THE SEMANTICS OF *AT DET TIME* AND THEIR ROLE IN DISCOURSE COHERENCE*

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Temporal adverbials, such as those exemplified in (1), play an essential role in the temporal interpretation of sentences. Coming in a myriad of forms, their core function can be described as providing additional temporal information. Yet, a closer look reveals that adverbials play a more nuanced role in the larger discourse.

(1) *On Tuesday / last night / that same day / now / tomorrow / late in the evening*

On a sentential level, temporal adverbials may specify the event time or topic time. Consider the sentences in (2), both of which are modified by the adverbial *at 9 AM*. Due to the temporal structure specific to each sentence, the adverbial in (2a) locates the event time as being at 9 AM, so that Alex's departure occurred at this time. However, the adverbial in (2b) locates the topic time at 9 AM rather than the event time. Thus, Alex's departure occurred prior to 9 AM.

(2) a. *At 9 AM*, Alex left.
b. *At 9 AM*, Alex had (already) left.

On a discursive level, temporal adverbials can also override more general principles of event ordering. Consider the sentence in (3a) followed by (3b); the typical interpretation is that Sue was hired after she cleaned the speaker's house. However, the simple addition of the adverbial *yesterday* in (3c) reverses the order of events such that Sue being hired can be interpreted as taking place prior to cleaning the house.

(3) a. Sue came and cleaned our house.
b. … My wife hired her and paid her in cash.
c. … *Yesterday*, my wife hired her and paid her in cash.

The main focus of this paper is on the set of temporal adverbials of the form *at DET time* where *DET* may be the definite article (*the*), the proximal demonstrative (*this*), and the distal demonstrative (*that*). Despite the similarities in form, these adverbials display surprising differences, both in terms of the time intervals they can refer to and how they are employed to shape the relations between eventualities. The paper will show how the existing semantics for the various components of these adverbials are inadequate in

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accounting for the semantic properties of these adverbials. Lastly, the paper presents an analysis of *at DET time* through a dynamic semantic framework.

1. Temporal and coherence properties of *at DET time*

There are two properties relevant to the discussion of *at DET time*. The temporal property refers to the particular time intervals (i.e., past, present, future) that *at DET time* can refer to. Generally, *at this time* can refer to past, present, and future time intervals while *at that time* can refer to past and future intervals, but not present intervals. Lastly, *at the time* is the most restricted in that it can only refer to past intervals. These observations are exemplified in (4); these examples are minimal triplets, describing the same pair of eventualities in the same order and marked with the same aspect (i.e., progressive). Their only difference is their tense, which provides an indication of the temporal location of the described eventualities. The felicity of the various *at DET time* adverbials change alongside the changing of tense.

(4) a. Alice was arranging the table in the dining room.
At this / that / the time, Tom was decorating the cake in the kitchen.

b. Alice is arranging the table in the dining room.
At this / #that / #the time, Tom is decorating the cake in the kitchen.

c. Alice will be arranging the table in the dining room.
At this / that / #the time, Tom will be decorating the cake in the kitchen.

Due to the referential nature of demonstratives and the definite article, *at DET time* does not merely provide temporal information about the clause it modifies, but is also used as a sentence linker. As such, the coherence property refers to the kinds of coherence relations that these adverbials are felicitous with. Note that coherence relations refer to inter-clausal relations that outline the structure of discourse. Most frameworks dealing with discourse coherence posit a large—albeit, finite—set of coherence relations, but this paper focuses on two relations: Narration and Background. Suppose that α and β were two clauses with α preceding β, then Lascarides and Asher (1993: 4) provides definitions for Narration and Background in (5).

(5) a. **Narration(α, β):** The event described in β is a consequence of (but not strictly speaking caused by) the event described in α.

b. **Background(α, β):** The state described in β is the backdrop or circumstances under which the event in α occurred (no causal connections but the event and state temporally overlap).

In essence, Narration characterizes a series of sequential eventualities, each contingent upon the previous while Background characterizes an overlap between a state and an

event such that the state provides context to the event. There are more framework-specific formal definitions of these relations, though for the purposes of this paper, these general definitions shall suffice.

In terms of *at DET time*, what can be observed is that the adverbials involving demonstratives (i.e., *at this/that time*) are felicitous with a wide range of coherence relations, including but not limited to Narration and Background. However, *at the time* appears to only be felicitous with Background relations. These observations are exemplified in (6) where (6b-c) act as follow-ups to (6a).

(6) a. Alice collided into Tom at full force.
b. **Background:** …. *At this / that / the time,* he was cutting the wedding cake.
c. **Narration:** … *At this / that / #the time,* he fell forward into the buffet table.

The differences in the temporal and coherence properties of the various forms of *at DET time* are surprising given the simplicity of the general structure and the similarities between the variants.

2. Relevant background

2.1 Some theoretical background on definite referential expressions

As the most notable difference between the variants of *at DET time* is the determiner, this section overviews theoretical discussions surrounding definite referential expressions that is relevant to the topic at hand.

Much as been said about the definite article, but most modern semantic analyses of definite phrases (i.e., DPs headed by the definite article) agree that the DP refers to a unique referent that satisfies the descriptive content provided by the NP (Kadmon 1987, Heim and Kratzer 1998, Elbourne 2008). Analyses of demonstratives often characterize them as an extension of the definite article. As such, *this/that NP* also refers to unique referents that satisfy the descriptive content provided by the NP. However, demonstratives can also indicate the distance of the referent relative to a deictic centre, which is typically the speaker. This is particularly apparent when the proximal and distal demonstratives are used contrastively; in (7), the referent of *this muffin* is typically interpreted as being closer to the speaker compared to the referent of *that muffin*.

(7) I want this muffin, not that muffin.

Both definite and demonstrative phrases can participate in bridging, an inference that two objects/events are related through some covert relation that is necessary in making the text coherent (Asher and Lascarides 1998). An example of bridging involving definite phrases is shown in (8) where the text can only be coherent if *the engine* refers to the engine of the speaker's car mentioned in the first clause. Yet, no engine was explicitly introduced in the context prior to the definite phrase. As such, the relation between *the engine* and *my car* is a covert relation.

(8) I took my car on a test drive. The engine made a weird noise.

Elbourne's (2008) analysis of demonstratives also involves bridging. Specifically, his analysis has bridging built into the semantics of demonstratives and uses it as part of the referential process. This is most apparent in instances where the referent of the demonstrative phrase is not present in the context of utterance. Consider the example in (9); Elbourne's analysis claims that the antecedent of the demonstrative phrase is pointed out by the deictic gesture towards the cat bed. Interlocutors then bridge from the cat bed to the cat most strongly associated with that bed (i.e., Garfield), thus reaching the intended referent.

(9) **Context:** The speaker owns one cat (Garfield) who is at the vet
That cat (*pointing at Garfield's bed*) loves lasagna.

Note that the referent and antecedent of the referential expression involved in bridging are not the same. In the case of *the engine* in (8), the antecedent is the speaker's car but the referent is the engine of the speaker's car. Similarly in (9), the antecedent of *that cat* is Garfield's bed while the referent is Garfield.

2.2 Some theoretical background on temporal structure

Given that temporal adverbials provide temporal information, understanding how temporal structure is constructed is also highly important to the analysis of *at DET time*. Consider the example in (10) (repeated from (3)). Each of the sentences in (10) have its own sentential temporal structure. This paper adopts the analysis provided by Klein (1994) in its approach to sentential temporal structure. In essence, Klein argues that each clause features three times. The utterance time (UT) is the time at which a sentence is uttered while the event time (ET) is the time at which the described eventuality takes place. The topic time (TT) relates the event time to the utterance time and is described as "some time for which the speaker wants to make an assertion" (Klein 1994: 24). The relation between the topic time and the utterance time is marked by tense while the relation between the topic time and event time is marked by aspect. Both sentences in (10) are in past tense and perfective aspect. As such, both sentences have the same sentential temporal structure as indicated in (11). More specifically, the event time of Sue's arrival and house cleaning is located in a topic time that is prior to the utterance time in (10a). Similarly, the event time of the speaker's wife hiring and paying Sue is located in another topic time that is prior to the utterance time in (10b).

(10) a. Sue came and cleaned our house.
b. My wife hired her and paid her in cash.

(11) a. $ET_1 \subset TT_1 < UT$
b. $ET_2 \subset TT_2 < UT$

Eventualities rarely occur in isolation and thus, aside from temporal structure being constructed within sentences, it is also constructed across sentences. At this level, discourse coherence plays a major role in determining discursive temporal structure as certain coherence relations have specific temporal requirements. Let us return to Narration which, involves sequential events. Partee (1984) provided an outline of how the sequential interpretation of events is achieved in narrative examples. She argued that eventive clauses introduce temporal discourse referents located immediately after the described event. This paper will refer to this discourse referent as a post-state. The post-state can then be picked up as the antecedent of the topic time of subsequent utterances. The example in (10) is certainly one of Narration as the hiring event took place after and as a result of the house cleaning event. By Partee's account, there exists a post-state located after the house cleaning event (see (12a)). Also by her account, this post-state is picked up as the antecedent of the topic time of the second sentence (see (12b)).

(12) a. $ET_1 <$ post-state(ET_1)
b. $TT_2 =$ post-state(ET_1)

Incorporating both (11) and (12) leads to the interpretation that the hiring event took place inside a topic time that is identical to the post-state of the house cleaning event. All of these are located prior to the utterance time. In simpler terms, Partee's account correctly predicts that the hiring event took place after the house-cleaning event.

In general, sequentiality is achieved through a chain of topic times whose antecedent is the post-state of a previous event, but there is an exception. Namely, this chain of events can be broken through the presence of a temporal adverbial because temporal adverbials introduce their own temporal discourse referent. This referent does not necessarily align with the chain of events that has been established and in turn can act as an alternative antecedent to the topic time of subsequent clauses. Consider the example in (13) which is identical to (10) with the only difference being that the second sentence is modified by the adverbial *yesterday*.

(13) a. Sue came and cleaned our house.
b. *Yesterday*, my wife hired her and paid her in cash.

The sentential temporal structure of the sentences in (13) remains the same as the sentential temporal structure of the sentences in (10) as these are determined by Tense and Aspect which were unchanged. Similarly, the discursive temporal structure for (13a) is unchanged from (10a) as the two utterances are identical, but now, the topic time of (13b) has an antecedent, which is located in some time yesterday (see (14b)). This opens the possibility that the hiring event took place prior to the house cleaning event. Note this alternative interpretation was not available for (10) because the only possible antecedent of the topic time of the second clause was the post-state of the house cleaning event.

(14) a. $ET_1 <$ post-state(ET_1)
b. $TT_2 =$ some time yesterday

Incorporating both the sentential and discursive temporal structures, the interpretation of (13) is such that there was a house cleaning event which took place prior to the utterance time. Additionally, there was also a related hiring event which took place in a time that was some time in the day prior to the utterance time. Furthermore, there is no restriction that prevents the hiring event from occurring prior to the house cleaning event. As such, the events described in (13) could have taken place in the reverse order of the events described in (10).

3. Two analyses of *at DET time*

3.1 A static, compositional analysis of *at DET time*

It is tempting to provide a semantic account of *at DET time* by employing a standard static compositional framework. After all, there is nothing inherently unusual in terms of the lexical items present in the adverbials and as section 1 has shown, some aspects of the adverbials appear to be compositional. However, this section will show that a standard analysis will not account for all the properties of the adverbials.

Consider the denotation of each of the lexical items involved in the *at DET time* adverbials. Starting with the preposition *at*, I propose that the preposition equates two temporal variables; this is in the context where it is used in a temporal domain rather than a spatial domain. It is also unremarkable to assume that the noun *time* merely asserts that the time variable *t* is a time.

(15) $[\![\text{at}]\!]^g = \lambda t.\ \lambda t'.\ t' = t$

(16) $[\![\text{time}]\!]^g = \lambda t.\ t \text{ is a time}$

For the various determiners of interest in this paper, I employ Elbourne's (2008) denotation for both the definite article and the demonstratives. As discussed briefly in section 2.1, the definite article presupposes uniqueness via the iota operator and asserts that the referent *z* satisfies the descriptive content *h* provided by the NP. Elbourne's denotation for demonstratives is extended from his denotation of the definite article as evident by the uniqueness presupposition and the assertion that the referent *z* also satisfies the nominal descriptive content *h*. But bridging is also encoded into the denotation of demonstratives; this is indicated by the relational function *f* which asserts some connection between the referent *z* and the antecedent *x*. The final semantic component is that the antecedent *x* is distal/proximal relative to some deictic center; in spatial domains, the deictic center may be the speaker *a*, but in the temporal domain, the deictic center is the utterance time t_0.

(17) $[\![\text{the}]\!]^g = \lambda h.\ \iota z\text{: } h(z) = 1$

(18) a. $[\![\text{this}]\!]^{a,t0,g} = \lambda x.\ \lambda f.\ \lambda h.\ \iota z\text{: } h(z) = 1 \ \&\ f(x)(z) = 1 \ \&\ \text{proximal}(x, a, t_0)$

b. $[\![\text{that}]\!]^{a,t0,g} = \lambda x.\ \lambda f.\ \lambda h.\ \iota z\text{: } h(z) = 1 \ \&\ f(x)(z) = 1 \ \&\ \text{distal}(x, a, t_0)$

Composing everything together, the expected denotation of *at DET time* is that there is some unspecified time *t'* which is equal to the referent of the DP.

(19) $[\![\text{at DET time}]\!] = \lambda t'.\ t' = [\![\text{DET time}]\!]$

If the focus of this paper was just on *at this/that time*, then the above denotation would be adequate. First, one can use the distal/proximal property of demonstratives to account for the temporal properties of *at this/that time*. The main idea being that there are no absolute restrictions on proximity because any distance may be considered "near" in the right context. This means that in the temporal domain where the utterance time is the deictic center, any time can be considered proximal to the utterance time, including the utterance time itself. A similar flexibility can be observed with distality; any time can be considered distal to the utterance time in the right context. The only exception is the utterance time itself because distality requires that there is a non-zero distance between two entities. As such, if the utterance time is interpreted as being synonymous with the present, then it makes sense that *at this time* may refer to past, present and future time as these are all times which could be considered as proximal to the utterance time. It also makes sense that *at that time* can only refer to past and future times as these are the only times which could be considered as distal relative to the utterance time.

The bridging relation encoded in demonstratives can be employed to account for the flexible coherence property of *at this/that time*. Let us assume that the antecedent of *this/that time* is an eventuality and the referent is some time associated with this eventuality. Elbourne's analysis did not place any particular restriction upon the encoded bridging relation and as such, a variety of times may be bridged from the antecedent event. This includes both the runtime of an event (i.e., the event time) or the post-state of the event. If multiple times may be the bridged referent, then a greater variety of coherence relations can be established between the clause that the adverbial is modifying and the clause containing the antecedent event.

The inadequacies of the denotation in (19) become apparent as we consider what it predicts for the semantics of *at the time*. In general, the denotation in (19) predicts that *at the time* should behave less restrictively than *at this/that time.* Note that the only difference between *at the time* and *at this/that time* is the determiner. Furthermore, the definite article encodes no conditions on the distance of the referent. Thus, the expectation is that *the time* can refer to all times. However, as section 1 has shown, *at the time* can only refer to past times. Additionally, while Elbourne did not encode bridging into the denotation of the definite article, section 2.1 has shown that definite phrases participate readily in bridging. Moreover, there are no restrictions on the kinds of bridging relations that can be established between the referent of *the time* and its antecedent. Therefore, both the runtime and post-state of an event should be available as potential referents of *the time* and thus, *at the time* should allow a variety of coherence relations to be established. However, as also observed in section 1, *at the time* only

allows Background to be established between the clause it modifies and the clause describing the antecedent event.

In sum, while a static, compositional approach to *at DET time* can account for the properties of *at this/that time*, a more nuanced analysis is necessary to explain the properties of *at the time*.

3.2 A dynamic, compositional analysis of *at DET time* via CDRT

To resolve the inadequacies of the traditional static compositional semantic framework, the paper turns to Compositional Discourse Representation Theory (CDRT). In this section, the paper provides a brief introduction to CDRT and outlines how it can be used to account for the properties of *at DET time*.

Consider the Narration example in (20) (slightly modified from (6)) and its logical representation in CDRT in (21).

(20) a. At noon, Alice collided into Tom.
b. He fell forward into the buffet table.

(21) [t_1, e_2, t_2, x_3, x_4, e_5, t_5 |

a. t_1 = 12 PM, $t_1 < t_0$, $\tau(e_2) \subset t_1$, $\tau(e_2) < t_2$, $x_3 = \text{alice}^o$, $x_4 = \text{tom}^o$, collide-into(x_3, x_4, e_2),

b. $t_2 < t_0$, $\tau(e_5) \subset t_2$, $\tau(e_5) < t_5$, fall-into-the-buffet-table(x_4, e_5)]

In CDRT, the logical forms of words and clauses can be expressed using the linear notation involving square brackets and a vertical divider ("[|]"). To the left of the vertical divider lists the set of discourse referents introduced by different parts of the syntactic structures in (20) (i.e., t_1, e_2, t_2, x_3, x_4, e_5, t_5). To the right of the vertical divider are all of the conditions which outline what each of the discourse referents are and how they are related to each other. Let us consider the conditions associated with (20a), outlined in (21a). The last three conditions of (21a) (i.e., $x_3 = alice^o$, $x_4 = tom^o$, *collide-into*(x_3, x_4, e_2)) indicate that there is a collision event e_2 involving two participants x_3, x_4 who are Alice and Tom respectively. The remaining conditions specify the temporal structure. The temporal adverbial *at noon* introduces a temporal discourse referent—located at 12 PM—which acts as the antecedent of the topic time of (20a) (i.e., $t_1 = 12\ PM$). By Klein (1994), past tense dictates that the topic time be prior to the utterance time (i.e., $t_1 < t_0$) while perfective aspect dictates that the event time $\tau(e_2)$ is included inside the topic time (i.e., $\tau(e_2) \subset t_1$). Altshuler (2014) formalized Partee's (1984) analysis of sequential events and proposed that perfective aspect is also responsible for introducing the post-state of the described event. In the case of (20a), the post-state of the collision event is t_2 and is located after the runtime of the collision event (i.e., $\tau(e_2) < t_2$).

Interpreting the conditions in (21b) is a similar exercise to (21a). The last condition asserts the presence of a falling event e_5, which involved x_4 (i.e., Tom). By Partee's

(1984) analysis, recall that sequentiality in Narration arises exactly because subsequent clauses take previously introduced post-states as the antecedent of their topic time. Hence the post-state of the collision event t_2 is involved in the conditions that define the temporal structure for (20b). Once again, past tense dictates that t_2 is prior to the utterance time (i.e., $t_2 < t_0$) while perfective aspect requires that the runtime of the falling event be included inside t_2 (i.e., $\tau(e_5) \subset t_2$) and introduces the post-state of the falling event (i.e., $\tau(e_5) < t_5$). If more eventive clauses followed (20b), then the post-state of the falling event t_5 would serve as the topic time of those clauses in the absence of temporal adverbials.

Returning to *at DET time*, let us consider how one would approach *at this/that time* in CDRT. The denotations of the proximal and distal demonstratives are presented in (22); while they may look significantly different from those provided by Elbourne (2008) (see (18)), they are in fact largely direct translations of his denotations. First, these demonstratives introduce a discourse referent—in this case, a temporal discourse referent t_j as the discussion at hand surrounds the temporal domain. Like Elbourne, the first argument *Q* is satisfied by the descriptive content of the NP, which will be the noun *time* (see (23) for the logical form of *this/that time*). Bridging is also encoded into the denotation via $B_n(e_i)(t_j)$ where e_i is the antecedent event. The last condition to be taken directly from Elbourne's denotations is $proximal/distal(\tau(e_i), a, t_0)$, which indicates that the antecedent event is proximal/distal with respect to the utterance time. Note that because events and times are not strictly of the same kind, the runtime of the antecedent event is used in the proximal/distal condition rather than the event itself. The only notable departure from Elbourne's denotation is the presence of the second argument *Q'*, which exists solely for type-raising; this is necessary in order to allow the temporal adverbial to take the clause that it modifies as one of its arguments.

(22) a. $[_D\ this_{ei,Bn}] \rightsquigarrow \lambda Q.\ \lambda Q'.\ [\ t_j \mid B_n(e_i)(t_j),\ proximal(\tau(e_i),\ a,\ t_0)];\ Q(t_j);\ Q'(t_j)$
b. $[_D\ that_{ei,Bn}] \rightsquigarrow \lambda Q.\ \lambda Q'.\ [\ t_j \mid B_n(e_i)(t_j),\ distal(\tau(e_i),\ a,\ t_0)];\ Q(t_j);\ Q'(t_j)$

(23) a. $[_{DP}\ this_{ei,Bn}\ time] \rightsquigarrow \lambda Q'.\ [\ t_j \mid B_n(e_i)(t_j),\ time(t_j),\ proximal(\tau(e_i),\ a,\ t_0)];\ Q'(t_j)$
b. $[_{DP}\ that_{ei,Bn}\ time] \rightsquigarrow \lambda Q'.\ [\ t_j \mid B_n(e_i)(t_j),\ time(t_j),\ distal(\tau(e_i),\ a,\ t_0)];\ Q'(t_j)$

Before moving onto the discussion of the preposition *at*, it is important to consider why bridging is even necessary in the analysis of *at DET time*. Typically, reference involving the definite article or demonstratives do not involve bridging because in most instances of reference, the antecedent and the referent are identical. Thus, bridging is often an unnecessary complication as it separates the referent from the antecedent. However, there are two main reasons for why bridging is necessary for reference in the temporal domain. Adverbials involving referential expressions such as *at DET time* cannot appear at the start of discourse because there would be nothing for the DP to refer to. But the existence of prior discourse means the introduction of a variety of eventualities. Furthermore, if eventualities can be seen as being composed of a set of different times (e.g., pre-state, runtime, post-state, etc.), then a multitude of introduced eventualities means an even greater multitude of times. But not all of these times are

potential referents for the DP in *at DET time*. While a variety of factors may also contribute to restricting the domain of potential referents, bridging a referent time from some antecedent event is the most straightforward way to do so. There is also a more intuitive reasoning for the necessity of bridging. Specifically, when *at DET time* is uttered, there is a sense that it carries a covert post-modification (e.g., *at the time [that I was previously talking about]*). Bridging can be used to account for this sense because the covert post-modification is exactly the implicit relation that is established between the antecedent and the referent of the adverbial.

Returning to the discussion of the semantics of *at DET time*, (24) presents the logical form of the preposition *at*. Similar to the denotations presented in (22) for the demonstratives, the denotation of *at* here has not changed significantly from the denotation I presented in (15); it still equates two times—t_k and *t'*, but it has been modified to include an additional clausal argument *Q* where t_k will act as the topic time. Similar to the modification for the demonstratives, this modification was also done so that the adverbial may take the clause it modifies as one of its arguments.

(24) $[at_{tk}] \rightsquigarrow \lambda R.\ \lambda Q.\ R(\lambda t'.\ [\ |\ t_k = t'];\ Q(t_k))$

The logical forms of *at this/that time* are presented in (25). An advantage of CDRT is that logical forms compose in the same way as they do in traditional static compositional semantics. Rather than focusing on the details of how these forms were constructed, the paper will focus instead on how readers can interpret these forms. In essence, *at this/that time* takes—as its remaining unspecified argument—the clause *Q* that it is modifying and asserts that the topic time of that clause (i.e., t_k) is identical to either the runtime or post-state of some antecedent event e_i. This is achieved through a series of equivalence relations (i.e., $t_k = t_j$ and $B_n(e_i)(t_j) = \tau(e_i)$ or $B_n(e_i)(t_j) = t_i$).

(25) a. $[_{AdvP}\ at_{tk}\ this_{ei,Bn}\ time]$
$\rightsquigarrow \lambda Q.\ [\ t_j\ |\ B_n(e_i)(t_j),\ time(t_j),\ t_k = t_j,\ proximal(\tau(e_i),\ a,\ t_0)];\ Q(t_k)$
where $B_n(e_i)(t_j) = \tau(e_i)$ or $B_n(e_i)(t_j) = t_i$

b. $[_{AdvP}\ at_{tk}\ that_{ei,Bn}\ time]$
$\rightsquigarrow \lambda Q.\ [\ t_j\ |\ B_n(e_i)(t_j),\ time(t_j),\ t_k = t_j,\ distal(\tau(e_i),\ a,\ t_0)];\ Q(t_k)$
where $B_n(e_i)(t_j) = \tau(e_i)$ or $B_n(e_i)(t_j) = t_i$

Suppose the second clause in example (20) were modified by *at that time* (see (26)). Since the second clause is marked by perfective aspect, the runtime of Tom's fall is included inside the topic time of the second clause. But by the semantics of *at that time*, the topic time is also equivalent to either the runtime or post-state of the collision event.

(26) At noon, Alice collided into Tom. *At that time,* he fell into the buffet table.

But there cannot be two referents for *at this/that time*, so interlocutors choose the referent which allows them to most easily establish coherence. This can depend on a multitude of

contextual factors. In the case of (26), the most reasonable referent will be the post-state as falling is a common result of collisions. In order to ensure that Tom's fall takes place after the collision, the referent of *at that time* must be the post-state of the collision event. Note that given enough context, it is still possible that the two events occurred simultaneously, however, it is not as likely.

The reasoning for why *at this/?that time* is felicitous with a wide number of coherence relations remains the same; the availability of multiple potential referents ensures that *at this/that time* have a flexible coherence property. The explanation for the temporal properties of *at this/that time* also remains unchanged. *At this time* may refer to past, present and future times as all three times could be considered as proximal to the utterance time while *at that time* may only refer to past and future times as these are the only times which could be considered distal relative to the utterance time.

The logical form for the definite article is presented in (27) which differs minimally from the denotations of the demonstratives. Both introduce a temporal discourse referent t_j that satisfies the nominal descriptive content *Q* and is bridged from an antecedent event e_i. Furthermore, *Q'* is also present due to Type Raising. The only difference is that the definite article does not have the distal/proximal condition. The definite article also carries Kadmon's (1990) Uniqueness Condition which accounts for the uniqueness presupposition often associated with this determiner.

(27) $[_D \text{the}_{ei,Bn}] \rightsquigarrow \lambda Q.\, \lambda Q'.\, [\, t_j \mid B_n(e_i)(t_j)]; Q(t_j); Q'(t_j)$
with Kadmon's (1990) Uniqueness Condition

The denotation of *at the time* is presented in (28). Similar to the other adverbials of interest, *at the time* takes the clause it modifies as an argument but asserts that the topic time of that clause is equal to the runtime of the antecedent event. Only the runtime is available as the referent because there is an additional restriction that Background must be established between *Q* and the clause which introduces the antecedent event e_i.

(28) $[_{AdvP}\ \text{at}_{tk}\ \text{the}_{ei,Bn}\ \text{time}]$
$\rightsquigarrow \lambda Q.\, [\, t_j \mid B_n(e_i)(t_j) = \tau(e_i), \text{time}(t_j), t_k = t_j]; Q(t_k)$
where Q must be the Background of the clause introducing e_i

Consider the example in (29). The second clause is marked by progressive aspect and so, the topic time of the second clause is included inside the runtime of the wedding cake cutting event. Unlike *at this/that time* where discourse coherence is established based on the content of the two relevant clauses, the presence of *at the time* immediately signals that the clause it modifies forms a Background relation with some clause in the previous context. For (29), this is certainly reasonable as collisions can occur simultaneously to other events. To achieve this simultaneous reading, the topic time of the second clause is equated to the runtime of the collision event. In conjunction with the temporal structure established by the progressive aspect, interlocutors reach the interpretation that the runtime of the collision is included within the runtime of the wedding cake cutting.

(29) At noon, Alice collided into Tom. *At the time*, he was cutting the wedding cake.

Only two questions remain: *Why Background?* and *Why only past times?* The explanation provided here is somewhat speculative, but the reasoning is similar. The restriction to Background may be the result of competition between the definite article and the demonstrative. Diessel (2006) observed that "definite articles signal the continuation of a currently activated discourse participant, whereas anaphoric demonstratives indicate a topic shift or a contrast between two previously established discourse referents" (477). Given Partee's (1984) characterization, Narration could easily be viewed as a series of changing topics. As such, it is reasonable that *at this/that time* is better suited towards establishing Narration than *at the time* given Diessel's characterization of the two kinds of determiners. This then restricts *at the time* to modifying clauses describing eventualities which are not the main focus of discussion, but rather provide supplemental information to the main topic; this is essentially Background.

As for why *at the time* is restricted to past times, this may be the result of a competition with *at the moment*, which appears to only allow reference to the present (see (30)). A multitude of reasons could be given for why *at the moment* can only refer to the present, the most intuitive of which being that *moment* refers to a shorter duration of time compared to *time* which has no restrictions on duration. But given the surface level structural and descriptive similarities between the two adverbials, it is possible that *at the moment* has become idiomatized to referring to the utterance time and in turn, *at the time* became restricted to past times.

(30) a. Alice was arranging the table in the dining room.
#*At the moment*, Tom was decorating the cake in the kitchen.

b. Alice is arranging the table in the dining room.
At the moment, Tom is (also) decorating the cake in the kitchen.

c. Alice will be arranging the table in the dining room.
#*At the moment*, Tom will be decorating the cake in the kitchen.

In sum, *at DET time* equates the topic time of the clause it modifies to bridged times associated with previously introduced events. However, different times are available as referents of *at this/that time* compared to *at the time*. *At this/that time* can equate the topic time to either the runtime or post-state of the antecedent event, which allows interlocutors to establish a variety of coherence relations including both Background and Narration. However, *at the time* is restricted to referring to only the runtime of the antecedent event because the adverbial signals that Background must be established between the clause it modifies and the clause that introduces the antecedent event. As for the kinds of times that these adverbials may refer to, *at this/that time* are able to refer to only those times which satisfy either the proximal or distal condition encoded within the proximal and

distal demonstratives respectively. Meanwhile, *at the time* refers only to past times potentially due to the availability of *at the moment* to refer to the present.

4. Conclusion

At DET time has received little attention in the literature on temporal adverbials. However, the analysis provided in this paper sheds light on the compositionality of complex adverbials. On one hand, they are somewhat compositional as their general function can be constructed from the semantics of its components. However, adverbials such as *at the time* behave in ways which cannot be predicted from its components. The analysis presented in this paper considered these adverbials from multiple levels of discourse in order to account for both the compositional and non-compositional properties of these adverbials.

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