LEXICAL SEMANTICS OF VERBS

The Davidsonian event argument

• Assumption of the theories of aspectual classes:
The meaning of verbs as lexical items (and also VPs and Ss) is partly characterized by an eventuality type they denote (or they denote a set of eventualities of a given aspectual class type)

• Questions:
So what are then eventualities? What are they properties of? Are they properties of states of affairs in the world? Are they properties of natural language predicates?

1. Origins

The suggestion that action sentences involve implicit reference to and quantification over events was first proposed by Frank Ramsey (1927) (see Pianesi&Varzi 2000, p.17)[1]:

> " 'That Caesar died' is really an existential proposition, asserting the existence of an event of a certain sort, thus resembling 'Italy has a king', which asserts the existence of a man of a certain sort. The event which is of that sort is called the death of Caesar, and should no more be confused with the fact that Caesar died than the king of Italy should be confused with the fact that Italy has a king" (1927, p.37).

The same suggestion can also be found in
  Reichenbach, Hans. 1947. *Elements of Symbolic Logic*. New York: Macmillan.
  Prior, Arthur. 1949. *Logic and the Basis of Ethics*. Oxford: Clarendon Press.
  Ryle, Gilbert. 1949. *The Concept of Mind*. Barnes and Noble. London

Donald Davidson (1967) is taken to be the first to clearly formulate this idea.

2. Davidson's (1967) Basic Idea

Davidson, Donald. 1967. 'The logical form of action sentences.' In: N. Rescher (ed.) *The Logic of Decision and Action*. Pittsburgh: University of Pittsburgh Press, pp. 81 - 95. Reprinted in: *Essays on Actions and Events*, Oxford: Clarendon Press, 1980, pp. 105 – 22. (The page numbers and example numbers below are from the 1980 reprint.)

• Intuition: Anaphoric reference to an event by means of the pronoun *it*.

> "Strange goings on!   Jones did it slowly, deliberately, in the bathroom, with a knife, at midnight.   What he did was butter a piece of toast. (…) the 'it' of 'Jones did it slowly,

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[1] Pianesi, Fabio and Achille C. Varzi. 2000. 'Events and Event Talk: An Introduction.' In Higginbotham, James, Fabio Pianesi, and and Achille C. Varzi. (eds.), *Speaking of Events*, New York: Oxford University Press, 2000, pp. 3-47.

deliberately, …' seems to refer to some entity, presumably an action, that is then characterized in a number of ways." Davidson (1967, p. 81 / 1980, p.105)

"Much of our talk of action suggests the same idea: that there are such *things* as actions, and that a sentence like (2) [*Jones buttered the toast in the bathroom with a knife at midnight*.] describes the action in a number of ways. 'Jones did it with a knife.' 'Please tell me more about it.' The 'it' here doesn't refer to Jones or the knife, but to what Jones did – or so it seems.' (Davidson (1967, p. 81 / 1980, p.108-9)

See also Austin's (*How to do things with words*, 1962) discussion of excuses in Davidson (1967, p. 81 / 1980, p.109ff.)

IN A NUTSHELL: The Davidsonian theory is a cluster of theories about predicates/relations, their arguments, and modifiers. Three novel ideas:

  i.   BUTTER (as in *Jones buttered the toast in the bathroom with a knife at midnight*) is a 3-place relation with an event argument (instead of being treated as a 2-place relation);
  ii. the event argument is existentially quantified; and
  iii. the modifiers are predicates of the event argument, added conjunctively.

According to Davidson, verbs of action such as *kicked* involve implicit existential quantification over events. On Davidson's view, *n*-place action verbs of tensed sentences are represented by (*n*+1)-place predicates, where the extra variable is a variable ranging over actions (a type of event). Action sentences are represented with explicit (first-order) existential quantification over an event argument, implying that they are indefinite descriptions of events.

(1)   *Shem kicked Shaun.*
      Ordinary first order logic: kick (Shem, Shaun)
                                       kick: 2-place predicate

      Davidson (1967): $(\exists x)$ (kicked (Shem, Shaun, x))   [= (17) in Davidson]
                                       kick: 3-place predicate

      Current notation: $\exists e$ [kick (Shem, Shaun, e)] 'e': the event argument
                                       In words: There exists some event *e* which was a kicking of Shaun by Shem (ignoring tense).

The use of existential quantification implies that ordinary action sentences presuppose an ontology of events through the use of verbs: When we use action verbs, we implicitly refer to events.

Ordinary first order logic (FOL):

The sentence *Shem kicked Shaun* is represented by means of an ATOMIC FORMULA / SENTENCE *kick (Shem, Shaun)*: It consists of a binary (two-place) predicate, *kick* and two singular terms, *Shem* and *Shaun*.

In general: ATOMIC FORMULA / SENTENCE = predicate (term$_1$, . . . , term$_n$)

                 TERM = constant (e.g., *Shem, Shaun*) or
                        variable (*x, y, …*) or
                        function (term$_1$, . . . , term$_n$)
                        (Example: *f(x)* may stand for "the father of x")

PREDICATE comes with some valence (or arity, number of its arguments) ≥1:
one-place: *laugh*, as in *laugh (Shem)*
two-place: *kick*, as in *kick (Shem, Shaun)*
three-place: *put*, as in *put (Shem, the-lamp, the-table)*

An atomic sentence is an atomic formula in which no variable occurs free.

In **Davidson's analysis**, the sentence *Shem kicked Shaun* is represented by means of a formula that is NOT atomic. It is an existentially quantified sentence involving a three-place predicate with a bound event variable. (The event argument remains implicit in so far as it is not expressed overtly in the surface form.) It asserts that a kicking of Shaun by Shem took place— i.e., there exists some event *e* which was a kicking of Shaun by Shem (ignoring tense).

The event argument is treated as a first-order variable of quantification.

- "I find entirely persuasive (…) Reichenbach's proposal that ordinary action sentences have, in effect, an existential quantifier binding the action-variable" (Davidson 1967, p. 81 / 1980, p.117).

  Background: Davidson (1967) builds on Hans Reichenbach (1947). In *Elements of Symbolic Logic*, Reichenbach (1947:§48) proposes that individuals may be of the 'thing type' or the 'event type', the latter being "space-time coincidences [which] do not endure" (p. 267). Events like a coronation, an assassination, an earthquake, an automobile accident (Reichenbach's examples, see pp. 267-8) are are treated as arguments of sentences, just as 'things' are. In Reichenbach's representation, the event argument is a variable which is bound by the existential quantifier. Davidson disagrees with Reichenbach regarding Reichenbach's proposal that 'an event *x* consists in the fact that *x*', but he adopts the notation and the idea that events are arguments. An event argument allows the event itself to hold a place in the argument structure of the predicate[2].

- On Davidson's view, action sentences are indefinite descriptions of events, just like nominalizations of the type *a rising of the sun, a flight to the North Pole* or *examination (of the students)*

  a rising of the sun: an *e* such that rise (the sun, *e*)
  examination (of the students): an *e* such that examine (*x*, the students, *e*)   (cf. also Higginbotham 2000, p.51)

LINGUISTICS: In **generative grammar**, this amounts to the hypothesis that the thematic grid of a verbal predicate has an extra (eventive) position:

(2)   kick: <*x*, *y*, *e*>

The verb *kick* is true of things *x*, *y*, and *e* if and only if *e* is a kicking of *y* by *x*. This extra event argument *e* is treated as any other ordinary variable by semantic and syntactic operations. If no other quantifier or operator binds it, the event variable is bound by default existential closure. (See Heim 1982, Higginbotham 1985.)

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[2] Davidson argues against Reichenbach's idea that [= (4)] has an unproblematic logical form distinct from that of [= (5)] or [= (6)].
    a. Amudsen flew to the North Pole. [= (4) in Davidson 1967/80]
    b. (∃x) (x consists in the fact that Amudsen flew to the North Pole). [= (5)]
    c. A flight by Amudsen to the North Pole. [= (6)]
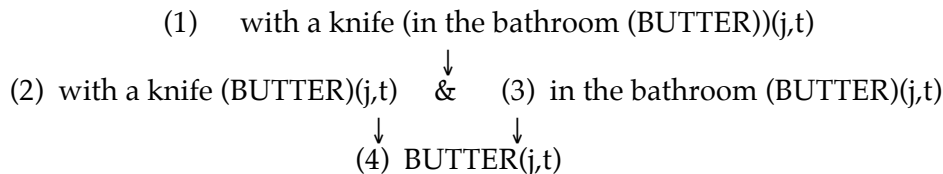
3. The Modifier Argument

3.1 The 'Diamond' Entailment Pattern

One of the most important arguments for Davidson's original proposal is the *Modifier Argument*: namely, Davidson's analysis allows us to account for the entailment relations among   action sentences like the following:

(1)   Jones buttered the toast in the bathroom with a knife.
(2)   Jones buttered the toast in the bathroom.
(3)   Jones buttered the toast with a knife.
(4)   Jones buttered the toast.

Clearly, (1) entails the conjunction of (2) and (3), each of which alone entails (4).   The conjunction of (2) and (3) does not entail (1).   Such entailment relations are represented in terms of the 'diamond entailment' pattern:

(5)   'Diamond' Entailment Pattern

$$(1) \quad \text{with a knife (in the bathroom (BUTTER))(j,t)}$$
$$\downarrow$$
$$(2) \text{ with a knife (BUTTER)(j,t)} \quad \& \quad (3) \text{ in the bathroom (BUTTER)(j,t)}$$
$$\downarrow \qquad\qquad\qquad \downarrow$$
$$(4) \text{ BUTTER(j,t)}$$

The conjunction of (2) and (3) does not entail (1).

Why?

Suppose that *Jones buttered the toast in the bathroom* with a toothbrush and *Jones buttered the toast* in the kitchen *with a knife*. The conjunction of (2) and (3) is then true, but (1) may be false.

Note: Davidson (1967) starts with the following sentence:

(1) *Jones buttered the toast slowly, deliberately, in the bathroom, with a knife, at midnight.*

He sets aside the adverbs *deliberately* and *slowly*. *Deliberately* raises the issue of intentionality and agency. The attributive *slowly* is excluded because (i) unlike the other adverbial clauses [in (1)], it "fails to introduce a new entity" (p. 82; p.106) and (ii) because of the special problem of its relative nature.
     The intentional adverb *deliberately* attributes something to the agent of the action and not to the action itself. Davidson (1967): "To say someone did something intentionally is to describe the action in a way that bears a special relation to the beliefs and attitudes of the agent…" (p. 94).
     The sentence in (1) may prompt the question "Slowly? Compared to what?" Davidson uses the example of crossing the Channel in fifteen hours: by boat, this would be a slow crossing; by means of swimming, this would be a fast crossing. In this instance, the interpretation of the adverb depends not on the action ("the crossing") but on the means ("by boat" or "by swimming").
     Davidson's discussion is limited at the outset to locative, instrumental, and temporal modifiers and the token in (1) is revised to (2) (Davidson himself removed the commas).

3.2 The 'Variable Polyadicity' Problem – Kenny (1963)

The observed entailment relations among sentences like (1) - (4) depend on the presence (and absence) of modifiers, but such entailment relations cannot be adequately represented with the tools of standard predicate logic.

SOLUTION 1: We could treat (1) - (4) as atomic sentences that contain distinct, logically autonomous predicates with various numbers of argument places. I.e., the verb *butter* would correspond to more than one logical predicate, each of which would have a different number and possibly type of argument places. When predicates have more than one possible combination of arguments, it exhibits 'variable polyadicity'.

(1a)	buttered (j, t, with-a-knife, in-the-bathroom)	BUTTER 3:	four-place predicate
(2a)	buttered (j, t, in-the-bathroom)	BUTTER 2a:	three-place predicate
(3a)	buttered (j, t, with-a-knife)	BUTTER 2b:	three-place predicate
(4a)	buttered (j, t)	BUTTER 1:	two-place predicate

PROBLEM with SOLUTION 1: "If we go on to analyze 'Jones buttered the toast' as containing a two-place predicate, 'Jones buttered the toast in the bathroom' as containing a three-place predicate, and so forth, we obliterate the logical relations between these sentences, namely, that (2) [Jones buttered the toast in the bathroom with a knife at midnight] entails the others. (…), the original sentences contain a common syntactic element ('buttered') which we intuitively recognize as relevant to the meaning relations of the sentences. But the proposed analyses show no such common element" (Davidson 1967/80, p.107).

Then the relevant entailments could only be explained in terms of *ad hoc* meaning postulates.

The problem of 'variable polydiacity' of verbs in connection with sentences like (1) – (4) was first noticed by Anthony Kenny (1963, Ch. 8) (cf. Davidson 1967/80, p.108).

SOLUTION 2: Another possible solution would be to treat the verb *butter* as a four-place predicate, something like in (5).

(5) buttered (Jones, the-toast, with something, somewhere)

(2a), (3a), and (4a) would then be treated as elliptic for (5), with two or one of the places not explicitly filled, although they are underlyingly present as 'standby positions'.

PROBLEM with SOLUTION 2: It would presuppose the existence of a definite upper bound to the number of adverbial modifiers that a single verb such as *butter* can co-occur with (see Davidson 1967/80, p.107).

CONCLUSION: We cannot account for the relevant logical connections by treating action verbs as ordinary predicates in predicate logic. There is no straightforward way of accounting for such logical entailments in standard predicate logic. See Davidson's discussion of possible alternative proposals by Kenny, Chisholm, von Wright, Reichenbach.

3.3   Solution to the polyadicity problem: Modifers as Predicates of the Event Argument
On Davidson's analysis the modifiers - *with a knife* and *in the bathroom* - are predicates of the event argument, added conjunctively.

(1c)   ∃e [butter (Jones, the-toast, e) ∧ with(a-knife, e) ∧ in(the-bathroom, e)]
(2c)   ∃e [butter (Jones, the-toast, e) ∧ in(the-bathroom, e)]
(3c)   ∃e [butter (Jones, the-toast, e) ∧ with(a-knife, e)]
(4c)   ∃e [butter (Jones, the-toast, e)]

Events as hooks: events are used as hooks to tie together modifiers with the predicate they modify.

∃e [butter (Jones, the-toast, e) ∧ with(a-knife, e) ∧ in(the-bathroom, e)]
In words: There is an event *e* such that *e* is a buttering by Jones of the toast and *e* is with a knife and *e* is in the bathroom.

4. Arguments vs. Modifiers (Adjuncts)
In the original Davidsonian approach, the difference between arguments and adjuncts is encoded in the semantic representation.

- Arguments have ordered positions in the argument structure of the verb:
  e.g. *butter (Jones, the-toast, e).*
- Adjuncts are modifiers of the event argument: e.g. *with (a-knife, e).*

 "In general we conceal logical structure when we treat prepositions as integral parts of verbs; it is a merit of the present proposal that it suggests a way of treating prepositions as contributing structure. Not only is it good to have the inference from (19) to (20); it is also good to be able to keep track of the common element in 'fly to' and 'fly away from' and this of course we cannot do if we treat these as unstructured predicates." (1967, p.93/1980, p.119).

(6)   a.   I flew my spaceship to the Morning Star.   [= (19)]
              ∃e (Flew(I, my spaceship, *e*) ∧ To (the Morning Star, *e*))

       b.   I flew my spaceship to the Morning Star.   [= (20)]
              ∃e (Flew(I, my spaceship, *e*)

Kratzer (1993, p.103) expresses a common way in which Davidson (1967) is understood by linguists: "In his analysis of action sentences, Donald Davidson drew a clear distinction between arguments and adjuncts."[3]

The potential problem with Davidson's and Kratzer's statements is that there is nothing in Davidson (1967) preventing us from suggesting that the representation of a ditransitive (3-place) verb such as *give* in (7) would not have a representation as in (8):

(7)   Bill gave the book to Mary.
(8)   ∃e [Gave (Bill, the book, *e*) & To(Mary, *e*)]

(8) goes against most linguistic theories that standardly take the *to*-phrase of *give* to be an obligatory (oblique) argument of *give*, rather than a modifier (or adjunct). But then Davidson's statement on prepositional phrases and Kratzer's statement on Davidson's argument/adjunct distinction are incongruous (unless Kratzer views the obligatory *to*-phrase in (7) as an adjunct, which she does not.)

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[3] Kratzer, Angelika. 1993. 'On External Arguments'. In E. Benedicto and J. Runner (eds.). *Functional Projections*. UMass Occasional Papers **17**, Graduate Linguistics Student Association, University of Massachusetts, Amherst, MA, pp. 103-130.