Neodavidsonianism in Semantics and Syntax*

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September 7, 2014

1 Introduction

Ever since Davidson (1967), an important ingredient of verbal meaning has been the event variable. Davidson's argument is that in a sentence like (1a), the verb has an event variable in addition to its argument variables, which yields the logical form in (1b) and the paraphrase in (1c),

(1) a. Jones buttered the toast.
b. ∃e[buttering(e, Jones, the toast)]
c. There are events of buttering of which Jones is the agent and the toast is the object.

Davidson argues that these event representations are well-suited to capture important entailment relations. Consider the examples in (2a)-(2e).

(2) a. Jones buttered the toast.
b. Jones buttered the toast slowly.
c. Jones buttered the toast slowly in the bathroom.
d. Jones buttered the toast slowly in the bathroom with a knife.
e. Jones buttered the toast slowly in the bathroom with a knife at midnight.

In these examples, (2e) entails (2a), (2b), (2c), and (2d); (2d) entails (2a), (2b), and (2c); (2c) entails (2a) and (2b); (2b) entails (2a). This follows straightforwardly if there is an event modifier common to all the modifiers. The modifiers can then be linked by conjunction, in which case the entailments would follow as a natural consequence of conjunction reduction.

(3) ∃e[buttering(e, Jones, the toast) & Slow(e) & In(e, the bathroom) & With(e, a knife) & At(e, midnight)]

This is the core idea of the Davidsonian approach to semantics, namely the conjunction of event predicates.

Immediately after Davidson presented his proposal for conjoining modifiers and predicates, Castañeda (1967) argued that the thematic arguments could be separated/severed from the verb.

*I am grateful to Artemis Alexiadou, Elly van Gelderen, an anonymous reviewer, and Rob Truswell for their valuable comments on a previous version of this chapter.

That is, (1b) could rather be represented as in (4), where thematic relations are independent two-place predicates.

(4) ∃e[buttering(e) & Agent(e, Jones) & Theme(e, the toast)]

Logical forms with this structure are called Neo-Davidsonian (Parsons 1990). Dowty (1989) calls (1b) the 'ordered-argument' method and (4) the 'neo-Davidsonian' method.[1]

Observe that scholars such as Parsons (1990) would be happy if all decomposition is assigned to the lexicon. That is, we could stipulate the meaning postulate in (5) and this would suffice.[2]

(5) 'V(e, F, G)' is true ↔ ∀*x*(Agent(e, *x*) ↔ F*x*) ∧ V*e ∧ ∀*x*(Theme(e, *x*) ↔ G*x*)
(Schein 1993: 9)

Thus, it is crucial to distinguish *decomposition* from *separation*, where the latter assumes that thematic arguments are never part of the verb, either in logical forms or in the lexicon. Parsons mostly assumed decomposition rather than separation.[3] In this chapter, I will focus on arguments that require separation and where decomposition won't be sufficient. This will especially become clear in section 2 when I discuss semantic arguments for separation, as especially Schein (1993) makes clear.[4]

It is worth noticing that what both Davidson and Parsons call 'logical form' is not the same as the notion of Logical Form (LF), which is a syntactic level of representation (cf. May (1977, 1985)). As Hornstein (2002: 345) points out, the 'conception of LF is analogous (*not* identical) to earlier conceptions of logical form (or logical syntax) [. . .] found in the work of philosophers like Frege, Russell, Carnap, and Strawson'. Kratzer (1996: 110) cites Parsons (1993) (see Parsons (1995: 650)) saying that the theory in Parsons (1990) is a 'proposal for the logical forms of sentences, unsupplemented by an account of how those forms originate by combining sentence parts'. One can for example argue that there is ordered argument association in the syntax and in conceptual structure, or one can argue that there is ordered argument association in the syntax but separation in conceptual structure. Yet another option is to argue that there is separation both in the syntax and conceptual structure. These three options are illustrated in (6) in the order in which they were just described.

(6) a. stab: λx.λy.λe. stab(e, y, x)
b. stab: λx.λy.λe. stab(e) & Agent(e, y) & Theme(e,x)
c. stab: λe. stab(e)

In the literature one finds the label Neodavidsonianism applied to both (6b) and (6c). Parsons (1990) and Ramchand (2008) are representatives of (6b) whereas Schein (1993), Borer (2005a,b), Bowers (2010) and Lohndal (2014) are representatives of (6c). Kratzer (1996) and Pylkkänen

[1] Since Gruber (1965) and Jackendoff (1972), there has been a lot of discussion of what the appropriate thematic roles are. See Dowty (1991) for arguments that we can only define prototypical roles, though Schein (2002) argues against this. See also Zubizarreta (1987) and Ramchand (1998) for discussion.

[2] The star in 'V*e' marks that this is the metalanguage translation.

[3] Parsons (1990: 96-99) does present an argument for why decomposition is required. Schein (1993: 94) provides further support for this argument, and Bayer (1996: 206) provides counterarguments. See also Bartsch (1976), Carlson (1984), Higginbotham (1985, 1986), Taylor (1985) and Krifka (1989, 1992).

[4] There is a rich and important literature in lexical semantics that does not assume that arguments are severed. I cannot discuss this literature here, but see Jackendoff (1990), Levin and Rappaport Hovav (1995, 2005), Reinhart (2002), Reinhart and Siloni (2005), Horvath and Siloni (2011), Everaert et al. (2012).

(2008) argue for the in-between alternative where the Agent is separated but not the Theme, as discussed in section 2.[5]

The goal of this chapter is to discuss Neodavidsonianism in semantics and syntax. Section 2 looks at Neodavidsonianism in semantics by focusing on the evidence for conjoining thematic predicates. Particular attention will be devoted to the arguments in Schein (1993) and Kratzer (1996), where it is argued that the Agent is not lexically represented on the verb. Section 3 will consider examples of Neodavidsonian approaches to the syntax-semantics interace. Section 4 concludes the chapter.

2 Neodavidsonianism in Semantics

Davidson's original motivation was semantic in nature: He wanted to capture entailment relations. This is clearly conveyed in the following quote.

> I would like to give an account of the logical or grammatical role of the parts of words of such sentences [simple sentences about actions] that is consistent with the entailment relations between such sentences and with what is known of the role of those same parts or words in other (non-action) sentences. I take this enterprise to be the same as showing how the meanings of action sentences depend on their structure (Davidson 1967: 81).

A lot of work since has also focused on the semantic aspects, viz. the influential Higginbotham (1985) and much other work. In this section, I will focus on some of the most influential and convincing semantic arguments for adopting the Neodavidsonian approach. I will mainly focus on arguments for severing the agent from the verb's lexical representation, but also towards the end present a couple of arguments concerning Themes.[6]

2.1 Severing the Agent from the verb

In this section, I will consider arguments in favor of severing the Agent from the verb's grammatical representation. I first discuss Kratzer's (1996) argument before I turn to Schein's (1993) argument.[7]

2.1.1 Kratzer (1996)

Kratzer (1996) starts out by rephrasing the argument by Marantz (1984) which says that external arguments are not arguments of verbs. Marantz observes that there are many cases where the

[5] Due to space limitations, I will only be focusing on Agents and Themes in this section. See McGinnis (2001), Jeong (2007) Pylkkänen (2008) for much discussion of indirect objects and applicatives. Especially Pylkkänen provides a compositional semantics that fits well with the discussion in section 3.3.

[6] I will not discuss the proposal in Krifka (1989, 1992) for reasons of space as it is quite complex. Essentially, Krifka suggests a theory of how the reference of nominals that bear thematic roles affects the aspectual understanding of the events they participate in. Various patient relations are analyzed in terms of how they map the mereological structure of the object to the mereological structure of the event. See Bayer (1996) and Larson (2013) for more discussion.

[7] This part is a slightly revised version of material that appears in Lohndal (2014).

interpretation of the verb depends on the internal argument. Marantz (1984: 25) gives the following examples from English.

(7) a. throw a baseball
b. throw support behind a candidate
c. throw a boxing match (i.e., take a dive)
d. throw a fit

(8) a. take a book from the shelf
b. take a bus to New York
c. take a nap
d. take an aspirin for a cold
e. take a letter in shorthand

(9) a. kill a cockroach
b. kill a conversation
c. kill an evening watching T.V.
d. kill a bottle (i.e., empty it)
e. kill an audience (i.e., wow them)

One could of course argue that these verbs are homophonous, but that seems like a cop-out and it also seems to miss a generalization that one can make, namely that the verb and its internal argument together determine the relevant interpretation (cf. Marantz (1984: 25)). Furthermore, Marantz (1984: 26): notes that '...the choice of subject for the verbs does not determine the semantic role of their objects'. This is supported by the data in (10)-(11), where the subjects are different but the object could be the same.

(10) a. The policeman threw NP.
b. The boxer threw NP.
c. The social director threw NP.
d. Throw NP!

(11) a. Everyone is always killing NP.
b. The drunk refused to kill NP.
c. Silence can certainly kill NP.
d. Cars kill NP.

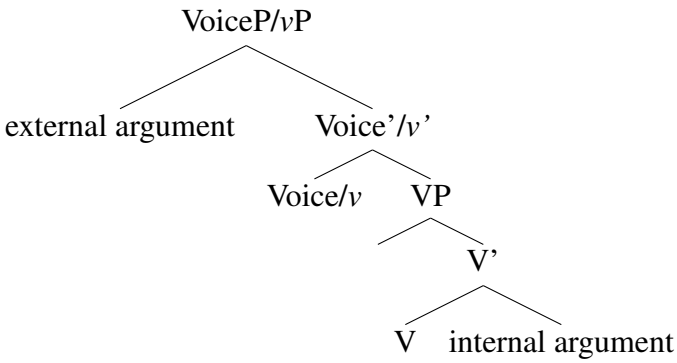
These facts would all follow if external arguments are not true argument of their verbs, Marantz argues. That is, by excluding the subject from the unit consisting of the verb and the object, we can capture this asymmetry between subjects and objects.[8]

Since Kratzer's paper, there has been a lot of work on the syntax of external arguments, see e.g., Hale and Keyser (1993, 2002) Harley (1995), Kratzer (1996), Marantz (1997), Borer (2005a,b), Alexiadou et al. (2006, In press), Folli and Harley (2007), Jeong (2007), Pylkkänen (2008), Ramchand (2008), Schäfer (2008, 2012) and Merchant (2013). There is not necessarily a consensus as to

[8]This may not hold for all languages. Müller (2008: 47-50) and references therein argue that it does not hold for German.

the nature of the projection that introduces the external argument (either Spec*v*P or SpecVoiceP), but a lot of the literature is in agreement that a separate projection introduces the external argument. Thus we typically get the following structure.

(12)



In this structure, the internal argument is illustrated in the complement position of the verb. An additional Applicative projection is typically added for the indirect object, cf. McGinnis (2001), Jeong (2007), Pylkkänen (2008).

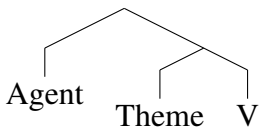
However, Kratzer's argument only goes through if the specification of the verb's meaning only refers to the internal argument, and furthermore, if idiomatic dependencies like these can be captured by defining the meaning of the verb. Kratzer discusses the first premise but not the second. She seems to assume that idiomatic dependencies must be specified over objects in the lexicon, that is, over the verb and its Theme. Marantz (1997) has a different view (see also Harley (2009)), namely that idiomatic dependencies can be defined over outputs of syntax, in which case Kratzer's argument would not go through. This does not entail that the Agent should not be severed, but that we need to investigate the relationship between the verb and the Theme more closely. I will not discuss these issues here, see Marantz (1997) and Lohndal (2014) for discussion.

2.1.2 Schein (1993)

Schein (1993) puts forward arguments showing that we need the Neodavidsonian representation in the semantics, a representation that he refers to as full thematic separation. Schein makes the strong claim that the Agent relation, the Theme relation and the verb relation are independent of each other.

Schein's project is to argue that lexical decomposition, as seen above, is not sufficient, and that separation is required. The way Schein implements this idea is to put a Theme in between the Agent and the verb. as illustrated in (13). If the Agent is not lexically represented on the verb, but rather introduced by structure separate from the verb, the Agent can be the agent of an event that is not that of the verb.

(13)



Schein introduces such a case involving a distributive quantifier as the Theme, e.g., (15) below. Such a Theme may induce a mereological partition relation between the event of Agent and the event of the verb. Importantly, though, in this case no substantive verbal meaning is added. There is not a substantial semantic relation to the event of the verb, as e.g., a causative would contribute,

but simply the mereological relation. In order to make this clearer, let us see how a mereology of events is motivated.

Consider the data in (14), from Schein (1993: 7).[9]

(14) a. Unharmoniously, every organ student sustained a note on the Wurlitzer for sixteen measures.

b. In slow progression, every organ student struck a note on the Wurlitzer.

Schein argues that the reading for (14a) is one where each student is related to a note on the Wurlitzer, that is, for each to have an event of his own, the quantifier must include a quantifier of events within its scope. Note that it is not the individual note that is unharmonious but the ensemble. Each of the students only plays a part in the larger action. There is no other way to get this reading, and the sentence would be false if, for example, one of the students keeps it going for eight measures and then another student does the other eight, as Schein observes. The same argument can be made for (14b). The solitary events performed by the students can only be related to the larger one as parts of the whole. Summarizing, the mereological relation is encoded through a quantifier which includes the condition that *e'* is part of *e* ($e' \leq e$).

Let us return to the need for lexical decomposition. Schein's discussion centers around cases like (15)-(18). I will in what follows concentrate on (15).

(15) Three video games taught every quarterback two new plays.
Intended reading: 'Between the three of them, the video games are responsible for the fact that each quarterback learned two new plays.'

(16) Three agents sold (the) two buildings (each) to exactly two investors.

(17) Three letters of recommendation from influential figures earned the two new graduates (each) two offers.

(18) Three automatic tellers gave (the) two new members (each) exactly two passwords.

One may wonder why Schein adds the third NP *two new plays* in (15). The reason is that this eliminates the possibility that the universal *every quarterback* denotes a group, e.g., *the quarterbacks*. If we were dealing with a group denotation, one could possibly analyze (15) as akin to *The games taught the quarterbacks*. That is, the group of games taught the group of quarterbacks. If that is the case, the particular reading that Schein has identified does not obtain. Therefore, in the example at hand, the universal has to denote a genuine quantifier since it has an indefinite that depends on it. That is, *two new plays* depends on *every quarterback*: for every quarterback there are two new plays that he learned. The claim is that the mereological/part-whole relation among events ($e' \leq e$) connects quantification over quarterbacks and their solitary events to the larger event where three video games are the teachers (Schein 1993: 8). So *every quarterback* and *three video games* are cumulatively related, but *every quarterback* also seems to behave like an ordinary distributive quantifier phrase in its relation to *two new plays*, as Kratzer (2000) makes clear.

Note that in the logical form above, the Agent and the Theme are independent of each other and also of the verb. (Schein 1993: 8, 57) suggests a corresponding logical form for (15), namely (19), where *INFL* means the relation between the event and its agents.[10]

[9] See Ferreira (2005) for more discussion of this issue.

[10] A brief note about Schein's take on plurals, which is important for understanding his logical forms: A plural like

(19) $\exists$e(teach(e)
$\wedge$ [$\exists X$: 3(X) $\wedge$ $\forall x(Xx \rightarrow Gx)$]$\forall x$(INFL($e$, x) $\leftrightarrow$ Xx)
$\wedge$ [every y: Qy] [$\exists e'$: $e' \leq e$]($\forall z$(TO(e', z) $\leftrightarrow$ $z = y$)
$\wedge$ [$\exists Z$: 2 (Z) $\wedge$ $\forall z(Wz \rightarrow Pz)$]$\forall z$(OF($e'$, z) $\leftrightarrow$ Wz)))[11]

We can spell this out in English as in (20). The lower case e and the use of singularity are just for simplicity. In real life these are second-order quantifiers.[12]

(20) There is an event e, and e is a teaching,
and a three-membered plurality X comprising only video games, such that for every x, x is an agent of e just if it is among those three in X,
and for every quarterback y, there is a part e' of e, such that the targets of the teaching are all and only the quarterbacks,
and there is a two-membered plurality Z, comprising only plays, such that the content of the teaching e' was all and only the plays of Z.

We see that the part-whole relation among events ($e' \leq e$) connects quantification over quarterbacks and their solitary events to the larger event where three video games are the teachers (Schein 1993: 8). Notice that in the logical form above, the Agent and the Theme are scopally independent of each other and also of the verb. Here is what Schein says about the interpretation of (19).

(21) It is [...] essential to the meaning of [(15)] that the θ-role bound into by the subject not occur within the scope of other quantifiers, as in [(19)], and that the action of the three video games be related mereologically to what happened to the individual quarterbacks (Schein 1993: 57).

Schein devotes a lot of time to showing that if *teach* is a polyadic predicate, we do not get the correct logical forms. That is, in (22), either the universal will be inside the scope of the plural, or the reverse, and all thematic relations will be within the scope of the quantifiers.[13]

(22) [$\exists X$: 3(X) $\wedge$ $\forall x(Xx \rightarrow Gx)$] [every y: Qy] [$\exists Z$: 2(Z) $\wedge$ $\forall z(Zz \rightarrow Pz)$]
$\exists e$ teach(X, y, Z, e) (Schein 1993: 57)

As Schein points out, the problem for such polyadic logical forms is to find a meaning that relate individual objects to plural objects. From the point of view of entries such as (22), the difference between (15) and (23a) is only a matter of scope. The logical form is given in (23b).

(23) a. Every quarterback was taught two new plays by three video games.
b. [every y: Qy] [$\exists Z$: 2(Z) $\wedge$ $\forall z(Zz \rightarrow Pz)$] [$\exists X$: 3($X$) $\wedge$ $\forall x(Xx \rightarrow Gx)$]
$\exists e$ teach(X, y, Z, e) (Schein 1993: 58)

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the As is a second-order description of a predicate: a predicate such that if it holds of x, x is an A. This means that *the cats* comes out as a definite second-order description:

(i) $\iota Y(\exists yYy \wedge \forall y(Yy \leftrightarrow cat(y))$

[11] Brasoveanu (2010) and Champollion (2010) argue that event variables are not required in this particular logical form involving the quantifier *every*. See their papers for further details.

[12] Schein (1993) observes that this formulation is actually not strong enough. See his book for more discussion.

[13] Though see McKay (2006) for a different view.

But the meaning of (15) is crucially different in ways that scope does not reflect. In (23a), all the NPs related to plural objects occur in the scope of the quantifier over individual objects. This is different in (15) since one of these NPs has escaped, as Schein puts it. I will not go through all the other illustrations Schein provides of why polyadic predicates fail to give the correct meanings and instead I refer the reader to chapter 4 of his book for comprehensive discussion.

Kratzer (2000) shows that it is technically possible to get around Schein's (1993) argument for severing the Agent. Here I will outline her argument and emphasize, as she does, what one has to buy in order to escape Schein's arguments. Kratzer uses the sentence in (24a) and the goal is to derive the logical representation in (24b).[14] This logical form is simplified compared to the logical form Schein has, but the simplification does not matter for present purposes.

(24) a. **Three copy editors caught every mistake (in the manuscript)**
b. $\exists e \exists x$[3 copy editors(x) $\wedge$ agent(x)(e) $\wedge \forall y$[mistake(y) $\rightarrow \exists e'$[e' $\leq$ e $\wedge$ catch(y)(e')]]]

Kratzer makes the following assumptions:

(25) a. Denotations are assigned to bracketed strings of lexical items in a type-driven fashion (Klein and Sag 1985)
b. For any string α, T(α) is the denotation of α
c. Types: e (individuals), s (events or states; eventualities as in Bach (1981)), and t (truth-values)
d. Composition Principles: Functional Application and Existential Closure (for this example)

With these assumptions in hand, she provides the following derivation:

(26) a. T(**every mistake**) = $\lambda R_{<e<st>>} \lambda e \forall y$ [mistake(y) $\rightarrow \exists e'$[e' $\leq$ e $\wedge$ R(y)(e')]]
b. T(**catch**) = $\lambda Q_{<<e<st>><st>>} \lambda x \lambda e$ [agent(x)(e) $\wedge$ Q(catch$_{<e<st>>}$(e))
c. T(**catch** (**every mistake**)) =
$\lambda x \lambda e$ [agent(x)(e) $\wedge$ T(**every mistake**) (catch)(e)] =
$\lambda x \lambda e$ [agent(x)(e) $\wedge \forall y$ [mistake(y) $\rightarrow \exists e'$[e' $\leq$ e $\wedge$ catch(y)(e')]]]
From (a), (b), by Functional Application.
d. T(**3 copy editors**) = $\lambda R_{<e<st>>} \lambda e \exists x$[3 copy editors(x) $\wedge$ R(x)(e)]
e. T(**3 copy editors** (**catch** (**every mistake**))) =
T(**3 copy editors**)($\lambda x \lambda e$ [agent(x)(e) $\wedge \forall y$ [mistake(y) $\rightarrow \exists e'$[e' $\leq$ e $\wedge$ catch(y)(e')]]]) =
$\lambda e \exists x$[3 copy editors(x) $\wedge$ agent(x)(e) $\wedge \forall y$ [mistake(y) $\rightarrow \exists e'$[e' $\leq$ e $\wedge$ catch(y)(e')]]]
From (c), (d), by Functional Application.
f. $\exists e \exists x$[3 copy editors(x) $\wedge$ agent(x)(e) $\wedge \forall y$[mistake(y) $\rightarrow \exists e'$[e' $\leq$ e $\wedge$ catch(y)(e')]]]
From (e), by Existential Closure.

This derivation gets us the intended reading, without severing the Agent. Step (b) shows that all the arguments of **catch** are part of the lexical entry. Kratzer argues that there is a price to pay if we do this: 1) A complicated semantic type for the direct object position of **catch** is needed,

[14] I am following Kratzer in using boldface to distinguish the object language from the metalanguage. Boldface denotes the object language here.

and 2) it's necessary to posit different argument structure for **catch** and 'catch', that is, the object language word and the metalanguage word would have different denotations. Many semanticists, including Kratzer, argue that this is not a price we should be willing to pay, and she goes on to show that severing the Agent makes it possible to do without these two assumptions. Furthermore, a derivation of the sort that we have just seen does not preserve the intuition (as expressed by, for example, Levin and Rappaport Hovav (1995)) that there is an 'underlying' matching of semantic structure to argument structure.

In the semantics literature, there is no agreement on whether or not to sever the agent from the verbs. In the next subsection, I discuss whether Themes should be severed or not.

2.2 Severing the Theme from the verb

In order for the semantics to be fully Neodavidsonian in the domain of thematic arguments, Themes (or Patients) have to be severed from the lexical representation of the verb.[15] Here I will consider a couple of arguments in favor of severing the Theme (both are discussed in Lohndal (2014)).

The first argument concerns the semantic interpretation of reciprocals (Schein 2003). Consider the sentence in (27).

(27) The cockroaches suffocated each other.

The sentence in (27) could be true 'even where only the entire group sits at the cusp of catastrophe' (Schein 2003: 349). Put differently, had there been only one less cockroach, all cockroaches would have survived. Schein (2003: 350) observes that none of the following paraphrases accurately captures this reading.

(28) a. The cockroaches each suffocated the others.
b. The cockroaches each suffocated some of the others.
c. The cockroaches suffocated, each suffocating the others.
d. The cockroaches suffocated, each suffocating some of the others.

The problem is that all the paraphrases assign *each* a scope that includes the verb. The main point here is that each cockroach is in a thematic relation to some event E that contributed to the mass suffocation. But E is not itself a suffocation of one cockroach by another. Schein concludes that the scope of *each* includes the thematic relation, but not the event predicate *suffocate*. He gives the logical form in (29a), which has the paraphrase in (29b) (Schein 2003: 350).

(29) a. $\exists$e[the X : cockroaches[X]](Agent[e, X] & suffocate[e] & Theme[e, X] &
[ιX : Agent[e, X]][Each x : Xx] [$\iota e'$: Overlaps[e', e] & Agent[e', x]]
[$\exists e''$: t(e'') $\leq$ t(e')] [ιY : Others[x, Y] & Agent[e'', Y]] Theme[e', Y])
b. 'The cockroaches suffocate themselves,
(with) them each acting
against the others that acted.'

Had there been only one less cockroach, they would all have made it. So each does something to some of the others that contributes to their mass suffocation, but that contribution is not a suffocation, as all the paraphrases in (28a)-(28d) would suggest.

[15] I will use the label Theme as a cover-term for the internal argument, cf. Dowty (1991)'s proto thematic roles.

Some readers may object that there are many independent issues that need to be dealt with concerning reciprocity before the above argument can be accepted. Here I will not discuss reciprocity in detail, but refer the reader to Dotlačil (2010) and LaTerza (2014) for further arguments that reciprocity requires a Neo-Davidsonian semantics where no arguments are part of the verb's denotation. In particular, LaTerza develops a Neo-Davidsonian view of distributivity first discussed by Taylor (1985) and Schein (1993) and uses this to account for why reciprocal sentences can be true in a constrained variety of different types of situations, and reciprocal's ability to appear in a wide range of argument positions.

The second argument concerns the argument/adjunct distinction (Lohndal 2014). If the Theme is part of the lexical representation of the verb, that means that the obligatoriness of a Theme indicates 'V(e,x)' rather than 'V(e) & Theme(e,x). Put differently, the Theme is obligatory.' Consider the following data.

(30) a. *Barry stepped.
b. *Barry stepped the path into the garden.
c. Barry stepped into the garden.

These examples show that the verb *step* requires an obligatory PP. However, if that is indicative of the adicity of this verb, *into the garden* does not have a consistent Davidsonian semantics despite being a poster child for such a semantics, since it would have to be part of the verb's denotation. That is, according to Davidsonian and Neodavidsonian approaches, PPs are always adjuncts. If we want to maintain the (Neo)Davidsonian semantics for *into the garden*, the above examples do not indicate that the Theme predicate is obligatory. Something else needs to account for this apparent obligatoriness of the PP associated with the verb *step*.

There are also cases of disjunctive obligatoriness. This is illustrated in the following examples.

(31) a. *Mary passed.
b. *Mary crossed.

(32) a. Mary passed the garden.
b. Mary crossed the garden.

(33) a. Mary passed into the garden.
b. Mary crossed into the garden.

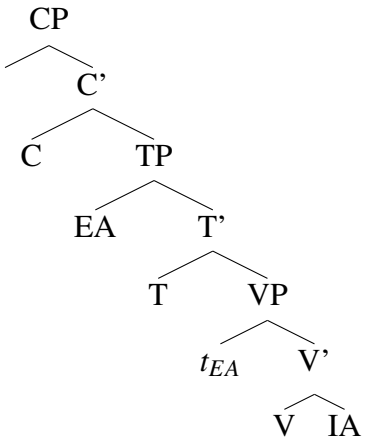
The argument just made applies to these sentences as well. The verbs *pass* and *cross* can either take a nominal complement or a PP adjunct. Neodavidsonians cannot conclude anything about obligatoriness based on such data since PPs are supposed to be optional and DPs obligatory. Therefore the badness of (31) has to be due to something else. See Lohndal (2014) for a proposal where the badness of such data is associated with conceptual structure.

3 Neodavidsonianism at the Syntax-Semantics Interface

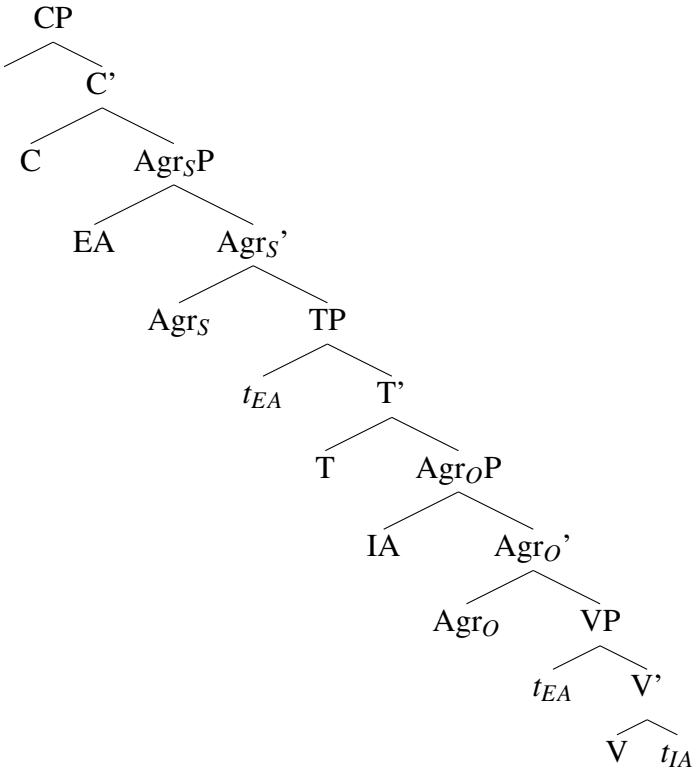
In the previous section, I presented arguments in favor of Neodavidsonianism that are primarily semantic in nature. Independently of work on the semantics of argument structure, some work in syntax started to argue for the claim that arguments occupy separate functional projections. This move was taken part-way in Chomsky (1993) where it was argued that all arguments move

into a functional projection (see also Koopman and Sportiche (1991) on subjects). Instead of the traditional syntax in (34a), it was argued that the correct structural representation looks like in (34b). EA and IA denote external and internal argument, respectively.

(34) a.



b.



In (34a), the external argument originates internally to the VP and moves to the canonical subject position, SpecTP (cf. McCloskey (1997)). This movement has been generalized in (34b), where both the subject and the object move into dedicated abstract agreement positions. Later, (34b) was replaced by a little v projection introducing the external argument (Chomsky 1995). There was no dedicated projection for the direct object; it was usually analyzed as V's sister.

The extension in Chomsky (1993) is only partial since theta-role relations are determined within the VP. That is, at the point where argument structure is determined, there is no Neodavidsonian structure (all arguments are within the VP). A full-blown Neodavidsonian syntax was first proposed in Borer (1994) and since argued for in great detail in Borer (2005a,b) (see also Lin

(2001)). Ramchand (2008: 42) uses the term 'post-Davidsonian' to 'describe a syntacticized neo-Davidsonian view whereby verbal heads in the decomposition are eventuality descriptions with a single open position for a predicational subject'. Although I see the merit of using a separate term for proposals where the logical forms are accompanied by a specific hierachical syntax, I will continue to use the term Neodavidsonian in this chapter.

In this section, I will look at a family of Neodavidsonian approaches to the syntax-semantics interface. I will start by looking at Borer, then Ramchand (2008) before I consider Pylkkänen (2008) and Bowers (2010). Lastly I will consider the proposal in Lohndal (2014). Common to all these approaches is that they rely on a certain syntactic hierarchy. They do not say much about what determines the order of this hierarchy. Presumably the order is universal (cf. Cinque (1999)), raising several issues that I won't be able to discuss here.

3.1 The exoskeletal view

Borer (2005a,b) develops a constructional approach to the syntax-semantics interface.[16] For her, there is no projection of argument properties from lexical items. Rather, lexical items are inserted into what she calls syntactic templates. These templates are independent of specific requirements on lexical items. Thus there is no specification of argument structure properties in lexical items. Borer makes a redundancy argument, namely that there is no reason for a property to be both lexically specified and syntactically represented, as is the case in approaches that rely on theta roles and the Theta Criterion (Chomsky 1981). Borer argues that lexical flexibility is so pervasive that argument structure should not be lexically specified.[17] She discusses an illuminating case from Clark and Clark (1979), which involves the verb *to siren*.

(35) a. The factory horns sirened throughout the raid.
b. The factory horns sirened midday and everyone broke for lunch.
c. The police car sirened the Porsche to a stop.
d. The police car sirened up to the accident site.
e. The police car sirened the daylight out of me.

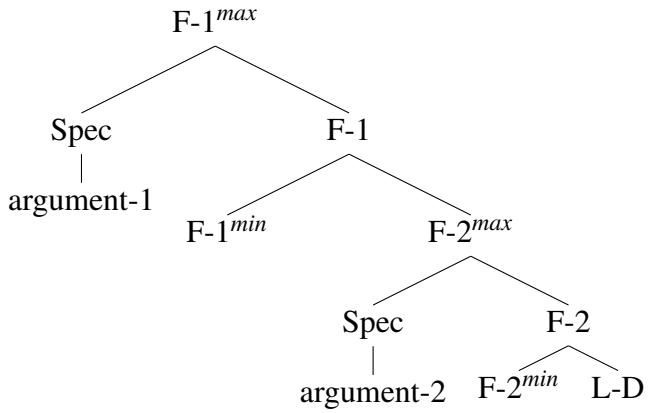
Even if native speakers of English have never heard *siren* used as a verb, they can easily interpret these sentences. The examples show that the new verb can appear with several subcategorization frames where the core meaning seems to be maintained (to produce a siren sound), though the specific meanings are augmented according to the syntactic environment. This strongly suggests that the meaning of *siren* cannot just come from the verb itself, but that it depends on the syntactic construction. In this sense, Borer follows many other scholars and approaches in arguing that semantically synonymous expressions cannot correspond to identical syntactic structures. She argues that there is a 'making sense' component which relies on the encyclopedic meaning of lexical items and the structure in which they occur.

The general structure of the argument domain of a clause looks as follows (Borer 2005a: 30).

[16] The exposition of Borer's theory is a revised version of the text in Lohndal (2014).

[17] See e.g., Potts (2008) for a critical discussion.

(36)



The bottom part is the lexical domain (L-D), which emerges from the merger of some listeme from the conceptual array (Borer 2005a: 27). A listeme 'is a unit of the conceptual system, however organized and conceived, and its meaning, part of an intricate web of layers, never directly interfaces with the computational system' (Borer 2005a: 11). Listemes are what Distributed Morphology calls roots (Borer 2005a: 20). Put differently, listemes do not have information that is accessible to the syntactic derivation. Listemes have great flexibility whereas functional vocabulary does not have the same flexibility. This gives the following dichotomy (Borer 2005a: 21):

(37) a. All aspects of the computation emerge from properties of structure, rather than properties of (substantive) listemes.

b. The burden of the computation is shouldered by the properties of functional items, where by functional items here we refer both to functional vocabulary, including, in effect, all grammatical formatives and affixation, as well as to functional structure.

Note that the traditional distinction between 'external' and 'internal' arguments (Williams 1981) makes little sense in a system where arguments are severed from the verb and merged in dedicated functional projections. For that reason, among others, Borer uses different labels for subjects and different types of objects.

An example of Borer's system can be given based on the following examples.

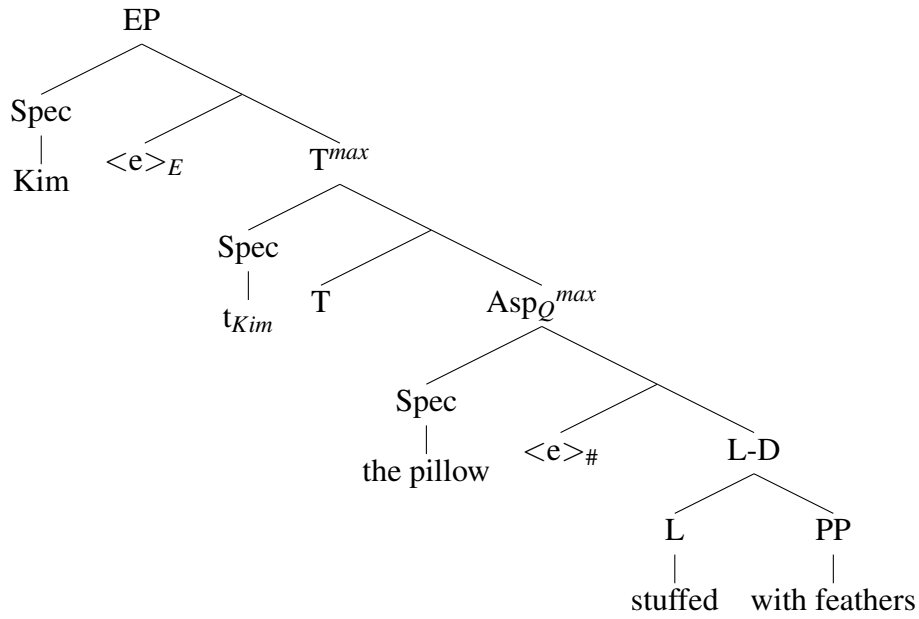
(38) a. Kim stuffed the pillow with the feathers (in two hours).

b. Kim stuffed the feathers into the pillow (in two hours).

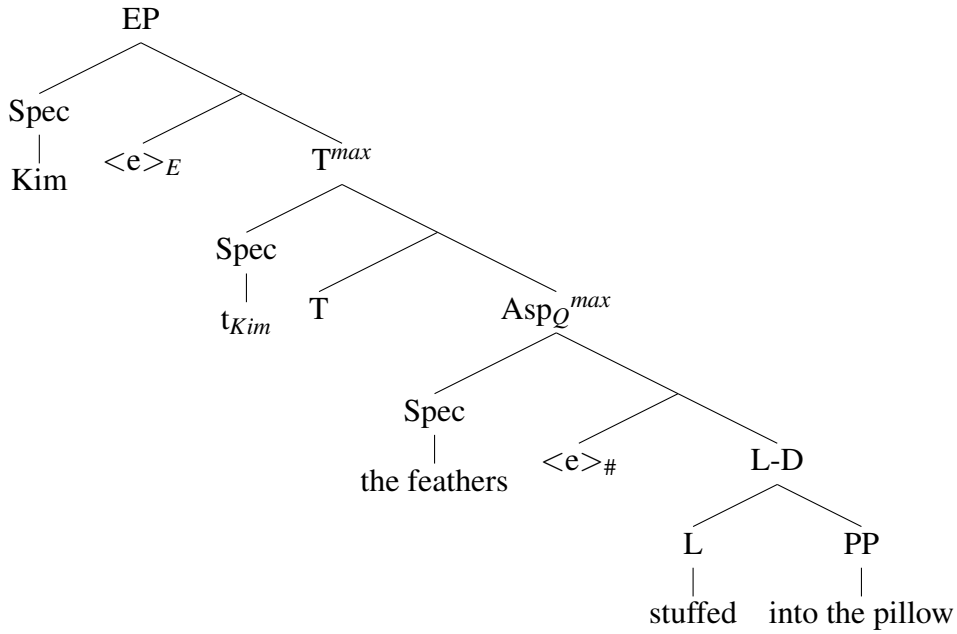
(38a) means that the pillow was entirely stuffed, but there may still be feathers left. (38b) has the other interpretation, namely that all the feathers are in the pillow, but the pillow might not be entirely stuffed. Borer (2005b) assigns two different syntactic structures to these sentences. They are provided in (39a) and (39b).[18]

[18] $<e>_E$ means that there is an open value in need of a range assignment from the specifier of Asp, and $<e>_\#$ means that there is an open value for events in need of a range assignment in order to establish a mapping from predicates to events (see Borer (2005b) for much more discussion of this system). In Asp_Q, Q stands for quantity, cf. Verkuyl (1972, 1989, 1993).

(39) a.



b.



The location in (39a) is the subject-of-quantity and sits in the specifier of Asp. The agent is the subject of an event phrase EP which also hosts the event variable. The PP, which is the understood subject matter, is merged with the L-head. In (39b), the subject matter is the subject-of-quantity, and structured change is measured with respect to the subject matter (Borer 2005b: 93). As the structures show, the specifier of the Asp phrase is what is measured out, cf. Tenny (1987, 1994). (Borer 2005b: 94) provides the following Neo-Davidsonian logical forms for the sentences in (38).

(40) a. ∃e[quantity(e) & originator(Kim, e) & subject-of-quantity(the pillow, e) & WITH(the feathers, e) & stuff(e)]

b. ∃e[quantity(e) & originator(Kim, e) & subject-of-quantity(the feathers, e) & INTO(the pillow, e) & stuff(e)]

In this way, the meaning of *stuff* remains the same even though the syntactic structures are different.

The mapping between syntax and semantics in Borer's theory is not very explicit. That it, it is unclear how the system moves from the syntactic structure to the semantic interpretation of that structure. It is clear that various annotations in the syntactic structure has an impact on the meaning, but beyond that, Borer does not say much about the interface itself.

3.2 A first phase syntax

Ramchand (2008) argues that syntax is crucial in determining many aspects of argument structure. She adopts a constructionist approach, in which structure is more important than lexical aspects when it comes to determining meaning, but she argues that verbs (actually roots) contain some information about syntactic selection. For approaches that assume that the lexicon contains roots, Ramchand (p. 11) presents the following two views:

(41) *The naked roots view*
The root contains no syntactically relevant information, not even category features (cf. Marantz (1997, 2005), Borer (2005a,b)).

(42) *The well-dressed roots view*
The root may contain some syntactic information, ranging from category information to syntactic selectional information and degrees of argument-structure information, depending on the particular theory. This information is mapped in a systematic way onto the syntactic representation which directly encodes it.[19] (Ramchand 2008: 11).

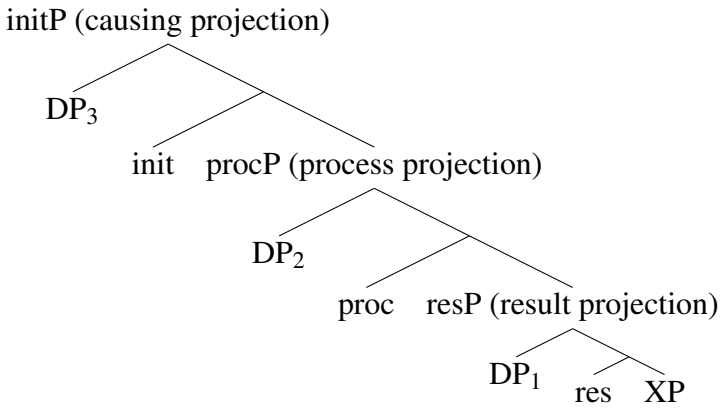
Ramchand opts for a theory that is closer to the well-dressed roots view, since she wants to '[...] encode some notion of selectional information that constrains the way lexical item can be associated with syntactic structure' (Ramchand 2008: 3). The main reason for this is to account for the lack of flexibility in cases like (43).

(43) a. *John slept the baby.
b. *John watched Mary bored/to boredom.

However, the main part of Ramchand's proposal is that the syntactic projection of arguments is based on event structure (cf. Borer (2005a,b), Ritter and Rosen (1998), Travis (2000)) and that the syntactic structure has a specific semantic interpretation. She proposes the syntactic structure in (44).

[19] Ramchand points out that this view is virtually indistinguishable from what she calls 'the static lexicon view', which is the view that the lexicon contains argument-structure information that correlates in a systematic way with syntactic structure. See Baker (1988) for such a view.

(44)



These projections have the following definitions:

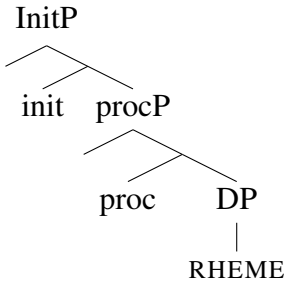
(45) a. **initP** introduces the causation event and licenses the external argument ('subject' of cause = INITIATOR)

b. **procP** specifies the nature of the change or process and licenses the entity undergoing change or process ('subject' of process = UNDERGOER)

c. **resP** gives the 'telos' or 'result state' of the event and licenses the entity that comes to hold the result state ('subject' of result = RESULTEE)

For Ramchand, many arguments are specifiers of dedicated functional projections. These arguments specify the subevental decompositions of events that are dynamic. There is one exception, though, namely that rhemes are complements instead of specifiers. That is, they have the following syntactic structure (Ramchand 2008: 46).

(46)



Rhemes, or 'Rhematic Objects', are objects of stative verbs and they are not subjects of any subevents, hence not specifiers. Examples of Rhemes are provided in (47) (Ramchand 2008: 33-34).

(47) a. Kathrine fears nightmares.

b. Alex weighs thirty pounds.

c. Ariel is naughty.

d. Ariel looks happy.

e. The cat is on the mat.

Thus, arguments can be complements or specifiers, depending on their role in event structure.

In terms of interpretation, Ramchand assumes one primitive role of event composition.

(48) Event Composition Rule
e = e1 $\rightarrow$ e2: e consists of two subevents, e1, e2, such that e1 causally implicated e2
(cf. Hale and Keyser 1993)

Two general primitive predicates over events correspond to the basic subevent types in the following way:

(49) a. State(e): e is a state
b. Process(e): e is an eventuality that contains internal change

The syntactic structure will determine the specific interpretation. In the *init* position, the state introduced by the *init* head is interpreted as causally implicating the process. On the other hand, in the *res* position, the state introduced by that head is interpreted as being causally implicated by the process (Ramchand 2008: 44). Ramchand defines two derived predicates over veents based on the event composition rules.

(50) IF, $\exists$ e_1, e_2[State(e_1) & Process(e_2) & $e_1 \rightarrow e_2$], then by definition Initiation(e_1)

(51) IF, $\exists$ e_1, e_2[State(e_1) & Process(e_2) & $e_2 \rightarrow e_1$], then by definition Result(e_1)

The specifiers in each predication relation are interpreted according to the primitive roles.

(52) a. Subject (x, e) and Initiation(e) entails that x is the INITATIOR of e.
b. Subject (x, e) and Process(e) entails that x is the UNDERGOER of e
c. Subject (x, e) and Result(e) entails that x is the RESULTEE of e

The three important heads in the structure have the following denotations (taken from Ramchand (2011: 458)).

(53) $[\![res]\!]$ = λPλxλe[P(e) & State(e) & Subject (x, e)]

(54) $[\![proc]\!]$ = λPλxλe$\exists$$e_1$, e_2[P(e_2) & Process(e_1) & e = ($e_1 \rightarrow e_2$) & Subject (x, e_1)]

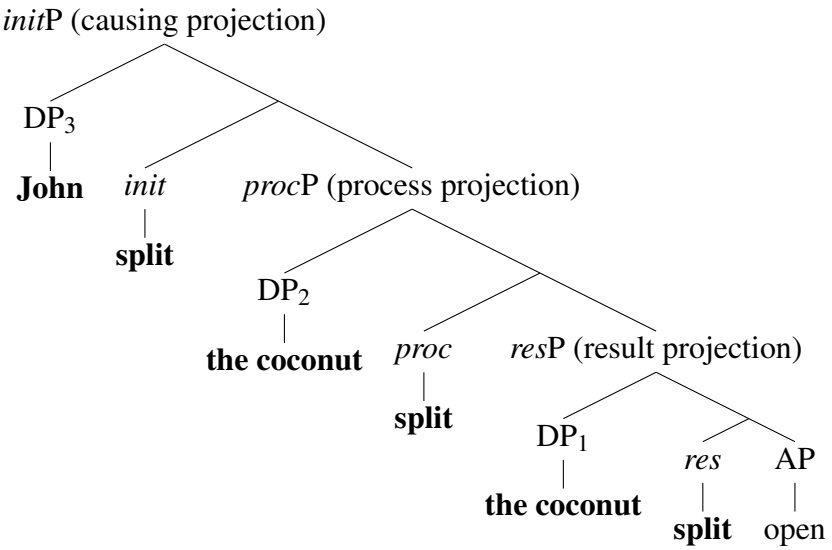
(55) $[\![init]\!]$ = λPλxλe$\exists$$e_1$, e_2[P(e_2) & State(e_1) & e = ($e_1 \rightarrow e_2$) & Subject (x, e_1)]

Importantly, these skeletal interpretations have to be filled by encyclopedic content, but they already contain important aspects of meaning simply by virtue of their structure.

Ramchand (2011) asks whether it is possible to make her proposal more austere in the sense of only making use of conjunction (cf. Pietroski (2005, 2011)). One consequence of this is that the event composition rule would have to be replaced by specific relations such as RESULT and CAUSE. The following tree structure and semantics illustrate what this would look like (Ramchand 2011: 460).

(56) a. John split the coconut open.

b.



c. $[\![resP]\!] = \lambda e \exists e_1$[Result-Part(e, e_1) & open(e_1) & split(e_1) & State(e_1) & Subject(e_1, 'the coconut')]
$[\![procP]\!] = \lambda e \exists e_2$[Proc-Part(e, e_2) & splitting(e_2) & Dyn(e_2) & Subject(e_2, 'the coconut')]
$[\![initP]\!] = \lambda e \exists e_3$[Cause(e, e_3) & splitting(e_3) & Subject (e_3, 'John')]

In the logical form, specific cognitive concepts are employed instead of the general 'leads to' relation. Ramchand argues that it may be that the latter is a more general semantic notion that can be utilized for embedding more broadly. If so, the benefit of reducing the event composition rule to conjunction and an arbitrary set of relational concepts is 'somewhat less pressing', as Ramchand (2011: 460) argues. She is also skeptical of reducing the predication relation (specifiers) and the event identification (complements) to instances of conjunction; see her paper for arguments.

Ramchand's system constitutes the first phase of the sentence, namely the argument domain. Her logical forms are clearly Neodavidsonian and she pairs them with a hierarhical syntax where generally each argument is introduced in a separate projection. The theory places great emphasis on the importance of structure instead of the nature of each lexical item that enters the structure. This is similar to the approach in Borer (2005a,b), even though Borer goes further in arguing that verbs (roots) have absolutely no information about their argument structure. As we have seen above, Ramchand maintains that some syntactic constraints on argument structure are necessary.

3.3 Introducing argument relations

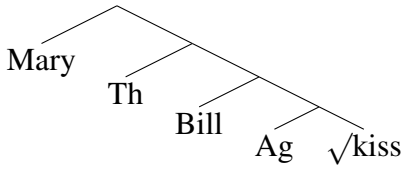
Pylkkänen (2008) and Bowers (2010) both make use of Neodavidsonian logical forms, which they combine with a syntax where each argument is introduced in a separate projection. Pylkkänen mainly relies on the approach in Kratzer (1996), which she extends to applicatives and causatives (see also Jeong (2007)). Here I will focus on the system in Bowers (2010) because I think that clearly demonstrates an alternative to the approaches in this section, and an alternative that many semanticists will find appealing. I will rely exclusively on the compositional semantics that Bowers provides in Appendix A on pages 197-200.

Bowers uses the sentence in (57) as his example.

(57) Bill kisses Mary.

The book itself is among others also devoted to defending a particular syntax, where the root is at the bottom of the structure and the Agent is merged after the root. The Theme is merged on top of the Agent. All arguments are specifiers of dedicated projections.

(58)



I will not discuss Bowers' arguments in favor of the particular syntactic structure. His semantic composition system is mainly based on Functional Application.

(59) *Functional Application:*
If α is a branching node and $\{\beta, \gamma\}$ is the set of α's daughters, then, for any assignment a, if $[\![\beta]\!]^a$ is a function whose domain contains $[\![\gamma]\!]^a$, then $[\![\alpha]\!]^a = [\![\beta]\!]^a([\![\gamma]\!]^a)$ (Heim and Kratzer 1998).

The relevant denotations are provided in (60), where some of the notation has been slightly altered to fit the notation in the rest of the chapter.

(60) a. $[\![kiss]\!] = \lambda e[\text{kiss}(e)]$
b. $[\![Ag]\!] = \lambda P \lambda y \lambda e[P(e) \,\&\, \text{Agent}(e,y)]$
c. $[\![Th]\!] = \lambda P \lambda x \lambda e[P(e) \,\&\, \text{Theme}(e,x)]$

Based on this, Bowers outlines the derivation in (61).

(61) a. $[\![Ag]\!]([\![kiss]\!]) = \lambda P \lambda y \lambda e[P(e) \,\&\, \text{Agent}(e,y)](\lambda e[\text{kiss}(e)])$
$= \lambda y \lambda e[\lambda e[\text{kiss}(e)](e) \,\&\, \text{Agent}(e,y)] = \lambda y \lambda e[\text{kiss}(e) \,\&\, \text{Agent}(e,y)]$
b. $([\![Ag]\!])([\![kiss]\!]))(\text{Bill}) = \lambda y \lambda e[\text{kiss}(e) \,\&\, \text{Agent}(e,y)](\text{Bill}) = \lambda e[\text{kiss}(e) \,\&\, \text{Agent}(e,\text{Bill})]$
c. $[\![Th]\!](([\![Ag]\!]([\![kiss]\!]))(\text{Bill})) = \lambda P \lambda x \lambda e[P(e) \,\&\, \text{Theme}(e,x)](\lambda e[\text{kiss}(e) \,\&\, \text{Agent}(e,\text{Bill})])$
$= \lambda x \lambda e[\lambda e[\text{kiss}(e) \,\&\, \text{Agent}(e,\text{Bill})](e) \,\&\, \text{Theme}(e,x)]$
$= \lambda x \lambda e[\text{kiss}(e) \,\&\, \text{Agent}(e,\text{Bill}) \,\&\, \text{Theme}(e,x)]$
d. $([\![Th]\!](([\![Ag]\!]([\![kiss]\!]))(\text{Bill})))(\text{Mary}) = \lambda x \lambda e[\text{kiss}(e) \,\&\, \text{Agent}(e,\text{Bill}) \,\&\, \text{Theme}(e,x)](\text{Mary})$
$= \lambda e[\text{kiss}(e) \,\&\, \text{Agent}(e,\text{Bill}) \,\&\, \text{Theme}(e,\text{Mary})]$

The only thing that remains to be done is to close the event variable off with an existential quantifier. Bowers argues that the category Pr does this, which is merged on top of the structure in (58) (Bowers 2010: 19). The denotation of Pr is give in (62). This is very similar to a run-of-the-mill existential closure assumed by many scholars, perhaps starting with Parsons (1990).

(62) $[\![Pr]\!] = \lambda P[\exists e P(e)]$

Applying this denotation to the denotation of ThP yields:

(63) $[\![Pr]\!]([\![ThP]\!]) = \lambda P[\exists e P(e)](\lambda e[\text{kiss}(e) \,\&\, \text{Agent}(e,\text{Bill}) \,\&\, \text{Theme}(e,\text{Mary})])$
$= \exists e[\lambda e[\text{kiss}(e) \,\&\, \text{Agent}(e,\text{Bill}) \,\&\, \text{Theme}(e,\text{Mary})](e)]$
$= \exists e[\text{kiss}(e) \,\&\, \text{Agent}(e,\text{Bill}) \,\&\, \text{Theme}(e,\text{Mary})]$

And this is the final logical form.

This way of using Functional Application together with λ-conversion can be applied to any syntactic structure where each argument is introduced by a separate projection. Thus one is not

committed to Bower's view on the order of the thematic arguments if one wants to use his compositional semantics. Note also that Functional Application can be utilized even though the verb is fully Neodavidsonian in the sense that there is separation both in the syntax and in the semantics.

3.4 Syntactic and semantic domains

In the previous subsection, we saw a Neodavidsonian view whereby Functional Application was used to derive the semantic representations by using a syntax where each argument is introduced in a separate projection. The approach in Lohndal (2014) attempts to make use of a different semantic composition operation, namely conjunction (see Pietroski (2005, 2011) and also Carlson (1984)). In essence, the approach attempts to combine a Neodavidsonian syntax with a conjunctive Neodavidsonian semantics.

Lohndal's core idea is that each application of Spell-Out corresponds to a conjunct in a logical form. Correspondingly, if we want full thematic separation in the logical forms, we need each argument and the predicate to be spelled out separately. Lohndal puts forward a view of syntax that achieves this, together with a specific model of the syntax-semantics interface.

The syntax does not make a categorical distinction between specifiers and complements, cf. Hoekstra (1991), Jayaseelan (2008), Chomsky (2010). The main syntactic relation, modulo adjuncts, is that of a merged head and a non-head, and whether that is called a head-complement relation or a specifier-head relation does not really matter.

The model in Lohndal (2014: chapter 4) requires that the model of Spell-Out in minimalist approaches to syntax be rethought. Lohndal does this by proposing a constraint on the kinds of representations that can be generated. The constraint looks as follows (Lohndal 2014: 92).

(64) *[XP YP].

(64) is a derivational constraint that bans two phrasal elements from being merged. A phrase is understood as a maximal projection, which Chomsky (1995: 242) defines as follows:

(65) A maximal projection is a projection that does not project further

Lohndal takes no position on the specific nature of the constraint in (64) other than that it has to be derivational (pace Moro (2000)); see Speas (1990: 48), Uriagereka (1999), Alexiadou and Anagnostopoulou (2001, 2007), Chomsky (2008, 2013), Richards (2010) and Adger (2013) for much discussion. Whenever the grammar would be confronted with a configuration like (64), the grammar will resolve the conflict by making sure that instead of two phrases merging, a head and a phrase are merged. Spell-Out enables this reduction in a specific way that will be outlined below. A similar logic has been used by Epstein (2009) and Epstein et al. (2012), where Spell-Out fixes an otherwise illicit representation. However there is a difference: For them, you can generate the representations and then Spell-Out can fix it. For Lohndal, you cannot generate the relevant representation at all. This is similar to Adger (2013) who changes the relationship between labeling and structure building, among other reasons to incorporate the constraint in (64).

Lohndal assumes that Agents are introduced by Voice^0, cf. Kratzer (1996), Alexiadou et al. (2006, In press). Lohndal emphasizes that the nature of the label does not matter much; see Chomsky (1995), Harley (1995), Folli and Harley (2007), Pylkkänen (2008), Ramchand (2008) and Sailor and Ahn (2010) for discussion.

Themes are also introduced by functional heads. Lohndal simply labels the relevant head F^0, for lack of a better name, though it is quite likely that this head is more aspectual in nature, cf. Tenny (1994), Borer (2005a,b).

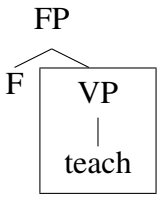
The verb is generally merged prior to all functional projections as argued by Borer (2005a,b) and Bowers (2010). This has to be the case in order to make sure that the verb is spelled out in a separate conjunct.[20]

Lohndal argues that the most transparent syntax-semantics mapping is one in which an application of Spell-Out corresponds to a conjunct at logical form. In order to see how a typical derivation would run, let us consider the following sentence.

(66) Three video games taught every quarterback.

Below are the three steps of the derivation. The arrows signal what the logical translation of the boxed syntactic structure (Spell-Out domains) is, assuming the approach in Schein (1993).

(67) a.

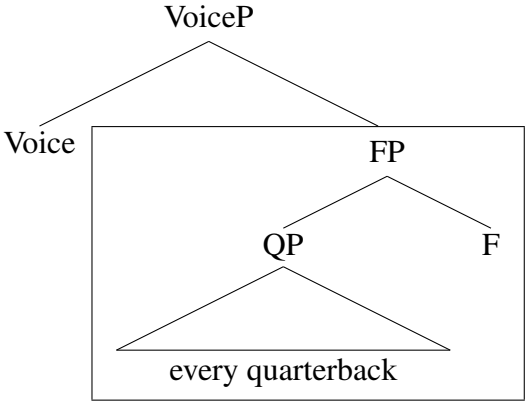


b. $\Longrightarrow$ teach(e)

This is the first step of the derivation. The verb somehow becomes a phrase and merges with the F head.[21]

The next step is to merge the Theme *every quarterback* with the FP. When the Theme is to be merged into the structure, the complement of the F head has to be spelled out due to the constraint (64). This complement is the VP and it is in a box in the syntactic tree. This box corresponds to the logical form given in (67b). When the Theme is merged, the derivation continues as follows, with merger of the Voice head.

(68) a.



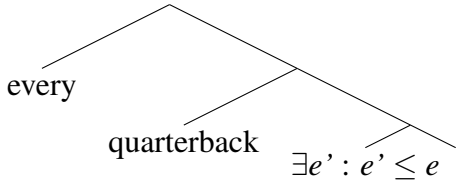
b. $\Longrightarrow$ [every y: Qy] [$\exists e'$: $e' \leq e$](Theme(e', y))

[20]Pylkkänen (2008: 84) suggests that all causative constructions involve a Cause head, which combines with non-causative predicates and introduces a causing event to their semantics. That proposal can easily be adopted in Lohndal's model.

[21]The event variable belongs to the verb in the lexicon, or it is acquired through the merger of a root with a categorizer. See Lohndal (2014) for discussion.

The FP will be interpreted as in (68b). Here the quantifier outscopes the mereological relation. There are two ways in which the mereological relation can enter the structure. The first option is to put it into the QP. In order to obtain the correct scope relation, the general structure of the QP would have to look roughly as follows.

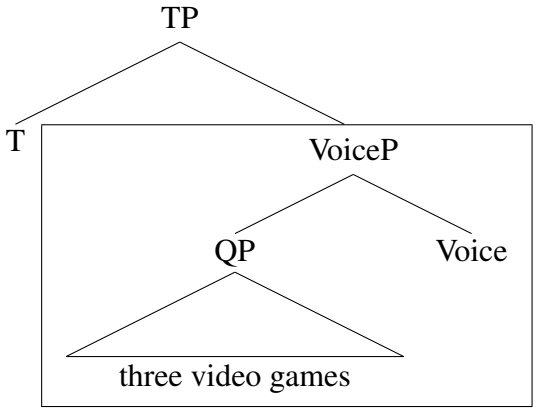
(69)



There are many complicated issues surrounding the internal architecture of QPs, which Lohndal does not discuss; he simply notes that this analysis is an alternative. Another alternative is to stipulate syncategorematicity and say that the QP is interpreted as '[every y: Qy] [$\exists e' : e' \leq e$]'. Both these proposals leave *every quarterback* as a constituent and treat *every* as taking a covert event quantifier argument.

Returning to the main derivation, when the Agent is to be merged, the complement of Voice has to be spelled out. This complement corresponds to the box in the tree structure and it has the logical denotation in (68b). The derivation can then continue and the Agent can be merged.

(70) a.



b. $\Longrightarrow [\exists X\text{: } 3(X) \wedge \forall x(Xx \rightarrow Gx)](\text{Agent}(e, x)$

The T head is merged, and the next Spell-Out domain is the domain that is boxed in the tree structure. This domain arises when the subject moves to merge with T. The Agent predicate contains an e variable, since there is no information that indicates that any other event variable is required, cf. the discussion of the Theme above.

Lohndal assumes that the Spell-Out domains are added to a stack, so that at the end of the derivation, these domains are all conjoined by the semantic composition principle Conjunction. This gives us the following representation.

(71) $[\exists X\text{: } 3(X) \wedge \forall x(Xx \rightarrow Gx)](\text{Agent}(e, x)$
$\wedge$ [every y: Qy] [$\exists e' : e' \leq e$](Theme(e', y) $\wedge$ teach(e)

At the end, existential closure is added, and we end up with the following final logical form.

(72) $\exists$e($[\exists X\text{: } 3(X) \wedge \forall x(Xx \rightarrow Gx)](\text{Agent}(e, x)$
$\wedge$ [every y: Qy] [$\exists e' : e' \leq e$](Theme(e', y) $\wedge$ teach(e))

Lohndal (2014) presents several arguments why both conjunction and existential closure are needed, among others based on cases where existential closure takes place on only a subset of the conjuncts.

In addition to conjunction and existential closure, Lohndal needs a mapping principle integrating the thematic arguments into the thematic predicates, cf. already Carlson (1984). That is, somehow 'Theme(e, _)' has to become e.g., 'Theme(e, John)'. Pietroski (2005) essentially appeals to a type-shifting operation to achieve this, whereas Higginbotham (1985) makes use of a different formalism. Lohndal suggests the mapping operation *Thematic Integration*. It is defined as in (73).

(73) **Thematic Integration**


→Spell-Out→ R(e, DP).

The operation takes a syntactic structure consisting of a head and a complement and provides a mapping into logical form. It relies on a given set of heads H and a given set of thematic predicates R:

(74) H = {Voice, F, App, ... }

(75) R = {Agent, Theme, Experiencer, ... }

These sets are important in order to constrain the power of Thematic Integration and to account for something like the Uniformity of Theta Assignment Hypothesis (UTAH) (Baker 1988, 1997).

This is a very simplified version of Lohndal's proposal. See Lohndal (2014) for an extensive discussion of the assumptions and claims made above.

4 Conclusion

Donald Davidson's original proposal that there is an event variable in logical forms has been immensely influential. This chapter has surveyed a range of approaches that rely on Davidson's insights concerning adjuncts, but that also extend the insights to apply to thematic arguments. We have seen that there is a family of Neodavidsonian proposals. They all have in common that they adopt Neodavidsonian logical forms. The syntax is different for each specific approach, and some are not very specific about what the syntax would be. For those who provide a hierarchical syntax, they nevertheless arrive at fairly similar logical forms. However, the way in which they arrive at the logical forms differs substantially: Many of them use standard mechanisms such as Functional Application, whereas others use a conjunctive semantics without Functional Application. In a sense, the latter is a natural consequence of the original Davidsonian insight, namely that predicates are chained together by way of conjunction.

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