Class 4

Modification and Events

Modifiers in syntax

Modifier = constituent that doesn't change syntactic category of its sister.

happy – adjective (phrase)
very happy – adjective phrase (AP)
➔ *very* is an AP modifier

women – noun (phrase)
tall women – noun phrase (NP)
➔ *tall* is an NP modifier (adnominal) **More examples?**

ran quickly – verb phrase (VP) modifier (adverb, adverbial)

very quickly – (also) adverb modifier **Further?**

men in the kitchen, men who knit, men and/or women,

almost every man

Semantics: Modifier Functions

Modifier function = a function of type *aa*.

happy – *et*
very happy – *et*
very – (*et*)(*et*)
➔ *very* denotes a modifier function

women – *et*
tall women – *et*
tall – (*et*)(*et*)

every man – (*et*)*t*
almost every man – (*et*)*t*
almost – ((*et*)*t*)((*et*)*t*)

Alternatively:
every – (*et*)((*et*)*t*)
almost every – (*et*)((*et*)*t*)
almost – ((*et*)((*et*)*t*))((*et*)((*et*)*t*))

Syntax-Semantics

Hypothesis:

All modifiers in syntax denote modifier functions.

[

In categorial grammar:

Type(N)=et Type(N→N)=(et)(et)

Type(NP)=(et)t Type(NP→NP)=((et)t)((et)t)

In general:

Type(X→X) = (Type(X))(Type(X))

]

But what denotations should modifier functions have?

Intersective adnominal modifiers

[[*fast cars*]] = **car** ∩ **fast**

[[*houses in England*]] = **house** ∩ **in_England**

[[*houses where I lived*]] =

house ∩ { $x \in E$ **: live_in**(**I**,x) }

A function F of type $(et)(et)$ is an **intersective modifier** if there is a set of entities B s.t. for every function g_{et} characterizing a set A, the et function $F(g)$ characterizes the set $A \cap B$.

Adverbials – similarity to adnominals

	Adnominals	Adverbials
Adjectives/ Adverbs	*fast cars*	*ate fast*
Preposition Phrases	*houses in England*	*ate in England*
Relative Clauses	*houses where I lived*	*ate where I lived*

Question: Can we treat adverbials as intersective modifiers?

Common answer:

- Surely not as (et)(et) modifiers.
- But we can treat them as intersective (e(et))(e(et)) modifiers, using the notion of **events.**

Intersective entailments with adjectives

Attributive/predicative alternation:

Mary is a Dutch woman ⇔

Mary is Dutch and Mary is a woman

Permutation:

Mary is a Dutch pregnant woman ⇔

Mary is a pregnant Dutch woman

Replacement of noun:

Jan is a Dutch surgeon & Jan is a violinist

→ *Jan is a Dutch violinist*

These entailments are all explained by the treatment of *Dutch* as an (*et*)(*et*) intersective modifier.

Intersective entailments with adverbials?

Attributive/predicative alternation (?):

Mary dug under the castle / quickly ⬅??➔
Mary dug and Mary was under the castle / quick

Permutation (yes!):

Mary dug quickly under the castle ⬅➔
Mary dug under the castle quickly

Replacement of verb (no!):

Jan ran quickly / in the park & Jan ate
=/=> *Jan ate quickly / in the park*

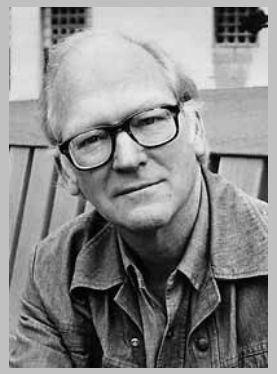
Conclusion: it's hard to treat adverbials as intersective (et)(et) modifiers.

Approaches to adverbial modifiers

1. **Montague:** Non-intersective modifiers!

2. **Davidson:** Intersective modifiers of covert argument positions.

Davidson's insight



Davidson, D. (1967). The logical form of action sentences. In N. Rescher (Ed.), *The Logic of Decision and Action* (pp. 81-96). University of Pittsburgh Press.

Donald Davidson
(1917-2003)

Mary dug quickly under the castle

$= \exists \mathbf{e}.\ dig(\mathbf{m},\mathbf{e}) \wedge quick(\mathbf{e}) \wedge under\_the\_castle(\mathbf{e})$

- Using events, we can treat verb modification as involving conjunction, similar to intersective modification of nouns.

Davidson's event argument

A verbal predicate has a covert semantic argument, just like nouns do

Noun denotations:

cat: *et* no syntactic argument corresponds to *e*

Intransitive Verb denotations (Montague):

sing: *et* subject argument corresponds to *e*

Intransitive Verb denotations (Davidson):

sing: *e*(*et*) subject argument corresponds to *e*

no syntactic argument corresponds to *e*

this *e* is the "event" argument!

Questions for Davidson

1- How to think of the denotation of verbs?

sing: *et* = the set of singers

sing: *e*(*et*) = the binary relation between singers and singing events

[[sing]](*x*)(*y*) =1 iff *x* sings in the event *y*

2- How to think of the denotation of adverbs?

Intersective modifiers of the event argument!

3- How do we modify the event argument?

Adjectives with relational nouns

beautiful:

predicative $[\![beautiful]\!] = B \subseteq E$

attributive $[\![beautiful]\!] = \mathbf{beautiful} : \wp(E) \to \wp(E)$

For every set $X \subseteq E$:

$\mathbf{beautiful}(X) = B \cap X$

beautiful girl:

$[\![beautiful\ girl]\!] = \mathbf{beautiful}(G) = B \cap G$

'girl' = Unary relation

beautiful friend of Mary:

$[\![friend]\!] = \mathbf{friend} : E \to \wp(E)$

$[\![of\ Mary]\!] = \mathbf{m} \in E$

$[\![friend\ of\ Mary]\!] = \mathbf{friend}(\mathbf{m}) \subseteq E$

$[\![beautiful\ friend\ of\ Mary]\!] = B \cap \mathbf{friend}(\mathbf{m}) \subseteq E$

'friend' = Binary relation

Adverbs with verbs

beautiful friend of Mary:

$$[\![\textit{friend}]\!] = \textbf{friend} : E \to \wp(E)$$

$$[\![\textit{of Mary}]\!] = \mathbf{m} \in E$$

$$[\![\textit{friend of Mary}]\!] = \textbf{friend}(\mathbf{m}) \subseteq E$$

$$[\![\textit{beautiful friend of Mary}]\!] = B \cap \textbf{friend}(\mathbf{m}) \subseteq E$$

'friend' = Binary relation

Mary sang beautifully:

$$[\![\textit{sang}]\!] = \textbf{sing} : E \to \wp(E)$$

$$[\![\textit{Mary}]\!] = \mathbf{m} \in E$$

$$[\![\textit{Mary sang}]\!] = \textbf{sing}(\mathbf{m}) \subseteq E$$

$$[\![\textit{Mary sang beautifully}]\!] = B \cap \textbf{sing}(\mathbf{m}) \subseteq E$$

$$= \text{“the beautiful events in which Mary sang”}$$

'sang' = Intrans. verb = Binary relation

Intersective adverbials formally

Let *M* be a modifier function of type (e(et))(e(et)).
➔ *M* sends any binary relation over entities *R* to binary relation over entities *M*(*R*).

We say that M is “intersective on an argument **a**” if modification is based on intersection with some set of enities X with that argument.

Formally: M is *a2-intersective* if there is a set of entities X such that for every binary relation over entities R –

M(R) = { <x,y> | y ∈ X & <x,y> ∈ R }

Intersective adverbials in lambda's

$$\mathbf{M}^{X}_{(e(et))(e(et))} = \lambda R_{e(et)}.\lambda x_e.\lambda y_e.X(y) \wedge R(x)(y)$$

Example: *Mary sang beautifully*

$$\mathbf{beautifully}_{(e(et))(e(et))} = \lambda R_{e(et)}.\lambda x_e.\lambda y_e.\mathbf{B}(y) \wedge R(x)(y)$$

$[\![sang\ beautifully]\!]$

$= \mathbf{beautifully}(\mathbf{sing})$

$= \lambda x_e.\lambda y_e.\mathbf{B}(y) \wedge \mathbf{S}(x)(y)$

$[\![Mary\ sang\ beautifully]\!]$

$= (\mathbf{beautifully}(\mathbf{sing}))(\mathbf{m})$

$= \lambda y_e.\mathbf{B}(y) \wedge \mathbf{S}(\mathbf{m})(y)$

= "the beautiful events in which Mary sang"

Questions for Davidson (cont.)

4- How does a sentence with a Davidsonian verb denotation gets its truth value?

Existential closure: Any set of events *Y* can be mapped to the truth-value $\exists x.Y(x)$.

$$[\![Mary\ sang\ beautifully]\!]$$
$$= (\mathbf{beautifully}(\mathbf{sing}))(\mathbf{m})$$
$$= \lambda y_e.\mathbf{B}(y) \wedge \mathbf{S}(\mathbf{m})(y)$$
$$= \text{“the beautiful events in which Mary sang”}$$

After existential closure

$$[\![Mary\ sang\ beautifully]\!]$$
$$= \exists y_e.\mathbf{B}(y) \wedge \mathbf{S}(\mathbf{m})(y)$$
$$= \text{“there is a beautiful event in which Mary sang”}$$

Entailments with adverbials (1)

Permutation:

John sang beautifully in the shower ⇐⇒
John sang in the shower beautifully

Replacement of verb (no!):

Jan ran quickly / in the park & *Jan ate*
=/=> *Jan ate quickly / in the park*

Entailments with adverbials (2)

Attributive/predicative alternation (?):

John sang beautifully ←??→
John sang and John was beautiful

But note(!):

John sang beautifully ←→
John sang and **John's singing** was beautiful

Oh- John's singing is the mysterious event…

Event nominals

singing = the set of events in which someone sang

Formally:

$$[[\,sang\,]] = S \subseteq E^2$$

$$[[\,singing\,]] = \{x : \exists y.S(y)(x)\} \subseteq E$$

This accounts for entailments like:

John sang ➔ There was a singing (event)

Or more naturally:

John destroyed the city

➔ There was a destruction (of the city) (by John)

Radical "Neo-Davidsonian" approach

Jones buttered the toast in the bathroom with the knife at midnight.

Davidsonian event-based proposition:

$\exists e$ [BUTTER (jones, the toast, e) & IN (e, the bathroom) & INSTR (e, the knife) & AT (e, midnight)]

Neo-Davidsonian approach – radical interpretation:

- Verbs denote one-place predicates over events (type *et*). No room for thematic argument slots in verbal denotations!
- The thematic argument slots are generated by syntax.

$\exists e$ [BUTTER (e) & AGENT (e, jones) & PATIENT (e, the toast) & IN (e, the bathroom) & INSTR (e, the knife) & AT (e, midnight)]

No distinction between adjuncts and complements in semantics!

Moderate "Neo-Davidsonian" approach

Decompositional Davidsonian entries:

to close: $\lambda y\, \lambda x\, \lambda e$ [CLOSE (e) & AGENT (e, x) & THEME (e, y)]

to close: $\lambda y\, \lambda x\, \lambda e$ [AGENT (e, x) & THEME (e, y) & $\exists$e' [CAUSE (e, e') & THEME (e', y) & $\exists$s [BECOME (e', s) & CLOSED (s) & THEME (s, y)]]]

An advantage of the radical view

Unaccusatives vs. Passives:

John fell =/=> Something felled John
John was felled ==> Something felled John

The door closed =/=> Something closed the door
The door was closed ==> Something closed the door

Carlson:

$CLOSE$ = predicate characterizing the set of events in which something fell

[[*close*-UNACC]] =

$$\lambda x.\lambda e.CLOSE(e) \wedge theme(e,x)$$

[[*close*-PASS]] =

$$\lambda x.\lambda e.CLOSE(e) \wedge theme(e,x) \wedge \exists y.agent(e,y)$$

A disadvantage of the radical view

Dowty:

- Any event of *selling* is an event of *buying*.
- Thus, corresponding sets of events satisfy

$$SELL = BUY.$$

- How can we reconstruct the right argument structure with thematic arguments for active transitive verbs like sell and *buy*?

Note:

X sells Y to Z ⟷ *Z buys Y from X*

Reason to doubt the radical view.

Further reading

General Overview

Claudia Maienborn, Event semantics, in Claudia Maienborn, Klaus von Heusinger & Paul Portner (eds.), Semantics. An international handbook of natural language meaning; Volume 1. (HSK Handbook series), Berlin, New York: Mouton de Gruyter.
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http://www.phil.uu.nl/~yoad/papers/WinterZwartsEventSemantics.pdf