

## Mapping to Objects and Events

### 1 Proto-roles, argument selection and the neo-Davidsonian program

Dowty (1991): ‘Thematic roles’ are really prototypes that allow for different ‘degrees of membership’ based on the entailments in (1) and (2).

- (1) *Contributing properties for the Agent Proto-Role*
  - a. volitional involvement in event or state
  - b. sentience (and/or perception)
  - c. causing an event or change of state in another participant
  - d. movement (relative to the position of another participant)
  - e. (exists independently of the event named by the verb)
  
- (2) *Contributing properties for the Patient Proto-Role*
  - a. undergoes change of state
  - b. incremental theme
  - c. causally affected by another participant
  - d. stationary relative to movement of another participant
  - e. (does not exist independently of the event, or not at all)

These are entailments on arguments based on specific verbs; there is no constraint that a single argument have entailments only from one group, and no constraint on number, but the distribution of entailments affects argument selection as follows:

- (3) a. ARGUMENT SELECTION PRINCIPLE  
In predicates with grammatical subject and object, the argument for which the predicate entails the greatest number of Proto-Agent properties will be lexicalized as the subject of the predicate; the argument having the greatest number of Proto-Patient properties will be lexicalized as the direct object.
- b. COROLLARY 1  
If two arguments of a relation have (approximately) equal numbers of entailed P-Agent and P-Patient properties, then either or both may be lexicalized as the subject (and similarly for objects).
- c. COROLLARY 2  
With a three-place predicate, the nonsubject argument having the greatest number of entailed P-Patient properties will be lexicalized as the direct object and the nonsubject argument having fewer entailed P-Patient properties will be lexicalized as an oblique or prepositional object (and if two nonsubject arguments have approximately equal numbers of P-Patient properties, either or both may be DO).

Dowty notes that traditional roles correspond to collections of P-Agent/P-Patient entailments:

- (4) a. AGENT = volition (+ causation (+ sentience + movement))
- b. EXPERIENCER = sentience
- c. INSTRUMENT = causation + movement
- d. THEME = change + incremental theme + dependent existence + causally affected
- e. PATIENT = change + incremental theme + dependent existence

But incremental theme is not true of all traditional THEMES, and incremental theme, as we’ll see in more detail shortly, is itself possibly heterogeneous. More generally, the important feature of

Dowty's program is that labels like those in (4) are purely descriptive; they have no theoretical status when it comes to argument expression or, presumably, logical form. Before we ask whether this view is consistent with the neo-Davidsonian program, let's examine some results.

**Variable transitivity** One result is that it provides a natural account of 'degrees of transitivity': verbs like those in (5) have arguments with multiple, non-overlapping P-Agent and P-Patient properties, and are consistently rated as 'highly transitive'.

(5) build (a house), write (a letter), murder, eat, wash (a plate)

**Alternate lexicalizations** A second result is that 'perspectival antonyms' like *buy/sell*, *borrow/loan*, *give/take*, etc. are dealt with straightforwardly. Psych-verbs are more complicated, but provide interesting support for the proposal:

(6) EXPERIENCER subject  
a.  $x$  likes  $y$   
b.  $x$  fears  $y$   
c.  $x$  regards  $y$  as VP  
d.  $x$  is surprised at  $y$   
e.  $x$  is disturbed by  $y$

(7) STIMULUS subject  
a.  $y$  pleases  $x$   
b.  $y$  frightens  $x$   
c.  $y$  strikes  $x$  as VP  
d.  $y$  surprises  $x$   
e.  $y$  disturbs  $x$

For all of these, the EXPERIENCER is entailed to be sentient, and the STIMULUS is entailed to cause an emotional reaction/cognitive judgment in the EXPERIENCER. These are both P-Agent entailments, and seem to be it for the verbs. However, the verbs in (7) have inchoative as well as stative uses (not just in English but cross-linguistically), whereby a change of state is entailed of the EXPERIENCER. This is illustrated in (8): (8a) is only stative; (8b) is ambiguous, and the ambiguity correlates with a generic (= stative) vs. existential (= inchoative) interpretation of the bare plural NP *spiders*.

(8) a. Kim feared spiders.  
b. Spiders frightened Kim.

The class of STIMULUS-subject verbs, then, have senses that entail a P-Patient property of the EXPERIENCER.

**Asymmetrical symmetric verbs** Some verbs are symmetrical:

(9) a. This one and that one rhyme/intersect/are similar/are different.  
b. This rhymes with/intersects/is similar to/is different from that.

(10) a. Kim and Sandy hugged/embraced/kissed/made love/talked.  
b. Kim hugged/embraced/kissed/made love to/talked with Sandy.

(11) a. Kim and Sandy married/played chess/debated.  
b. Kim married/played chess with/debated Sandy.

However, not all alternations are felicitous:

- (12) a. The drunk hugged the lamppost.  
b. #The drunk and the lamppost hugged.

The crucial difference between the three groups of verbs: those in (11) require volitional involvement of both arguments; those in (9) require it of neither; those in (10) require it of one argument. Since volitionality is a P-Agent entailment, it gets linked to the subject position.

Is volitionality a ‘default’ external argument property? Let’s have another look at the ‘role definitions’ in (4).

**Internal argument alternations** The so-called *spray-load* alternation has been claimed to involve a subtle shift in meaning: the (a) sentences in (13)-(14) suggest that the totality of hay/paint is affected; the (b) sentences suggest that the totality of the cart/wall is affected. These intuitions are confirmed by the anomaly of (13a-b).

(Similar verbs: *brush, cram, crowd, cultivate, dab, daub, drape, drizzle, dust, hang, heap, inject, jam, mound, pack, pile....*; see Levin 1993 for a full list.)

- (13) a. Kim (completely) loaded the hay onto the truck.  
b. Kim (completely) loaded the truck with hay.

- (14) a. Kim (completely) sprayed the paint onto the wall.  
b. Kim (completely) sprayed the wall with paint.

- (15) a. Kim completely sprayed paint on the wall.  
b. Kim completely loaded hay onto the truck.

These examples, along with the following contrasts, suggest that the direct object is an INCREMENTAL THEME, regardless of whether it is also the ‘container’/‘surface’ or the ‘stuff’.

- (16) a. Lee sprayed this wall with paint in an hour.  
b. Lee sprayed this wall with paint for an hour.  
c. ??Lee sprayed paint on this wall in an hour.  
d. Lee sprayed pain on this wall for an hour.

- (17) a. ??Lee sprayed subway cars with this can of paint in an hour.  
b. Lee sprayed subway cars with this can of paint for an hour.  
c. Lee sprayed this (whole) can of paint onto subway cars in an hour.  
d. Lee sprayed this (??whole) can of paint onto subway cars for an hour.

Note that either argument (the container/surface or the stuff) could in principle be an INCREMENTAL THEME, because both undergo a gradual change on the basis of which we could track the progress of the event. Compare this to the two verbs we discussed last week: *hit* and *break*.

- (18) a. Pat hit the fence with the stick.  
b. Pat hit the stick against the fence. (= (18a))

- (19) a. Pat broke the fence with the stick.  
b. Pat broke the stick against the fence. (≠ (19a))

Dowty’s observations:

- (20) a. *spray/load* class  
 (i) entail change of state in both arguments; either could be incremental theme  
 (ii) appear in both patterns but with slight change in meaning due to incremental theme entailment fixed to object position
- b. *break* class  
 (i) entail change of state in only one argument  
 (ii) appear in both patterns but with radical change in meaning due to change of state entailment fixed to object position
- c. *hit* class  
 (i) no difference in proto-role entailments (motion?)  
 (ii) complete synonymy between two patterns

Dowty 1991, p. 595: “It is difficult to see how a (semantically non-ad hoc) classification in terms of ‘atomic’ thematic roles could combine with an argument selection principle to describe these classes economically.”

Fair enough. On the other hand, we don’t yet have a principled reason for why (3a) holds. It seems that there is a conspiracy to ensure that expressions that undergo changes, and especially those that undergo gradual changes on the basis of which we can track the course of an event, end up as direct objects. Is this an accident, or is it telling us something about more abstract structures/meanings at play here?

To answer this, we need to develop a finer-grained understanding of incremental themes and the relation between nominal and verbal reference.

## 2 Relations between objects and events

Let’s begin with some basic observations and definitions. First, we distinguish between *cumulative* and *quantized reference*.

- (21) *Cumulative reference: CUM*  
 $\forall P[CUM(P) \leftrightarrow \forall x, y[P(x) \wedge P(y) \rightarrow P(x + y)]]$

- (22) *Quantized reference: QUA*  
 $\forall P[QUA(P) \leftrightarrow \forall x, y[P(x) \wedge P(y) \rightarrow \neg y < x]]$

According to these definitions, mass nouns (*rice, mud, blood*), plural nouns (*books, records, cigarettes*), and atelic VPs (*run, sing, eat*) are cumulative. Count nouns are in some sense trivially quantized since they are ATOMIC. Mass and plural nouns with measure terms are quantized (*two bowls of rice, three pints of blood, four (boxes of) books*), as are telic VPs (*run a mile, sing a song, eat an apple*). Most interestingly, these factors interact:

- (23) a. run for/??in an hour  
 b. run a mile ??for/in an hour
- (24) a. drink wine for/??in an hour  
 b. drink a glass of wine (??)for/in an hour

The lexical semantics of the verb does make a difference, however, as we have already seen: without the possibility of a change in the direct object, we don’t see aspectual alternations based on its properties:

- (25) Kim saw a zebra/zebras for/??in 45 seconds.

So is (a)telicity just cumulative vs. quantized reference? Not quite: the event descriptions in the sentences in (26) are telic but not quantized.

- (26) a. Kim ran to the store.  
 b. Kim pushed the car to the gas station.  
 c. Kim lowered the heat to medium.  
 d. Kim raised the temperature to 68 degrees.

These kinds of examples show that telicity is rather that property that results in an event description identifying a *set terminal point* (Vendler 1967; defs. from Krifka 1992, p. 35):

(27) *Terminal Point: TP*  
 $\forall e, t [TP(e) = t \leftrightarrow t \subseteq \tau(e) \wedge \forall t' [t' \subseteq \tau(e) \rightarrow t' \preceq t]]$

(28) *Set Terminal Point: STP*  
 $\forall P [STP(P) = \forall e [P(e) \rightarrow \forall e' [P(e') \wedge e' \subseteq e \rightarrow TP(e) = TP(e')]]]$

As it turns out, all cumulative event predicates are  $\neg STP$ , and all quantized event predicates are *STP*, so for the most part we can just talk in these terms, but the more precise definition of (a)telic should probably be (not) *STP*.

- **NB:** (A)telicity is a property of event descriptions, not events. “Consider a concrete event of running and a concrete event of running a mile; ... surely both events have a terminal point (both events might even be identical). The difference is that an event of running might be part of a another event of running which has a later terminal point, whereas this is not possible for an event of running a mile.” (pp. 34-35 Krifka 1992)

So, how do we actually account for the interaction of ‘incremental theme’ arguments and (a)telicity in examples like (24)? And should (23) be treated the same way? What about Dowty’s other types of incremental themes?

Krifka (1989, 1992, 1998): Derive the object/event correlation in terms of the semantics of thematic roles within a general neo-Davidsonian event semantics. Specifically, Krifka proposes that a defining characteristic of the various types of incremental theme roles (his GRADUAL EFFECTED PATIENT, GRADUAL CONSUMED PATIENT, and GRADUAL PATIENT; presumably also Dowty’s HOLISTIC and REPRESENTATION-SOURCE THEMES) is that they satisfy ‘Mapping to Objects’ and ‘Mapping to Events’:

(29) a. *Mapping to Objects*  
 $\forall R [\text{MAP-O}(R) \leftrightarrow \forall e, e', x [R(e, x) \wedge e' \succeq e \rightarrow \exists x' [x' \succeq x \wedge R(e', x')]]]$   
 b. *Mapping to Events*  
 $\forall R [\text{MAP-E}(R) \leftrightarrow \forall e, x, x' [R(e, x) \wedge x' \succeq x \rightarrow \exists e' [e' \succeq e \wedge R(e', x')]]]$

The result is that there is a homomorphic relation between the part structure of the IT argument (using IT as a cover term here) and the part structure of the event. Let’s see how this works to derive the correlation between nominal and verbal reference in (30).

- (30) a. read poetry for/??in an hour  
 b. read a poem (??)for/in an hour (*for* triggers progressive/partitive interpretation)  
 c. read the poem (??)for/in an hour (ditto)  
 d. read poems for/(?)in an hour (*in* requires distributive interpretation)

**Aside:** Krifka’s assumption about time-span adverbials is that both measure the runtime of an event, but *for TIME* presupposes that event description it combines with is cumulative, while *in TIME* presupposes that it is atomic (analogous to classifiers/measure phrases vs. numerals).

This is a insightful analysis, with a huge amount of explanatory power, as we will see in the next few weeks. However, there are some problems, in particular with the assumption that we are working with a particular (and small) set of roles here. First, how do we ensure the right relation between events and parts of the apple in (31a-b) or (32a-b)?

- (31) a. eat the apple  
b. peel the apple

- (32) a. read the book  
b. burn the book

If we can't appropriately restrict the parts, these won't satisfy Mapping to Events.

Second, how do we handle cases that strictly speaking do not satisfy Mapping to Objects, such as *build the house*, where the event involves things like scaffolding (and arguably architectural plans) that are not part of the house? Krifka's response is to invoke SCENARIOS, which is intuitively right, but seems to be a bit of a patch in the context of the broader semantic analysis.

Third, and perhaps most importantly if we want to maintain a neo-Davidsonian analysis, how can we handle cases in which the argument that satisfies MAP-E and MAP-O is not a 'theme' in any other traditional sense, such as Dowty's HOLISTIC THEMES in (33) and REPRESENTATION-SOURCE THEMES in (34)? Also, what kind of paths should we be looking at? What exactly does *from NYC to Chicago* denote?

- (33) a. walk from A to B, drive (a car) from NYC to Chicago, run a mile  
b. grow into an adult, become an architect

- (34) copy a file, memorize a poem, read a book

Finally, what about verbs that describe gradual changes and have variable telicity but don't obviously have IT arguments at all?

- (35) a. The water cooled in/for 10 minutes.  
b. The balloon ascended in/for 30 minutes.  
c. The tub filled in/for 5 minutes.

It's clear that the 'mapping principles' are getting at a core property of these constructions and the relation between nominal and verbal reference. But are thematic roles (neo-Davidsonian or otherwise) the best way to capture this relation?

## References

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