Focus on adjuncts: events and continuations in the semantics of *only*

Masha Esipova and Lucas Champollion (New York University)

Overview The literature on *only* and exhaustification in general (Szabolcsi 1981, Groenendijk & Stokhof 1984, Rooth 1992, Bonomi & Casalegno 1993, Beaver & Clark 2008, a.o.) has been primarily concerned with exhaustified VPs (*John only [danced]*$_{\mathrm{F}}$) and argument DPs (*Only [John]*$_{\mathrm{F}}$ *danced*). We shift the focus to adjuncts, i.e., non-obligatory modifiers. We show that while event semantics was originally introduced to deal with adjuncts, standard event semantics (SES; Davidsonian: Davidson 1967, or Neo-Davidsonian: Carlson 1984, Parsons 1990, a.o.) assigns the wrong truth conditions to examples where (i) *only* applies to adjuncts (*John danced only [in the garden]*$_{\mathrm{F}}$), or (ii) a constituent containing *only* is modified by adjuncts (*On one day John only [danced]*$_{\mathrm{F}}$). We argue that this is because constituents in the scope of *only* require access to material outside its scope. Continuations (Barker 2002) provide that access. We propose a uniform analysis of *only* that can handle adjuncts in the continuized event-based framework by Champollion 2015.

Problem: *only* and adjuncts Adjuncts pose two issues for previous compositional analyses of *only*:
i) Applying *only* to adjuncts leads to wrong truth conditions. *Only* can apply to adjuncts, as in (1a). Since Davidson 1967, adjuncts have been typically analyzed via events, and in SES adjuncts are treated as predicates of events (type *vt*). Such predicates don't contain information on the other constituents of the sentence (e.g., the verb and its subject); under standard assumptions about how alternatives are calculated, this means the negated alternatives of adjuncts don't contain such information either. For example, in the Davidsonian SES-based account of *only* in Bonomi & Casalegno 1993 (B&C), treating adjuncts as *vt*-type event predicates derives the incorrect truth conditions in (1b) for (1a). (These truth conditions are simplified; in B&C's system, sentences denote pairs of propositions. But this is irrelevant for our argument.)

(1) a. John danced only [in the garden]$_{\mathrm{F}}$.
b. $\exists e[\mathsf{dance}(e) \wedge \mathsf{ag}(e, \mathsf{j}) \wedge \mathsf{loc}(e, \iota x.\mathsf{garden}(x)) \wedge \forall e'[\exists e''[\mathsf{loc}(e'', \iota x.\mathsf{garden}(x)) \wedge e' \subseteq e'']]]$
'John danced in the garden and no events occurred in any other locations.'

ii) After *only* has applied, adjuncts can't modify the alternatives it negates. In the most natural readings of (2) and (3), the adjunct is interpreted outside the scope of *only* and binds two occurrences of x in its scope: one in the asserted alternative, one in the negated ones. SES doesn't generate the right truth conditions because the negated alternatives are computed at VP level and do not contain any information about anything outside the scope of *only* that is not in the argument structure of the exhaustified predicate. While for (2) one might argue that the temporal modifier *on most days* is in the argument structure of *danced*, (3) shows that these readings obtain for *bona fide* adjuncts. Treating (2) and (3) as instances of LF reconstruction doesn't capture the binding pattern: the two occurrences of x end up being bound independently from one another.

(2) a. On most days John only [danced]$_{\mathrm{F}}$.
b. *Actual truth conditions:* Most days x are such that John danced on x and did nothing else on x.
c. *Truth conditions predicted by B&C: w/o reconstruction:* $\mathsf{most}(\mathsf{day})(\lambda i.\exists e[\mathsf{dance}(e) \wedge \mathsf{ag}(e, \mathsf{j}) \wedge \mathsf{time}(e) \subseteq i)]) \wedge \forall e'[\mathsf{ag}(e', \mathsf{j}) \to \exists e''[\mathsf{dance}(e'') \wedge \mathsf{ag}(e'', \mathsf{j}) \wedge e' \subseteq e'']]]$
'John danced on most days and didn't do anything else at any time.'
with reconstruction: $\mathsf{most}(\mathsf{day})(\lambda i.\exists e[\mathsf{dance}(e) \wedge \mathsf{ag}(e, \mathsf{j}) \wedge \mathsf{time}(e) \subseteq i]) \wedge \mathsf{most}(\mathsf{day})$ $(\lambda i'.\forall e'[(\mathsf{ag}(e', \mathsf{j}) \wedge \mathsf{time}(e') \subseteq i') \to \exists e''[\mathsf{dance}(e'') \wedge \mathsf{ag}(e'', \mathsf{j}) \wedge \mathsf{time}(e'') \subseteq i' \wedge e' \subseteq e'']])$
'John danced on most days, and on most days he didn't do anything other than dance.'

(3) With most knives John only [buttered a toast]$_{\mathrm{F}}$. (B&C predict similar results for (3) as for (2))
Actual truth conditions: For most knives x, John buttered a toast with x and did nothing else with x.

Proposal: *only* in continuized event semantics The gist of the two issues above is the same: we want to be able to introduce information that is not predetermined by the predicate's argument structure into the scope of *only* after *only* has applied. A natural solution to this type of problem is to use continuations, a generalization of QR that can apply to constituents of any type (Barker 2002, a.o.). What we need for the examples above, then, is a continuized event semantics, such as Champollion 2015, within which we implement a uniform analysis of *only*.

Implementation In Champollion's framework, verbs and their projections denote existential quantifiers over eventualities ($\langle vt, t\rangle$); the f argument serves as a continuation that allows introducing further information into the scope of the existential quantifier:

(4) $[\![\text{danced}]\!] = \lambda f_{vt}.\exists e[\mathsf{dance}(e) \wedge f(e)]$

Modifiers (θ-lifted arguments and adjuncts) are uniformly of type $\langle\langle vt, t\rangle, \langle vt, t\rangle\rangle$:

(5) a. $[\![\text{John}_{ag}]\!] = \lambda V_{\langle vt,t\rangle}\lambda f_{vt}.V(\lambda e.f(e) \wedge \mathsf{ag}(e) = \mathsf{j})$
b. $[\![\text{in the garden}]\!] = \lambda V_{\langle vt,t\rangle}\lambda f_{vt}.V(\lambda e.f(e) \wedge \mathsf{loc}(e) = \mathsf{garden})$

A sentence-level closure, $[\![\text{[closure]}]\!]$, contributes a trivial continuation, $\lambda e.\mathsf{true}$:

(6) $[\![\text{John danced}]\!] = [\![\text{John}_{ag}]\!]([\![\text{danced}]\!])([\![\text{[closure]}]\!]) = \exists e[\mathsf{dance}(e) \wedge \mathsf{ag}(e) = \mathsf{j} \wedge \mathsf{true}]$

We implement exhaustification in general as follows: take a continuized constituent α and assert that (i) the ordinary semantic value of α holds of its continuation X, and (ii) all (relevant) alternatives Y to α are false of X. We treat *only* the same way, except that it presupposes (i) and asserts (ii):

(7) $[\![\text{only } \alpha]\!] = \lambda X.\underline{[\![\alpha]\!]^O(X)} \wedge \forall Y[Y \in [\![\alpha]\!]^A \rightarrow \neg Y(X)]$ presupposition underlined
$[\![\alpha]\!]^O$ = ordinary semantic value of α, $[\![\alpha]\!]^A$ = set of alternatives to α (Rooth 1992)

This works well for (1) and (2). We treat arguments and adjuncts alike (both called ModP here):

(8) a. $[\![\text{only ModP}]\!] = \lambda V_{\langle vt,t\rangle}\lambda f_{vt}.\underline{[\![\text{ModP}]\!]^O(V)(f)} \wedge \forall M'_{\langle\langle vt,t\rangle,\langle vt,t\rangle\rangle}[M' \in [\![\text{ModP}]\!]^A \rightarrow \neg M'(V)(f)]$
b. $[\![\text{John danced only [in the garden]}_{\text{F}}]\!] = \underline{\exists e[\mathsf{dance}(e) \wedge \mathsf{ag}(e) = \mathsf{j} \wedge \mathsf{loc}(e) = \mathsf{garden}]}$
$\wedge \forall M'[M' \in [\![\text{in the garden}]\!]^A \rightarrow \neg M'(\lambda f_{vt}.\exists e[\mathsf{dance}(e)])(\lambda e.\mathsf{ag}(e) = \mathsf{j})]$
c. If our only alternative is *on the roof* ($\lambda V_{\langle vt,t\rangle}\lambda f_{vt}.V(\lambda e.f(e) \wedge \mathsf{loc}(e) = \mathsf{roof})$), (8b) = $\underline{\exists e[\mathsf{dance}(e)}$
$\underline{\wedge \mathsf{ag}(e) = \mathsf{j} \wedge \mathsf{loc}(e) = \mathsf{garden}]} \wedge \neg\exists e[\mathsf{dance}(e) \wedge \mathsf{ag}(e) = \mathsf{j} \wedge \mathsf{loc}(e) = \mathsf{roof}]$

(9) a. $[\![\text{only VP}]\!] = \lambda f_{vt}.\underline{[\![\text{VP}]\!]^O(f)} \wedge \forall V'_{\langle vt,t\rangle}[V' \in [\![\text{VP}]\!]^A \rightarrow \neg V'(f)]$
b. $[\![\text{on most days}]\!] = \lambda V_{\langle vt,t\rangle}\lambda f_{vt}.\mathsf{most}(\mathsf{day})(\lambda i.V(\lambda e.f(e) \wedge \mathsf{time}(e) \subseteq i))$
c. $[\![\text{On most days John only [danced]}_{\text{F}}]\!] = [\mathsf{most}(\mathsf{day})(\lambda i.\underline{\exists e[\mathsf{dance}(e) \wedge \mathsf{ag}(e) = \mathsf{j} \wedge \mathsf{time}(e) \subseteq i]}$
$\wedge \forall V'[V' \in [\![\text{danced}]\!]^A \rightarrow \neg V'(\lambda e.\mathsf{ag}(e) = \mathsf{j} \wedge \mathsf{time}(e) \subseteq i)])$
d. If our only alternative is *sang* ($\lambda f_{vt}.\exists e[\mathsf{sing}(e) \wedge f(e)]$), then (9c) = $\mathsf{most}(\mathsf{day})(\lambda i.\underline{\exists e[\mathsf{dance}(e) \wedge}$
$\underline{\mathsf{ag}(e) = \mathsf{j} \wedge \mathsf{time}(e) \subseteq i]} \wedge \neg\exists e'[\mathsf{sing}(e') \wedge \mathsf{ag}(e') = \mathsf{j} \wedge \mathsf{time}(e') \subseteq i])$

Situations? One could entertain the idea of an alternative, situation-based approach to examples like (2) and (3), in which adjuncts are linked to verbs via a minimal topic situation (Kratzer 2016) and topicalized modifiers serve as restrictors of the topic situation. To our knowledge, a situation-based semantics of *only* has never been worked out in detail. We do not attempt to develop one here as it is not clear how to compositionally achieve binding into negated alternatives for examples with (i) non-temporal modifiers (ii) headed by *most*, and because the underpinnings of situation semantics are not well understood (e.g., Dekker 2004).

Conclusion The significance of our analysis of *only* is that it is the first to apply uniformly and successfully to arguments and adjuncts alike. We have shown that constituents in the scope of *only* can require access to adjuncts outside its scope. As the Neo-Davidsonian nature of our event semantic backbone is crucial, our result constitutes a novel argument for a uniform treatment of arguments and adjuncts (Schein 1993).

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