Davidsonian events and thematic roles: Are they necessary?

A reply to Kratzer and Schein

Lucas Champollion

University of Pennsylvania

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What is the basic meaning of verbs?

Do typical verbal arguments show up in the verbal predicate?

Traditional	Davidson	Schein	Kratzer
Yes	Yes	No	Partly

Traditional (e.g. Montague, 1970)

Yes: Each syntactic argument occurs in the verbal predicate

- $[\![\text{stab}]\!] = \lambda x \lambda y[stab(x, y)]$
- $[\![\text{Brutus stabbed Caesar}]\!] = stab(brutus, caesar)$

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Davidson (1967)

Yes, plus an event argument:

- $[\![\text{stab}]\!] = \lambda x \lambda y \lambda e[stab(e, x, y)]$
- $[\![\text{Brutus stabbed Caesar}]\!] = \exists e.stab(e, brutus, caesar)$

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Neo-Davidsonian (Parsons, 1990; Schein, 1993)

No: arguments are related to the event via thematic roles

- $[\![\text{stab}]\!] = \lambda e[\mathit{stab}(e)]$
- $[\![\text{Brutus stabbed Caesar}]\!] =$
  $\exists e.\mathit{agent}(e, \mathit{brutus}) \wedge \mathit{stab}(e) \wedge \mathit{theme}(e, \mathit{caesar})$

What is the basic meaning of verbs?

Do typical verbal arguments show up in the verbal predicate?

Traditional	Davidson	Schein	Kratzer
Yes	Yes	No	Partly

Intermediate (Kratzer, 1996, forthcoming)

Partly: Only the theme occurs in the verbal predicate

- $[\![\text{stab}]\!] = \lambda y \lambda e[stab(e, y)]$
- $[\![\text{Brutus stabbed Caesar}]\!] =$ $\exists e.agent(e, brutus) \wedge stab(e, caesar)$

Contribution of this talk

Previous answers:

Traditional	Davidson	Schein	Kratzer
Yes	Yes	No	Partly

This talk argues against Kratzer (forthcoming), who presents and refines an argument by Schein (1993)

- They consider certain readings involving plural NPs and the quantifier *every*
- They claim that some of these readings can only be captured with explicit events and thematic roles
- In this talk, I give equivalent representations without explicit events or thematic roles

Types of interactions between quantifiers

Distributive

Every man loves a woman.

- A potentially different woman for every man
- Follows from standard semantics of *every man* as a generalized quantifier: $\lambda VP\ [\forall x\ man(x) \rightarrow VP(x)]$

Types of interactions between quantifiers

Cumulative

600 Dutch firms own 5000 American computers.

- Each Dutch firm owns at least one computer
- Each computer is owned by at least one firm

Types of interactions between quantifiers

Collective

Three boys lifted a piano.

- Does not entail that any one boy lifted a piano

Kratzer: *Every* is compatible with cumulative readings

Kratzer's example

Three copy editors caught every mistake in the manuscript.

Distributive readings

- e.g. Each copy editor caught all the mistakes

Scopeless readings

- Collective reading: A group of three copy editors made sure that every mistake was caught
- Cumulative reading: Three copy editors, between them, caught every mistake

Kratzer's case for thematic roles

Kratzer's (and Schein's) argument:

- The standard translation *every* is not compatible with cumulative readings
- Their nonstandard proposal for *every* is compatible, but only if the thematic role *agent* exists
- Therefore, the thematic role *agent* exists

Kratzer's reading does not require thematic roles

What I will argue:

- I will present an independently motivated translation for *every*
- This translation predicts that *every* can take part in cumulative readings
- Like all cumulative readings, Kratzer's reading can be modeled both with and without thematic roles
- So Kratzer's reading is not an argument either way

Background assumptions

The following notions are common assumptions in the semantics of plurals and events (e.g. Link, 1983; Landman, 2000).

Basic notions in mereology

Definition

A *complete join semilattice* is a poset $L = \langle S, \sqsubseteq \rangle$ where any nonempty subset of S has a least upper bound w.r.t. $\sqsubseteq$.

- We call $\sqsubseteq$ the *part-of* relation of L.
- The least upper bound of two elements x and y is written $x \oplus y$, the *sum* of x and y. (We say that x and y *sum up to* z iff $x \oplus y = z$.)
- Note: $a \oplus b = b$ whenever $a \sqsubseteq b$.
- We call an entity x *atomic* iff there is no y such that $y \sqsubseteq x$. Otherwise we call x a *sum*.

Linguistic background assumptions

- Singular common nouns (e.g. boy) denote atomic individuals
- Plural common nouns (e.g. boys) denote sums
- Plural counting quantifiers (e.g. three boys) existentially quantify over sums

Closure of one-place predicates under sum

Definition

Given a complete join semilattice $\langle S, \sqsubseteq \rangle$ and a predicate $P \subseteq S$, the *closure of P under sum* (written $^*P$) is defined as the smallest predicate P' such that

1. if $P(X)$ then $P'(X)$
2. if $P'(X_1)$ and $P'(X_2)$ then $P'(X_1 \oplus X_2)$

- $^*P$ holds of x just in case x is a sum of P's
- Example: if $boy(a)$ and $boy(b)$ then $^*boy(a \oplus b)$
  - "If Al is a boy and Bob is a boy then Al and Bob are boys"

Closure of two-place predicates under sum

Definition

Given a complete join semilattice $\langle S, \sqsubseteq \rangle$ and a two-place relation $R \subseteq S \times S$, the *closure of R under sum* (written $^{**}R$) is defined as the smallest relation R' such that

1. if $R(X, Y)$ then $R'(X, Y)$
2. if $R'(X_1, Y_1)$ and $R'(X_2, Y_2)$ then $R'(X_1 \oplus X_2, Y_1 \oplus Y_2)$

- $^{**}R(X, Y)$ holds just in case x is a sum of elements that stand in relation R to a set of elements whose sum is Y
- Example: $^{**}agent(E, X)$ holds just in case E is a sum of events whose agents sum up to X

Kratzer's own representation of her reading

Kratzer's example

Three copy editors caught every mistake in the manuscript.

Kratzer's representation

$\exists E\ \exists X\ [\textit{3-copy-editors}(X) \wedge\ {}^{**}\textit{agent}(E, X)$
$\wedge \forall y\ [\textit{mistake}(y) \rightarrow \exists e\ [e \sqsubseteq E \wedge \textit{catch}(e, y)]]$
$\wedge \exists Y\ [{}^{*}\textit{mistake}(Y) \wedge {}^{**}\textit{catch}(E, Y)]$

- "There is a sum event E whose agents sum up to three copy editors. For every mistake there is a part of E in which it is caught. E only contains mistake-catching events."
- Kratzer's claim: we need the agent role to achieve nonscopal relation between editors and mistakes

Cumulative readings (Scha, 1981)

Example

600 Dutch firms own 5000 American computers.

- There is a set/sum X of 600 Dutch firms
- There is a set/sum Y of 5000 American computers
- Each firm owns at least one computer
- Each computer is owned by at least one firm

Representing a cumulative reading (Krifka, 1986)

$\exists X\ 600\text{-}firms(X) \wedge \exists Y\ 5000\text{-}computers(Y) \wedge {}^{**}own(X, Y)$

Representing Kratzer's example

Kratzer's example

Three copy editors caught every mistake.

- There is a sum X of three copy editors
- There is a sum Y containing every mistake
- Each copy editor caught at least one mistake
- Each mistake was caught by at least one copy editor

Representing a cumulative reading (Krifka, 1986)

$\exists X\ 3\text{-}copy\text{-}editors(X) \wedge \exists Y\ every\text{-}mistake(Y) \wedge {}^{**}caught(X, Y)$

Standard translation of *every mistake* doesn't work

Three editors caught every mistake

$\exists X$ 3-$copy$-$editors(X) \wedge \exists Y$ $every$-$mistake(Y) \wedge {}^{**}caught(X, Y)$

Standard entry for *every mistake*

$\lambda Y \, \forall y \; mistake(y) \rightarrow y \in Y$

- The standard entry holds of any set that contains every mistake and possibly some non-mistakes
- This would make the cumulative reading true even if some of the copy editors caught only non-mistakes
- We need an entry that holds of any set that contains every mistake and nothing else

Why Kratzer rejects a cumulative account

Kratzer is aware that her reading can be described as a cumulative reading . She gives the following reasons for rejecting a standard cumulative account:

1. Empirically, *every* doesn't otherwise take part in cumulative readings
2. Neither the standard entry for *every* nor her own entry are compatible with cumulative readings
3. Standard formalizations have difficulties with the interaction of distributive and 'cumulative' quantifiers (Roberts, 1987; Schein, 1993)

Refuting the first argument

1. Argument: Empirically, *every* doesn't take part in cumulative readings

Observation

There are non-distributive readings with *every*.

Claim

The mechanism we need for these readings can be used for cumulative readings too.

Examples of non-distributive readings of *every*

Reviewed by Matthewson (2001):

- In this class, I try to combine every/#each theory of plurality. Landman (2000)
- It took every/*each boy to lift the piano. Beghelli and Stowell (1997)
- She counted every proposal / ?each of the proposals. Dowty (1987)
- each student's desk (unambiguous)
  vs. every student's desk (ambiguous)
  (Barbara Partee, p.c. to Matthewson)

Refuting the second argument

2. Argument: Neither the standard entry for *every* nor her own entry are compatible with cumulative readings

Observation

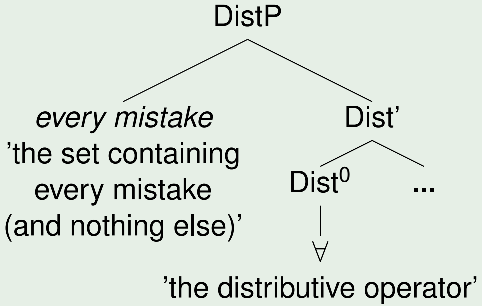
Kratzer does not consider alternative translations for *every* (Szabolcsi, 1997a; Beghelli and Stowell, 1997; Matthewson, 2001; Sauerland, 2003)

Claim

We can derive cumulative readings with these translations

An alternative translation for *every mistake*

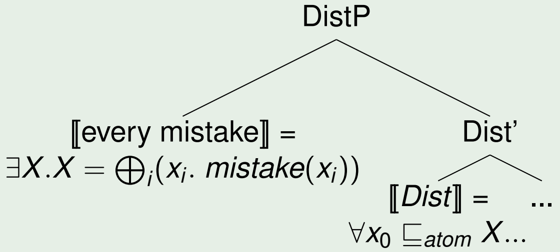
Szabolcsi (1997a), Beghelli and Stowell (1997)



- Independently motivated by pair-list readings

Replacing sets by sums

Translation into the mereological framework



- Similar proposals in Matthewson (2001); Sauerland (2003)

The new entry works in Kratzer's example

Kratzer's example

Three copy editors caught every mistake.

Translation using the new entry

$\exists X\ \textit{3-copy-editors}(X) \wedge \exists Y\ Y = \bigoplus_i (y_i.\ \textit{mistake}(y_i))$
$\wedge^{**}\textit{caught}(X, Y)$

- There is a sum X of three copy editors
- There is a sum Y of all the mistakes and nothing else
- Each copy editor caught at least one mistake
- Each mistake was caught by at least one copy editor

Where do we insert the distributive operator?

⟦every mistake⟧

DistP

⟦every mistake⟧ = $\exists X . X = \bigoplus_i (x_i.\ mistake(x_i))$

Dist'

⟦*Dist*⟧ = $\forall x_0 \sqsubseteq_{atom} X \ldots$

...

⟦Three copy editors caught every mistake⟧

$\exists X\ 3\text{-}copy\text{-}editors(X) \wedge \exists Y\ \ Y = \bigoplus_i (y_i.\ mistake(y_i))$
$\wedge\ {}^{**}caught(X, Y)$

Where do we insert the distributive operator?

We have the following choices:

i) Leave out	ii) Insert outside **	iii) Insert inside **
?	?	?

Where do we insert the distributive operator?

We have the following choices:

i) Leave out

?

ii) Insert outside **

?

iii) Insert inside **

?

Result

$\exists X$ *3-copy-editors*$(X) \wedge \exists Y\ Y = \bigoplus_i (y_i.\ mistake(y_i)) \wedge {}^{**}caught(X, Y)$

Where do we insert the distributive operator?

We have the following choices:

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Result

$\exists X\ 3\text{-}copy\text{-}editors(X) \wedge \exists Y\ Y = \bigoplus_i (y_i.\ mistake(y_i)) \wedge {}^{**}caught(X, Y)$

- Why does *Dist* make no contribution?
- Compositionality would lead us to expect that it shows up

Where do we insert the distributive operator?

We have the following choices:

i) Leave out	ii) Insert outside **	iii) Insert inside **
Not compositional	?	?

Result

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Result

$\exists X\ 3\text{-}copy\text{-}editors(X) \wedge \exists Y\ Y = \bigoplus_i(y_i.\ mistake(y_i))$
$\wedge\ \forall y_0 \sqsubseteq_{atom} Y\ [{}^{**}caught(X, y_0)]$

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i) Leave out	ii) Insert outside **	iii) Insert inside **
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Result

$\exists X\ 3\text{-}copy\text{-}editors(X) \wedge \exists Y\ Y = \bigoplus_i (y_i.\ mistake(y_i))$
$\wedge\ \forall y_0 \sqsubseteq_{atom} Y\ [{}^{**}caught(X, y_0)]$

- Entails that each mistake is caught by all three copy editors
- Not the reading we're after!

Where do we insert the distributive operator?

We have the following choices:

i) Leave out	ii) Insert outside **	iii) Insert inside **
Not compositional	Wrong reading	?

Result

$\exists X$ 3-copy-editors$(X) \wedge \exists Y\ Y = \bigoplus_i (y_i.\ mistake(y_i))$
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Where do we insert the distributive operator?

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Not compositional	Wrong reading	?

Result

$\exists X\ \textit{3-copy-editors}(X) \wedge \exists Y\ Y = \bigoplus_i (y_i.\ \textit{mistake}(y_i))$
$\wedge \langle X, Y \rangle \in {}^{**}\lambda x \lambda y\ \forall y_0 \sqsubseteq_{atom} y\ [\textit{caught}(x, y_0)]]$

Where do we insert the distributive operator?

We have the following choices:

i) Leave out	ii) Insert outside **	iii) Insert inside **
Not compositional	Wrong reading	?

Result

$\exists X\ \textit{3-copy-editors}(X) \wedge \exists Y\ Y = \bigoplus_i (y_i.\ \textit{mistake}(y_i))$
$\wedge \langle X, Y \rangle \in {}^{**}\lambda x \lambda y\ \forall y_0 \sqsubseteq_{atom} y\ [\textit{caught}(x, y_0)]]$

- Entails that each mistake was found by some editor
- Provably equivalent to (i) if *caught* ranges only over atomic mistakes

Where do we insert the distributive operator?

We have the following choices:

i) Leave out	ii) Insert outside **	iii) Insert inside **
Not compositional	Wrong reading	Yes!

Result

$\exists X\ 3\text{-}copy\text{-}editors(X) \wedge \exists Y\ Y = \bigoplus_i (y_i.\ mistake(y_i))$
$\wedge\ \langle X, Y \rangle \in {}^{**}\lambda x \lambda y\ \forall y_0 \sqsubseteq_{atom} y\ [caught(x, y_0)]]$

- Entails that each mistake was found by some editor
- Provably equivalent to (i) if *caught* ranges only over atomic mistakes

Kratzer's and my representations are equivalent

My representation

$\exists X$ 3-$copy\text{-}editors(X) \wedge \exists Y\ Y = \bigoplus_i (y_i.\ mistake(y_i))$
$\wedge \langle X, Y \rangle \in {}^{**}\lambda x \lambda y\ \forall y_0 \sqsubseteq_{atom} y\ [catch_1(x, y_0)]]$

Kratzer's representation

$\exists E\ \exists X\ [3\text{-}copy\text{-}editors(X) \wedge\ {}^{**}agent(E, X)$
$\wedge \forall y\ [mistake(y) \rightarrow \exists e\ [e \sqsubseteq E \wedge catch_2(e, y)]]$
$\wedge \exists Y\ [{}^{*}mistake(Y) \wedge {}^{**}catch_2(E, Y)]$

Provably equivalent under these assumptions:

- $\forall x \forall y\ catch_1(x, y) \leftrightarrow \exists e\ [agent(e, x) \wedge catch_2(e, y)]$
- $\forall i \in \{1, 2\}\ \forall a\ \forall y\ [catch_i(a, y) \rightarrow y$ is atomic]

Refuting the third argument

3. Argument: Standard formalizations have difficulties with the interaction of distributive and 'cumulative' quantifiers (Roberts, 1987; Schein, 1993)

Observation

In Szabolcsi (1997b)'s semantics, *every* consists of a "cumulative" and a "distributive" part.

Claim

This semantics can model readings in which the same universal quantifier acts cumulatively and distributively.

Modeling interaction of cumulativity and distributivity

Schein's example

Three video games taught every quarterback two new plays.

Representation

$$\exists X\ 3\text{-}video\text{-}games(X) \wedge \exists Y\ Y = \bigoplus_i (y_i.\ quarterback(y_i))$$
$$\wedge \langle X, Y \rangle \in {}^{**}\lambda x \lambda y\ \forall y_0 \sqsubseteq_{atom} y$$
$$[\exists Z\ two\text{-}plays(Z) \wedge {}^{**}taught(x, y_0, Z)]]$$

- Entails that there were two plays per quarterback
- Entails that the total number of video games involved is three

Summary

- Kratzer's and Schein's data do not conclusively show that events and thematic roles exist
- "Every" has two parts: a cumulative and a distributive part
- Its interaction with pluralizing operators produces Kratzer/Schein-style readings in *any* framework

- Outlook
  - Need to predict why *every* only gives rise to cumulative readings as a theme
  - Need to check if intervention of ** between two components of *every* is compatible with existing theories of the distribution of **

The End

Thank you!

Lucas Champollion
champoll@ling.upenn.edu

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