repeated below, is odd irrespective of a particular (non-mistaken time) scenario and irrespective of a particular time concept.

(29) #John thought two years ago that Mary is pregnant.

31 In describing Abusch's and Heim's analyses, we assumed that a suitable time concept picks out the time that Mary has a big belly. While an assumption of this sort is often made, Klecha (2015) shows that it is misguided. He provides the following example:

(i) Mary puts a balloon under her shirt. John then observes her in this state, and then says to everyone: 'Mary is pregnant!' Later that day, Mary takes the balloon out from under her shirt and pops it. Bill, aware of everything that happened, says to Mary: '(Earlier today,) John told everyone that you're pregnant.'

In this scenario, the cause of John's belief that Mary is pregnant, i.e. the balloon under her shirt, is absent by the time of Bill's report. Nevertheless, the present tense is acceptable, suggesting that the cause of John's belief need not hold at the utterance time. In light of this example, Abusch (p.c.) suggests that the time concept in (i) could pick out the day in which the attitude time is included (rather than the time of the balloon being under Mary's shirt). While this would allow us to account for (i), it prompts us to ask what factors determine a suitable time concept. As noted by Bary et al. (2016), an answer to this question requires first and foremost a better understanding of the factors licensing a felicitous usage of the embedded present, something that is lacking at this moment, though we hope that § 4.3.1 has opened some avenues for future research.

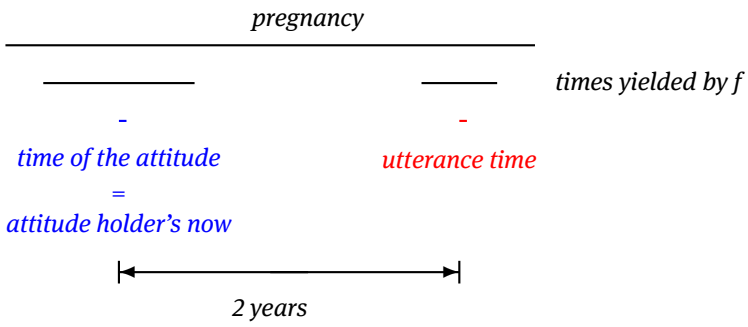

Fig. 4.4. the infelicity of (29)

The second constraint in (54-b) states that the time yielded by *f* when evaluated with the respect to the actual world and time of the attitude should overlap with the actual utterance time (see Figure 1 below). The past tense tells us that the time of the attitude is in the past of the utterance time and the time adverbial specifies that there is two years in between the two. The fact that we have assumed that the attitude holder is not mistaken about the time gives us that attitude holder's now is identical to the time of the attitude. And finally, the first constraint in (54-a) tells us that *f*, when evaluated with respect to the attitude holder's world and now, should not follow the attitude holder's now completely. This leaves open the possibilities that it either overlaps with the attitude holder's now (see Figure 1), or is entirely in the past of the attitude holder's now, but either way, for the sentence to be true, the pregnancy John makes a claim about would have to include a time span of more than two years, which is impossible (given that John is well-informed about basic human affairs).

But what if the attitude holder is mistaken about the time? Recall that this is not a marginal case: we made the first modification (from time of the attitude to attitude holder's now) exactly because people can be mistaken about the time (and often are mistaken about the time). Note also that in the concrete example that we gave, where we took for *f* the meaning of the description 'while the cause of her right now visible big belly holds', the two constraints did give the right predictions without any specification of whether or not the attitude holder was mistaken about the time. And it turns out that this holds for many other plausible time concepts too: they make the correct predictions irrespective of the scenario (see Heim 1994 for many such time concepts in various contexts). However, it is also possible to construct counterexamples in mistaken-time scenarios.

Imagine that today John declares: 'Bill's 40th birthday was some time ago and that Mary was pregnant on that day'. Let us assume that John is mistaken. In fact, Bill's

40th birthday is today, i.e. the day of John's declaration! As noted by Heim (1994, fn.28) there is a strong intuition that in this context, (24) could not be uttered felicitously.

(24) John said that Mary is pregnant.

Let's now see why the wrong prediction is made by the constraints in (54). In the scenario just described, it seems natural to take the time concept to be the meaning of the description 'on Bill's 40th birthday'. The scenario satisfies the first constraint: the time concept evaluated with respect to John's world and now is in the past of John's now (for John 'on Bills 40th birthday' is in the past of where he locates himself) and hence not completely in the future. The second constraint is also satisfied in the scenario: evaluated with respect to the actual world and time, the time concept yields today, a time that can overlap with the actual utterance time. Since both constraints are satisfied, the prediction is that the sentence is felicitous in this context, contra to our intuitions.

Heim suggests that we could circumvent this problematic prediction by generally banning so-called *time neutral concepts*. A concept such as 'on Bill's 40th birthday' is temporally neutral since there is nothing about the meaning of 'on Bill's 40th birthday' that tells us where it is located with respect to the utterance time. While this suggestion does, indeed, solve the problem, it is a stipulation; nothing is said about *why* time neutral concepts ought to be ruled out.

One possibility is to say that the constraints in (54) are constraints on *suitable* acquaintance relations. And a concept that is neutral with respect to a time is not suitable.[32] Such a response, of course, presupposes particular criteria for what counts as a suitable acquaintance relation – a presupposition that is often made in work on *de re* belief since Quine (1969) and Lewis (1979), but is nevertheless controversial. In fact, Hawthorne and Manley (2012) have provided compelling arguments that it is hopeless to define such criteria and conclude that semantic theorizing should not rely on acquaintance relations altogether.

In what follows, we will not take a stand on this issue. Rather, we propose an amendment to the analysis presented in this section which can account for the mistaken identity case. This amendment, we argue, follows from the semantics of the present tense.

32 Thanks to Yael Sharvit (p.c.) for suggesting this possibility – a possibility that is not explicitly mentioned by Heim (or Abusch) but is arguably inferable from their *de re* analysis of tense. See also Ogihara 1995 for a discussion of this point.

4.3.4 The meaning of the present tense revisited

The attentive reader might have observed already that the counterexample in the previous section could only arise because Heim's first constraint in (54-a) had quite a relaxed temporal relation: non-futurity rather than presentness. The reader might also have noticed that so far we have not seen any arguments for why it should be non-futurity. In fact, purely based on the discussion in § 4.3.2.1, the choice for presentness would have been more natural. This, in fact, is our proposed solution to the problem identified in the previous section. That is, Heim's first constraint should have a stricter temporal restriction: presentness rather than non-futurity. This amendment is outlined below (in bold):

(55) Heim Constraints Revised

a. *f* evaluated with respect to the attitude holder's world and now (at the time of his attitude) **should overlap holder's now**

b. *f* evaluated with respect to the actual world and the time of the attitude should overlap with the utterance time

Let us consider why this amendment allows us to rule out 'John said that Mary is pregnant' as a report of what happened earlier today, namely when John declared: 'Bill's 40th birthday was in the past and that Mary was pregnant on that day' despite that fact that Bill's 40th birthday is really today. As before, we assume that the time concept is the meaning of the description 'on Bill's 40th birthday'. In this case, the scenario does not satisfy the first constraint above: the time concept evaluated with respect to John's world and now is in the past of John's now (for John 'on Bills 40th birthday' is in the past of where he locates himself) and hence not overlapping (as is now required). The fact that the second constraint is satisfied is irrelevant.

Given the relative ease with which we were able to solve the problem, the natural question to ask is: why did Abusch and Heim not posit presentness rather than non-futurity? As we shall see at the end of Chapter 5, the reason is tied to the *Upper Limit Constraint*. What we would now like to do now is show how our amended constraints above, in (55), follow straightforwardly from the semantics of the present tense. This will require building on the analysis of the present tense proposed in § 4.2. To that end, let us return to the scenario below, discussed in § 4.3.1:

(56) a. Conversation at 10am in the mall. Sue to John: How is Mary today? John to Sue: Mary is pregnant!

b. Conversation at 3pm on the same day at the beach. Bill to Sue: How is Mary today? Sue to Bill: **John said that she is pregnant**.

Taking our cue from Heim's constraints discussed in the previous section, we observe that the bolded report in (56-b) is true on the double access reading because two conditions are met. To describe these conditions, we will need to refer to the time and

world at which John replied to Sue at the mall. We symbolize those as $w_@$ and t_{mall} respectively. Below, in (57)-(58), we first give each condition in descriptive terms, and then in more analytical terms.

(57) Relative Present Condition

a. If John's utterance was true, then Mary is pregnant in $w_@$ at t_{mall}.
b. For any $\langle w, t\rangle$ compatible with what John said: Mary is pregnant in w at t.

(58) Absolute Present Condition

a. If John's utterance was true, then Mary is pregnant throughout an interval that includes the time at which the bolded report in (56-b) is uttered.
b. There is a description δ such that when δ is evaluated in $w_@$ at t_{mall} it picks out an interval that includes the time at which the bolded report in (56-b) is uttered. For any $\langle w, t\rangle$ compatible with what John said: δ evaluated at $\langle w, t\rangle$ picks out an interval throughout which Mary is pregnant in w.

We call (57) *Relative Present Condition* because it makes the present tense look like a relative present – a sort of Priorian present tense (Prior 1967) that picks out those times compatible with what the subject said. Following Abusch (1997), we refer to such times as *the local evaluation time*. In order to appreciate its force, imagine that prior to the election, Clinton said: 'Obama will be the winner in November'. After the election in November it would be odd to report that as 'Clinton said that Obama is the winner'. By incorporating the notion of a local evaluation time, (57) is more general than (but compatible with) the constraint in (55-a) discussed in the previous subsection, which makes reference to the attitude holder's now.

We call (58) *Absolute Present Condition* because it makes the present tense look like an absolute present – a tense that in any context picks out the utterance time of that context. Note that (58-b) requires the utterance time to be part of an interval that is picked out by a description δ. In this way, we preserve Heim's insight in (55-b) discussed in the previous section. The key difference is that we assume that this description is the RTC that comes with any tense (recall the discussion in § 4.2). In the bolded report in (56-b), the RTC would presumably correspond to today, which was part of Bill's question to Sue in (56-b). This would explain why the bolded report in (56-b) is true if uttered on the same day as t_{mall} but not if uttered on the following day.

In sum we propose that the present tense in English is an amalgam of both a relative and an absolute present. More concretely, we propose that the English present demands truth at the local evaluation time (relative tense component) and at or after the utterance time (absolute tense component). In a simple present tense clause like 'I am happy', the local evaluation time is the utterance time so the two components cannot be told apart. The two components also cannot be distinguished when the present is embedded under 'will':

(59) John will buy a fish that is alive.

The local evaluation time for 'is' in (59) is a future time introduced by 'will'. Since a future time is at or after the utterance time, again the two components are indistinguishable. However, when the present is embedded under a past attitude verb, which controls the local evaluation time, the two components come apart.

We demonstrate this by providing the meaning of the complement of 'said' in the bolded report in (56-b) above, namely 'Mary is pregnant'. This meaning is given in (60) below. Note that $s^\star$ and $w^\star$ denote the utterance time and the speech world of the bolded report in (56-b) respectively.

(60) $\lambda t_0 \lambda w_0$: $t_0 \in \text{RTC}_1(w_0, t_0) \wedge \exists t'(t' \succeq s^\star \wedge t' \in \text{RTC}_1(w^\star, t_{mall}))$.
$\forall t''(t'' \in \text{RTC}_1(w_0, t_0) \rightarrow \text{be.pregnant}(w_0, t'', \text{mary}))$

The formula above treats the aforementioned relative and absolute components of the present tense as presuppositional constraints on the RTC: RTC_1 must include the local evaluation time t_0, as well as some time that is at or after s*. The present tense also contributes a universal statement to the assertion, namely that Mary's pregnancy state in w_0 holds throughout the time interval t described by RTC_1 in w_0 at t_0.

The meaning in (60) allows us to mimic the Abusch/Heim analysis of double access via a new route. Before discussing a key difference of our proposal, we note a possible disadvantage. Notice that the presupposition in (60) includes the formula:

(61) $\exists t'(t' \succeq s^\star \wedge t' \in \text{RTC}_1(w^\star, t_{mall}))$

The question that arises for our analysis is: how does t_{mall} get into the truth conditions? If that index is filled in by the utterance time, the present tense becomes, or can be, just a simple relative present. For the most part, the data does not support this option for English. However, recall the following discourses, discussed at the end of § 4.3.1.2:

(45) Rusev said that his heart only belongs to him. They then made out until Ryback walked out. He said that this is not Teen Wolf, but rather Monday Night RAW. **He also said that he is hungry and then started a feed me more chant.**

(46) I called him and he said **he is on his way and will be at my place by 7 PM**. He never came.

Here, the embedded present tense in the bolded reports get a purely relative interpretation, which may support the idea that the index in (61) above need not be filled in with t_{mall}.[33]

33 Kusliy (2016) observes that constructions such those in (i) and (ii) below also exemplify a purely relative interpretation of the English present:

We do not pursue this idea here, however, since the goal of this chapter is to derive the double access interpretation. To that end, we will stipulate that t_{mall} gets into the truth conditions via binding by the higher tense:

(62) John PAST λt said that Mary $\text{PRES}_{w@,t}$ is pregnant.

We leave it for further research as to how to best motivate (62), and offer the following truth conditions of the bolded report in (56-b) that assume it:

(63) $\lambda w_0.\ \exists t\ (t \prec s^\star \wedge t \in \text{RTC}_1(w_0, s^\star) \wedge \text{say}(\text{john}, w_0, t, \phi))$, where ϕ = (64)

(64) $\lambda t_0 \lambda w_0$: $t_0 \in \text{RTC}_1(w_0, t_0) \wedge \exists t'(t' \succeq s^\star \wedge t' \in \text{RTC}_1(w^\star, t)).\ \forall t''(t'' \in \text{RTC}_1(w_0, t_0) \rightarrow \text{be.pregnant}(w_0, t'', \text{mary}))$

Given the question under discussion, namely "How is Mary today?", we assume that RTC_1 in the formula above is the *today-function*: it assigns to any w, t, the set of times t' that are on the same day as t. Moreover, given the universal statement in the assertion of (64), it must have been compatible with what John said at the mall that Mary continued to be pregnant throughout the day – in fact, the whole day – not just after John's utterance at the mall, but also at $s^\star$, i.e. the utterance time of the bolded report in (56-b), when Sue is on the beach. This is the hallmark of the double access reading.

Let us now turn to show why the presupposition in (64) is satisfied. The first conjunct in (64) is satisfied since t_0 occurs during the day in which t_0 occurs. The second conjunct in (64) is satisfied as long as $s^\star$ (i.e. the utterance time of the bolded report in (56-b), when Sue is on the beach) is no later than the end of the day when t, the time of John's utterance at the mall, occurs. The past on 'said' already tells us that John's utterance at the mall precedes $s^\star$. Therefore, $s^\star$ has to be between John's utterance at the mall and the end of the day in which John's utterance at the mall was made.

At this point, it is helpful to summarize how this analysis is related to our earlier observations about Heim's reformulation of Abusch's analysis. We observed that in a particular case of mistaken identity (involving Bill's 40th birthday), Heim's constraints made the incorrect predictions. To that end, we proposed the following revision (=(55)):

(65) Heim Constraints Revised

a. f evaluated with respect to the attitude holder's world and now (at the time of his attitude) **should overlap holder's now**

b. f evaluated with respect to the actual world and the time of the attitude should overlap with the utterance time

(i) Meet a man who is reading a book, Kazuko did.

(ii) Say that Hanako is reading a newspaper, Taro did.

And then we attempted to show that the above constraints follow straightforwardly from the semantics of the present tense. The reader can check that if RTC_1 in (64) is assumed to be the meaning of the description 'on Bill's 40th birthday', which is prior to the attitude holder's now (in the context considered), then we predict a presupposition failure.

We end this section by briefly noting that our analysis differs from Abusch's, Heim's and any other *de re* analyses which assumes *res* movement.[34] Our theory explains the *de re* component of Double Access noted in § 4.3.2.2 via the mediation of RTCs: the attitude holder does not have to have any belief about the utterance time, but rather about times that are included within the RTC. Even though the RTC itself has to include the utterance time from the speaker's perspective, there is no such requirement on the attitude holder.[35]

Moreover, our analysis differs from the Abusch/Heim analysis in not assuming the *Upper Limit Constraint*, a blanket constraint that forbids locating an event after the local evaluation time. In fact, our proposed change in (65) is an explicit refutation of this constraint. We come back to this point in Chapter 5. In the next section, we show how the analysis of the present tense proposed in this section allows us to calculate cessation in embedded contexts – a task that we set for ourselves at the beginning of this chapter.

4.4 Calculating cessation in embedded contexts

We return to the discourse in (22), repeated below:

(22) We were at the party last night and got to discussing nationalities. John proclaimed proudly that his mother is American and **his dad was Dutch**.

Notice that the first conjunct in the second sentence embeds a present tense under a past tensed verb, i.e. 'John proclaimed that his mother is American'. For (22) to be felicitous, the RTC on *is* must describe an interval that includes the utterance time of (22). Assuming that the RTC is shared across the conjuncts – presumably picking out the lifetime of the party participants since their nationalities are in question – the RTC for the second conjunct (i.e. 'he added that his dad was Dutch') also meets this requirement and so a present tense could have felicitously been used there.[36] Alas, it was not used; the weaker, past tensed 'was Dutch' was used. Assuming a cooperative

34 See Bar-Lev 2014, 2015 for a recent discussion.

35 Cf. Gennari 2003, which assumes that the attitude holder has a belief about some time that is not before the utterance time in order to avoid *res* movement as a sort of explanation. Thanks to Moshe Bar-Lev (p.c.) for a discussion of this point.

36 The RTC in the matrix of both conjuncts is presumably different; it picks out the time of the party (which does not overlap the utterance time).

speaker, it must be that the present could not be used because John's original utterance would not have supported it. And assuming John was being cooperative, this would mean that 'my father is Dutch' would have been false and that is because his father has passed away.

Notice that in our calculation, we assumed that the past tense was "weaker" than the present tense – the latter constitutes a scalar alternative to the former (recall the discussion in § 4.1-§ 4.2). Now that we have proposed a new semantics for the present tense, let us briefly show that our assumption is warranted. To do so, let us consider the following, simplified reports:

(66) John said that his father is Dutch.

(67) John said that his father was Dutch.

Given our proposed analysis in the previous section, and assuming that the matrix and embedded clauses have distinct RTCs, (66) has the following truth-conditions:

(68) $\lambda w_0.\ \exists t\ (t \prec s^\star \wedge t \in \text{RTC}_1(w_0, s^\star) \wedge \text{say}(\text{john}, w_0, t, \phi))$, where ϕ = (69)

(69) $\lambda t_0 \lambda w_0$: $t_0 \in \text{RTC}_2(w_0, t_0) \wedge \exists t'(t' \succeq s^\star \wedge t' \in \text{RTC}_2(w^\star, t))$.
$\forall t''(t'' \in \text{RTC}_2(w_0, t_0) \rightarrow \text{be.dutch}(w_0, t'', \text{his.father}))$

Recall that given the universal statement in the assertion of (69), it must have been compatible with what John said in the past (at the party) that his dad was Dutch during and after his now (the time he self-locates himself), up until the utterance time of (66). John does not have to have made any claims about the utterance time, but rather about times that are included within the RTC.

As for (67), we propose the truth conditions below, which contain the same meaning of the past tense that we posited in (68) – the difference being that both the matrix and the embedded clause have a past tense meaning:

(70) $\lambda w_0.\ \exists t\ (t \prec s^\star \wedge t \in \text{RTC}_1(w_0, s^\star) \wedge \text{say}(\text{john}, w_0, t, \phi))$, where ϕ = (71)

(71) $\lambda t_0 \lambda w_0$: $\exists t'\ (t' \prec t_0 \wedge t' \in \text{RTC}_2(w_0, t_0) \wedge \text{be.dutch}(\text{his.father}, w_0, t'))$

According to the truth conditions above, it must have been compatible with what John said in the past (at the party) that his dad was Dutch prior to his now (the time he self-locates himself).

At first blush, it may appear that there is no logical relationship between (68)-(69) and (70)-(71). To repeat, (68)-(69) requires, roughly, that John's dad was Dutch *during and after* John's now (up until the utterance time of (66)), while (70)-(71) requires that John's dad was Dutch *prior* to John's now. However, recall our principle in (3), which we motivated in § 4.1:

(3) The Temporal Profile of Statives:
For any tenseless stative clause ϕ, if a moment m is in $[\![\phi]\!]$, then there is a moment m' preceding m and a moment m'' following m such that m' and m'' are in $[\![\phi]\!]$.

Applying (3) to (68)-(69), we get the following: if John's dad being Dutch is required to hold *during* John's now, then – given (3) – John's dad being Dutch is also required to hold a moment *prior* to his now. And that is enough to verify (70)-(71).[37] That is, given (3), (68)-(69) entails (70)-(71).

The opposite direction does not hold, however. If John's dad being Dutch is required to hold *prior* to John's now, say at m', then – given (3) – John's dad being Dutch is also required to hold a moment *after* m'. But that would not be enough to verify (68)-(69).

We end this chapter with two important issues that arise given the calculation of cessation discussed in this section. The first concerns the fact that the source of cessation comes from an embedded clause, i.e. the use of an embedded past rather than present. We have implicitly assumed that this fact can serve as the basis of a Gricean analysis. It should be noted, however, that this view is controversial, requiring that the attitude holder (i.e. John in our example) be opinionated (Russell 2006, Russell 2012). That is, assuming that John has an opinion on whether or not his father is currently Dutch – an assumption that is reasonable – the hearer would likely conclude that John believes that his father is not currently Dutch (and hence dead). But what about cases where the attitude holder is not opinionated? Do we ever find cessation in such cases? We leave this question open for further research, noting that constructing good test cases is correlated with an independent observation, namely that opinionatedness is related to whether a given attitude verb is a neg-raising verb (Sharvit and Gajewski 2008, 2012).

The second issue concerns discourses such as (72):

(72) I met a musician last night. He had a cool accent. He said **his father was Dutch** and that affected his speech.

Notice that unlike in (22), a cessation implicature is less likely to arise from the past tensed 'was Dutch' in (72). We conjecture that the first sentence in (72) sets the RTC for subsequent sentences. In particular, it restricts tenses to times during my encounter with the musician. This means that the RTC on the past tense on 'was Dutch' in (72) does not satisfy the condition needed for a felicitous present tense alternative. In particular, an RTC which does not pick a time overlapping the utterance time would not satisfy the presuppositional constraints of the present tense. As a result, we would never advance to Gricean reasoning. This idea is summarized below:

(73) A cessation implicature arises with PAST-ϕ when the RTC does not – by itself – trigger a presupposition failure with PRES-ϕ.[38]

37 Here, the fact that John's dad being Dutch is also required to hold *after* his now is irrelevant.

38 Notice that (73) is revised from (21) in § 4.2 to reflect the meaning of the present tense proposed in the previous section.

The goal of the next chapter is to show how (73) may be correlated to what is often called a "simultaneous reading": the intuition that, e.g. in (72) the state of being Dutch is simultaneous with the attitude holder's now. As we shall see, this alleged reading is a challenge to the semantics of the past tense adopted here and often forms the basis for a distinct analysis that usually goes by the name "Sequence of Tense". In fact, we have already seen glimpses of such an analysis at the outset of § 4.3, where we considered the following rule from http://www.englishpractice.com: "If the tense in the principal clause is in the past tense, the tense in the subordinate clause will be in the corresponding past tense." We first discuss motivations for this rule and then discuss how it is related to Abusch's (1997) *Upper Limit Constraint*.

5 Sequence of tense

5.1 Relative present

The end of Chapter 4 considered a contrast between the following two discourses:

(22) We were at the party last night and got to discussing nationalities. John proclaimed proudly that his mother is American and **his dad was Dutch**.

(72) I met a musician last night. He had a cool accent. He said **his father was Dutch** and that affected his speech.

Recall that while (22) exemplifies cessation, (72) does not. We proposed that the difference can be explained given the generalization below:

(73) A cessation implicature arises with PAST-ϕ when the RTC does not – by itself – trigger a presupposition failure with PRES-ϕ.

We claimed that the RTC in (72), but not in (22), would trigger a presupposition failure of the present tensed alternative 'be Dutch' and this is what explains why cessation arises in (22), but not in (72).

Note that the presupposition failure would arise with 'be Dutch' in (72) because the English present tense has an absolutive component; it makes reference to the utterance time. This leads to the following prediction:

(1) Typological Prediction:
In a language where the present tense is purely relative, cessation implicatures should arise even when the RTC excludes the utterance time.

In this section, we show that this prediction is borne out in Hebrew and Russian – two languages which have a pure relative present, as the data below illustrates:

(2) a. ha-more xašav še avi acbani.
The-teacher think-PAST that Avi anxious.PRES
'The teacher thought that Avi was anxious.'

b. ha-more xašav še avi haya acbani.
The-teacher think-PAST that Avi be.PAST anxious
'The teacher thought that Avi had been anxious.'

(3) a. Lev dumal, čto Ljuba bol'na.
Lev think-PAST that Ljuba sick.PRES
'Lev thought that Ljuba was sick.'

b. Lev dumal, čto Ljuba byla bol'na.
Lev think-PAST that Ljuba be.PAST sick
'Lev thought that Ljuba had been sick.'

Notice that despite the use of the present in the embedded clause, the truth conditions of (2-a) and (3-a) are independent of any anxiousness or sickness respectively, believed or otherwise, holding at the utterance time. The anxiousness and sickness have to do with the attitude holder's now.[1] When a past tensed copula is used in the embedded clause, however, as in (2-b) and (3-b), the impression one gets is that the attitude holder had a thought he might have expressed by saying: 'You were anxious' and 'You were sick', insinuating cessation of anxiousness and sickness respectively. This suggests that as in English, cessation implicatures in Hebrew and Russian can be triggered by a comparison with the present tense. In turn, we hypothesize that properties of the present tense in a given language will effect whether or not an embedded past tense triggers a cessation implicature. With an RTC that includes the time of the attitude but excludes utterance time, the English embedded past tense has no viable present tense alternative and so it does not trigger cessation. The Hebrew and Russian embedded past tense, however, has a viable present tense alternative (since the present tense is purely relative) and so cessation is triggered.[2]

The just discussed cross-linguistic correlation between tense interpretations has been noticed before. But, it has been characterized in different terms. Sharvit (2003) correlates the type of present tense a language has with the possibility that a language would have what Enç (1987, 635) named the *simultaneous reading* of a past stative embedded under a past tense attitude verb. According to Enç (1987), on a simultaneous

1 Further evidence that Russian has a purely relative present tense comes from the data below:

(i) Dva goda nazad Petja uznal, čto Maša beremenna.
Two years ago Peter found.out that Masha pregnant.PRES
'Two years ago, Peter found out that Masha was pregnant.' (Kondroshova 1998)

(ii) Maša videla čeloveka, kotoryj plačet.
Masha saw person who cry.PRES
'Masha saw a person who is crying.' (Kondrashova 2005)

(iii) Často slučalos', čto Miša plakal/#plačet.
Often happened that Michael cry.PST/cries.PRES
Intended: 'It often happened that Michael cried.' (Schlenker 1999)

In (i), the embedded present tense does not lead to an infelicitous interpretation like it does in English. We can make sense of this if we assume that the present tense does not have an absolutive component; it merely picks out the attitude holder's now. In (ii) and (iii) things are different. Here, there is no intensional predicate akin to a propositional attitude and, as a result, the present tense must pick out the speech time. In (iii), this leads to infelicity given the past oriented 'Často slučalos" ('It often happened').

2 As noted by Simon Charlow (p.c.), Greek may be a language which puts this analysis into question. According to Sharvit (2003), Greek has a relative present like Hebrew and Russian. However, there seems to be no cessation with an embedded past tense. Future research will hopefully reveal whether this is indeed the case.

reading of 'John heard that Mary was pregnant', "John hears at a past time that Mary is pregnant at the time of the hearing." According to Sharvit, if a language has an absolutive present tense, it must have a mechanism for generating simultaneous readings.

In light of our observations about the distribution of cessation implicatures, we have begun to wonder whether there truly is a simultaneous reading. We offer the conjecture in (4):

(4) Simultaneity Conjecture:
It is the perception of the absence of a cessation implicature that is reported as 'simultaneity' for past tensed statives embedded under attitude predicates.

This conjecture is relevant for English, where cessation is absent with a past tense embedded under a past attitude, but it is not relevant for Hebrew or Russian, where an embedded past tense does give rise to cessation and where correspondingly, simultaneous readings are rarely reported.[3] The conjecture in (4) is likewise irrelevant for a past tense embedded under a present tensed attitude:

(5) John thinks that his father was Dutch.

Here too the presence of a cessation implicature (i.e. that the father is no longer Dutch, according to John) accompanies a lack of simultaneity claims.

One does, however, see hints of the connection between non-cessation and simultaneity in discussions of indirect discourse. For example, when drawing support for his view that past tenses can be semantically vacuous, Jespersen (1924, 293) considers the comment below, from Ginneken (1907, 499). Here, cessation of being a particular kind of individual is not found and this fact is then commented upon.

(6) Je ne savais pas qui il était. Est-ce que je veux dire par-là qu'il est quelque autre maintenant? Nullement.
'I didn't know who he was. Do I mean by that that he is something else now? Not at all.'

Similarly, Sharvit (2003) uses the minimal pair below to illustrate simultaneity in English versus in Hebrew:

3 The discussion by Boskovic (2012) suggests that Russian, Polish, Czech, Serbo Croatian, Romanian, Japanese, Korean, Hindi, Turkish, Malayalam, Bangla and Angika similarly lack "simultaneous readings", while Dutch, Modern Greek, Spanish, French, German and Italian work like English. See Altshuler (2004, 2008), Khomitsevich (2008) and Grønn and von Stechow (2010) for more discussion about Russian; Ogihara (1996), Kusumoto (1999), Gennari (2001), Kubota et al. (2011) and Ogihara and Sharvit (2012) for more discussion about Japanese. See also Sharvit (2014) for a discussion of some Hebrew cases which have been reported as exemplifying simultaneous readings. Sharvit argues that these are special cases, derived by independent means, and distinguishes between "pure simultaneous" and "pseudo-simultaneous" readings. These two readings have also been distinguished in terms of temporal *de re* (Khomitsevich 2008, Bar-Lev 2015).

(7) a. Bill said that eight was an odd number.

b. #Bill amar še šmone haya mispar bilti zugi.
Bill say-PAST that eight be-PAST number not even
'Bill said that eight had been an odd number.'

Sharvit remarks that, unlike (7-a), (7-b) is strange because it would mean attributing to Bill the tacit assumption that being odd is a property that a number could have temporarily. Observe that this tacit assumption does not follow simply from the fact that at some point in the past, the number eight was in a state of oddness. It requires further that eight ceased to be odd at some point.[4]

5.2 Simultaneous readings and tense shifting

Jespersen (1924, 292ff) characterized the phenomena of interest here in terms of a shifting of tense from direct to indirect discourse. An utterance of 'I am ill' can be reported as 'He said that he was ill' and so Jespersen dubs the lower PAST an *indirect present*. The correspondence between direct and indirect speech has been used as the basis of a challenge to the semantics of the past tense adopted here – a challenge that turns out to rely on an implicit rejection of the hypothesis in (3), repeated below, which concerns the temporal profile of statives:

(3) The Temporal Profile of Statives:
For any tenseless stative clause ϕ, if a moment m is in $[\![\phi]\!]$, then there is a moment m' preceding m and a moment m'' following m such that m' and m'' are in $[\![\phi]\!]$.

Suppose that Dr. Spock says: "Scotty is ill" and this utterance gets reported with (8-b), whose semantics is given by (9):

(8) a. Dr. Spock: "Scotty is ill"
b. The doctor said that Scotty was ill.

(9) a. $\lambda w_0.\ \exists t\ (t \prec s^\star \wedge t \in \text{RTC}_1(w_0, s^\star) \wedge say(\text{doctor}, w_0, t, \phi))$,
where ϕ = (9-b)
b. $\lambda t_0 \lambda w_0.\ \exists t''(t'' \prec s^\star \wedge t'' \in \text{RTC}_1(w^\star, t) \wedge \text{be.ill}(w_0, t'', \text{scotty}))$

4 Recall from § 4.3.1.3 that (7-a) can also be odd because of cessation:

(i) Bill is an idiot! #He said that eight was an odd number.

(9-b), so the argument goes, appears to fall short. It attributes to Spock a claim about an illness holding prior to his now, when (8-b) contains no such claim. This argument relies on the assumption that one can claim that a state holds at a moment m without it also holding at a moment m' prior to m. But this is exactly what the hypothesis in (3) rules out.

One could of course wonder why, when a speaker intends to report (8-a), he does not make use of an utterance with an "embedded present meaning", viz. (10-b) below, instead of (9-b):

(10) a. $\lambda w_0.\ \exists t\,(t \prec s^\star \wedge t \in \text{RTC}_1(w_0, s^\star) \wedge say(\text{doctor}, w_0, t, \phi))$,
where ϕ = (10-b)

b. $\lambda t_0 \lambda w_0$: $t_0 \in \text{RTC}_1(w_0, t_0) \wedge \exists t'(t' \succeq s^\star \wedge t' \in \text{RTC}_1(w^\star, t_i))$.
$\forall t''(t'' \in \text{RTC}_1(w_0, t_0) \rightarrow \text{be.ill}(w_0, t'', \text{scotty}))$

The problem is that the English PRES has an absolute component. Were it not to have such a component (e.g. if it were a purely relative tense), PRES would have been the resource to use here and indeed, in other languages such as Hebrew and Russian, it is used for this purpose, as we have seen. Speakers of English are aware of this deficit and can take it into account when interpreting utterances. Perhaps it is this compensation that encourages the idea that there are simultaneous readings.

5.3 Alleged simultaneity with the progressive

When Stowell (2007, 448) introduces "the so-called 'simultaneous' interpretation", he notes that it arises "with stative predicates, and with habitual, progressive, and perfect predicates, which behave like statives in this respect". Why should that be? One hypothesis is to say that habituals, progressives and perfects behave like statives because they are statives (see, e.g. Moens and Steedman 1988, Kamp and Reyle 1993, de Swart 2007, Bittner 2008). We consider evidence that progressive predicates are statives. We focus on the progressive here because we ultimately want to say something about the example in (11)[5], which has often been cited to motivate a sequence of

5 This example is from Abusch 1988 and is constructed based on the following discourse from Kamp and Rohrer 1983 below.

(i) Hier il décida enfin ce qu'il allait faire. Dans trois il dirait à ses parents qu'il allait quitter la maison.
'Yesterday he finally decided what he was going to do. In three days, he would tell his parents that he was going to leave home.'

tense mechanism that derives the putative simultaneous readings.[6] The progressive is important here because its counterpart with the simple past does not give rise to the putative simultaneous reading:

(11) John decided a week ago that in ten days at breakfast he would say to his mother that **they were having** their last meal together.

(12) John decided a week ago that in ten days at breakfast he would say to his mother that **they had** their last meal together.

One piece of evidence that progressive predicates are stative comes from facts about narrative progression. Recall the following contrast considered in Chapter 2, from Kamp et al. (2011):

(13) a. Josef turned around.
b. The man pulled his gun from his holster.
c. Josef took a step back.

(14) a. Josef turned around.
b. The man had a gun in his holster.
c. Josef took a step back.

The only difference between (13) and (14) is the b-sentence. Whereas the former discourse contains the eventive VP 'pulled a gun', the latter discourse contains the stative VP 'had a gun'. This impacts how we understand the ordering of the described eventualities. The discourse in (13) exemplifies narrative progression: the events are understood to occur in the order in which they are described. The discourse in (14), however, is more complicated. Although we infer narrative progression in (14-a) and (14-c), the state described in (14-b) is understood to hold at the time that Josef turned around.

Now consider the discourse in (15):

(15) a. Josef turned around.
b. The man was pulling his gun from his holster.
c. Josef took a step back.

Interestingly, (15-b) patterns with (14-b) and not (13-b). That is, the gun pulling described in (15-b) is understood to hold at the time that Josef turned around. And this is a general pattern with progressive predicates in discourse: they describe an eventuality that overlaps some other eventuality previously mentioned in the discourse. A plausible hypothesis for why this is the case is that progressives are predicates of states.

6 See, e.g. Heim (1994, 159), Ogihara (1996, 121), Kusumoto (1999, 75), Schlenker (1999, 42), Kuhn and Portner (2001, 61), Sharvit (2004, 319-320), Stowell (2007), Schulz (2012, 5).

Further evidence for this position comes from data involving the perfect progressive. Since at least Dowty (1979) it is well known that some but not all achievements may combine with the progressive (viz. '#noticing' vs. 'leaving'). Interestingly, Mittwoch (1991) observes that those achievements which can combine with the progressive are generally infelicitous when also combined with the perfect (i.e. to make a perfect progressive). This is illustrated by the contrast below, taken from Rothstein 2004:

(16) a. Fred and Susan were leaving.
b. #Fred and Susan have been leaving.

How are we to explain this contrast?

For this we turn to recent analysis by Gyarmathy (2015). She begins with the well known observation that a perfect progressive can have multiple interpretations. The perfect of telic predicates typically describes an event's final state, while the perfect of statives typically has an ongoing interpretation (in addition to an experiential perfect interpretation) on which the relevant state is understood to be ongoing at the time of evaluation (e.g. 'Susanna has lived in Düsseldorf'). Now, let us assume that the progressive is a predicate of states. Given this assumption, we expect an ongoing interpretation when the input to the perfect is a progressive. However, as noted by Gyarmathy, this conflicts with the observation that a progressive achievement is generally synonymous with an 'about to'-construction: viz. 'John was arriving' is synonymous with 'John was about to arrive'. As such, we derive a clash, rooted in a non-compatibility of interval sizes, and thereby explain why achievements that can combine with the progressive are generally infelicitous when also combined with the perfect.

In sum, we have provided two reasons to believe that the progressive is a predicate of states. However, it may also be the case that progressives have the same temporal profile as statives, even though they are not statives in all other respects. Consider, for example, Bennett and Partee's (1972) remark below, which is part of an explanation of why 'John is walking' entails 'John has walked since yesterday':

(17) Suppose 'John walks' is true at p. Then there exists an interval I such that $p \in I$, p is not an endpoint for I, and 'John walks' is true at I.

As was noted in § 4.1, Bennett and Partee's *endpoint* requirement could be understood as a reflex of the fact that the grammar adheres to (3), repeated below, which concerns stative predication:

(3) The Temporal Profile of Statives:
For any tenseless stative clause ϕ, if a moment m is in $[\![\phi]\!]$, then there is a moment m' preceding m and a moment m'' following m such that m' and m'' are in $[\![\phi]\!]$.

That is, if $p \in I$ and p is not an endpoint for I, then there is a p' before p and a p'' after p such that: (i) p' and $p'' \in I$ and (ii) p' and p'' are not endpoints for I.

Let us now return to (11), repeated below, assuming either that progressives are predicates of states or that they behave in accordance to (17). In either case, we assume that progressives comport with (3).

(11) John decided a week ago that in ten days at breakfast he would say to his mother that **they were having** their last meal together. (Abusch (1988), modified from Kamp and Rohrer (1983))

Abusch (1997, 27) claims with respect to (11) that "the contemplated meal does not precede any time evoked in the sentence" and that "the were having time does not precede any time alluded to in the sentence". Remarks like these quite often accompany this example and, as noted at the outset of this section, are used to motivate a sequence of tense mechanism that derives the putative simultaneous reading. Note, however, that given (3), Abusch's first observation is true but irrelevant and the second statement is false. What we think is going on in (11) is the following: there is a time evoked in the sentence, the attitude holder's now (times compatible with where the sayer temporally locates himself at the time of the statement), relative to which there is a past moment at which the last meal is in progress. This idea is captured by the following paraphrase:

(18) A week ago, John made a decision according to which, in 3 days from now he will make an announcement to his mother from which it will follow that their last meal is under way at an interval that properly includes a moment prior to the announcement.

While we think the paraphrase above accurately captures the meaning of (11), it does not explain why people get intuitions of simultaneity in (11). Our explanation of this intuition should now be familiar. The past tense on 'were having' indicates that breakfast eating goes on prior to the sayer's now. The lack of a felicitous present tense alternative to 'were having' means that no cessation implicature is triggered[7]:

(19) ??John decided a week ago that in ten days at breakfast he would say to his mother that they are having their last meal together.

7 According to some speakers, (19) is improved if the embedded present tense is understood as a historical present, as in the following discourse:

(i) John walks into the restaurant and sit next to his mother. She looks sad. Perhaps because she already knows. John decided a week ago that he would say to his mother that they are having their last meal together.

And so if the basis for (11) is a decision by John to utter: "we are having our last meal" then, given the hypothesis in (3), (11) is true. The lack of a cessation implicature makes it an adequate rendering of that decision and the interpretation is likely to be described as simultaneous.

5.4 Final words on tense shifting: Evidence for and against

In addition to the breakfast example in (11), Heim (1994, 159) cites two other examples that allegedly provide evidence in favor of a sequence of tense mechanism that derives simultaneous readings. The first example in (20) is from Ogihara (1989) and the second example in (21) is from A. Santisteban (p.c.):

(20) He said he would buy a fish that was still alive.

(21) He decided to jump before they fired.

Ogihara's example in (20) uses a past tensed stative 'was alive' and hence our analysis of this example is analogous to the others discussed to this point. The example in (21), on the other hand, is different from the other examples discussed thus far because it uses a temporal adjunct clause. Such clauses are critical for the evaluation of the conjecture in (4), repeated below:

(4) Simultaneity Conjecture:
It is the perception of the absence of a cessation implicature that is reported as 'simultaneity' for past tensed statives embedded under attitude predicates.

Unfortunately, a serious discussion of temporal adjunct clauses would warrant a separate chapter and thus we limit ourselves to a remark in the spirit of the approach in Kubota et al. (2011), while acknowledging that temporal adjunct clauses (and 'before' clauses in particular) may, in fact, constitute evidence for a sequence of tense mechanism.[8]

Here is our brief remark. Heim comments that in (21) the time of firing is not ordered before either the utterance time or the evaluation time for any other part of the sentence, which constitutes a challenge to the semantics of the past tense assumed here. This challenge rests on the idea that "A before B" describes an A-time that precedes a B-time. In that case, the potential firing time would have to follow the jumping and the deciding, as Heim says. However, Krifka (2010) argues that "A before B" describes a time t at which A is true and such that there is no (relevant) time t' prior to t at which B is true. On that view, the subordinate clause in (21) could be interpreted

8 For relevant work on the topic, see Arregui and Kusumoto (1998), Grønn and von Stechow (2011), Sharvit (2014) and references therein.

with the meaning of the past tense proposed here, where t_0 would be bound by the verb 'decide'.

Let us now turn to a case that is covered by our analysis of tense and where sequence of tense analyses are silent. Suppose that Hitler believed in 1939 that he was more powerful than Stalin and suppose that, given the evidence available at the time, this belief was unjustified—so much so, that present day historians cannot explain the discrepancy. This state of affairs cannot be reported with (22) below:

(22) #What surprises most historians is Hitler's belief that he **is** stronger than Stalin.

The problem is the present tense on the copula. The facts described are reportable if the present tense is replaced with the past tense:

(23) What surprises most historians is Hitler's belief that he **was** stronger than Stalin.

But what rules out (22)? On our account, the belief reported in (22) is one that is held in the past. Hitler may have been confused about his strength relative to Stalin but he was not so confused as to locate himself in the 21st century. We have a presupposition failure here just like in the other examples discussed in the previous chapter, where the RTC picks out a time that does not overlap the utterance time. Note that the fact that the present tense is unacceptable in (22) explains why there is no cessation implicature in (23). And because of that, nothing gets in the way of thinking that the perception of strength imbalance continued up to the believing time.

Examples like (23), originally attributed to Irene Heim, are discussed by Ogihara (1996, 132). He takes them to indicate that a simultaneous reading of the past tense is possible even when not in the scope of a past-inflected verb. This conclusion is problematic for accounts like Ogihara's in which the putative simultaneous reading is the result of a syntactic rule that relies on the presence of a commanding bearer of past tense features.

To summarize our results, we point out implicit assumptions made along the way and some outstanding issues. We proposed the following hypothesis in the previous chapter: if a stative tenseless clause is true at a moment m, it is true as well at a moment that precedes m. If this is so, then for any stative clause ϕ, the proposition expressed by PAST ϕ in a given context is logically weaker than the one that would have been expressed by PRES ϕ, its present tensed alternative. And then by Gricean reasoning, a use of a stative PAST ϕ will implicate that PRES ϕ is false. If the RTC for the tense includes the utterance time, the falsity of PRES ϕ entails that no state of the kind described by ϕ holds. We called this a *cessation implicature*. Cessation implicatures can arise in embedded past tense clauses, in addition to matrix ones. This happens in languages whose present tense is relative and it happens in languages whose present tense is absolutive as long as the RTC for the embedded tense includes the utterance time. If it does not, then no cessation implicature is triggered and we suggest that it is

this absence of cessation that speakers/linguists associate with a simultaneous interpretation of a past tense embedded under a past tensed attitude verb. Throughout we assumed a univocal, anteriority meaning for the past tense. We showed that a common objection to this assumption is at odds with the hypothesis recalled at the beginning of this paragraph.

5.5 ULC and beyond

In § 4.3.4 we revised Heim's (1994) reformulation of Abusch's (1997) analysis to account for a particular mistaken identity case (involving Bill's 40th birthday). In particular, we revised the bolded condition in (24-a):

(24) Heim Constraints Revised

a. *f* evaluated with respect to the attitude holder's world and now (at the time of his attitude) **should overlap holder's now**

b. *f* evaluated with respect to the actual world and the time of the attitude should overlap with the utterance time

We then showed how this revision follows straightforwardly from the meaning of the present tense. In this section, we would like to consider an implication of our revision that concerns the semantics of the past tense.

To see what is at stake, consider the report in (25):

(25) John thought that Mary was pregnant.

The intuition behind (25) is that it can be used to report John saying (26) and (27), but not (28):

(26) Mary was pregnant.

(27) Mary is pregnant.

(28) Mary will be pregnant.

If we were to treat the embedded past tense as being absolute, we would say that Mary's pregnancy is located at some time prior to the utterance time. As such, we would correctly predict that (25) is compatible with a situation in which the pregnancy held at the time of John's now (assuming he is not mistaken about the time) or prior to it. This captures the correlation between (25) and (26)-(27).

However, as noted by Abusch (1997), the absolute analysis also predicts that (25) is compatible with a situation in which the pregnancy held after John's now (assuming he is not mistaken about the time) and before the utterance time. And as noted above, (25) cannot be used to report John saying (28). This intuition can be sharpened by the contrast below:

(29) In February, John thought that Mary was pregnant the month before.

(30) ??In February, John thought that Mary was pregnant the month after.

On Abusch's analysis, this contrast is accounted for by the *Upper Limit Constraint* (ULC), which says that the embedded event cannot be later than the local evaluation time.[9] The ULC would directly rule out (25) as a report of (28) since it would prevent Mary's pregnancy from being understood as taking place after John's now.

Abusch also showed that the ULC could be used to constrain so-called *de re* pasts. According to Abusch, these are cases where a past time is introduced in an extensional context and then is re-used in an intensional context, e.g.:

(31) John found an ostrich in his apartment yesterday. Just before he opened the door, he thought that a burglar attacked him. (Abusch 1997, 4)

Abusch notes that without the ULC, the following would be predicted about the discourse above: the embedded tense on 'attack' is anaphoric on the past tense which denotes the time of the door opening. From this it follows that John's original thought must have been: 'When I open the door, a burglar will attack me'. But then, if the door opening is later than John's thinking, the burglar's attack (which is co-temporal with the opening) must also be later than the thinking. The problem is that this is not a possible interpretation of 'He thought that a burglar attacked him' in (31). The solution is, then, to adopt the ULC, which directly rules out this interpretation.

At this point, it should be noted that the data discussed in this section could be used to motivate the non-futurity in the initial constraint proposed by Heim, repeated below. That is, the first constraint below – which crucially differs from (24-a) above – is a version of the ULC.

(32) Heim Constraints

a. *f* evaluated with respect to the attitude holder's world and now (at the time of his attitude) **should not follow the attitude holder's now completely**

b. *f* evaluated with respect to the actual world and the time of the attitude should overlap with the utterance time

Since the non-futurity is something that we got rid of in order to account for mistaken-time case, we now face the question of whether our account suffers from not being able to explain the data above. The short answer is "no". The longer answer will take some time to unpack and this is the aim of the remainder of this section.

9 There have been various implementations of this constraint (see, e.g. Schlenker 2004b for discussion). In what follows, our discussion of this constraint will apply equally to all formulations that we know of.

To begin with, note that we showed that the revised constraint in (24-a) above follows from the meaning of the present tense. As such, our proposed meaning of the present tense is indifferent to the data that centers around the behavior of an embedded past tense. In other words, our proposed meaning of the past tense leaves open the possibility to use the ULC (in one way or another). Nevertheless, in what follows, we would like to summarize how our proposed analysis explains the data considered in this section without needing to posit the ULC.

To begin with, note that we have assumed throughout that the English past tense is relative. Therefore, our analysis straightforwardly rules out (30), where the pregnancy is understood to hold after (and not before) John's now. For the same reason, it explains why (25) could not be used to report John saying (28). As for the correlation between (25) and (27), there are two possible ways to go. If one makes the assumption that (25) is ambiguous (i.e. it has two truth-conditionally distinct readings corresponding to whether it is used as a report of (26) or (27)), then one could, in addition, assume that there are sequence of tense mechanisms which ensure that the embedded past tense is interpreted as a present tense. The other possibility, which we have endorsed in this chapter, is to deny the assumption that (25) is ambiguous; the only reading of a report like (25) is one in which the pregnancy held prior to John's now. This follows straightforwardly from a relative past analysis.

It is important to note that regardless of which analysis is chosen (i.e. one that posits sequence of tense mechanisms or one that does not)[10], there are plausible relative tense accounts which can explain the data in this section without positing the ULC. We end this chapter by noting arguments that the ULC is empirically inadequate to begin with. We begin by considering uses of a true *de re* present in the following interaction at the Air Berlin baggage counter:

10 We note here that – to the best of our knowledge – no evidence has been provided for the view that (25) is ambiguous (i.e. it has two truth-conditionally distinct readings corresponding to whether it is used as a report of (26) or (27)). As noted by Simon Charlow (p.c), we can apply the test for ambiguity from Percus and Sauerland 2003 involving 'only'. Assume that two years ago, John thought (i) below, while Susanna thought (ii):

(i) Mary was pregnant last year.

(ii) Mary is currently pregnant.

Now the relevant question is whether I can report what has happened by saying:

(iii) Only John thought that Mary was pregnant.

If (iii) were a felicitous report of (i) and (ii) in the context considered, then we would have evidence that (25) is ambiguous. However, according to judgments of native speakers, (iii) would be misleading. As such we still lack evidence that (25) is ambiguous.

(33) a. Customer: I believe you have my bags.
b. Employee: Who said I have your bags?
c. Customer: **The stewardess told me you have my bags**.
d. Employee: When did she tell you that?
e. Customer: On the flight.

In a typical *de re* fashion, the customer uses the present tensed verb 'have' in (33-c) to speak about a time that is present from his and the employee's perspective, but would have been future from the stewardess' perspective. The bag-having is future relative to the local evaluation time set by 'told', thereby violating the ULC.

While it is unclear how our analysis could account for this use of the *de re* present[11], what is clear is that it provides strong argumentation against the ULC. We also note that this is a genuine case of temporal *de re*, unlike (31) above, which we believe involves sharing of contextually restricted RTCs. To see a genuine case of temporal *de re* with a past tense, one would have to construct a discourse along the lines of (33). We think this is possible and offer the following example:

(34) a. Al walks up to Jackie and asks what Frank is up to these days. She responds: "He's painting our car yellow at this very moment. He should be done by tomorrow."
b. 3 days later, Al goes over to Frank's house and says: "Where's the car?"
c. Frank: Whaddya want with my car?
d. Al: I wanna see it. **Jackie told me you painted it yellow**.

In addition to (33), (35)-(38) below can be construed as evidence that the ULC is empirically inadequate. These discourses, taken from Klecha (2016), involve the future oriented attitudes 'hope' and 'pray'. The original source of these examples is the Corpus of Contemporary American English.

(35) But none of that has put Singh in the headlines like his comments after finishing second at the Wachovia Championship in Charlotte, two weeks before the Colonial. He said Sorenstam had no business playing the PGA Tour, **he hoped she missed the cut** and he'd withdraw if paired with her, the AP reported.

(36) He was going to find that Guardian and do what he had to do. But his gut dropped at the thought of killing anyone in cold blood, even to save his brother. **He hoped she tried to kill him first**. Then he could behead her with a clean conscience.

11 Indeed, we are unaware of any analysis of tense that can explain this example (see Heim 2015 for discussion).

(37) "There were times when I picked one receiver and **prayed he got open**," recalled Collins, who completed 49.4 percent of his passes as a rookie out of Penn State, and finished with a quarterback rating of 61.9. "If he got open great; If not, I took the sack or threw it away."

(38) Thirteen months and she would legally be able to walk out the door and live on her own. Her trust fund would be hers. She would no longer be dependent on her mother and Victor. Thirteen months. **She prayed she survived that long**. It wasn't that she was worried about Victor killing her. She feared her own hand.

In all these examples, the event described by the clause embedded under 'hope' and 'pray' respectively is understood to be located after the attitude holder's now. Klecha concludes based on these data that "the ULC is actually a 'lexically' sensitive constraint, or more precisely, it is sensitive to the kind of modal base a modal quantifies over (which may vary between or within modal lexical items)." In particular, Klecha assumes that all attitude verbs are modal expressions, whose temporal orientation is dependent on their modal base: epistemic or circumstantial. Attitudes like 'hope' and 'pray' can take either modal base (thereby allowing a wide range of readings) and it is when they take a circumstantial base that a forward shifted reading results. In contrast, attitudes like 'think' and 'believe' do not take a circumstantial base, and are therefore incompatible with forward shifting.[12] We find this hypothesis plausible and hope that future research will be devoted to accounting for these intriguing cases in which an embedded past tense involves future shifting.

12 Some potential evidence for Klecha's analysis is that (33-c) involves the verb 'tell', which patterns with 'hope' and 'pray' in taking a circumstantial modal base. The problem, however, is that a future-shifted interpretation of 'The stewardess told me you have my bags' seems only possible if the present tense is interpreted *de re*. This seems to be the key difference between (33-c) and Klecha's corpus examples above.

6 Concluding thoughts: Ways of composing with viewpoint aspect

In Part I of this monograph we saw a glimpse of how 'now' interacts with tense and discourse relations. We also provided a method for testing the definitional adequacy of two discourse relations and through the exercise learned a bit about narrative progression. In Part II of the monograph we explored further what the meaning of tense is like and provided a formal semantics for past and present tense. In conclusion of this monograph, I would like to provide a glimpse of what I think the compositional semantics looks like and point out some outstanding issues that have to do with the semantics of viewpoint aspect.

6.1 Towards a compositional semantics

Below, I provide meanings of stative and eventive VPs. These meanings are standard, with the exception that I distinguish between events and states in light of our analysis in Chapter 2.[1] A stative description like 'Mary be pregnant' denotes a function which requires two inputs: a state s and a world w, where s is a pregnancy state that holds of Mary in w. Similarly, an eventive description like 'John run' denotes a function which requires two inputs: an event e and a world w, where e is a running event by John in w.

(1) Examples of VP meanings

a. 'Mary be pregnant' $\rightsquigarrow$ $\lambda s \lambda w$.be.pregnant(w, s, mary)

b. 'John run' $\rightsquigarrow$ $\lambda e \lambda w$.run(w, e, john)

Let us now move on to consider the meanings for *temporal locating adverbs*, i.e. those adverbs that specify the temporal location of a given eventuality (Kamp 2013). Since our goal here is to provide a glimpse of the composition – rather than an analysis of particular temporal locating adverbs – we provide meanings of only two temporal locating adverbs, namely 'August 17, 2015' and 'now'.[2]

(2) Examples of meanings of temporal locating adverbs

a. August 17, 2015 $\rightsquigarrow$ $\lambda P \lambda t \lambda v \lambda w.\ \text{august.17.2015}(t) \wedge t \mathbin{O} \tau(v) \wedge P(w, v)$

b. $\text{Now}^{i,j}$ $\rightsquigarrow$ $\lambda P \lambda t \lambda v \lambda w.\ t \subseteq \tau(s_i) \wedge s_i = \textsc{fin}(e_j) \wedge t \mathbin{O} \tau(v) \wedge P(w, v)$

1 See § 2.4.2 in particular.

2 See Altshuler (2014b) and references therein for an analysis of the various kinds of temporal locating adverbs.

According to (2), temporal locating adverbs take VP meanings as an input. They do not saturate any arguments of the VP but rather introduce a new argument, namely a time t. An adverb like 'August 17, 2015' specifies t as being August 17, 2015 and requires that t overlap an eventuality v in the extension of the VP that it combines with. An adverb like 'now', however, does not specify a unique location, but puts bounds on it.[3] In particular, 'now' requires t to be within the run time of a prominent state s_i, which is the final state of a prominent event e_j.[4]

Finally, let us consider tense meanings:

(3) Tense meanings

a. $\text{PRES}^i \rightsquigarrow$
$\lambda Q \lambda t_0 \lambda w_0 \colon t_0 \in \text{RTC}_1(w_0, t_0) \wedge \exists t' (t' \succeq s^\star \wedge t' \in \text{RTC}(w^\star, t_i)).$
$\exists v \, \forall t'' (t'' \in \text{RTC}(w_0, t_0) \rightarrow Q(w_0, t'', v))$

b. $\text{PAST} \rightsquigarrow$
$\lambda Q \lambda t_0 \lambda w_0 \colon \exists t \, (t \prec t_0 \wedge t \in \text{RTC}(w_0, t_0)).$
$\exists v \, \forall t' (t' \in \text{RTC}(w_0, t_0) \rightarrow Q(w_0, t', v))$

A key thing to notice here is that tenses saturate both the time and eventuality argument of an *Adverbial Phrase* (AdvP), i.e. the phrase composed of a VP and a temporal locating adverb. With respect to the eventuality argument, tenses are treated as devices of existential closure.

Note that this is just one way of slicing up the pie. There is nothing presented in this monograph which forces this analysis. For example, it would also be possible to say that temporal locating adverbs saturate the eventuality argument of the VP. It could also be the case that viewpoint aspect, something that we have said very little about, has the role of saturating the eventuality argument, a view that we will return to shortly. For the time being, let us simply acknowledge that this way of slicing up the pie is consistent with the facts presented in this monograph.

As for the saturation of the time argument by the tense, there is plenty to say, though nothing beyond what was already said in Chapter 4 and Chapter 5. To review, the present tense in English imposes two presuppositional constraints on the reference time concept RTC. The first constraint says that when evaluated at the local evaluation world w_0 and local evaluation time t_0, RTC must include t_0. The second constraint says that when evaluated at the speech world and a time t_i, which is possibly bound by the higher tense[5], RTC must include some time t' that is at or after the utterance time $s^\star$. Finally, the assertive content of the present tense ensures that the

3 Partee (1984) calls such adverbs *frame adverbs*. They include 'next week', 'at noon' and 'on Sunday'.

4 See § 2.3 for a discussion of how the values of these prominent entities is determined.

5 See the discussion of (61) in § 4.3.4.

eventuality quantified over is instantiated in the world of evaluation throughout the time interval described by RTC in the local evaluation world and time.

As for the past tense in English, it imposes a single presuppositional constraint on the reference time concept RTC[6]: when evaluated at the local evaluation world and time, RTC must include some time t that is prior to the utterance time $s^\star$. Finally, as is the case with the present tense, the assertive content of the past tense ensures that the eventuality quantified over is instantiated in the world of evaluation throughout the time interval described by RTC in the local evaluation world and time.

In conclusion of this subsection, I would like to highlight that the temporal location of the described eventuality is – according to the proposal – restricted by both temporal locating adverbs and the tense. This idea, of course, is not new. As noted in Chapter 2, it goes back to Reichenbach (1947). However, our particular version of the Reichenbachian analysis of tense raises the following question: What is the role of viewpoint aspect? This question is pertinent because – since Klein (1994) – it has become customary in formal semantics to think of viewpoint aspect as being *time relational*, i.e. relating the run time of an eventuality to the time encoded by the tense.[7] Since we have not said much about viewpoint aspect in this monograph, the reader may feel that too much burden has been placed on the semantics of tense and temporal locating adverbs (and/or not enough burden has been placed on the semantics viewpoint aspect).

In the next and final section, I would like to compare Klein's analysis of viewpoint aspect with another analysis, according to which viewpoint aspect is an eventuality description modifier (Bach 1986, Krifka 1992). The goal of the comparison will be to explore several well-known phenomena which highlight ways in which the two theories diverge. Unfortunately, however, the places in which they diverge are not decisive and, since both analyses are compatible with what has been presented in this monograph, I will conclude that further research is necessary to determine which theory of viewpoint aspect is more desirable. Nevertheless, I hope the comparison exercise will be helpful in seeing what some of the key issues are.

6 As such, the formula in (3-b) can be simplified as follows:

(i) $\lambda Q \lambda t_0 \lambda w_0 \colon \exists t\, (t \prec t_0 \wedge t \in \text{RTC}(w_0, t_0)).\ \exists v (Q(w_0, v, t))$

7 While Klein is typically cited for this idea, it really goes back to earlier work by Hans Kamp and colleagues in the early 80s.

6.2 Viewpoint aspect

6.2.1 The neo-Kleinian and Bach/Krifka analyses

Klein (1994) proposed that viewpoint aspect relates eventualities to times. This idea has been extremely influential. Klein's analysis has given rise to work not only on the interaction between aspect and tense, but also on adverbs, modals, mood and evidentials.[8] This work, which I will refer to as the "neo-Kleinian analysis of aspect", is summed up by the formulas below:

(4) PROGRESSIVE$\rightsquigarrow \lambda P \lambda t. \exists e(t \subseteq \tau(e) \wedge P(e))$

(5) PERFECTIVE$\rightsquigarrow \lambda P \lambda t. \exists e(\tau(e) \subseteq t \wedge P(e))$

(6) PERFECT$\rightsquigarrow \lambda P \lambda t. \exists e(\tau(e) \prec t \wedge P(e))$

The formula in (4) makes Comrie's (1976) intuition that the progressive portrays a situation "from [the] inside" precise: the time with respect to which we evaluate a progressive sentence is contained within the run time of the described event that warrants the assertion. In contrast, the formula in (5) models Comrie's intuition that the perfective portrays the opposite relation, i.e. it portrays a situation "from [the] outside." Finally, the formula in (6) captures Reichenbach's (1947) idea that the perfect describes a "past of a past" or, put differently, it portrays that the event is over by the topic time (Kratzer 1998).

A different approach to viewpoint aspect, and the progressive in particular, was proposed by Bach (1986). He suggested that, mereologically speaking, and in terms of event semantics, there is a part-whole relation between the meaning of, e.g. 'John was drawing a circle' and 'John drew a circle':

- part of an event of drawing ≈ part of a circle
- whole event of drawing ≈ whole circle

This suggestion led Krifka (1992, 47) to posit two distinct partitive operators shown below, where PART denotes a function from a set of individuals to a set of partial individuals, while PROGRESSIVE denotes an analogous function from a set of events to a set of partial events.

(7) PART$\rightsquigarrow \lambda R \lambda x'. \exists x(x' \sqsubseteq x \wedge R(x))$

(8) PROGRESSIVE$\rightsquigarrow \lambda P \lambda e'. \exists e(e' \sqsubseteq e \wedge P(e))$

8 See, e.g. Kratzer 1998, Demirdache and Uribe-Etxebarria 2000, Iatridou et al. 2001, Musan 2002, Paslawska and von Stechow 2003, Gerö and von Stechow 2003, Grønn 2003, Matthewson 2006, Hacquard 2006, Deo 2006, Bittner 2008, Bary 2009, Deal 2009, Thomas 2012, Rett and Murray Rett and Murray.

Notice that the PROGRESSIVE does not encodes times; it is an eventuality description modifier, mapping a set of eventualities onto another set of eventualities.

6.2.2 Comparing the two analyses

Composition problem with the perfect progressive and aspectual stacking
Consider the perfect progressive sentence below:

(9) John has been building a house out of hay.

Without getting into the specifics of what the truth conditions for (9) are, it appears that both the perfect and the progressive make semantic contributions. In other words, it appears that the perfect progressive is compositional.[9] However, if that is right, then the neo-Kleinian meanings in (4) and (6) above are empirically inadequate for the simple reason that they cannot compose.

This is a well-known problem and one move that is often made by the neo-Kleinians is to deny that the perfect is a viewpoint aspect:

(10) PROGRESSIVE$\rightsquigarrow \lambda P \lambda t . \exists e(t \subseteq \tau(e) \wedge P(e))$

(11) PERFECTIVE$\rightsquigarrow \lambda P \lambda t . \exists e(\tau(e) \subseteq t \wedge P(e))$

(12) ~~PERFECT$\rightsquigarrow \lambda P \lambda t . \exists e(\tau(e) \prec t \wedge P(e))$~~

Building on McCoard's (1978) *Extended Now* analysis, a popular solution to the composition problem is to say that the perfect encodes a relation between times.[10] In other words, the perfect is a kind of a tense, as originally proposed by Reichenbach (1947) and described as such by many grammarians. Within the compositional semantics proposed in the previous section, we could say that PROGRESSIVE in (10) applies directly to the VP meanings (a set of eventualities), returning a set of times. Subsequently, PERFECT would compose as a temporal modifier, denoting a function from a set of times to a set of times. The only thing that we would have to change in our compositional semantics would be meanings of temporal adverbs, a point to which we return shortly.

In contrast to the neo-Kleinian analysis, the Bach/Krifka analysis can maintain the view that the perfect is a viewpoint aspect if we assume that, like the progressive, it is an eventuality description modifier. One possible reason for treating the perfect in this way comes from thinking about the modified version of (9), as in (13) below, and asking what the speaker is pointing to here.

9 For a different approach to the perfect progressive see Mittwoch 2008.

10 See, e.g. Fabricius-Hansen 1986, von Stechow 1999, Iatridou et al. 2001, Rathert 2004, Pancheva and von Stechow 2004.

(13) Look at that (pointing)! John has been building a house out of hay.

The natural answer seems to be *a partial house made out of hay*. Using terminology from Chapter 2 and Chapter 3, we can rephrase this as *the final state of a partial house building event*. This idea, of course, is not new. There have been many theories of the perfect that are centered around the intuition that the perfect describe an event's final state.[11] One way to make this formally explicit is to say that PERFECT denotes a function from a set of events to a set of final states of those events, as in (14):

(14) $\text{PERFECT} \rightsquigarrow \lambda P \lambda s . \exists e (s = \text{FIN}(e) \wedge P(e))$

Now, to capture our intuitions about (13), let's assume that the PROGRESSIVE, repeated in (15), first composes with VP meanings, followed by the PERFECT. In such a case, we would derive a set of final states of partial events in the extension of the VP.[12]

(15) $\text{PROGRESSIVE} \rightsquigarrow \lambda P \lambda e' . \exists e (e' \sqsubseteq e \wedge P(e))$

So how do we choose between the Bach/Krifka and the revised neo-Kleinian analysis of the perfect? At this point it is not clear. In fact, it could very well turn out that both analyses of the perfect are necessary. That is, it could be the case that the perfect functions like a tense and an aspect (Rothstein 2006, Gaus 2015). The take-away point from this short discussion is that while the Bach/Krifka analysis is tailored for analyzing the perfect progressive, the neo-Kleinian analysis requires some adjustments. It remains an open question whether the adjustments noted above are desirable.

One way to approach this question is to ask the more general question, namely whether aspectual stacking is productive cross-linguistically. And if so, what sort of adjustments would have to be made (each time) by the neo-Kleinians. One particularly interesting case to consider is aspectual composition in Russian. According to the Russian Academy Grammar (1960), every verbal form in Russian is either perfective or imperfective. Imperfective verbal stems can be morphologically simple or complex. In the former case, they provide a basis for the derivation of the perfective forms, which involves prefixation. Academy Grammar (1960) lists twenty-eight prefixes that can be attached to an imperfective verb to yield a perfective one and up to sixteen prefixes can be compatible with one and the same verbal stem. The term *lexical prefix* is often used to describe perfective prefixes which add an identifiable extra bit of information relating to how the event progresses. The term *superlexical* prefix, on the other hand, is often used to describe perfective prefixes which can be compositionally understood as

11 Recall the discussion in § 2.3.

12 It remains an open question whether the order of composition is constrained by the syntax or the semantics.

bearing a predicational relation to a determiner phrase in object position (Romanova 2005).

The example below, in (16), illustrates the lexical prefix 'do-' combining with a simple imperfective verb, 'čital' ('read'), yielding the perfective verb 'dočital' ('finished reading'). Of particular interest, however, is the observation that the imperfective suffix '–yva', can be added to the perfective verb to yield a complex imperfective verb, 'dočityval' ('finishing reading'). This process is often referred to in the literature as *secondary imperfectivization*.

(16) a. Ivan čital knigu.
Ivan IPF.read book
'Ivan was reading a book'
b. Ivan dočital knigu.
Ivan PFV.IPF.read book
'Ivan finished a book.'
c. Ivan dočityval knigu.
Ivan IPF.PFV.IPF.read book
'Ivan was finishing a book.'

While there is some debate as to whether the perfective prefixes are, in fact, instantiations of PERFECTIVE[13], I am not aware of any analyses which would *not* posit PERFECTIVE in the logical form of a sentence like (16-b) (wherever it comes from). As such, when we go on to consider (16-c), we are led to similar questions that we entertained with the perfect progressive in English. In particular, we are led to ask how IMPERFECTIVE can possibly compose with PERFECTIVE within the neo-Kleinian analysis of viewpoint aspect. And, once again, we are led to two possible answers. One approach is to simply deny that the Russian imperfective is a viewpoint aspect. This approach was taken by Paslawska and von Stechow (2003), who made the following claim:

(17) '...there seems to be no structural functional category that could somehow be linked with an imperfective feature in AspP...there is no such thing as the meaning of the [Russian] imperfective; this 'aspect' is really a non-aspect." (Paslawska and von Stechow (2003, 336))

Another way, of course, is to make adjustments in the meaning of one or both of the aspects in question. For example, Zucchi (1999) provides a compositional semantics for examples like (16-a)-(16-c), but departs from the neo-Kleinian semantics in many respects. While discussing Zucchi's analysis would take us too far afield, I hope that future research can look at aspectual composition in Russian and in other languages

13 See, e.g. Filip 2008, Tatevosov 2011, 2014, Kagan 2015.

of the world through the lenses of the two approaches to viewpoint aspect discussed here.[14]

Do adverbs fix the topic time?

Let's consider the sentence below in light of the following question: what is the topic time for John's crossing described in the second sentence of the discourse?

(18) It was June 14, 1998. John was crossing my street. Then a bus hit him.

For the sake of argument, let us assume that the topic time is June 14, 1998. After all, if (18) is true, then there was a (partial) crossing event by John on June 14, 1998. It is important to note that such a view – while plausible – does not bode well for the neo-Kleinian truth-conditions of PROGRESSIVE, repeated below.

(19) PROGRESSIVE$\rightsquigarrow \lambda P \lambda t.\exists e(t \subseteq \tau(e) \wedge P(e))$

That is, if assume that 'June 14, 1998' restricts t in the formula above to be June 14, 1998, then when PROGRESSIVE composes with the VP 'cross my street', it would be predicted that the crossing took place throughout June 14, 1998, and possibly after. But this, of course, is too strong. Street crossings typically take some seconds.

An easy fix to the problem would be to say that the adverb fixes the topic time to be a subinterval of June 14, 1998, as in (20) (see, e.g. Dowty 1979, von Stechow 2002, Borik 2006 for an analysis along these lines):

(20) June 14, 1998$\rightsquigarrow \lambda Q \lambda t'.\exists t(t' \subseteq t \wedge \text{june.14.1998}(t) \wedge Q(t'))$

Another possibility would be to say that there is an implicit preposition 'on' in the discourse (i.e. 'John was crossing my street on June 14, 1998') that provides the partitivity (Kamp and Reyle 1993, von Stechow 2002). In either case, it is important to note that whether we go neo-Kleinian or Bach/Krifka, partitivity must surface somewhere, be it in the domain of events or times.[15] Moreover, note that if one does adopt the Bach/Krifka analysis of viewpoint aspect, which is partitive in the event domain, then the semantics of temporal locating adverbs provided in the previous section, and repeated below (leaving out the world argument), already account for discourses such as (18).

(21) June 14, 1998$\rightsquigarrow \lambda P \lambda t.\lambda e(t \mathbin{O} \tau(e) \wedge \text{june.14.1998}(t) \wedge P(e))$

14 Another fruitful domain of research that is highly relevant is aspectual coercion, which some have analyzed as a case of aspectual stacking (cf. de Swart 1998, 2000, Bary 2009).

15 Recall that Bennett and Partee 1972 analyze the progressive as being partitive in the time domain, giving us yet another possible analysis of viewpoint aspect.

That is, when (21) composes with a set of partial crossing events, it is correctly predicted that these events overlap June 14, 1988.

In light of this discussion, I leave it open for further research where exactly partitivity sneaks in in the compositional semantics. As we shall see shortly, this question is also tied to another well known phenomenon, known as the *imperfective paradox*.

Imperfective paradox

A well-known problem for both analyses of viewpoint aspect that we have been considering the existential quantification of the meaning of PROGRESSIVE. In what follows, I will first concentrate on the neo-Kleinian meaning in (19), repeated below.

(22) $\text{PROGRESSIVE}_{\rightsquigarrow} = \lambda P \lambda t . \exists e (t \subseteq \tau(e) \wedge P(e))$

When applied to a telic description such as 'write a letter', we derive an undesired entailment that a letter has been written. Neo-Kleinians often acknowledge this shortcoming, known as the *imperfective paradox* (Dowty 1979), and assume (often explicitly) that (22) could be enriched with a modal semantics.

Bary (2009) takes this challenge head-on and builds on work by Gerö and von Stechow (2003) to propose the following modal extension:

(23) $\text{PROGRESSIVE}_{\rightsquigarrow} = \lambda P \lambda t . \forall w' (\text{Intert}_t(w^\star)(w') \rightarrow \exists e (t \subseteq_\circ \tau(e) \wedge P(w')(e)))$

There are two key ingredients in (23). The first is the relation '$\text{Intert}_t(w^\star)(w')$' which ensures that the world history w' is the same as the actual world $w^\star$ until the end of the topic time t. The second is the relation '$t \subseteq_\circ \tau(e)$', which ensures that t is contained within the run time of the event e, and t is not a final part of this run time.[16] Given the universal quantification, this amounts to the following truth-conditions: a progressive sentence is true iff in every inertia world w' of $w^\star$ at the topic time t there is an event e whose run time is a superinterval of t such that t is not a final part of this run time. Disregarding problems with inertia worlds (see, e.g. Landman 1992, Varasdi 2014), (23) shows how a neo-Kleinian analysis can be extended to deal with the imperfective paradox.

A possible worry for (23) is that it now appears that the semantics of the progressive is quite different from the perfective and the perfect. Bary (2009, 111-112) addresses this worry with respect to the perfective, showing that PERFECTIVE could be extended in a parallel fashion:

(24) $\text{PERFECTIVE}_{\rightsquigarrow} = \lambda P \lambda t . \forall w' (\text{Intert}_t(w^\star)(w') \rightarrow \exists e (\tau(e) \subseteq t \wedge P(w')(e)))$

16 For another way of modalizing PROGRESSIVE within a modal semantics, see Cable 2015.

The original, neo-Kleinian proposal about how PROGRESSIVE and PERFECTIVE differ is preserved in (23) and (24): whereas the runtime of the P-event is a proper superinterval of the topic time *t* in (23), it is a subinterval in (24). This difference ensures that the universal quantification over inertia worlds—which plays a crucial role in (23) – is trivial in (24); (24) is truth-conditionally equivalent to the original neo-Kleinian meaning. This is a good result for languages like Russian, where perfective of a telic VP always leads to a culmination entailment:[17]

(25) a. Ja včera pro-čital bibliju
I yesterday PFV-read bible
'I finished the bible yesterday'
b. #no ne do konca.
but not until end
'but not until the end.'

Here (25-a) entails that the bible reading event culminated in the bible having been read. For this reason, (25-b) is not a possible follow-up (cf. 'I read the bible last night but didn't get to the end' is ok in English).

It is not a good result, however, for languages in which the perfective of a telic VP leads to the imperfective paradox (which is therefore a misnomer). For example, consider the following Hindi data:

(26) a. maayaa-ne biskuT-ko khaa-yaa
Maya-ERG cookie-ACC eat-PFV
'Maya ate the cookie'
b. par use puuraa nahiin khaa-yaa
but it-ACC finish not eat-PFV
'but did not finish it.'

(26) shows that the perfective 'biskuT-ko khaayaa' in Hindi does not lead to the entailment that the cookie was finished (Singh 1998). That is, (26) exemplifies a *non-culminating accomplishment*, which raises foundational questions about what it

17 Note that Russian also has delimited perfectives, viz. the example below. However, for cases such as these, it makes no sense to talk about culmination since delimited perfectives are activities; they are not telic.

(i) Včera ja po-guljal v parke
yesterday I PFV-walked in park
'Yesterday I walked around in the park for a bit.'

Form	Is it ever used to describe an event that was instantiated in the past and continued to develop until the utterance time?	Does it ever lead to the imperfective paradox?
a. English progressive	Yes	Yes
b. Russian perfective	No	No
c. Hindi perfective	No	Yes

Fig. 6.1. Contrasting aspectual forms

means to be (im)perfective.[18] The comparison between (26) and (27) below provides an important clue:

(27) a. maayaa-ne biskuT-ko khaa-yaa
Maya-ERG cookie-ACC eat-PFV
Intended: 'Maya was eating the cookie'

b. #aur use ab tak khaa rahii hai
and it still eat PROG be.PRS
'and is still eating it.'

As was first observed by Koenig and Muansuwan (2000) with respect to Thai, the perfective may lead to the imperfective paradox (viz. (26)), but it is never used to describe an event that was instantiated in the past and continued to develop until the utterance time. That is, the perfective in (27) cannot be used in a way analogous to the progressive in, e.g. 'Maya was eating the cookie and she still is.'

In sum, we have aspectual forms of the kind illustrated in Figure 6.1. There are imperfective forms like the English progressive, which lead to the imperfective paradox and are used to describe an event that was instantiated in the past and continued to develop until the utterance time. We also have perfective forms like the Russian perfective, which do not lead to the imperfective paradox and are therefore never used to describe an event that was instantiated in the past and continued to develop until the utterance time. Finally, we have perfective forms like in Hindi, which lead to the imperfective paradox but cannot be used to describe an event that was instantiated in the past and continued to develop until the utterance time.

The c-form in Figure 6.1 is not discussed by the neo-Kleinians and this is both surprising and unfortunate. It is surprising since many (if not most) of the perfective forms in the world's languages are of this kind.[19] It is unfortunate because it is unclear how a neo-Kleinian analysis could be extended to account for the distinction in a-

18 For research related to this question see, e.g., Smith 1997, Bohnemeyer and Swift 2004, Martin and Schäfer 2012, Demirdache and Martin 2015, Martin 2015, Arche 2014, Altshuler 2014a, Gyarmathy and Altshuler 2016.

19 Here is a small sample of languages for which this claim has been made: Japanese (Ikegami 1985), Karachay-Balkar (Tatevosov 2008), Malagasy (Travis 2000), Mandarin (Teng 1972, Koenig and Chief 2008), Punjabi (Raja 2003), St'át'imcets and Skwxwúmesh (Bar-El et al. 2005), Tagalog (Dell 1987),

and c-forms on the one hand, and b- and c-forms on the other, especially if one also wanted to preserve Bary's insight in (23) and (24).[20] The difficulty of extending Klein's account to account for these different forms is highlighted by Grønn's (2003) proposal to include a new aspectual operator into the neo-Kleinian typology—one that imposes the overlap relation.[21] Grønn writes: "one could replace the imperfective condition e O t with with a disjunction $t \subseteq e \vee e \subseteq t$. The modality could then be smuggled into the first disjunct" (Grønn (2003, 58)). The issue, of course, is: how do you smuggle in the modality? Moreover, how does one make the modality fine grained enough to explain the difference between the a- and c-forms in Figure 6.1, which both lead to the imperfective paradox?

To the best of my knowledge, Koenig and Muansuwan (2000) were the first to address such questions, though not within a neo-Kleinian framework. Working to explain the perfective in Thai, which could be classified as a c-form in Figure 6.1, Koenig and Muansuwan proposed that the perfective imposes a maximality constraint: given a property of events P, a P-event must be the maximal subpart of the possible continuations that have the property P.[22] Using this insight, we can extend the Bach/Krifka analysis in the following way:

(28) PROGRESSIVE (English)$\rightsquigarrow \lambda P \lambda e'.\exists e(e' \sqsubseteq e \wedge P(e))$

(29) PERFECTIVE (Hindi)$\rightsquigarrow \lambda P \lambda e'.\exists e(e' \sqsubseteq e \wedge \text{MAX}(e', P) \wedge P(e))$

(30) PERFECTIVE (Russian)$\rightsquigarrow \lambda P \lambda e'.\exists e(e' = e \wedge \text{MAX}(e', P) \wedge P(e))$

Of course, to account for the generalizations in Figure 6.1, we still need to spell out what we mean by the partitive condition $e' \sqsubseteq e$ in a way that is consistent with the MAX predicate. Without doing so, the imperfective paradox is not accounted for.

In response to this challenge, Altshuler (2014a) showed how the analysis above could be implemented within Landman's modal semantics which involves the notion of a *stage* (Landman 1992, 2008), motivating the hypothesis in (1) below:

Tamil (Pederson 2007), Thai (Koenig and Muansuwan 2000), among many others. See Arche 2014 and references therein for more discussion.

20 See Bar-El et al. 2005 for an attempt to do so, which essentially involves positing a modal operator in addition to a neo-Kleinian perfective operator. Such an analysis is arguably motivated by the morphology of St'át'imcets and Skwxwúmesh, where transitive suffixation is intrisically tied to the imperfective paradox. It seems dubious, however, that the languages under consideration here warrant a similar analysis.

21 This builds on Smith's (1997) idea that there is an aspectual class, neutral aspect, whose meaning generalizes across the perfective/imperfective. See Csirmaz (2004) and Altshuler (2014a) for a critical discussion.

22 Filip (2001, 2008) also argues that the perfective in Slavic languages involve maximality.

(31) (Im)perfective operators

a. An operator is perfective if it requires a maximal stage of an event in the extension of the VP that it combines with.
b. An operator is imperfective if it requires a stage of an event in the extension of the VP that it combines with, but this stage need not be maximal.

While discussing the hypothesis in detail would take us too far afield[23], I would like to point out that if event partitivity is what allows us to account for the contrasting aspectual forms in Figure 6.1, while also allowing us to have a theory of what it means to be (im)perfective, then what do we buy from thinking that aspectual meaning is neo-Kleinian? Whatever the answer to the question is, one thing is clear: it will have to involve a theory of how viewpoint aspect combines with temporal locating adverbs to mediate between events, states and times.

23 See Močnik 2015 for more discussion and extension of the hypothesis.

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