

## Events and the Semantic Content of Thematic Relations

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In Davidson (1967, 1985), Castañeda (1967) and Parsons (1985, 1990), the problem of variable polyadicity as reflected in the inferential relations among the sentences in (1) is treated by a decomposition of the common predicate *stab*.

- (1) a. Brutus stabbed Caesar in the back with a knife. (Parsons 1990)  
b. Brutus stabbed Caesar in the back.  
c. Brutus stabbed Caesar with a knife.  
d. Brutus stabbed Caesar.  
e. Brutus stabbed.

- (a) entails (b) & (c) & (d) & (e). (b) & (c) & (d) & (e) does not entail (a).  
(b) entails (c) & (d) & (e). (c) & (d) & (e) does not entail (b).  
(c) entails (d) & (e). (d) & (e) does not entail (c).  
(d) entails (e). (e) does not entail (d).

- (2)  $\exists e \text{ stab}(e, \text{Brutus}, \text{Caesar}, \text{the back}, \text{a knife})$ .

$\text{stab}(e,x,y,z,w)$  is true of  $\langle \mathbf{e}, \mathbf{b}, \mathbf{c}, \mathbf{d}, \mathbf{k} \rangle$  iff  
 $\text{stab}(\mathbf{e}) \ \& \ \text{stabber}(\mathbf{e}, \mathbf{b}) \ \& \ \text{stabbee}(\mathbf{e}, \mathbf{c}) \ \& \ \text{in}(\mathbf{e}, \mathbf{d}) \ \& \ \text{with}(\mathbf{e}, \mathbf{k})$

Let's call any relation to events,  $R(e,x)$ , a thematic relation, among which are  $\text{stabber}(e,x)$ ,  $\text{stabbee}(e,x)$ ,  $\text{in}(e,x)$  and  $\text{with}(e,k)$ . For the inferences of (1), the decomposition into thematic relations can remain lexical as in (2), or it can be carried over into the syntax as in (3).

- (3)  $\exists e(\text{stab}(e) \ \& \ \text{stabber}(e, \text{Brutus}) \ \& \ \text{stabbee}(e, \text{Caesar}) \ \& \ \text{in}(e, \text{the back}) \ \& \ \text{with}(e, \text{a knife}))$

Elsewhere, when we turn to the interaction of plurals and quantifiers, the decomposition proves to be syntactic. In *Plurals and Events*, I called this radical decomposition *essential separation*. Observe in (5) that the terms decomposing the verb,  $coverer[e,X]$  and  $cover(e')$ , apply to different events and they are separated by elements from elsewhere in the sentence: the quantifiers *two workbenches* and *each* include within their scope  $cover(e')$  but not  $coverer[e,X]$ .

- (4) a. Three hundred quilt patches covered over two workbenches each with two bedspreads.  
 b. Three video games taught every quarterback two new plays.
- (5)  $\exists e([\exists X : 300 \text{ quilt patches}] \text{coverer}[e,X]^1 \ \& \ [\exists Y : \text{two workbenches}] \ [Each \ y : Yy] \ [\exists e' : e' \leq e](\text{cover}(e') \ \& \ \text{coveree}[e',y] \ \& \ [\exists Z : \text{two bedspreads}] \ \text{with}[e',Z])$

The syntactic separation of  $coverer[e,X]$  and  $cover(e')$  is essential to the extent that sentences like (4a) have interpretations that can be represented only by the likes of (5), which it is the burden of *Plurals and Events*, chapter 4, to have shown.<sup>2</sup> The tedious part of the argument is to show that no other logical syntax will do, but it is easy enough to imagine conditions for the truth of (4a) that are congenial to (5). Imagine that four bedspreads, draped as described, are made altogether from a total of three hundred quilt patches. The three hundred patches together cover the workbenches but do not all go into the bedspreads on any one bench. Moreover, some of the individual patches have themselves been torn between this or that bedspread. There is in this case a large event,  $e$  in (5), where exactly three hundred patches covered workbenches with bedspreads, and

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<sup>1</sup> I use square brackets to indicate that the enclosed variables are free in a possibly complex expression. Thus the square brackets indicate here that *coverer* may stand for something other than a primitive dyadic relation. In contrast, I use parentheses (or simple concatenation) to enclose the arguments of primitive predicates and relations.

nothing more precise can be said about how the patches were disposed of, just that this large event comprises two smaller events,  $e'$  in (5), in each of which a workbench is covered by patches making up two bedspreads.<sup>3</sup> The sentence (4a) can be taken to assert that two workbenches were each covered over with two bedspreads while leaving vague the distribution of the quilt patches. It is this combination of distributivity between *two workbenches each* and *two bedspreads* with the vague distribution of the quilt patches that makes the separation of thematic relations in (5) essential.

Now the inference patterns in (1) and the combinatorial properties that lead to (5) argue only for decomposition, that is, for a certain logical syntax, “ $\text{stab}(e) \ \& \ \text{R}(e,x) \ \& \ \text{S}(e,y)$ ”, and tell us nothing about the content of the thematic relations ‘ $\text{R}(e,x)$ ’ and ‘ $\text{S}(e,y)$ ’ assumed. They tell us that *explain to John* is “ $\text{explain}(e) \ \& \ \text{to}_1(e, \text{John})$ ” and *roll to John*, “ $\text{roll}(e) \ \& \ \text{to}_2(e, \text{John})$ ”; but they can’t say whether the prepositions are the same thematic relation or accidental homophones. It could be that each verb provides its own idiosyncratic collection, such as *stabber* $[e,\alpha]$ , *stabbee* $[e,\alpha]$ , *coverer* $[e,\alpha]$ , *coveree* $[e,\alpha]$ , *in* $[e,\alpha]$ , *with* $[e,\alpha]$ , and the thematic relations are as numerous as the verbs themselves twice- or thrice- fold (*P&E* 85ff., n. 2 p. 331ff.). Once the formal point about decomposition has been established, we should go on to inquire after the content of its terms, and here linguistics has quite a bit to say. In a tradition descending from Gruber (1965) and Jackendoff (1972), a notion of thematic role is deployed primarily to explain

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<sup>2</sup> Cf. Bayer 1997 for some opposing discussion.

<sup>3</sup> The logical form (4) simplifies and slights an important aspect of the meaning of (3), which for present purposes we can ignore. The two workbenches’ being each covered with two bedspreads is not merely part of the three hundred patches’ covering but completely coincides with it. v. Schein 1993, p. 146ff.

uniformities in meaning and grammar *across the lexicon*, and thus the same preposition *to* is called upon to formalize the inferences in (6).

(6) *To(e,x)*. (Jackendoff 1987)

*Bill ran to the house* |- *Bill is at the house*.

*Bill gave the book to Harry* |- *The book is with Harry*.

*The light changed from red to green* |- *the light was green*.

*Mary explained the idea to John* |- *John has the idea*. (Dowty 1989)

*John rolled the ball to the fence* |- *The ball is at the fence*.

\**Bill ran toward the house* |- *Bill is at the house*.

\**Bill pointed to the house* |- *Bill is at the house*.

Alongside formalized inference, thematic roles are called upon to relate meaning to grammar. In the most ambitious formulations, the thematic role of an argument determines where it appears in the sentence's phrase structure<sup>4</sup> (v. *Universal Alignment Hypothesis* (Perlmutter & Postal 1984), *Uniformity of Theta Assignment Hypothesis* (Baker 1988). v. discussion in Pesetsky 1995). In explaining widespread syntactic patterns, we end up with a small class of thematic roles and thus many verbs the subjects of which are all Agents or Experiencers, and many verbs all of whose direct objects are Themes or Patients. In short, many verbs feel like they are saying the same thing about their subjects, that they are Agents, for example, and grammar appears to confirm the classification that emerges from such judgments.

Identifying the terms of the decomposition in (3) and (5) with the thematic roles that we see across the lexicon, we have instead (7) and (8):

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<sup>4</sup>As well as other grammatical processes. v. Levin 1993, Levin & Rappaport Hovav 1995 for a survey and Dowty 1989, 1991 for a survey and important, skeptical remarks.

- (7)  $\exists e(\text{stab}(e) \ \& \ \text{Agent}[e, \text{Brutus}] \ \& \ \text{Patient}[e, \text{Caesar}] \ \& \ \text{in}[e, \text{the back}] \ \& \ \text{with}[e, \text{a knife}])$
- .
- (8)  $\exists e([\exists X : 300 \text{ quilt patches}] \ \text{Theme}[e, X] \ \& \ [\exists Y : \text{two workbenches}] \ [\text{Each } y : Yy] \ [\exists e' : e' \leq e](\text{cover}(e')) \ \& \ \text{Location}[e', y] \ \& \ [\exists Z : \text{two bedspreads}] \ \text{with}[e', Z])$

If decomposition proceeds as in (7) and (8), with thematic relations as separate phrases, and their syntactic positions are predictable, we can explain the course of acquisition and our understanding of novel verbs and of familiar verbs in novel contexts, as in *The blog looked the clob out of the droon* (Gleitman 1991, Borer 1994, 1998ab) and *You keated the board with the marbles vs. You keated the marbles onto the board* (Gropen et al. 1991). By separation, the verb expresses only the event concept, *look(e)* or *keat(e)*, and it swaps into a syntactic structure in which the thematic relations are already given. Since there is an invariance in the meaning of these thematic relations from one verb to another, something is understood of what happened in the reported event. Thus the extensibility of thematic relations to novel contexts is an important consideration in favor of both their syntactic separation and their generalization across the lexicon.<sup>5</sup>

### Absolute or Relativized Thematic Roles?

The generalization to a few thematic roles invites the first question that I wish to take up here: Are thematic roles absolute or relativized to event concepts and semantic fields? Is Brutus the Agent of an event *tout court*, ‘Agent(*e*, Brutus)’, or the Agent for a

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<sup>5</sup> The combinatorial argument from chapter 4 of *Plurals and Events* as well as a further argument in chapter 8, p. 165f. are not the only ones for syntactic separation. See also Benua and Borer 1996; Borer 1994, 1998; Kratzer 1996; McClure 1995; Ritter & Rosen 1998, to appear; Rosen 1999; Travis 1994, 1997, to appear; van Hout 1992, 1996.

stabbing, ‘Agent(*e*, Brutus, ‘stab’)?’ In (9) the question has more bite, where thematic roles apply both to a physical action and an abstract one.

- (9) i. a. Mary rolled the ball to John | - John has the ball.  
       b. Mary explained the idea to John | - John has the idea.<sup>6</sup>
- ii. a. Brutus stabbed Caesar.  
       b. Brutus insulted Caesar.

Does John do the same thing, ‘to(*e*, John)’, in the one event that he does in the other. Or, is he the goal for an explanation ‘to(*e*, John, ‘explain’)’ in one, and the goal for a rolling, ‘to(*e*, John, ‘roll’)’ in the other?<sup>7</sup> Similarly, does Caesar succumb in the same way, ‘Patient(*e*, Caesar)’ to both insult and injury, or by different cuts, ‘Patient(*e*, Caesar, ‘stab’)’ and ‘Patient(*e*, Caesar, ‘insult’)?’ Is it ‘Agent(*e*, Brutus)’, or ‘Agent(*e*, Brutus, ‘stab’)’ and ‘Agent(*e*, Brutus, ‘insult’)?’ All but one of the considerations mentioned so far in favor of decomposition and thematic roles are of no help here. As I said earlier, the inference patterns of (1) and the combinatorial properties of essential separation are indifferent to the content of thematic roles. Where thematic

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<sup>6</sup> Sabine Iatridou (p.c.) points out that the implication is dependent on the background conditions assumed: *Sisyphus rolled the ball to the pinnacle, but it didn't stay put, Mary explained the idea to John, but he still didn't get it.*

<sup>7</sup> Dowty (1989) remarks, “I have no idea at present how to go about constructing a criterion that permits thematic roles to depend on what we might call natural classes of verb meanings, as illustrated by [(9ia)] and [(9ib)], without permitting quite arbitrary dependence on verb meaning.” I raise the question; but, for the reason given in Fodor (1998, p. 50), I do not think that an observation of polysemy is itself a good argument for relativized concepts. Later arguments are more sincere. It might seem that much of what is assumed here runs afoul of the demise of definitions (Fodor 1998, Fodor & Lepore 1998), semantic atomism. The decomposition so-called of ‘stab’ does not however define it -- at least not according to the syntactic decomposition on offer. Rather, the claim is that one is mistaken in thinking that *stab* has the syntax ‘stab(*e*,*x*,*y*)’. It’s ‘stab(*e*)’ and it means STAB(*e*), respecting semantic atomism. In addition, there are several zero morphemes (or perhaps Case itself) with the meanings of various thematic roles. Semantic atomism comes with a rather disquotational lexicon (Fodor 1998, p. 55). I could say better whether the zero morphemes are also consistent with semantic atomism, if I knew how to do the disquotational semantics for bound morphemes such as the verbal prefix *re-*. As for the thematic roles themselves, I assume that one can ask whether or not they are relativized to event concepts or semantic fields in the same spirit that one asks whether an attributive predicate such as *slow* is similarly relativized, without fear that either answer defines these concepts in a way contrary to semantic atomism.

roles matter, the interaction between grammar and thematic roles can proceed, positioning ‘Agent( $e$ , Brutus,  $\alpha$ )’ just the same as it would ‘Agent( $e$ , Brutus)’; and, what speakers know when they know (6) can be formalized as (10) or (11), with either absolute or relativized thematic roles.

$$(10) \quad \forall e \forall x \forall y \exists e' ((\text{Theme}(e, x) \ \& \ \text{To}(e, y)) \rightarrow (\text{Theme}(e', x) \ \& \ \text{At}(e', y)))$$

$$(11) \quad \forall \xi \forall e \forall x \forall y \exists e' ((\text{Theme}(e, x, \xi) \ \& \ \text{To}(e, y, \xi)) \rightarrow (\text{Theme}(e', x, \xi) \ \& \ \text{At}(e', y, \xi)))$$

We can however make some progress on the question, reflecting on the extensibility of thematic relations in novel contexts:

(12) The blog looked the clob out of the droon.

(13) a. You keated the marbles onto the board.  
b. You keated the board with the marbles.

To know what we know of what passed among you, the marbles and the board cannot depend on knowing anything particular about keating. Moreover, what we understand to have happened between the clob and the droon is likely to be inconsistent with what we would otherwise expect from lookings (Gleitman 1990, Bowerman 1982, Pinker 1989, Borer 1998b). What we understand of their participation must follow from what we already know about like participants in other situations. Thus, even if thematic roles are themselves relativized to event concepts, we have knowledge of the form in (14) where  $\Phi$  contains no free occurrences of ‘ $\xi$ ’, from which we can infer  $\Phi$  without knowing what a keating is<sup>8</sup>.

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<sup>8</sup> This is reminiscent of the view (Dowty 1989, Ladusaw & Dowty 1988) that thematic roles are ‘compiled’ from the entailments of primitively, polyadic verbs. Thus the Agent thematic role is the conjunction of all  $\Phi[e, x]$  (with only  $e$  and  $x$  free in  $\Phi$ ) such that for every verb  $V$  in the class of verbs with Agents for subjects  $\forall e \forall x \forall y_1 \dots y_n (V(e, x, y_1, \dots, y_n) \rightarrow \Phi[e, x])$ . See Parsons (1995) for discussion.

$$(14) \quad \forall \xi \forall e \forall x (\text{Agent}(e, x, \xi) \rightarrow \Phi[e, x])$$

Suppose further that what one knows (15) of Themes in general and of other thematic roles in general is sufficient to discriminate one from the other (cf. Dowty 1989), as appears to be the case from what we understand of their novel uses.

$$(15) \quad \begin{aligned} &\forall \xi \forall e \forall x (\text{Theme}(e, x, \xi) \rightarrow \Phi'[e, x]) \\ &\forall \xi \forall e \forall x (\text{With}(e, x, \xi) \rightarrow \Phi''[e, x]) \\ &\forall \xi \forall e \forall x (\text{On}(e, x, \xi) \rightarrow \Phi'''[e, x]) \end{aligned}$$

Are not  $\Phi[e, x]$ ,  $\Phi'[e, x]$ ,  $\Phi''[e, x]$  and  $\Phi'''[e, x]$  then constitutive of absolute thematic roles? It seems that extensibility to novel contexts betrays knowledge that:

$$(16) \quad \begin{aligned} &\forall \xi \forall e \forall x (\text{Agent}(e, x, \xi) \rightarrow \text{Agent}(e, x)) \\ &\forall \xi \forall e \forall x (\text{Theme}(e, x, \xi) \rightarrow \text{Theme}(e, x)) \\ &\forall \xi \forall e \forall x (\text{With}(e, x, \xi) \rightarrow \text{With}(e, x)) \\ &\forall \xi \forall e \forall x (\text{On}(e, x, \xi) \rightarrow \text{On}(e, x)) \end{aligned}$$

So much argues that speakers have within their grasp absolute thematic roles, but it does not decide between (17) and (18), i.e., whether they or their relativized counterparts (if there are such) are what appear in logical form.

$$(17) \quad \exists e (\text{stab}(e) \ \& \ \text{Agent}(e, \text{Brutus}) \ \& \ \text{Patient}(e, \text{Caesar}) \ \& \ \text{in}(e, \text{the back}) \ \& \ \text{with}(e, \text{a knife}))$$

$$(18) \quad \exists e (\text{stab}(e) \ \& \ \text{Agent}(e, \text{Brutus}, \text{'stab'}) \ \& \ \text{Patient}(e, \text{Caesar}, \text{'stab'}) \ \& \ \text{in}(e, \text{the back}, \text{'stab'}) \ \& \ \text{with}(e, \text{a knife}, \text{'stab'}))$$

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Parsons (1995: 657) suggests that (i) argues for absolute thematic roles, but (i) can be formalized with relativized thematic roles as in (ii).

- (i) a. I don't know if that car was sold, given, imposed, or what. But, whatever it was, it was to Martha, not to you; so stop sniveling.  
b. Everything evil done in the city that day was done by the barbarians.
- (ii) a. ... $\forall \xi \forall e (\text{Theme}(e, \text{that car}, \xi) \rightarrow (\text{To}(e, \text{Martha}, \xi) \ \& \ \neg \text{To}(e, \text{Martha}, \xi)))$ ...  
b.  $\forall \xi \forall e ((\xi e \ \& \ \text{evil}(e) \ \& \ \text{In}(e, \text{the city}, \xi) \ \& \ \text{On}(e, \text{that day}, \xi)) \rightarrow \text{Agent}(e, \text{the barbarians}, \xi))$

Event identities

We can look for further constraints on the choice between (17) and (18) to a connection between assertions of event identities and relativized thematic relations.<sup>9</sup> If events are like everything else, there should sometimes be alternative descriptions of the same event. When Ray plays a sonata on his clarinet, his playing the sonata is the same event as his playing the clarinet, or so it would seem. Similarly, when Jim drinks exactly one beer in exactly one hour at Ken's Pub on Thursday afternoon, one judges that Jim's drinking at Ken's pub, Jim's drinking on Thursday afternoon, Jim's drinking at Ken's pub on a Thursday afternoon, Jim's drinking a beer in nothing less than an hour, Jim's drinking beer for an hour, etc. all seem to be the same event. Yet such identities, innocent or not, threaten, as we will see next, to relativize thematic relations as soon as a conjunction of them is taken to compose logical form.

Suppose, for example, that a sphere rotates and under friction with the air heats up. One can truthfully report that the sphere's rotating was its heating up. If this report expresses an identity and it is assumed that nominalization abstracts on the event argument of the corresponding sentence (Parsons 1990), we confront the following inference:

- (19) i. ***The sphere heated up slowly.***  
 **$\exists e(\text{heat up}(e) \ \& \ \text{Theme}(e, s) \ \& \ \text{slow}(e))$**
- ii. heat up(h) & Theme(h, s) & slow(h) (i., Existential Instantiation)
- iii. ***The sphere's rotating was the sphere's heating up.***  
 **$(\text{the } e)(\text{rotate}(e) \ \& \ \text{Theme}(e, s)) = (\text{the } e)(\text{heat up}(e) \ \& \ \text{Theme}(e, s))$**

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<sup>9</sup> There is an extensive literature on what follows. See Parsons 1990, Davies 1991, Carlson 1998 and Pianesi & Varzi 1999 for a survey of the issues and references cited.

- iv. (the  $e$ )(rotate( $e$ ) & Theme( $e,s$ )) = h (ii., iii., *the*)
- v. rotate(h) & Theme(h,s) (iv., *the*)
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- vi. rotate(h) & Theme(h,s) & slow(h) (ii, v, &-Elimination, &-Introduction)
- vii. ***The sphere rotated slowly.***  
 **$\exists e(\text{rotate}(e) \ \& \ \text{Theme}(e, s) \ \& \ \text{slow}(e))$**  (vi., Existential Generalization)

That is, if (19iii) is a true identity statement, then (19i) and (19iii) should entail (19vii) according to their Davidsonian logical forms. The inference is however rejected. It is obvious that events do not have an absolute property of being slow but only under comparison with like events. The sphere heated up slowly for a heating up, and even if that is the same event as the sphere's rotating, it cannot be inferred that the sphere rotated slowly for a rotating. In fact, only a very rapid rotation will generate enough friction for heat:

- (20) i. ***The sphere heated up slowly.***  
 **$\exists e(\text{heat up}(e) \ \& \ \text{Theme}(e, s) \ \& \ \text{slow}(e, \text{'heat up'})$**
- iii. ***The sphere's rotating was the sphere's heating up.***  
 **$(\text{the } e)(\text{rotate}(e) \ \& \ \text{Theme}(e,s)) = (\text{the } e)(\text{heat up}(e) \ \& \ \text{Theme}(e,s))$**
- 
- #vii. ***The sphere rotated slowly.***  
 **$\exists e(\text{rotate}(e) \ \& \ \text{Theme}(e, s) \ \& \ \text{slow}(e, \text{'rotate'})$**

An attributive adjective such as *slow* is by nature relativized, but the same argument threatens to relativize thematic relations as well. If (21ii) is a true identity statement, then (21ii) and (21i) should entail (21iii).

- (21) i. *The sphere heated up at .01°/sec.*

$\exists e(\text{heat up}(e) \ \& \ \text{Theme}(e, s) \ \& \ \text{At}(e, .01^\circ/\text{sec.}))$

- ii. *The sphere's rotating was the sphere's heating up.*  
 (the  $e$ )(rotate( $e$ ) & Theme( $e, s$ )) = (the  $e$ )(heat up( $e$ ) & Theme( $e, s$ ))

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- #iii. *The sphere rotated at .01°/sec.*  
 $\exists e(\text{rotate}(e) \ \& \ \text{Theme}(e, s) \ \& \ \text{At}(e, .01^\circ/\text{sec.}))$

To block the inference it would be enough to relativize any of the thematic relations--  $e$  is at .01°/sec for a heating, or  $e$  is of the sphere for a heating. This argument for relativized thematic relations is however only as strong as the identity statement in (21ii), and it may just be better to deny it (Parsons 1990: 157). The sentence is undeniably true, but in the face of such wayward uses of the copula as in *Mary's praising of John was her disapproving of Peter* or *Reagan's election was the conservative social agenda's inauguration*, there is no reason to assume that it expresses strict identity. Perhaps the sphere's rotation and its heating up are after all distinct events that merely coincide in space and time. One can well imagine that if air had been absent from the ambient environment, it would have been the very same rotation without the sphere's heating up.<sup>10</sup>

The inferences in (19) and (21) thus illustrate a trade-off: to block them, either deny that the sentences (19iii) and (21ii) express strict identity, contrary to the logical forms shown, and allow that events are finer-grained, that there are many where one might have thought there was one, or relativize a thematic role, replacing  $\text{At}(e, .01^\circ/\text{sec.})$  with  $\text{At}(e, .01^\circ/\text{sec.}, \text{'heat'})$  and  $\text{At}(e, .01^\circ/\text{sec.}, \text{'rotate'})$ . If, as in (19) and (21), logical

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<sup>10</sup> Of course it could not be the same rotation if that meant the same velocity under the same force propelling it forwards.

form is a simple conjunction of thematic relations, then we cannot have all at once both absolute thematic relations and the coarser-grained events that true identities would convey. In the case of rotating and heating up it may disappoint only a few philosophers to learn that they are not the same, but if one insists on absolute thematic roles throughout, we may discover that there is no end to the events that need to be distinguished.

In fact, the fine-grained events come sooner. Assumptions more fundamental to the analysis than absolute thematic relations point to them. For either (23a) or (23b) to do the work of (24), it must be understood that the agents referred to are the only agents of the event and the patients referred to, its only patients.

- (22) 248 engineers assembled 27 airplanes.  
 (23) a. Agent[ $e, X, \xi$ ] & assemble( $e$ ) & Patient[ $e, Y, \xi$ ]  
       b. Agent[ $e, X$ ] & assemble( $e$ ) & Patient[ $e, Y$ ]  
 (24) Assemble( $e, X, Y$ )

Otherwise, if this event could contain other agents, say, some mechanics, or other patients, some helicopters, we would not be able to infer from (23) that the engineers assembled the airplanes rather than the helicopters or that the airplanes were not assembled by the mechanics. The named participants must exhaust the participants in their thematic relations or else the Davidsonian analysis doesn't get off the ground<sup>11</sup>. If

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<sup>11</sup> v. Carlson 1984 and for extensive argument of this point, v. Lasersohn (1995), chapter 6, 69ff. The representation of exhaustivity is taken up in Schein(1998, forthcoming). Exhaustivity is distinguished from Thematic Uniqueness, a principle of grammar that stipulates that a thematic role will not be assigned to more than one argument. A logical form such as (i) violates Thematic Uniqueness but respects Exhaustivity. The thematic relations are taken to be complex, and Exhaustivity holds that the  $X$  are all the participants that are both Theme and  $R$  to  $e$ . The logical form in (ii) is also consistent with Exhaustivity

so, it follows from the logical forms in (25) and (26) that Ray's playing music on the clarinet is not the same event as his playing the clarinet (Parsons 1990: 157).

- (25) Ray played music on the clarinet.  
 $\exists e(\text{Agent}[e, r] \ \& \ \text{play}(e) \ \& \ \text{Theme}[e, m] \ \& \ \text{On}[e, c])$
- (26) Ray played the clarinet.  
 $\exists e(\text{Agent}[e, r] \ \& \ \text{play}(e) \ \& \ \text{Theme}[e, c])$

The unique Theme of one event is music, and the unique Theme of the other is the clarinet. By a similar argument, weighing the Volvo is not the same event as weighing the Volvo's parts, although I decide to weigh the parts by weighing the Volvo:

- (27) I weighed the Volvo.  
 $\exists e(\text{Agent}[e, i] \ \& \ \text{weigh}(e) \ \& \ \text{Theme}[e, v])$
- (28) I weighed the Volvo's parts.  
 $\exists e(\text{Agent}[e, i] \ \& \ \text{weigh}(e) \ \& \ \text{Theme}[e, P])$

The Theme of the first event is the Volvo, and the parts are the Theme of the second.

These events have different Themes if the one, the Volvo, is not identical to the many, its parts; and thus the events are distinct. Similarly again, the Carnegie Deli's sitting opposite Carnegie Hall is not the same as Carnegie Hall sitting opposite the Carnegie Deli, since they have different Themes and different locations:

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although it violates Thematic Uniqueness. If, however, thematic relations are simple, absolute thematic roles, then Exhaustivity implies Uniqueness.

- (i)  $(\text{Theme} \ \& \ R)[e, X] \ \& \ V(e) \ \& \ (\text{Theme} \ \& \ S)[e, Y]$   
 (ii)  $\text{Theme}[e, X, \xi] \ \& \ V(e) \ \& \ \text{Theme}[e, Y, \zeta]$

- (29) The Carnegie Deli sits opposite Carnegie Hall.  
 $\exists e(\text{Theme}[e, d] \ \& \ \text{sit}(e) \ \& \ \text{Opposite}[e, h])$
- (30) Carnegie Hall sits opposite the Carnegie Deli.  
 $\exists e(\text{Theme}[e, h] \ \& \ \text{sit}(e) \ \& \ \text{Opposite}[e, d])$

Arguments for fine-grained events arise as soon as we acknowledge the exhaustivity of thematic relations, which no Davidsonian analysis can do without, and now notice that relativizing thematic relations will not deflect these arguments. There is no hope that the thematic relations or event concept expressed in (29) will differ from those in (30) or that they will distinguish (27) from (28). The events themselves have to be different. The question posed by the choice between (17) and (18) appears then to be moot. If speakers are in possession of absolute thematic relations ((16)) and independent considerations ((25)-(30)) in any case require fine-grained events, why should it be supposed that speakers use relativized thematic relations?

Sec. 2 below develops an argument against absolute thematic relations that arises from plurality and collective predication. Even if events are as fine-grained as you like, the new difficulty for absolute thematic roles will persist.<sup>12</sup> The argument against

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<sup>12</sup> Dowty (1991) voices skepticism about thematic roles, but by my lights he is a true believer. His skepticism derives from the observation that there are many verbs with arguments that would be classified as Agents and Patients by grammatical standards that nevertheless differ with respect to the attributes listed in (i).

- (i) A. Proto-Agent (Dowty 1991)
- a. volitional involvement in the event or state.
  - b. sentience (and/or perception)
  - c. causing an event or change of state in another event.
  - d. movement relative to the position of the event named by the verb.
  - e. exists independently of the event named by the verb.
- B. Proto-Patient
- a. undergoes change of state

absolute thematic relations is thus freed of metaphysical assumptions about events (unlike (21)), which perhaps makes it more compelling. An interesting and unexpected aspect of the argument is that it makes crucial use of the logical syntax of separation (v. (5) above) to get a fix on the content of thematic roles. The conclusion is that either thematic roles will have to be relativized to event concepts or, as I suspect is the case, there is yet more abstract syntax.

If I quit after such an argument, I leave thematic relations less than absolute and events so fine-grained that playing the clarinet is not the same as playing music on it, weighing the Volvo's parts by weighing the Volvo is not the same event as weighing the Volvo, the Carnegie Deli's sitting opposite Carnegie Hall is not the same as Carnegie Hall's sitting opposite the Carnegie Deli, and Jim's drinking beers is not the same as his drinking some beers. I would rather not leave the theory in such a weakened condition if it is to ever stand as more than an engine for patterns of inference ((1)) and combinatorics ((4)-(5)). The fault lies with logical form, with the simple, flat-footed conjunction of

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- 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.

You should be disappointed if you had defined Agent as Causer but this does not undermine the thematic role. Far from it, Dowty has shown us how to save it if we take his theory at face value. I take it that he has simply provided a conceptual analysis:

- (ii) Agent( $e,x$ ) is true of  $\langle e,a \rangle$  iff  
 $a$  is the *most* proto-agentive in  $e$  with respect to the six attributes in (i.A).
- Patient( $e,x$ ) is true of  $\langle e,a \rangle$  iff  
 $a$  is the *most* proto-patient in  $e$  with respect to the six attributes in (i.B).

The thematic roles in (ii) are absolute. Each has only one sense that applies to every event on every occasion of use. What I have to say about thematic roles is nastier.

thematic relations. In the end, abstract syntax will be called upon to save both absolute thematic relations and a naive, fairly coarse understanding of events.

Sec. 1 offers a defense (§1.1) of speakers' judgments that events are coarser and an analysis (§1.3) that reconciles this *a priori* intuition with the exhaustivity of thematic relations. A more articulated logical form introduces a distinction between scenes with a given resolution and the events they are scenes of. The fine-grained scenes answer the problem of exhaustivity while events remain the medium-grained subjects of intuition. Such a convenient solution may look like sleight-of-hand were it not for the fact that the scenes and resolutions proposed are a natural extension of the mereology of events, which is necessary on independent grounds (§1.2) when navigating among pluralities of events, where event boundaries have to be redrawn to sort out who did what to whom.

The last section, 3, is a treatment of telicity designed for the following problem: given our fairly coarse understanding of events according to which Jim's drinking beers is the very same event as his drinking some beers, how can we defuse the following inference without relativizing any of the thematic relations.

- (31) Jim's drinking some beers in nothing less than an hour = Jim's drinking beers for an hour.

Jim drank some beers in nothing less than an hour.

$\exists e(\text{Agent}(e,j) \ \& \ \text{drink}(e) \ \& \ \text{Patient}(e, \text{some beers}) \ \& \ \text{In}(e, \text{nothing less than an hour}))$

Jim drank beers.

$\exists e(\text{Agent}(e,j) \ \& \ \text{drink}(e) \ \& \ \text{Patient}(e, \text{beer}))$

\*Jim drank beers in nothing less than an hour.

$\exists e(\text{Agent}(e,j) \ \& \ \text{drink}(e) \ \& \ \text{Patient}(e, \text{beers}) \ \& \ \text{In}(e, \text{nothing less than an hour}))$

This part very quickly states its solution, a further articulation of logical form that manages to undo the inference in (31) without sacrificing the identity of the reported events. But, the honest toil has just begun. I have to show that the solution takes the right view of telicity, and so the discussion of telicity and its literature ranges beyond the immediate concerns that relate event identity, thematic content and logical form.

## 1. Events

### 1.1. Medium-grained Events

Talk about events is like talk about other things. They are particulars, and as such they are sometimes the values of variables. If our thoughts about them are like our thoughts about other things, the same events can enter into many different thoughts.

Granted there are also differences between events and objects. I can sensibly ask of the occupants of two distinct regions of space-time whether or not they are the same object displaced, but not whether or not they are the same event. Enough metaphysics.

Observing the behaviors of speakers, we conclude that they discern and talk about objects, and from such observations, we should also conclude-- so the theory claims-- that they discern and talk about events. Behavior justifies the attribution and the semantics that relies on it long before we have identity conditions for the speaker's concepts of object and event. If the identity conditions for objects are largely indeterminate, then the

theory expects no better for events.<sup>13</sup> I should first begin to worry if events showed an unnatural clarity in their identity conditions as if they were just sets of points or partial models for sentences.

The fine-grained events that the theory has forced on us at this point are however unlike other things. As soon as we think of an event under one description it becomes unavailable to any other. If ever there were alternative descriptions of the same event, they should include pairs like *Ray's playing music on the clarinet* and *Ray's playing the clarinet*, *my weighing the Volvo's parts by weighing the Volvo* and *my weighing the Volvo*, *the Carnegie Deli's sitting opposite Carnegie Hall* and *Carnegie Hall's sitting opposite the Carnegie Deli* and *Jim's drinking beers* and *Jim's drinking some beers*.

Wider intuitions uphold these identities. If the theoretical conclusion is that the sphere's rotating isn't really the same event as its heating up, intuitions confirm-- or at least allow-- that the very same rotation could have happened without the sphere heating up. In contrast, although one could imagine the very same performance in a different acoustic environment, one cannot imagine circumstances under which the performance described by *Ray's playing the clarinet* would be the same had the allegedly distinct event described by *Ray's playing music on the clarinet* not occurred. These are distinct events that cannot be redescribed and cannot be imagined apart from one another. Similar remarks apply to the two weighings and the two sittings opposite.

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<sup>13</sup> These sentiments echo Parsons (1990) and Pianesi & Varzi (1999) and Lombard (1998) among recent examples. For recent discussion of related metaphysical issues, see Koslicki (1998, 1999). The literature on aspect (Taylor 1977, 1985, Dowty 1982, Bach 1986 among others) has long pursued an analogy between Verb Phrases denoting events and Noun Phrases denoting objects, extending the count/mass distinction to both without fully explicating the distinction.

Parsons (1990: 159) comments on such uncongenial intuitions that “as Taylor 1985 points out, it is not difficult to coin a notion of *kinship*, where two events are *akin* if they are identical according to your favorite theory. We then say that two events are ‘the same’ if and only if they are akin in this sense. Since we often use ‘the same’ to stand for some salient sense of similarity short of identity, the notion may save the *a priori* intuitions without contradicting the theory.” True enough-- but I want to volunteer a favorite theory of event identity about as much as I want to give a theory of object identity, and I don’t want to hand-wave at the data either. Can’t I give a semantics and an account of verbal behavior that comports with *a priori* intuitions without proffering a metaphysics?

Fine-grained events toss a large heap of sand into the workings of our intuitions. Suppose I try to explain that weighing *x* is weighing the mass of *x*, scrubbing *x* is scrubbing the surface of *x*, *x*’s being paralyzed is for some *y* of *x*’s nerves, *y*’s being paralyzed, or I try to declare a meaning of my own invention-- *to molecularize* is to enumerate and classify the molecules of an object or objects, so that to molecularize *x* is, by explicit definition, to molecularize the molecules of *x*. We have already seen that the theory precludes such identities so long as the analysis is as in (32):

- (32) weigh(*e*) & Patient[*e*, *x*]  
 weigh(*e*) & Patient[*e*, *x*’s mass]
- scrub(*e*) & Patient[*e*, *x*]  
 scrub(*e*) & Patient[*e*, *x*’s surface]
- molecularize(*e*) & Patient[*e*, *x*]  
 molecularize(*e*) & Patient[*e*, *x*’s molecules]

Exhaustivity precludes the same event from having different, unique Patients. Perhaps the contrary intuitions should only be taken to indicate a refinement in the analysis.

When I define molecularizing  $x$ , what I really say is that  $e$  stands in that relation to  $x$  just in case it stands in some intimately related but different relation to  $x$ 's molecules:

- (33) weigh( $e$ ) & Patient1[ $e, x$ ]  
 weigh( $e$ ) & Patient2[ $e, x$ 's mass]
- scrub( $e$ ) & Patient1[ $e, x$ ]  
 scrub( $e$ ) & Patient2[ $e, x$ 's surface]
- molecularize( $e$ ) & Patient1[ $e, x$ ]  
 molecularize( $e$ ) & Patient2[ $e, x$ 's molecules]

The very same event has both a unique Patient1 and a unique Patient2<sup>14</sup>, and thus the theory and the intuition that these are the same events appear to be reconciled. The reconciliation does not last for long. Scrubbing Aaron is the same as scrubbing Aaron's surface ((34)). But, Aaron's surface is the same object as the surface of Aaron's skin cells ((35)). So, scrubbing Aaron's surface is the same as scrubbing Aaron's skin cells' surface ((36)), and this last event is judged to be the same as scrubbing Aaron's skin cells ((37)).

(34)  $(1e)(\text{scrub}(e) \ \& \ \text{Patient1}(e, \text{Aaron})) = (1e)(\text{scrub}(e) \ \& \ \text{Patient2}(e, \text{Aaron's surface}))$

(35) Aaron's surface = Aaron's skin cells' surface

(36)  $(1e)(\text{scrub}(e) \ \& \ \text{Patient2}(e, \text{Aaron's surface})) =$   
 $(1e)(\text{scrub}(e) \ \& \ \text{Patient2}(e, \text{Aaron's skin cells' surface}))$

(37)  $(1e)(\text{scrub}(e) \ \& \ \text{Patient2}(e, \text{Aaron's skin cells' surface})) =$   
 $(1e)(\text{scrub}(e) \ \& \ \text{Patient1}(e, \text{Aaron's skin cells}))$ .

(38)  $(1e)(\text{scrub}(e) \ \& \ \text{Patient1}(e, \text{Aaron})) = (1e)(\text{scrub}(e) \ \& \ \text{Patient1}(e, \text{Aaron's skin cells}))$

<sup>14</sup> This indicates the direction of a solution for how Ray's playing music on the clarinet could be the same event as his playing the clarinet. Deny that the same thematic relation applies to both direct objects. Then both music and the clarinet exhaust the participants of their respective thematic relations. See n. 52.

Then, scrubbing Aaron is the same event as scrubbing Aaron's skin cells ((38)), which fits intuition, but derives a contradiction in the theory since both Aaron and Aaron's skin cells are asserted to be unique Patients1 in the same event. So the theory requires that when I stipulate molecularizing  $x$  to be the very same event as molecularizing  $x$ 's molecules, I can't really mean it. Under pain of contradiction, I mean that they are distinct but coincident.

Suppose the shoe were on the other foot, and it were a consequence of the theory that this particular scrubbing of Aaron is the same event as this particular scrubbing of Aaron's surface. Faced with (34)-(38) and like arguments, the theory then requires that Aaron's surface is not really the same object as Aaron's skin cells' surface, that the Volvo's mass is not the same object as the Volvo's parts' mass and that Herb's molecules are not the same objects as Herb's body's molecules. To fend off *a priori* intuitions to the contrary, one can of course plead for a notion of kinship defined according to a favorite theory of object identity that is as yet unknown. To offer such an unguarded theory is to believe that one has no enemies. I would rather from the start look for a semantics and logical form that let shine through both the intuition that the Volvo's mass and the Volvo's parts' mass are the same object and that my weighing the Volvo's parts was the same event as my weighing the Volvo.<sup>15</sup>

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<sup>15</sup> A skeptic demands that events be defined before we are allowed to quantify over them in logical form (and may thus prefer, e.g., to construct them from spatiotemporal points or regions. *v.* Parsons 1990: §8.2, 148ff. for diagnoses of the varieties of reductionism). The reply starts from the observation that everyone, the skeptic included, seems quite content to quantify over objects without having first defined what *they* are. Yet, so the reply goes (Reichenbach 1947), events are no more nor less well-defined than objects, and we

The solution to the problem lies, I believe, with the proper treatment of the remaining case of a symmetric predicate. Here too there is an *a priori* intuition that Carnegie Hall's sitting opposite the Carnegie Deli is the same event as Carnegie Deli's sitting opposite Carnegie, but the example raises a more imminent problem for the theory. Let's set aside the intuition about event identity and pick one of the events described in (39).

- (39) a. The Carnegie Deli sits opposite Carnegie Hall.  
 $\exists e(\text{Theme}[e, d] \ \& \ \text{sit}(e) \ \& \ \text{Opposite}[e, h])$
- b. Carnegie Hall sits opposite the Carnegie Deli.  
 $\exists e(\text{Theme}[e, h] \ \& \ \text{sit}(e) \ \& \ \text{Opposite}[e, d])$

Exhaustivity requires that for the chosen event, one thematic relation relates it only to the Carnegie Deli and the other, only to Carnegie Hall. But, what is it that the Carnegie Deli is doing in this event that Carnegie Hall isn't also doing? The observation that the predicate's meaning reveals asymmetry elsewhere-- that Danny Rose sits opposite the Carnegie Deli but the Carnegie Deli does not sit opposite Danny Rose-- is irrelevant if

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seem to recognize and talk about both. Of course, since neither notion is introduced with a definition, our understanding of them depends on the role they play in explaining speakers' knowledge and behavior. The reply to the skeptic is then presented *ad hominem*: whenever you think a speaker is entertaining a thought about an object, the same sorts of considerations show that speakers entertain thoughts about events too; it would be hypocritical of you, if not contradictory, to be so parsimonious about the one and so profligate with the other (and, if you would only put aside your misplaced angst about positing such entities and take speakers at their word, event semantics could improve your explanations of their behavior too). But, this reply to the skeptic commits us to taking speakers' judgments and their reports seriously. The reply that events are just as robust as objects goes up in smoke if we have to add that they are just like objects except that they are so fine-grained that we can never trust the speaker's (i.e., our) *prima facie* intuitions and we can never give alternative descriptions of the same event. The fact is that speakers do not judge events to be fine-grained: Jim's drinking some beers in an hour really was on that particular occasion his drinking beers for an hour and my weighing the Volvo really was my weighing its parts on that particular occasion, etc. In short, it is with respect to medium-grained events that we appear to talk about objects and events in roughly the same way with roughly the same precision.

what Danny Rose does to distinguish himself from the Deli in that event does not distinguish one building from the other in (39).<sup>16</sup>

To reconcile exhaustivity to both the intuition that (39a) and (39b) refer to the same event and the fact that the Carnegie Deli and Carnegie Hall are doing the same thing in that event, I will take (39a) to be reports from different scenes of the same event (v. Jackendoff 1976, Talmy 1978)<sup>17</sup>. Facing north on Seventh Avenue, there is a scene of an event where the Carnegie Deli is the only thing sitting and on the left and Carnegie Hall is the only thing sitting and on the right. Turning south, there is a different scene of the same event where now Carnegie Hall is alone on the left and the Deli is alone on the right. Nominalizations of the sentences in (39) abstract on the events, not the scenes, to refer to how things are in the world and not a percept of them, and it is true that the event of which there is a scene with the Carnegie Deli on the left and Carnegie Hall on the right is the same event of which there is a scene with the Carnegie Hall on the left and the Carnegie Deli on the right. In short, scenes are fine-grained, events are coarser, and sentences rely on (thematic) relations to scenes to convey what they have to say about

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<sup>16</sup> Admittedly, Carnegie Hall is the landmark and much grander venue from which the Deli borrows its name (cf. Carlson 1998: 48 n.2). So it's a New York joke to say that Carnegie Hall sits opposite the Carnegie Deli. But, perfectly symmetrical situations do exist. Try 'World Trade Center Tower One sits opposite World Trade Center Tower Two.' Parsons (1990) suggests that such symmetric relations may sometimes derive from a collective predicate. The example is chosen to thwart such a derivation: *\*The Carnegie Deli and Carnegie Hall sit opposite*. We have *The Carnegie Deli and Carnegie Hall sit opposite each other*, but here the relation 'x sits opposite y' is still basic. For further argument against deriving the collective predicate from the reciprocal, v. Carlson 1998. That allegedly symmetric predicates do not express truly symmetric relations, v. Gleitman 1969, Gleitman *et. al.* 1996, Tversky and Gati 1978, Talmy 1985a.

<sup>17</sup> Jackendoff and Talmy propose Figure and Ground to distinguish relations in symmetric predicates. Dowty 1991 notes that asymmetries in meaning brought about by a difference in perspective cannot be plausibly attributed to a difference in, say, *be*'s lexical meaning. His reluctance to consider Figure and Ground thematic relations derives from the assumption that the latter are lexical (and compiled from the entailments of lexical items). Here thematic relations are separate phrases, and Figure and Ground are as good as anything else, such as aspectual conditions, that could interpret functional projections.

events. Some details follow below. What will be of interest is the respect in which scenes are fine-grained and structured enough so that *weighing the Volvo* and *weighing the Volvo's parts* can also correspond to different scenes of the same event. Perspective does not distinguish scenes of the Volvo and its parts, which occupy the same spatiotemporal region. Rather I will appeal to a notion of resolution to distinguish a scene fine-grained enough to resolve the Volvo's parts from one which only resolves the whole Volvo. The notion of scene resolution arises here not only to vindicate *a priori* intuitions of event identity. It emerges as a natural extension of event mereology, which will be shown on independent grounds to pervade our talk about events.

## 1.2. Referring to Events

First, sentences often describe several events, as in (45), after an example due to Gillon (1987):

(45) Twenty composers collaborated on seven shows.

It reports recent activity on Broadway, where the twenty composers are divided among several, rival and cutthroat collaborations. Similarly we can imagine contexts for true assertions of (46) where the turtles are divided among several, rival fraternal orders, within which every turtle shares with every other but across which there is no comity (*P&E* 126ff.).

- (46) a. 17 turtles share 23 pizzas.  
 b. 17 turtles together ate 23 pizzas.  
 c. 17 turtles ate, every turtle breaking pizza with every other turtle, 23 pizzas.

There is no one collaboration that verifies (45) nor any one sharing for (46). These should be read as ‘there are some *events*’, in the plural, that are collaborations or sharings.

The plural quantification shows up in the logic as well. So first consider (47) on the reading indicated:

- (47) Twenty truckers loaded up one or more trucks.  
 ‘Whenever there was a loading up of one or more trucks, 20 truckers were the loaders’.

$[\forall e : \textit{load up of one or more trucks}[e] ] \textit{Agent}[e, 20 \textit{ truckers}]$

There is no felt implication that it was the same 20 truckers in every event. This tells us that the domain of events is not in general closed under fusion. Otherwise, the fusion of all loadings up of one or more trucks would itself be a loading up of one or more trucks, and they could each involve twenty truckers only if they were the same twenty.

- (48) These 10 truckers loaded up one or more trucks.  
Those 10 truckers loaded up one or more trucks.  
 The 20 truckers loaded up one or more trucks.

Now, on the other hand, (48) is valid; and unlike the universal, distributive quantifier in (47), the sentences in (48) must not be read with a singular ‘there was an event of 10 truckers...’ and ‘there was another event of 10 truckers’. Even if there is one loading by these 10 truckers and another loading by those 10 truckers, there is no certainty that the domain contains their fusion, a single event of loading by the twenty truckers. Rather, these sentences start off in the plural, ‘there were some events..’, and the inference in (48)

follows as a matter of logic: There were loadings by these 10 truckers and loadings by those 10 truckers, and so there were loadings by the 20 truckers. (*P&E* 107ff.)

Having said that the existential quantification over events is plural, (46) still presents a further problem for our understanding of how the events and their participants relate to one another. For suppose the fraternal orders of turtles share a central kitchen that serves pizzas by the slice and it so happens that no one pizza was shared at the meal of any one order. Each of the 23 pizzas is distributed among several meals. There is thus no sharing or eating  $e$  and pizza  $p$  of which it is true that  $\text{Patient}(e,p)$ , and thus it is unclear how it could be true that those pizzas are shared or eaten in those events. Under the circumstances, Landman (1995) and Krifka (1989) appeal to an object mereology. Conveniently, (46) is true under the same conditions as (49) assuming Brooklyn Standard Pizza:

- (49) 17 turtles share 184 pizza slices.  
 17 turtles share  $1,472\pi$  sq. in. of pizza.

The suggestion is that for the pizzas to have been eaten in some events it is enough for their parts to have been eaten in those events, thus overcoming the lack of correspondence between the events, the meals, and the individual objects, the pizzas. But, this lack of correspondence is not confined to cases where an object's fate can be reduced to that of its parts:

- (50) 248 engineers assembled as a detail crew 27 airplanes.

Like the earlier examples, (50) has a reading that allows the engineers to be divided among distinct crews. There are different details to an airplane. Any one crew assembles only a few components for any one airplane. Suppose there are fifteen crews among which the engineers are divided and thus fifteen events of assembling as a detail crew. There are also 27 events, each the history of an airplane's assembly. These 27 events completely overlap the fifteen, but no one of them is the product of any one of the fifteen. One cannot however replace *salva veritate* the reference to 27 airplanes with a reference to their parts:

(51) 248 engineers assembled as a detail crew 613 airplane components.

We cannot be sure from (51) alone that the airplanes were ever assembled or that they were assembled by these 248 engineers. A similar example:

(52) 248 gerrymanderers co-redrew 27 assembly districts.

The result of all this activity is a delineation of 27 assembly districts and not, say, any of their constituent neighborhoods. The result is arrived at by factions working against each other or at least indifferently to each other haphazardly tacking on their own turf, and thus there are co-redrawings. Again, the 27 assembly districts emerge from these contrary efforts with no assembly district the result of any one of them.

Landman (1995: 456) makes available the shift from objects to their parts only to predicates that can have a mass interpretation. So presumably it would not apply in (50)-(52) and he is left without any account of these readings. Yet, even where the predicate

does support a mass interpretation, the shift from objects to their parts can be shown to fail. As before, suppose that melting in a foundry is a complicated team effort so that we have (53) under the now familiar circumstances:

(53) 248 workers co-melted 27 gold statues.

The workers are divided among separate shifts, each shift manages to melt only a proper part of any one statue. The fact is that to melt a gold statue is to melt the gold that constitutes it. The predicate has a mass interpretation and, in this case, Landman's and Krifka's identifying the fate of the statues with the fate of their parts does not go far astray. But, we also have (54):

(54) 248 workers co-solidified 27 gold statues.

In solidifying a gold statue, the cold result had better be a statue. On the other hand, to solidify some gold, it's enough that it go cold in whatever shape. If the workers cast the gold statues, which look good for awhile, but, inadvertently or not, let the gold leak from the molds, (54) cannot be true. It is however true that the workers co-solidified the gold.

These examples show that we cannot in general allow the substitution of mereologically coincident objects *salva veritate*. So if the fate of pizza is not the fate of pizza parts, how then are the pizzas eaten when none is eaten in any one event of turtles sharing a meal?

A mereology of events is necessary and sufficient, without any appeal to a mereology of objects. We can re-draw the event boundaries. Redraw the events that constitute the

meals so that there are 23 in each of which a pizza is eaten. Redraw the activity of the fifteen detail crews so that there are 27 events each the assembly history of an airplane. The required correspondence is just that the sharings completely overlap the events of being shared and the assemblings completely overlap the events of being assembled. To sum up, existential quantification over events is typically plural quantification and in evaluating a sentence with respect to some events, we take into account redrawings of those events (*P&E* 126ff.)<sup>18</sup>.

### 1.3. Scenes and Events

Just the business of sorting out who did what to whom has brought in a mereology of events. It would be enough for (46) to say that there are some events where 17 turtles are eaters in coincident events and 23 pizzas are eaten in coincident events; but, it is a small step to make redrawing explicit and it will deliver the scenes fine-grained enough to assimilate all of (55)-(60) while allowing that each pair describes the same events.

(55) The Carnegie Deli sits opposite Carnegie Hall.

(56) Carnegie Hall sits opposite the Carnegie Deli.

(57) I weighed the Volvo.

(58) I weighed the Volvo's parts.

(59) Herb's body vibrated along the full length of the sofa.

(60) Herb's body parts vibrated along the full length of the sofa.

For (55) vs. (56), it was suggested that the same event is considered from different perspectives, distinguished by their orientation, northbound or southbound on Seventh

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<sup>18</sup> On event mereology and collectivizing predicates, see also Lasersohn 1990, 1995.

Avenue. For the sake of concreteness, assume that there is a relation Scene-of( $e, e'$ ) between scene  $e$  and event  $e'$ . (55) reports a scene with the Carnegie Deli on the left and Carnegie Hall on the right (61)-(63). Given this aspect to events, the Agent thematic is glossed as in (62), and 'opposite' as in (63).

(61)  $\exists e \exists e' (\text{Scene-of}(e, e') \ \& \ \text{Ag}[e, e', d] \ \& \ \text{sit}(e') \ \& \ \text{Op}[[e, e', h])$

(62)  $\text{Ag}[e, e', x] \leftrightarrow \forall y (y=x \leftrightarrow (\text{sitter}(e', y) \ \& \ \text{left-side}(e, y)))$

(63)  $\text{Op}[e, e', x] \leftrightarrow \forall y (y=x \leftrightarrow (\text{opposite}(e', y) \ \& \ \text{right-side}(e, y)))$

Note that the first conjuncts of (62) and (63) apply to both the Carnegie Deli and Carnegie Hall in either event. It is rather the perspectival predicate that delivers a unique Agent and a unique Opposite.

The interest of (57)-(60) is the refined perspective they require. As far as Seventh Avenue is concerned, it is enough that we have taken a broken white line to divide left-side and right-side and looked at the event once from the north and once from the south. We can allow that anything that occupies a spatiotemporal region on one side of the white line for a given scene is, say, on the left-side of that scene. We cannot however be so coarse in (57)-(60) since Herb's body and his body parts occupy the same spatiotemporal region as do the Volvo and its parts. Let it be then that perspectives differ in their resolution-- that a scene comes with a *reticule*:

(64) “*reticule*, a network of fine threads or lines of reference in the focal plane of a telescope or other optical instrument, serving to determine the position of an observed object.”

In redrawing the events that underlie and make true (50)-(52), we swap reticules. Instead of ‘Scene-of( $e, e'$ )’, I will say that a scene  $e$  resolves an event  $e'$ ,  $\Pi(e, e')$ , which can be true of many events of the scene. The events that a scene’s reticule delineates are those that it resolves, and I will let reticules delineate the events that satisfy thematic relations. Thus the point of (46) and (50)-(52) can now be recast as showing a need to swap reticules in evaluating the disparate conjuncts. The logical form of (46) is (65), where  $E_i$  redraws the events of  $E$  according to  $e_i$ ’s reticule, that is  $\Pi[E, e_i, E_i]$  as in (66):

(46) 17 turtles share 23 pizzas.

(65)  $\exists E \exists e_1 \exists E_1 \exists e_2 \exists E_2 (\Pi[E, e_1, E_1] \ \& \ \Pi[E, e_2, E_2] \ \& \ [\exists X: 17(X) \ \& \ turtles[X]] \ Ag[E_1, X] \ \& \ share[E] \ \& \ [\exists Y: 23(Y) \ \& \ pizzas[Y]] \ Pat[E_2, Y])$

(66)  $\Pi[E, e_i, E_i] \leftrightarrow \forall e (\exists e' (\text{overlaps}(e, e') \ \& \ E_i e' \ \& \ \Pi(e_i, e')) \leftrightarrow \exists e' (\text{overlaps}(e, e') \ \& \ E e'))$

Resolution applies to objects as well. Although the goings on that (59) and (60) refer to are the same, the scenes are different: in (59) we cannot “see” one body part from another, there’s only Herb. In (60), at greater resolution as it were, we see it all.

Replacing ‘left-side( $e, x$ )’ in (62) and (63) with a resolving perspective, we get for (59) and (60) the following:<sup>19</sup>

(59) Herb’s body vibrated along the full length of the sofa.

(67)  $\exists e \exists e' (\Pi(e, e') \ \& \ Ag[e, e', \text{Herb’s body}] \ \& \ vibrate(e') \ \& \ Along[e, e', \text{the full length of the sofa}])$

(68)  $Ag[e, e', \text{Herb’s body}] \leftrightarrow \forall y (y = \text{Herb’s body} \leftrightarrow (\text{vibrator}(e', y) \ \& \ \Pi(e, y)))$

<sup>19</sup> For the sake of simplicity, I am ignoring here reference to pluralities of events. Note, as Paul Pietroski reminds me, that the revised logical forms still preserve the entailments under (1) which provide the original motivation for decomposition. The logical form (61) for *The Carnegie Deli sits opposite Carnegie Hall* entails via the familiar logic of conjunction what would be the logical form for *The Carnegie Deli sits*. Similarly, the logical form (65) for *17 turtles share 23 pizzas* entails that 17 turtles share, and the logical form (67) for *Herb’s body vibrated along the full length of the sofa* entails that Herb’s body vibrated.

- (60) Herb's body parts vibrated along the full length of the sofa.  
 (69)  $\exists e \exists e' (\Pi(e, e') \ \& \ Ag[e, e', \text{Herb's body parts}] \ \& \ vibrate(e') \ \& \ Along[e, e', \text{the full length of the sofa}])$   
 (70)  $Ag[e, e', \text{Herb body parts}] \leftrightarrow \forall y (\text{Herb's body part}(y) \leftrightarrow (\text{vibrator}(e', y) \ \& \ \Pi(e, y)))$

It is, I think, a serious problem for Davidsonian analyses to find some model of the events that are alleged to verify (55)-(60). The Davidsonian logical forms *via* exhaustivity demand that Carnegie Hall's sitting opposite the Carnegie Deli and the Carnegie Deli's sitting opposite Carnegie Hall are not the same event and that Herb's body vibrating is not the same event as Herb's body parts vibrating. With everything pretty much doing the same thing in the same place, what can these non-identical events be? In brief, the proposal here admits to an error in what has been our informal reading of Davidsonian logical forms, "there is an event such that..." or "there are some events such that..." To talk of events is to invite identification with things individuated by their causal relations. It would be less misleading to read the logical forms as saying "there is a scene such that..." or "there are some scenes such that..."<sup>20,21</sup>

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<sup>20</sup> Of course if scenes are to play their expected role, then we must further assume that if a tree falls in the forest and there is no one around to hear it, it still makes a sound. That is, scenes are abstract and public: the same object or event under the same external conditions (lighting, e.g.) from the same vantage point under the same degree of resolution, etc., projects the same scene onto two dimensions no matter the moment or the perceiver.

<sup>21</sup> Comitative phrases are unruly members of the thematic role family. They are as symmetric as *The Carnegie Hall sits opposite Carnegie Hall*, (i)-(ii), and present the same problem for exhaustivity.

- (i) a. Brutus stabbed Caesar with Cassius.                      b. Cassius stabbed Caesar with Brutus.  
 (ii) a. Brutus was ushered into the Senate with Cassius.    b. Cassius was ushered into the Senate with Brutus.

Also, unlike what is expected from a conjunct, they do not drop *salva veritate*, (iii),

- (iii)     Brutus killed Caesar with Cassius, ?\*Therefore, Brutus killed Caesar.

And, they appear to show the effect of scope, (iv).

## 2. Thematic Roles and Plurality

Scenes and reticules have reconciled exhaustivity with absolute thematic roles. Yet, special problems arise when they are extended to collective bodies, such as the case of a collective agent ((42) below) discussed in Landman (1995).

- (40) a. I sing.  
b. The boys sing.

In (40), whatever I do, each of the boys does exactly the same thing. Thus if what I do fits your idea of being an Agent, then so does the collective action:

- (41)  $\text{Ag}[e,X] \leftrightarrow_{\text{Df}} \forall x(Xx \leftrightarrow \text{agent}(e,y))$

But, in (42), there is what I do, which is the same as what the top boy in the human pyramid does, and there is what everybody else does. The sentence isn't true unless at least one boy touches the ceiling but it does not require them all to. Of course this is the beauty of collective action and helping one's fellows-- not everyone has to do exactly the same thing, but they have to do something. No arbitrary plurality of boys with one among them touching the ceiling will make (42b) true. The others must have contributed in some way. What is it? We might think to escape from answering by claiming that a part-whole relation relates a bottom boy to the top boy just as my leg relates to my finger when

- 
- (iv) Brutus, with Cassius, killed Caesar with the knife.  
Brutus killed Caesar with the knife with Cassius.
- (v) Brutus, with the knife, killed Caesar with Cassius.  
Brutus, killed Caesar with Cassius with the knife.

The sentences in (iv) makes Cassius an accomplice to the knifing itself, but in (v) the knife is Brutus' weapon and Cassius is left to assist the murder in some other way. For a treatment, see Appendix.

I touch the ceiling. But, this just begs the question. The condition under which something is part of the collective Agent is itself dependent on the choice of verb and occasion of use. (I will also soon exclude object mereology from the combinatorial semantics.) So, if we have to say what exactly the collective Agents did, we say something like (43):

- (42) a. I touch the ceiling.  
b. The boys touch the ceiling.

- (43)  $Ag[e, X, \text{'touch'}] \leftrightarrow_{Df}$   
 $\forall x(Xx \leftrightarrow \exists y(\text{agent}(e, y) \ \& \ \exists z(\text{continuous}(z) \ \& \ \text{overlap}(e, x, z) \ \& \ \text{overlap}(e, y, z) \ \& \ \forall x \exists y(\text{overlap}(e, x, z) \rightarrow (Xy \ \& \ \text{overlap}(e, x, y))))))$

They are the Agents of  $e$  just in case for any one of them there is a continuous region between him and the agent (in this case, the toucher in the narrow sense) and any part of that region overlaps some of them. The last clause is a topological condition that distinguishes human pyramids from scattered boys, assuming, following Landman's discussion, that this is the target sense-- certainly, a possible interpretation of (42b). The relation ' $\text{overlap}(e, x, y)$ ' means that  $x$  overlaps  $y$  within  $e$ . The whole pyramid is ten boys, and they touch the ceiling. It is also true that the top six boys touch the ceiling in the same sense. So we must allow a smaller event to circumscribe its participants-- hence, the three-place relation ' $\text{overlap}(e, x, y)$ '. (43) applies equally well to the singular case in (42a), where  $X$  is understood to denote only me. Then, there must be a continuous region overlapping me and the toucher, any part of which overlaps me.

(43) instantiates a schema (44) for a relativized Agent, there is a common core but also a further condition idiosyncratic to the verb: an Agent-for-boys-touching-ceiling-in-circus-

act. In (40), an assertion that everybody does the same thing and sings,  $\psi$  in (44) reduces to an identity condition ' $x = y$ '. The scope for polysemy in (44) goes beyond Dowty (1991) or Jackendoff (198x) in that the choice of  $\psi$  is completely open-ended and dependent on the context of use.

$$(44) \quad \text{Ag}_V[e, X, \xi] \leftrightarrow_{\text{Df}} \forall x (Xx \leftrightarrow \exists y (\text{agent}(e, y) \ \& \ \psi[e, x, y, X]))$$

Surely this is to be avoided. It isn't that we can't freely make up new ideas and describe new actions. That's what new verbs are for, or nonce uses of old ones. But, can't there be a way out from (44), where there is a minimal, invariant meaning for the thematic role Agent (perhaps as in Dowty 1991, see n. 12 above) and it is left to the novel verb in describing the events it denotes to say further what perverse things its Agents are up to? Common sentiment is that the lexicon is the repository of all variation and idiosyncrasy and if functional projections mean anything they mean the same thing wherever they occur.

### Collective Predication and Absolute Thematic Relations

To justify scenes and reticules, I relied on simple examples where the participants, Herb's or the Volvo's body parts, all do the same thing. Since they are not essentially collective, I could get away with the likes of (70).

$$(70) \quad \text{Ag}[e, e', \text{Herb body parts}] \leftrightarrow \forall y (\text{Herb's body part}(y) \leftrightarrow (\text{vibrator}(e', y) \ \& \ \Pi(e, y)))$$

But, the circus act in (42) has us relativizing thematic roles to context of use:

(42) The boys touch the ceiling.

(43)  $\text{Ag}[e, X, \text{'touch'}] \leftrightarrow_{\text{Df}} \forall x(Xx \leftrightarrow \exists y(\text{agent}(e, y) \ \& \ \exists z(\text{continuous}(z) \ \& \ \text{overlap}(e, x, z) \ \& \ \text{overlap}(e, y, z) \ \& \ \forall x \exists y(\text{overlap}(e, x, z) \rightarrow (Xy \ \& \ \text{overlap}(e, x, y))))))$

(44)  $\text{Ag}_V[e, X, \xi] \leftrightarrow_{\text{Df}} \forall x(Xx \leftrightarrow \exists y(\text{agent}(e, y) \ \& \ \psi[e, x, y, X]))$

What is invariant about being an Agent is that there is always an agent in some narrow sense, who in this case is the boy on top of the pyramid with his finger on the ceiling, while the others stand in some idiosyncratic relation to him.

The fine-grain events, i.e., the scenes and reticules, now suggest a method for relocating what is idiosyncratic about each context of use to our understanding of the verb, leaving the thematic roles absolute.

(71)  $\text{Ag}[e, e', X] \leftrightarrow \forall x(Xx \leftrightarrow \exists y(\text{agent}(e', y) \ \& \ \Pi(e, x)))$

(72)  $\text{Pat}[e, e', X] \leftrightarrow \forall x(Xx \leftrightarrow \exists y(\text{patient}(e', y) \ \& \ \Pi(e, x)))$

The Agents are just those among whom there is an agent and all of whom a scene's first reticule resolves, and the Patients are similarly those among whom there is a patient and all of whom a scene's second reticule resolves. Now the topological condition peculiar to the agents of this circus act glosses the verb:

(73)  $\text{touch}[e_1, e_2, e'] \leftrightarrow_{\text{Df}} \dots \ \& \ \forall x(\Pi(e_1, x) \leftrightarrow \exists y(\text{agent}(e', y) \ \& \ \exists z(\text{continuous}(z) \ \& \ \text{overlap}(e', x, z) \ \& \ \text{overlap}(e', y, z) \ \& \ \forall x \exists y(\text{overlap}(e', x, z) \rightarrow (\Pi(e_1, y) \ \& \ \text{overlap}(e', x, y))))))$

(74)  $\forall[e_1, \dots, e'] \leftrightarrow_{\text{Df}} \dots \ \& \ \forall x(\Pi(e_1, x) \leftrightarrow \exists y(\text{agent}(e', y) \ \& \ \psi[e_1, e', x, y]))$

The verb asserts that the objects resolved by the first reticule must form a pyramid with the narrow agent of the event. The thematic role, being absolute, can itself make only the weakest assertions consistent with all lexical items and all contexts where it may be used. Without knowing who they are or what exactly they do as Agents, the semantics of the verb can still refer to all those who are to be taken as Agents, descriptively, as all those objects resolved by the first reticule ((73),(74)), and it may then impose idiosyncratic conditions on that group. Thus scenes and reticules, which were called upon to reconcile thematic exhaustivity with the observation that Carnegie Hall and the Carnegie Deli do the same thing and so do Herb's body and Herb's body parts, again step in to prop up absolute thematic roles.<sup>22</sup> It looks like a good day for absolute thematic roles since these fine-grained events are independently necessary and, as scenes, consistent with our *a priori* intuitions of event identity.

Relativized and absolute thematic relations differ in the end on the location of idiosyncratic, context-dependent conditions such as the topological condition on human pyramids in the circus act. Relativized thematic relations locate them with the thematic relation itself,  $\psi$  in (44), and absolute thematic relations deflect them to the verb,  $\psi$  in (74):

Relativized Thematic Relation:

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<sup>22</sup> In fact, they would allow us to bleach the thematic roles of all content other than an asserting that an object is resolved under the first, second, etc. reticule. It could be left entirely to the content of the verb to assert something stronger about the objects so resolved. As Norbert Hornstein (p.c.) points out, such a move would undermine the attempt to derive UTAH from the phrasal projection of thematic roles. Instead, linking conventions for the interpretation of verbs would be necessary to stipulate that they tend to make agents out of the objects resolved under the first reticule, and so on.

$$(44) \quad \text{Ag}_V[e, X, \xi] \leftrightarrow_{\text{Df}} \forall x (Xx \leftrightarrow \exists y (\text{agent}(e, y) \ \& \ \psi[e, x, y, X]))$$

Absolute Thematic Relation:

$$(71) \quad \text{Ag}[e, e', X] \leftrightarrow \forall x (Xx \leftrightarrow \exists y (\text{agent}(e', y) \ \& \ \Pi(e, x)))$$

$$(74) \quad \forall [e_1, \dots, e'] \leftrightarrow_{\text{Df}} \dots \ \& \ \forall x (\Pi(e_1, x) \leftrightarrow \exists y (\text{agent}(e', y) \ \& \ \psi[e_1, e', x, y]))$$

Essential separation provides the method for discerning the true location of these conditions. Consider for example (75), which patterns with the cases of essential separation introduced earlier:

(75) The boys hoisted every performing seal onto ten girls.

- (4) a. Three video games taught every quarterback two new plays.  
 b. Three hundred quilt patches covered over two workbenches each with two bedspreads.

For (75), I have in mind circus routines involving male and female human pyramids and performing seals. So the same topological condition applies here to both the boys and the girls. Now the point of separation is that there is a logical form for (75) that resembles (76) in crucial respects.

$$(76) \quad \exists e ([\iota X : \textit{the boys}] \text{Ag}[e, X] \ \& \ [\forall y : \text{seal}(y)] [\exists e' : e' \leq e] (\text{hoist}(e') \ \& \ \text{Th}[e', y] \ \& \ [\exists Z : \textit{ten girls}] \text{Onto}[e', Z]))$$

If absolute, the thematic relations themselves say very little, the topological condition being expressed by the verb. The problem in that case is that the verb will impose the topological condition on the Agents of  $e'$ . The Agents of  $e$ , that is, the boys, are left to do what they damn well please, since, of necessity, a universal, absolute thematic relation can say very little. Suppose for example that *the boys* refers to all the boys in the

audience as well as those in the human pyramid. (75) is of course false, but (76) is true of a scene that is large enough to take in the whole circus tent and resolve under the first reticule all the boys. For each seal, there is a part of this scene where the Agents of that part of the scene hoist the seal onto the girls. Now of course the verb can be moved outside the scope of the universal quantifier so that it applies to the boys' event, *hoist(e)*, where it would correctly impose the topological condition on them as the Agents of *e*. But then there is no condition to guarantee that the girls supporting a seal in its *e'* form a pyramid. In fact, the verb, if so displaced, will apply the condition to all the tens of girls supporting seals, the girls who bear the *Onto* relation within the larger *e*, and it will therefore require what (75) does not, viz., that all these girls form one gigantic pyramid.<sup>23</sup> This last observation excludes the possibility of repeating the verb both inside and outside the scope of the universal. Although this would subject everyone who needs it to the relevant topological condition, it goes too far and imposes the spurious requirement, the one gigantic pyramid. Obviously then the verb is not the locus at which to state the context-dependent conditions that affect the interpretation of thematic relations. What is needed is that the topological condition apply at each thematic relation to its events and objects and that the topological condition governing those events and objects be asserted only there. Of course if the topological condition is asserted there, then the thematic relation of, say, the subject must also assert that there is an agent in the robust, non-idiosyncratic sense since it is this agent that the others in the human pyramid are

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<sup>23</sup> (The fact that there is a separate preposition here doesn't matter. Prepositions, like thematic relations, will fail to have absolute meanings unless their verb-dependent idiosyncracies are similarly shifted to the meaning of the verb. In any case, it should also be possible to construct examples with double object constructions, where only thematic relations in the narrowest sense are involved.)

contiguous with.<sup>24</sup> This is as much as to say that thematic relations must be relativized as in (44). Separation thus turns out to be an argument for relativized thematic relations. Despite our best efforts with the fine-grained scenes, thematic relations turn out to be irreducibly relativized.

Must it be concluded from the argument for relativized thematic relations that there are definitions for our primitive thematic relations and that these definitions fall under a schema that seems to embrace and formalize polysemy in our basic concepts (contrary to semantic atomism, v. n.7) as (44) appears to imply?

$$(44) \quad \text{Ag}_V[e, X, \xi] \leftrightarrow_{\text{Df}} \forall x (Xx \leftrightarrow \exists y (\text{agent}(e, y) \ \& \ \psi[e, x, y, X]))$$

Not if what appears on the right-hand side of (44) belongs in the syntax itself, something along the lines of (76), where  $\psi$  corresponds to the content of an independent zero morpheme located in a higher functional projection.

$$(76) \quad [\exists X : \text{NP}] \exists e \exists e' (\psi[e, e', X] \ \& \ \exists y \text{ agent}(e, y) \ \& \ V(e) \dots)$$

Schein (1998, forthcoming) argues that the thematic relation Agent should not be directly predicated of the (plural) subject. That argument on very different grounds proceeds from the semantics of conjunction and facts about disjoint reference under reconstruction. For now, I will let you choose your poison since the arguments presented here do not discriminate between (44) and (76).

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<sup>24</sup> This should allay the worry of n. 22 that bleached thematic relations would undermine UTAH. The thematic role expressed by Agent must be at least as contentful as (44) and therefore projecting it fixes the position of the argument that bears it, as UTAH requires.

### 3. On Telicity

With what I saw at Ken's Pub that afternoon, I am inclined to take (31a) to report a true, strict identity with different scenes of the same event in mind. The nominalizations provide alternative descriptions of the same event.

- (31) a. Jim's drinking a few/ some beers in nothing less than an hour was Jim's drinking beer(s) for an hour.
- b. Jim drank a few/some beer(s) in nothing less than an hour.  
 $\exists e(\text{Agent}(e,j) \ \& \ \text{drink}(e) \ \& \ \text{Patient}(e, \text{a few/some beers}) \ \& \ \text{In}(e, \text{nothing less than an hour}))$
- c. Jim drank beer(s) for an hour.  
 $\underline{\exists e(\text{Agent}(e,j) \ \& \ \text{drink}(e) \ \& \ \text{Patient}(e, \text{beer}) \ \& \ \text{For}(e, \text{an hour}))}$
- d . \*Jim drank beer(s) in nothing less than an hour.  
 $\exists e(\text{Agent}(e,j) \ \& \ \text{drink}(e) \ \& \ \text{Patient}(e, \text{beer}) \ \& \ \text{In}(e, \text{nothing less than an hour}))$

To defuse the unsound inference, you might however prefer to deny the identity. It could be said that the first nominalization refers to a completed event occupying the same spatiotemporal region but distinct from the process that is referred to by the second nominalization. Thus the event verifying (31b) is not the same as the one verifying (31c), blocking the inference to (31d). Apart from my pleading the case for a coarser understanding of events, this metaphysical solution finds a way out from (31) only to run up against some insistent questions-- how is that a complex phrase such as *drink some beers* comes to describe only completed events while another complex phrase, *drink beer* describes only processes? It is not simply that the one phrase hides an expression

indicating completion which is absent from the other. Such an expression can be made explicit without undermining the contrast<sup>25</sup>:

- (77) Jim drank some beer(s) up in nothing less than an hour.  
 (78) \*Jim drank beer(s) up in nothing less than an hour.<sup>26</sup>

Further complicating the problem, we will see below that not only the descriptive content of a phrase but also the context of utterance determines whether it denotes on any occasion processes or completed events. Even if it were all sorted out according to the metaphysical solution that certain phrases at certain times denoted processes and certain phrases at certain times denoted completed events, one may then begin to wonder what is it about the speaker's understanding of the temporal adverbial *in nothing less than an hour* that restricts its application to completed events since there is nothing in the notion of temporal duration or measurement to explain it.

If not a metaphysical solution, and (31a) is taken to report a true identity, the unwanted inference prompts a revision in logical form. The inference can be undone if the adverbial phrase is 'relativized' to the phrase it modifies:

- (79) a. Jim's drinking a few/ some beers in nothing less than an hour was Jim's drinking beer(s) for an hour.  
 b. Jim drank a few/some beers in nothing less than an hour.  
 $\exists e(\text{Agent}(e,j) \ \& \ \text{drink}(e) \ \& \ \text{Patient}(e, \text{a few/some beers}) \ \& \ \text{In}[e, \text{nothing less than an hour, 'drink a few/some beers'}])$

<sup>25</sup> Verkuyl 1993 observes the contrast and discusses its significance for various accounts of telicity. It matters little whether (31d) are ungrammatical, infelicitous or just plain false. Given the logical forms in (31), the expectation is that (31d) and (78) should be true and felicitous. To the extent that (31d) and (78) mean anything, I think they are clearly false in that the smaller quantities of beer drunk were drunk in less than an hour.

<sup>26</sup> Note also *Jim drank some beer up* but *\*Jim drank beer up*.

c. Jim drank beer(s).

$\exists e(\text{Agent}(e,j) \ \& \ \text{drink}(e) \ \& \ \text{Patient}(e, \text{beer}))$

d . \*Jim drank beer(s) in nothing less than an hour.

$\exists e(\text{Agent}(e,j) \ \& \ \text{drink}(e) \ \& \ \text{Patient}(e, \text{beer}) \ \& \ \text{In}[e, \text{nothing less than an hour}, \text{'drink beer(s)'} ])$

The very same event is a drinking of a few/some beers and a drinking beer(s), and it occurred in nothing less than an hour for a drinking of a few/some beers (79b); but, it did not occur in nothing less than an hour for a drinking of beer(s) (79d). Although it represents a way out from the inference, this formal solution also begs clarification of how the speaker grasps a 'relativized' adverbial phrase. In what sense can an event occur in an hour for a drinking of some beers but not for a drinking of beers?

Without compromising on an absolute and transparent meaning for the primitive lexical item *in* --it just relates an event to a measure of its temporal extension-- the adverbial phrase contains a definite description of the event(s) so measured. They are the *least* event(s) among what has happened that  $\Phi$ , where the content  $\Phi$  of the description is fixed by what the adverbial phrase modifies. Thus (80) is the logical form of (79)<sup>27</sup>:

(79) \*Jim drank beer in nothing less than an hour.

(80)  $\exists e(\text{Agent}(e,j) \ \& \ \text{drink}(e) \ \& \ \text{Patient}(e, \text{beer}) \ \& \ [\text{the least } e': e' \leq e \ \& \ \text{Agent}(e',j) \ \& \ \text{drink}(e') \ \& \ \text{Patient}(e', \text{beer})] \ \text{In}(e', \text{nothing less than an hour}))$

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<sup>27</sup> For convenience, I again suppress plurality in the event description, but I assume that a plural definite description would go as in Sharvy 1980 and Cartwright 1996.

For any decent bout of drinking beer, there are no least events of it, or at least none that a speaker can be confident of measuring; and so the sentence is anomalous as a failure of definite reference. The notion of leastness is just the one induced by a mereological relation among events, secured by judgments of the kind that if Jim drank beer for an hour then there are proper parts of lesser duration where he also drank beer.<sup>28</sup>

The explanation for the infelicity of the bare plural in (81) is slightly different from that for the bare mass term in (79); but it too involves a failure of definite reference under conditions where the speaker/hearer should expect success.

(81) \*Jim drank beers in nothing less than an hour.

Suppose first that the plural means ‘two or more’. Then, if the event under consideration is a drinking of three or more beers, there fails to be a unique, least event of drinking beers. There are three or more such least events. If, on the other hand, exactly two beers are drunk, there is indeed a unique, least event of drinking beers, and yet the sentence remains infelicitous even in such a context. But, for Gricean reasons, the speaker should say in such a context that Jim drank two beers in nothing less than an hour (cf. *\*every father of Sam*). The bare plural introduces a vagueness of quantity for which there is no excuse, since the speaker and hearer know that uttering the sentence (81) in any context

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<sup>28</sup> Here I find myself in agreement with Krifka (1988, 1992, 1998) who recognizes that sortal conditions on the (neighboring) events that meet a description are crucial to an account of telicity and that it is not sufficient for such an account to appeal mainly to the expression of a resultant target state.

where there were other than exactly two beers drunk would be inconsistent with the definite reference required by the measure adverbial.<sup>29</sup>

It may be that the plural morpheme is better glossed as ‘one or more’.<sup>30</sup> The explanation remains the same *mutatis mutandis*: a semantic failure of reference whenever two or more beers are drunk makes the sentence pragmatically inappropriate in all contexts, even where exactly one beer is drunk.

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<sup>29</sup> As Fabio Pianesi (p.c.) points out to me, the pragmatic violation cannot merely be the weak one where I am uncooperative and say ‘Jim has drunk (two or more) beers’ when I know for a fact he has drunk five. Notice that in this case it is plausible or rational to represent myself as not knowing something more precise, although it may be misleading and uncooperative to do so. In contrast, we have the pragmatic violation in “\*Every father of Sam was at the party”, where to represent myself as not knowing that John could have only one father implies that I don’t understand the meaning of the word. Similarly, the perceived anomaly of “\*Jim drank beers in nothing less than an hour” is partly that one represents oneself as not knowing that exactly two beers were drunk although it is an analytic truth given the semantics of ‘in nothing less than an hour’.

What I suppose happens when one hears such a sentence is that one presumes that the speaker does not know how many beers and what she says should hold of however many beers were in fact drunk; but then the definite description fails in the general case.

<sup>30</sup> The meaning of plurality is elusive. Note that numberless reference requires the plural. Thus if the existence of solutions to an equation is known but not their number, one says (i) rather than (ii) or (iii). Nor is there any compulsion when (i) will do to utter the pedantic (iv).

- (i) The solutions to the equation are prime.
- (ii) The solution to the equation is prime.
- (iii) The two or more solutions to the equation are prime.
- (iv) The one or more solutions to the equation are prime.

The same observations hold even when the existential presupposition is removed from the determiner:

- (v) Whatever solution, if any, there is to the equation is prime.
- (vi) Whatever solutions, if any, there are to the equation are prime.
- (vii) Whatever two or more solutions (\*if any) there are to the equation are prime.
- (viii) Whatever one or more solutions (\*if any) there are to the equation are prime.

In fact, the contrast between (vi) and (vii, viii) suggests more-- that plurality does not itself have any meaning as a cardinal. Appearances to the contrary elsewhere must be implicatures, giving an unexpectedly large role to the pragmatics to create an illusion of semantic import.

### 3.1. Scope effects and the content of *the least event(s) that $\Phi$*

That the content of *the least event(s) that  $\Phi$*  is fixed by what the adverbial phrase modifies provides the occasion to observe some scope effects, which account for the contrast between the bare NP in (78) and the NP with determiner in (77):

(77) Jim drank some beer(s) (up) in nothing less than an hour.

(78) \*Jim drank beer(s) (up) in nothing less than an hour.

(82)  $[\exists y: \text{beer}(y)] \exists e(\text{Agent}(e,j) \ \& \ \text{drink}(e) \ \& \ \text{Patient}(e, y) \ \& \ [\text{the least } e': e' \leq e \ \& \ \text{Agent}(e',j) \ \& \ \text{drink}(e') \ \& \ \text{Patient}(e', y)] \ \text{In}(e', \text{nothing less than an hour}))$

In (77), the quantifier *some beer(s)* exports so that it is asserted, as in (82), that for some beer(s)  $y$ , the least event of drinking that beer  $y$  occurred in nothing less than an hour.

There can of course be such an event for any particular (quantity of) beer or beers. In contrast, it has long been known (Carlson 1977) that bare NPs resist exportation and thus the bare NP in (78) inevitably falls inside the description with the infelicitous outcome noted above.

Confirming the scope effect is a class of verbs that Quine (1960) called *notional* (as opposed to relational verbs) (v. also Heim 1987 and Kratzer's (1995) verbs with *well-behaved objects*) which resist exporting any quantifiers from object position:

(83) Sam has a deep voice.

\*There is a deep voice such that Sam has it.

Sam has three friends.

\*There are three friends such that Sam has them.

Sam ran some/five miles towards where he remembered seeing her.

\*There are some/five miles such that Sam ran them towards where he remembered seeing her.

Sam made some/three enemies.

\*There are some/three enemies such that Sam made them.

Sam sustained some/three cranial fractures.

\*There are some/three cranial fractures such that Sam sustained them.

Sam's pants developed some/three creases.

\*There are some/three creases such that Sam's pants developed them.

Sam's dermatitis revealed/exposed/produced some/three bald spots.

\*There are some/three bald spots such that Sam's dermatitis revealed/exposed/produced them.<sup>31</sup>

In constructions with notional verbs, *some* NP patterns with the bare NP. For

concreteness, suppose that Sam ran five miles toward where he remembered seeing her in exactly 40 minutes, we have (84) but both (85) and (86) are unacceptable:

(84) Sam ran five miles towards where he remembered seeing her in nothing less than 40 minutes.

(85) \* Sam ran some miles towards where he remembered seeing her in nothing less than 40 minutes.

(86) \*Sam ran miles towards where he remembered seeing her in nothing less than 40 minutes.

Compare the relational verb, for which purpose suppose that Jim drank five beers, that is, five pints, in exactly one hour:

(87) Jim drank (up) five beers in nothing less than an hour.

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<sup>31</sup> Some speakers (Norbert Hornstein (p.c.)) differ on the contrasts in (83), varying, I expect, with one's powers of imagination for reifying such things as creases, bald spots and flaws. Any gain in acceptability for the exported quantification in (83) should also be reflected in a parallel gain for the corresponding sentence in n. 32.

(88) Jim drank (up) some beer(s) in nothing less than an hour.

(89) \*Jim drank (up) beer(s) in nothing less than an hour.

There are some beers, the five downed, such that Jim drank them up in nothing less than hour. Similarly, there is some beer, five pints, such that Jim drank it up in nothing less than an hour. But, it is just this exportation of the quantifier that the notional construction in (85) excludes. The least event of running some miles is no better defined than the least event of running miles, and thus both (85) and (86) fail. In (84), the quantifier *five miles* does not export either; but, for any event of running five miles, there is nevertheless a unique, least part of it of running five miles, to which the adverbial phrase truthfully applies.<sup>32</sup>

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<sup>32</sup> The remaining examples of (83) also support the conclusion that *some* NP(s) and bare NP pattern alike with notional verbs. It requires some care however to elicit a contrast with *n* NP.

- (i) a. i. Sam made three enemies in nothing less than thirty minutes.  
 ii. \*Sam made some enemies in nothing less than thirty minutes.  
 iii. \* Sam made enemies in nothing less than thirty minutes.
- b. Sam sustained three cranial fractures in nothing less than thirty minutes.  
 \*Sam sustained some cranial fractures in nothing less than thirty minutes.  
 \*Sam sustained cranial fractures in nothing less than thirty minutes.
- c. Sam's pants developed three creases in nothing less than thirty seconds.  
 \*Sam's pants developed some creases in nothing less than thirty seconds.  
 \*Sam's pants developed creases in nothing less than thirty seconds.
- d. Sam's dermatitis revealed/exposed/produced three bald spots in nothing less than three days.  
 \*Sam's dermatitis revealed/exposed/produced some bald spots in nothing less than three days.  
 \*Sam's dermatitis revealed/exposed/produced bald spots in nothing less than three days.

Suppose for (ia) that Sam begins a course of insults, snubs and other slights that takes thirty minutes before it makes someone into a sworn enemy. If after arriving at the party Sam undertakes a concurrent assault on three guests so that after thirty minutes he has three new enemies, all the sentences of (ia) are felicitous. The fact is that there is no smaller interval in which he has made any enemies and it so happens that the smallest interval of making enemies has yielded several, justifying the use of the plural. Such a context elicits no contrast among the sentences. Suppose however that Sam makes an enemy in ten minutes, and his

In sum, the semantics framed in terms of *the least event(s) that  $\Phi$*  explains the correlation between the exportability of the quantifier and the contrast in (85) and (88) as well as the contrast between (85,86) and (84).

### 3.2. Context-dependence of *the least event(s) that $\Phi$*

Like most definite descriptions and other comparatives, the choice of comparison class and the success of definite reference prove to be context-dependent. Beyond resolving the domain restriction, there is no reason to suppose that the variability due to context-dependence is the occasion for some further lexical or structural ambiguity. The sentence in (90) reports Johnny Reb's action as a particular kind of gesture and it is vague about its effect on the cannon.

(90) Johnny Reb heaved the cannon toward the Union battery in ten seconds. (after an example from Jackendoff 1996)

If the cannon is taken to have moved in a linear motion closer to the Union battery, the sentence is anomalous since in that context there is no least movement toward the Union

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conduct at the party consists of three assaults in succession. Here again (i.a.i) is true, but (i.a.ii) and (i.a.iii) are unacceptable.

The fact that (i.a.ii) and (i.a.iii) are acceptable in case the three assaults are concurrent does however prompt a revision in the semantics of the adverbial phrase. For the semantics as given, concurrence should not save the definite description *the least event(s) of making (some) enemies* from referential failure, since none of the smaller events of making one enemy or making two enemies is the least. The effect of concurrence suggests instead a definite description of time intervals, *the time of (some) least event(s)  $\Phi$* . Should the plural mean 'two or more', the three events of making two enemies is each a least event of making (some) enemies. The time of these events is a unique interval just in case the events are concurrent, and in that case and only then does the definite description refer. The 'official' semantics should therefore be based on the temporal *the time of (some) least event(s)  $\Phi$* , but for the sake of simplicity I will continue in the text with descriptions of events *tout court*.

battery. In contrast, if the effect of Johnny Reb's heaving the cannon is rotation, there is then a least event of rotating towards the Union battery, measured at ten seconds. By restricting the domain of relevant events, what the speaker and hearer understand about the context enables definite reference.

Some further examples will mark the extent and generality of this effect. Under stereotypical conditions, it would be odd to say (91) of the astronomer looking up on a clear, moonless night and sighting the Pleiades:

(91) Herschel saw seven stars in 20 seconds.

If the event is thought of as punctual, the temporal measure is inappropriate, and also if the the event is thought of as extended, since there is no least event of seeing seven stars. In contrast, (92) is felicitous provided that all seven shooting stars are not simultaneous (cf. n. 32):

(92) Herschel saw seven shooting stars in 20 seconds.

Under those circumstances, there is a least event of seeing seven shooting stars, which is sufficient for the definite reference required by the temporal adverbial, without having to propose different analyses for (91) and (92).<sup>33</sup>

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<sup>33</sup> Note that simultaneity or an absence of incremental process is not in general fatal for the temporal adverb:

- (i) Newton ate an apple in 20 seconds.
- (ii) Newton ate seven apples in 20 seconds.

Although all the apples are eaten in one gulp, (i) and (ii) remain felicitous. There remains a least eating of an/seven apples, any smaller part of which would have left out some substance, apple, or some gesture such

In (90) and (91), the context varies the circumstances of the direct objects, the kind of movement undergone or the order of presentation. Variation in the circumstances of other arguments have a similar effect on telicity. Suppose it takes a few days to break ground and build a single settlement. The sentence (93) in an unassuming context fails for reasons similar to those of (78).

(93) 613 construction workers established new settlements in a year.

Yet, if it is further understood that the construction workers are also settlers so that the workers who build a settlement stay put, (93) and (94) become appropriate means to convey that 613 got settled in a year.<sup>34</sup>

(94) 613 settlers established new settlements in a year.

Again, I do not see circumstances changing the analysis of these sentences. Rather, in the first context, there is no least event of 613 workers establishing new settlements, but in the second context there is. It took all of a year to settle 613. This second context also shows a scope effect<sup>35</sup>.

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as the swallow. The accounts in Tenny(1987, 1992, 1994) and Krifka (1989, 1992, 1998) leave it unclear why simultaneity and the absence of incremental process should undermine his *seeing seven zebras in 20 sec.* but not *eating seven apples in 20 sec.* Cf. Dowty 1991, Verkuyl 1993, Jackendoff 1996.

<sup>34</sup> So construed, (94) becomes analogous to:

- (i) \$613 million established new settlements in a year.
- (ii) 61300 tons of concrete established new settlements in a year.

<sup>35</sup> Despite the given scenario, I find it still somewhat odd to say of particular individuals or a particular group that *they* established new settlements in a year even if it took that long for them all to get settled. I cannot explain this contrast between (94) and (97). In (96), *some settlers* unexported is as bad as (95); but, assigned wide-scope, it becomes like (97).

- (95) \*Settlers established new settlements in a year.  
 (96) ?? Some settlers established new settlements in a year.  
 (97) ?? The settlers established new settlements in a year.

Dowty 1991 and Jackendoff 1996 stress the point that what I have called here a scope effect is not confined to NPs in object position as sometimes assumed:

- (98) 300 refugees streamed/stepped across the checkpoint in three days. (after an example of Dowty 1991)  
 (99) \*Refugees streamed/stepped across the checkpoint in three days.  
 (100) Some refugees streamed/??stepped<sup>35</sup> across the checkpoint in three days.  
 (101) The refugees streamed/??stepped<sup>35</sup> across the checkpoint in three days.

The objects of prepositions also participate. Suppose beach property is converted to commercial advantage by building condos on it, and it takes only a couple weeks for any one building to go up. Lefrak's beachfront reclamation project built condos without interruption for twelve months:

- (102) \*Lefrak built condos on beaches in Far Rockaway in 3 months.  
 (103) Lefrak built condos on 2 miles of shoreline property in Far Rockaway in 3 months.  
 (104) Lefrak built condos on some/three beaches in Far Rockaway in 3 months.  
 (105) \*Lefrak built condos out of glass and concrete in 3 months.  
 (106) Lefrak built condos out of 3000 tons of glass and concrete in 3 months.

Recall that the account of the scope effect is that a quantifier with determiner such as *some* NP(*s*) can export, in contrast to a bare NP, out of the scope of the adverbial phrase and thus evade the content of the definite description *the least event(s) that  $\Phi$* . The observed distribution of the effect implies that a bare NP in any argument position falls

obligatorily within the scope of the adverbial phrase and yet *some* NP(s) originating in the same position can export out.

To sum up, a difference of scope between *some beers* and *beers* is the only difference between them that could explain their contrast in (88) and (89). The problem

(88) Jim drank up some beers in nothing less than an hour.

(89) \*Jim drank up beers in nothing less than an hour.

for Davidsonian logical form is how to make scope matter when modification is merely conjunction. Here and elsewhere (Schein 1998, forthcoming), I have explored the idea that the reference to an event inside  $In[e, NP]$  is in fact accomplished by a definite description. Fixing the content of that description provides the occasion for scope effects. I am not the first to suggest that when speakers use definite descriptions to refer to situations or events, that is, to things that individuate as easily as mud, auxiliary notions such as the *least Fs* or the *minimal Fs* are then imported to secure definite reference.

In an alternative, one could approach the contrast between *some beers* and *beers* without introducing a definite description. Recognizing the difference in scope, one could say that the adverbial “applies” to *drink x up* in (88) but to *drink beers up* in (89) and that the adverbial “selects” certain predicates and its selectional feature stipulates those that are sortal, thereby excluding *drink beers up*. The apparatus of selection is nowhere reflected in logical form and what the adverb actually says is just that the event  $e$  has a certain duration. As a selectional feature, that is, as a comment on lexical competence, one naturally falls into thinking of telicity as a relation among invariant concepts, and one can then be taken by surprise when contextual factors matter (v. n. 33).

One is driven to plead that *in NP* can apply even to an (nearly) instantaneous event of eating seven goldfish by swallowing them all whole and at once because the stereotypical event of eating is not instantaneous; and, *in NP* cannot apply to an instantaneous event of seeing seven zebras because the stereotypical seeing of seven zebras is in fact instantaneous although there are serial sightings of which one can say that seven zebras were seen *in NP*. This strikes me as a rather lame accommodation of pragmatic reality. In contrast, context has always had a secure and precise role in the interpretation of definite descriptions, which affords me a straightforward account of how telicity judgments depend on it.

### 3.3. Telicity: threshold or terminus?

In characterizing the contrast between (107) and (108), it is sometimes held (e.g. Krifka 1989, 1992, 1998) that any predicate to which *in NP* applies felicitously is one where all denoted events that overlap are temporally cofinal.

(107) \*Sam pushed the cart towards the wall in 20 seconds.

(108) Sam pushed the cart to the wall in 20 seconds.

Many parts of Sam's push to the wall are also pushings of the cart to the wall, but they all end at the wall in the same moment; and thus according to this characterization the predicate *push the cart to the wall* is eligible for the adverbial phrase *in 20 seconds*. In contrast, parts of Sam's push towards the wall are pushings towards the wall without terminating at the same time. The first half of the push is a pushing of the cart towards the wall that terminates halfway. Denoting overlapping events that fail to be cofinal, the

predicate *push the cart towards the wall* is excluded from modification by the temporal adverbial. Cofinality thus governs the distribution of the temporal adverb. It is said to hold of all those predicates to which *in NP* can felicitously apply.

With some license, the discussions in Kratzer (1996) and in Hay, Kennedy and Levin (1999) can be taken to invite the question whether Dowty's (1979, 2.3.5, 88ff.) *degree-achievement* verbs provide counterexamples to the characterization of telic predicates in terms of cofinality<sup>36</sup> and to raise the further question of whether the temporal adverbial measures the time to a terminal state or merely to some threshold:

- (109) The egg cooked (up) in 3 minutes and cooked for 30 minutes more until it was a handball.  
 (110) Sam's wisdom ripened in 45 years and ripened for another ten years into applesauce.

To answer the question at one extreme, suppose it were understood that the conjuncts in (109) applied to the same event, and so it is said of the 33 minutes that the egg cooked that it is an event of the egg cooking in 3 minutes. If true, then there is a part of it, say, a 28 minute event ending five minutes sooner, that is also a cooking of the egg in 3 minutes. The temporal adverbial *in 3 minutes* comes to imply only that an event has reached some threshold, which may have continued beyond, and *a fortiori* it undermines any suggestion that such adverbials apply only to predicates respecting cofinality. In the

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<sup>36</sup> The subsequent discussion also owes much to a reading of Higginbotham 1999 and Pietroski 1998 and correspondence with Fabio Pianesi.

semantics for the temporal adverbial now on offer, the implicit target state (*up* in (111)<sup>37</sup>) results only in the imposition of a threshold and would thus allow the conjuncts of (109) (and (110)) to apply to the same events<sup>38</sup>:

- (111) Patient( $e_{33}$ , *the egg*) & cook( $e_{33}$ ) & up( $e_{33}$ ) &  
 [the least  $e'$ :  $e' \leq e_{33}$  & Patient( $e'$ , *the egg*) & cook( $e'$ ) & up( $e'$ )] In( $e'$ , 3 min.)

The argument against cofinality rests on finding a predicate, such as *cook(e) the egg up* that holds of overlapping, non-cofinal events. The evidence for a threshold rather than a terminus, if there is any, turns on showing that a temporal adverb such as *in 3 minutes* holds also of events longer than three minutes, which is to show that even the modified predicate *cook(e) the egg up in 3 minutes* fails cofinality.

Consider, for concreteness, (112):

- (112) The room filled (up) with smoke.

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<sup>37</sup> I use the preposition as shorthand for what may very well be a more complex expression such as secondary predicate or resultative predicated of the egg (and the event) as in Kratzer 1996 and Hay et. al. 1999 among many others, e.g., Hoekstra 1992.

To illustrate, let's unpack 'up( $e$ )' as ' $\exists e' \exists n (\text{Cause}(e, e') \& G(e', n) \& n > K)$ ', where  $G$  is the scalar dimension and  $K$ , the threshold for egg-doneness—moisture content, bacteria content, whatever. We have both (i) and (ii):

- (i) cook( $e_3$ ) & Patient( $e_3, o$ ) & Cause( $e_3, e_3^+$ ) & G( $e_3^+, n_3$ ) &  $n_3 > K$   
 (ii) cook( $e_{33}$ ) & Patient( $e_{33}, o$ ) & Cause( $e_{33}, e_{33}^+$ ) & G( $e_{33}^+, n_{33}$ ) &  $n_{33} > K$

The smaller, 3-minute event,  $e_3$ , caused the  $n_3$ -degree of doneness, enough to consider the egg done, and the larger, 33-minute  $e_{33}$  brought the egg to the higher  $n_{33}$ -degree of doneness. So, both up( $e_3$ ) and up( $e_{33}$ ). The least event of cooking up is  $e_3$ , in three minutes. This illustrates an analysis for 'up( $e$ )' that imposes only a threshold. Note that, as this analysis makes clear, asserting both up( $e_3$ ) and up( $e_{33}$ ) does not lead to the incoherent claim that both the larger event and its proper part have the same effect in both causing the egg to be done. The different events have different effects, doneness to different degrees. Both effects happen to exceed the threshold. I thank Fabio Pianesi for discussion of this point.

<sup>38</sup> Note that paths such as *push the cart to the wall* and changes of state such as *the egg cooking up* or maturation in *Sam matured in 3 years* do not on the face of it have least events. Consider all the cofinal subpaths. To accommodate the reference to the least event that  $\Phi$ , a starting point is tacitly understood -- *pushing the cart (from its stationary position) to the wall, the egg cooking up (from the moment it begins to cook), Sam maturing in 3 years (from when we first met him)* etc.

The room begins to fill with smoke at  $t_0$ , and let us say that the sentence first becomes true at  $t_1$  when a visible haze is seen everywhere. Let  $e_1$  be the threshold event, the room's filling with smoke from  $t_0$  to  $t_1$ . It persists quite a bit beyond  $t_1$  so that the fog gets progressively denser until  $t_2$ , and the large event  $e_2$  includes all of it from  $t_0$  to  $t_2$ . An assertion of (112) after  $t_2$  is judged uncontroversially to be true, and we can now ask which event or events has made it so. One of them is surely  $e_1$  and the question is whether  $e_2$  is another, contrary to cofinality. On the other hand, consistent with cofinality, it may be that (112) is judged to be true when confronted with the dense fog only because we infer the existence of the smaller event  $e_1$ , which proves to be the only one of the two that the predicate denotes:

- (113) T       $\exists e$  (fill-up( $e$ ) & Theme( $e,r$ ) & with( $e,smoke$ ))  
 (114) T      (fill-up( $e_1$ ) & Theme( $e_1,r$ ) & with( $e_1,smoke$ ))  
 (115) F      (fill-up( $e_2$ ) & Theme( $e_2,r$ ) & with( $e_2, smoke$ ))

This attempt to spare cofinality cannot however succeed with logical form such as it is.

Suppose that the threshold haze at  $t_1$  weighs ten pounds, and by  $t_2$  the fog weighs a hundred pounds. Alongside (112), it is equally uncontroversial that (116) is true. Here of course only  $e_2$  with the hundred pounds of smoke could make it so:

- (116) The room filled (up) with a hundred pounds of smoke.  
 (117) F      (fill-up( $e_1$ ) & Theme( $e_1,r$ ) & with( $e_1, 100 lb. smoke$ ))  
 (118) T      (fill-up( $e_2$ ) & Theme( $e_2,r$ ) & with( $e_2, with 100 lb. smoke$ ))

Yet, given that  $\text{With}(e_2, 100 \text{ lb. smoke}) \rightarrow \text{With}(e_2, \text{smoke})$ , (118) implies the truth of (115), and thus the predicate *the room fills up(e) with smoke* denotes the overlapping but non-co-final events  $e_1$  and  $e_2$ .

It is now left to the champion of cofinality to try to distinguish the analyses of (112) and (116) so that while (116) remains true of  $e_2$ , revised logical forms allow (112) to hold only of  $e_1$ . It should be noted that such an effort does not have recourse to the claim that (112), when telic, is understood to be about some particular quantity of smoke, introduced either through tacit definite description or a contextually-fixed parameter, as in (119). The suggestion would be that  $e_1$  but crucially not  $e_2$  contains the intended quantity of smoke.

- (119) a.  $\exists e (\text{fill-up}(e) \ \& \ \text{Theme}(e,r) \ \& \ \text{with}(e, \text{the threshold quantity of smoke}))$   
 b.  $\exists e (\text{fill-up}(e) \ \& \ \text{Theme}(e,r) \ \& \ \text{with}(e, x\text{-quantity smoke}))$

The objection here is that the bare NP in (112), *with smoke*, comes to be equivalent in (119) to an NP with a determiner. Why doesn't such an equivalence efface the contrast found elsewhere, e.g., (77) and (78), between bare NPs and those with determiners? The present examples will serve to illustrate the point. Suppose now that the smoke is heavier than air and it all settles on the floor so that the room is not filled up with smoke. We can nevertheless truthfully say (120) and (121), where the prepositional objects license telicity (v. (102)-(106)).

- (120) The room filled (up) with 100 lbs. of smoke in ten minutes.  
 (121) The room filled (up) with some smoke in ten minutes.

As expected, (120) and (121) contrast with a bare NP. We cannot say of smoke that lies on the floor that:

(122) \*The room filled (up) with smoke in ten minutes.

It cannot be said because there is no least event of the room filling with smoke, since the bare indefinite cannot be taken to introduce a particular quantity of smoke. That is, (122) and (112) do not have an analysis along the lines of (119).

As this argument implies, in contexts where (112) and (122) are felicitous, something other than a particular quantity of smoke defines the least event, say, a target state of the room such as the density of its smoke or the degree of haziness throughout (Tenny 1987: 105ff., Hay, Kennedy and Levin 1999). This is surely correct, but to make such a target explicit even to a precise value will not prop up cofinality. The proposal would be to gloss (112) along the lines of (123):

(123)  $\exists e$  (fill( $e$ ) & Theme( $e,r$ ) & Hazy( $e, n$ ) & with( $e,smoke$ ))

The smoke in the room at  $e_1$  produces an  $n$ -degree haze. If the smoke at  $e_2$  produces an  $n+k$ -degree haze ( $k \neq 0$ ), then  $e_2$  would, as desired, be excluded, and (112) would hold only of the smaller  $e_1$ . In the general case, we can have however no confidence that variation in the quantity of smoke will always have an incremental effect in the target dimension.

Suppose, for example, that the understood target for an utterance of (124) is zero-degree visibility so that not even the ground crews venture out. There was enough fog, 500 lbs.,

at  $e_1$  to achieve this state ten minutes after it began to roll in. Visibility has bottomed out, and so ten minutes later when 1000 lbs. of fog have in  $e_2$  clouded over the runway, it still remains at zero-degree. Similarly, the target state for (125) is that the stain be no longer visible. It is of course possible to waste more paint than the job requires without thereby making the stain even less visible in any sense that the speaker or hearer are ready to grasp.

- (124) a. The runway clouded over with fog.  
 b. The runway clouded over with 1000 lbs. of fog.
- (125) a. The water stain on the wall was covered up with fresh paint.  
 b. The water stain on the wall was covered up with ten gallons of fresh paint.

The argument now repeats itself *mutatis mutandis*. In the imagined circumstances, all the sentences of (124) and (125) are true. But, the b.-examples hold only of the larger event  $e_2$ , which then entails that the a.-examples also hold of  $e_2$ , contrary to cofinality:

- (126) a.  $\text{cloud-over}(e_2) \ \& \ \text{Theme}(e_2,r) \ \& \ \text{visibility}(e_2, 0) \ \& \ \text{with}(e_2,\text{fog})$   
 b.  $\text{cloud-over}(e_2) \ \& \ \text{Theme}(e_2,r) \ \& \ \text{visibility}(e_2, 0) \ \& \ \text{with}(e_2, 1000 \text{ lbs. fog})$
- (127) a.  $\text{cover-up}(e_2) \ \& \ \text{Theme}(e_2,s) \ \& \ \text{visibility}(e_2, 0) \ \& \ \text{with}(e_2,\text{paint})$   
 b.  $\text{cover-up}(e_2) \ \& \ \text{Theme}(e_2,s) \ \& \ \text{visibility}(e_2, 0) \ \& \ \text{with}(e_2, 10 \text{ gal. paint})$

Cofinality fares no better under more sophisticated analyses of (112) and (116). It may be, as many have suggested, that the target state is expressed by a (small) clausal complement that denotes an event distinct from the process that produces it:

- (128)  $\exists e \exists e' (\text{fill}(e,e') \ \& \ \text{Theme}(e,r) \ \& \ \text{full}(e', r) \ \& \ \text{with}(e',\text{smoke}))$ .  
 Alternatively,           ... & with( $e, \text{smoke}$ ); or,  
                                   ... & with( $e,e', \text{smoke}$ )).

- (129)  $\exists e \exists e'$  (fill( $e, e'$ ) & Theme( $e, r$ ) & full( $e', r$ ) & with( $e', 100lb. smoke$ )).  
 Alternatively, ... & with( $e, 100lb. smoke$ ); or,  
 ... & with( $e, e', 100lb. smoke$ )).

The fact remains that (116) holds only of the larger event  $e_2$ , and however this event is parsed into  $e$  and  $e'$  so that (129) comes out true, (128) will also hold of it, given that With(..., 100lb. smoke)  $\rightarrow$  With(..., smoke). The move to treat *With NP* as a term in a conjunction, the basic Davidsonian analysis, suffices to undermine cofinality as a standard for classifying predicates as telic and eligible for *in NP*<sup>39</sup>. On the other hand, if the semantics of *in NP* is as proposed here, the predicates to which the adverb can felicitously apply sort themselves out. On any occasion of use, a predicate  $\Phi$  is telic, i.e., modifiable by *in NP*, just in case there is the least event(s) that  $\Phi$ .<sup>40</sup>

The temporal adverbial's conditions of application for a predicate for  $\Phi$  seem to flow from the notion of the least event(s) that  $\Phi$ , but it remains open whether this is all

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<sup>39</sup> If one were determined to stipulate that all telic predicates observe cofinality, one could start to incorporate the analysis of the temporal adverbial into the predicate itself as in (i):

- (112) The room filled up with smoke.  
 (i)  $\exists e$  (fill( $e$ ) & Theme( $e, r$ ) & with( $e, smoke$ ) & [the least  $e'$ :  $e' \leq e$  & fill( $e'$ ) & Theme( $e', r$ ) & with( $e', smoke$ )] $e' = e$ )

<sup>40</sup> This formulation as well as remarks throughout this section makes a concession to a common practice which I deplore. There is a received classification of predicates into Aktionsarten (Kenny-Vendler) (with some quibbling over the categories), a list of 'diagnostics' for membership, such as modification by 'in NP', 'for NP', auxiliary selection, entailments under the progressive, etc., and further hand-wringing when these diagnostics do not all agree on a diagnosis. But there is no reason to suppose that speakers apply diagnostics to sort the lexicon, as this view implies, and then go on to tolerate this or that construction only if it draws its predicate from the appropriate class. Rather, there is a syntax and semantics for 'in NP', a syntax and semantics for 'for NP', a theory of auxiliary selection that also comprises a syntax and semantics, and similarly for the progressive and other alleged diagnostics. Should there turn out to be a large overlap among the predicates to which any of these apply, the explanation for their overlap will presumably emerge from their respective analyses as will the explanation for their differences. Talk of 'telicity' indulges the view that speakers grasp some such superordinate concept and that the classification

there is to the meaning of *in NP*. For the  $e_2$  described in (130) that lasts 33 minutes and fills the room with 100 lbs. of smoke, it has just been argued that both (131) and (132) hold of it.

(130) (cf. (109),(110)) The room filled up with smoke in 3 minutes and filled for 30 minutes more with 90lbs. more smoke until a valve shut down.

(131) The room filled up with smoke.

(132) The room filled up with 100 lbs. smoke.

It is uncontroversial that (133) also holds of this larger event  $e_2$ :

(133) The room filled up with 100 lbs. smoke in 33 minutes.

Yet, the semantics as presented so far is more permissive. It allows that the first conjunct of (130), glossed as (134), also hold of the 33-minute  $e_2$ .

(134)  $\exists e(\text{Theme}(e, r) \ \& \ \text{fill}(e) \ \& \ \text{up}(e) \ \& \ \text{with}(e, \text{smoke}) \ \& \ [\text{the least } e': e' \leq e \ \& \ \text{Theme}(e', r) \ \& \ \text{fill}(e') \ \& \ \text{up}(e') \ \& \ \text{with}(e', \text{smoke})] \ \text{In}(e', 3 \text{ min.}))$

The logical form in (134) says only that some event of the room's filling up with smoke is such that its least part that is also a filling the room with smoke lasts 3 minutes. The large event meets this threshold condition. Admittedly this offends intuition, since an utterance of (135) seems to leave no room for the speaker to refer to anything other than an event of exactly three minutes.

(135) The room filled up with smoke in 3 minutes.

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of predicates accordingly is coherent. My rejection of this view is also my excuse for treating here only one of the alleged diagnostics of telicity, 'in NP'.

One could yield to intuition and so revise the meaning of the temporal adverbial, setting it in effect equivalent to (136), which requires that *in NP* hold only of the threshold event itself:

- (136)  $\exists e(\text{Theme}(e, r) \ \& \ \text{fill}(e) \ \& \ \text{up}(e) \ \& \ \text{with}(e, \text{smoke}) \ \& \ [\text{the least } e': e' \leq e \ \& \ \text{Theme}(e', r) \ \& \ \text{fill}(e') \ \& \ \text{up}(e') \ \& \ \text{with}(e', \text{smoke})] (e' = e \ \& \ \text{In}(e', 3 \text{ min.})))$

Alternatively, one could finesse the intuition: any subsequent thought that purports to refer back to the event of (135) does so only via a definite description, *the least event(s) such that the room filled up with smoke in 3 minutes*, which by itself forces reference to the smaller threshold event.<sup>41</sup>

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<sup>41</sup> Fabio Pianesi (p.c.) raises an interesting objection to the idea that (135) and the like could hold of the larger, 33-minute event. He observes that the imperfective present tense in (i) and (ii) can no longer be uttered after the three minutes it takes the egg to get done:

- (i) The egg cooks up in three minutes.  
(ii) L'uovo cuoce in tre minuti.

Yet, if (i) and (ii) could hold of a longer 33-minute event, it should be possible to use the imperfective at, say, the 25<sup>th</sup> minute while the longer event is still in progress. On the other hand, if (i) and (ii) could hold only of a three-minute event, then after the three minutes, the event is no longer in progress and the imperfective would be inappropriate, as observed.

Perhaps the following answers the objection. Observe that the imperfective *John kills Bill* is inappropriate even at the very instant Bill is dead. At that very point, the perfective is required.

- (iv)  $\text{Agent}(e, j) \ \& \ \text{Cause}(e, e') \ \& \ \text{die}(e') \ \& \ \text{Patient}(e', b)$

With respect to a logical form like (iv), the observation is that the present imperfective is acceptable only if *e* is now and no *e'* that would be a death ('die(*e'*)') caused by *e* is either now or before now. Cooking the egg up should be similar (cf. n. 37):

- (v)  $\text{cook}(e) \ \& \ \text{Patient}(e, o) \ \& \ \text{Cause}(e, e') \ \& \ \text{G}(e', n) \ \& \ n > K$

The present imperfective requires that *e* is now and no *e'* that would be an effect of *e* is now or before now. Consider the two cases. Suppose the sentence is uttered after the egg has cooked for one minute. *e* is now, but doneness at three minutes, the first such *e'*, is far enough in the future that it counts as neither now nor before now. After 3 minutes, and in particular at 25 minutes, the following situation obtains. If now includes the 25-minute *e*, then for some  $n > K$  it will also include an effect *e'* of *e* that is the egg being done

### 3.3.1. *for NP*

What was done for the semantics of *in NP* will also have to be extended to *for NP*.

The same 33-minute event is both the room filling with smoke for 33 minutes and the room filling up with 100 lbs. of smoke in 33-minutes:

(137) The room filled with smoke for 33 minutes and filled up with 100lbs. of smoke in 33 minutes.

If it is the very same event, what then precludes (138)?

(138) \*The room filled up with 100lbs. smoke (in 33 minutes) for 33 minutes.

There is no retreat to the position that *for NP* applies to processes that are distinct from the coincident completed events that *in NP* applies to. Besides all else that has been said against fine-grained events, a metaphysical distinction would incorrectly exclude (139) as it rules out (138) and (140).

(139) Joe Namath carried the football for 60 yards in 90 seconds.

(140) \*Joe Namath carried the football in 90 seconds for 60 yards.

If we follow the crowd and assume that *for NP* and *in NP* are in complementary

distribution, then the import of *for NP* for any predicate  $\Phi$  should be that there is not the

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to the nth degree. The point is that cooking for 22 more minutes has certainly made the egg a little more done. That incremental effect is above threshold, and it is achieved at the very instant the 25-minutes of cooking have elapsed. So, at 25-minutes, the imperfective is inappropriate, as it is in (v) at the very instant that John's action has caused a death. If something along these lines is correct, then the imperfective provides no further argument beyond the intuition noted in the text for restricting (135) to three-minute events.

least event(s) that  $\Phi$ <sup>42</sup>. As with *in NP*, the scope of the adverb determines  $\Phi$ , leading to the unacceptability of (138) and the contrasts in (141)-(143).

- (141) Joe Namath ran for 90 seconds.  
 (142) \*Joe Namath ran the 60 yards for 90 seconds.  
 (143) \*Joe Namath ran his run for 90 seconds.

Although both conjuncts of (130) may hold of the same event (and similarly for (109) and (110)), they cannot in fact share the very same predicate  $\Phi$ . Forcing them to do so degrades the sentences:

- (144) \*The room filled up with smoke in 3 minutes and for 30 minutes more with 90lbs. more smoke until a valve shut down.  
 (145) \*The egg cooked (up) in 3 minutes and for 30 minutes more until it was a handball.  
 (146) \*Sam's wisdom ripened in 45 years and for another ten years into applesauce.

In (144)-(146), the adverbials impose inconsistent conditions on the same  $\Phi$ .<sup>43</sup>

### 3.4. Semantic Knowledge

Grant for the moment that the semantics of *in NP* is correct: on every occasion where it is used felicitously and truthfully to modify a predicate  $\Phi$  there is an event  $e$  such that  $\Phi(e)$  and there is the least part of  $e$  that  $\Phi$ . The semantics and logical form are sufficient, as

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<sup>42</sup> One could hope that a more natural suggestion for the meaning of *for NP* will derive this generalization that it applies to events that  $F$  only if there is not the least part that  $F$ s. I am toying with the idea that *to F for 45 min.* means that a velocity,  $dx/dt$ , described by  $F$  is sustained for 45 minutes. Velocities are only definable over continuous functions, and this condition would exclude least parts.

<sup>43</sup> The sentences are marginally acceptable to the extent that the second conjunct is understood to contain a zero anaphor relating to the antecedent verb minus the resultant state:

- (i) The room filled up with smoke in 3 minutes and (filled) for 30 minutes more...  
 (ii) The egg cooked up in 3 minutes and (cooked) for 30 minutes more...

promised, to rescue coarser-grained events and in particular the truth of (31a) from the unsound inference that follows:

- (31) a. Jim's drinking a few/ some beers in nothing less than an hour = Jim's drinking beer(s) for an hour.
- b. Jim drank a few/some beer(s) in nothing less than an hour.  
 $[\exists y: \text{beer}(y)] \exists e(\text{Agent}(e,j) \ \& \ \text{drink}(e) \ \& \ \text{Patient}(e, y) \ \& \ [\text{the least } e': e' \leq e \ \& \ \text{Agent}(e',j) \ \& \ \text{drink}(e') \ \& \ \text{Patient}(e', y)] \ \text{In}(e', \text{nothing less than an hour}))$
- c. Jim drank beer(s) for an hour.  
 $\exists e(\text{Agent}(e,j) \ \& \ \text{drink}(e) \ \& \ \text{Patient}(e, \text{beer}) \ \dots)$
- d. \*Jim drank beer(s) in nothing less than an hour.  
 $\exists e(\text{Agent}(e,j) \ \& \ \text{drink}(e) \ \& \ [\exists y: \text{beer}(y)] \ \text{Patient}(e, y) \ \& \ [\text{the least } e': e' \leq e \ \& \ \text{Agent}(e',j) \ \& \ \text{drink}(e') \ \& \ [\exists y: \text{beer}(y)] \ \text{Patient}(e', y)] \ \text{In}(e', \text{nothing less than an hour}))$

Were the speaker simply to translate the sentences along the lines indicated, she would recognize that there is no valid inference to be had there. But, of course, when she judges that (90) is an infelicitous description of linear motion, she goes beyond the recognition that (90) would be true only if there is a least event of heaving the cannon toward the Union battery.

- (90) Johnny Reb heaved the cannon toward the Union battery in ten seconds.

She judges the sentence infelicitous because she knows *a priori* that there could not be such an event under the circumstances. Similarly, she judges (90) a felicitous description of a rotation, knowing that there would be a least rotation towards the Union battery.

These judgments imply mastery of a theory of motion. Judgments of other sentences may

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(iii) Sam's wisdom ripened (to maturity) in 45 years and (ripened) for another ten years...

imply some other expertise. There is no reason to expect that the knowledge deployed in inferring the (non)existence of a least event should not be as varied and open-ended as the knowledge that underlies lexical competence itself (v. Marconi 1997), enlisting theories of causation, physical constitution, spatial and temporal orientation or whatever else explains what competent speakers know competent speakers know.<sup>44</sup> These remarks should not be taken to discourage a project (e.g., Jackendoff 1996) proposing that certain modest axioms from a theory of motion will suffice to subsume many judgments about the telicity of a large class of predicates that turn out, abstractly or concretely, to describe motions. Such a project uncovers how judgments of telicity are as systematic as the lexical competence on which they rely. The view proposed here is that judgments about telicity reflect a judgment about the successful reference of *the least event(s) that  $\Phi$* , which on any occasion depends on what the speaker knows about the substituent for  $\Phi$ . What is dismissed is any further demand for a comprehensive theory of telicity per se that purports to lay out for us more general conditions.

Such a garden path towards telicity might begin from some observations about the contrast between (147) and (148) (cf. Krifka 1989, 1992, 1998).

(147) Adam ate the apple in the blink of a serpent's eye.

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<sup>44</sup> As a context of Fabio Pianesi's (p.c.) illustrates, speakers' judgments about (90) imply knowledge of a theory of action. Imagine that to aim the cannon at the Union battery requires a rotation of 45° and Johnny Reb simply overshoots, rotating 60°, and the cannon comes to rest aimed at the barn. In such a context, (90) is judged false despite the 45° rotation that is a subevent of the 60° rotation. If we take seriously the decomposition that Johnny Reb's action caused the cannon's motion,  $\exists e \exists e' (\text{Agent}(e, \text{JR}) \ \& \ \text{Cause}(e, e') \ \& \ \text{heave}(e') \ \& \ \text{Theme}(e', c) \ \dots)$ , we must ask when an event in this context counts as an action. Taking into account the intentions of the agent and the internal structure of the action, e.g., motor coordination (which itself provides indications when a planned action begins and ends), one would have to say that the entire swing is one action and not several. There is thus only one action in this context and its effect is a rotation of 60°, falsifying sentence (90).

(148) \*Adam fondled the apple in ten minutes.

In many an event, distinct processes unfold together. As Adam eats, the apple is consumed. As he moves to fondle it, its surface is caressed. We can think of these several processes as each a sequence of events and observe that in the case of the telic predicate (147) the sequence of events corresponding to the apple's consumption is of finite duration since at each turn some part of the apple is consumed and the process ends when there is nothing left. We can observe further that the sequence of Adam's actions map one-to-one onto the event of the apple's being consumed, and since the one comes to an end, so must the other and so must the larger event that comprises these constituent processes. Hence the predicate is telic. In (148), there is a similar one-to-one mapping between Adam's actions and its effects on the surface of the apple, and the surface is also a finite area. Yet, here there need be no end to Adam's fondling since the same surface area can be revisited. With no end to the event in sight, the predicate is judged atelic.

Now all of this is true of eating and fondling apples; and certainly, any speaker may infer that an event ends who knows that it is constituted by several processes and that there are isomorphisms among them and also an isomorphism between one of them and some finite measure. But, it is original sin to hold that every judgment of telicity draws on such an inference, or, in other words, to hold that isomorphisms among processes and finite measures provides some kind of an analysis of telicity. It might be thought that the examples in (149)-(152) are, like eating the apple, well-behaved from the point of view of this incrementalist account. The bucket is a finite volume progressively filled and the

circle is drawn in increments around the compass. Similarly, the sandcastle is built in stages and the fort demolished bit by bit.

- (149) Sam filled the bucket in an hour.
- (150) Sam drew a circle in an hour.
- (151) Sam built the sandcastle in an hour.
- (152) Sam demolished the fort in an hour.

There are however contexts where the structure of these events comes to resemble better fondling apples than eating them, without such contexts undermining the telicity of these examples.<sup>45</sup> Suppose that Sam works at a variable rate and that the bucket leaks at a variable rate and an evil twin works against Sam at variable rates to erase the circle, demolish the sandcastle and rebuild the fort. For that matter, there is a telic event that is gesture-for-gesture and molecule-for-molecule identical to Adam's fondling the apple:

- (153) Adam polished the apple in ten minutes (despite a sandstorm).

These contexts make clear that there is no inference from the meaning of the predicates, *fill the bucket*, *draw a circle*, *build the sandcastle*, *demolish the fort*, *polish the apple*, that Sam will make any progress at all let alone that the events come to an end. Moreover, Sam's variable rate and the variable rate of the opposing force make sure that the same volumes of the bucket, the same arcs of the circle, the same sections of the sandcastle and the same fortifications will be revisited many times over before Sam rests from her Sisyphean labor. Between (148) and (153), there seems in principle no way to parse the same event into constituent processes, isomorphisms between them and finite measures

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<sup>45</sup> Verkuyl 1993 and Jackendoff 1996 discuss the problem of 'backtracking' for the incrementalist account of motion on (finite) paths. The problem is pervasive, as (149)-(152) suggest.

so that it is atelic as fondling but telic as polishing. Speakers do not look for such an analysis of events in their judgments of telicity, and so the failure of such an analysis in the imagined contexts for (149)-(153) in no way disrupts the felicity of these sentences-- quite unlike (90), where the shift from rotation to linear motion changes a parameter crucial to understanding the temporal adverbial. Although it is formulated in the most general and topic-neutral terms-- sequences of events, isomorphisms, and finite measures-- and purports to characterize telicity, the incrementalist theory, which eats the apple but can't fill a leaky bucket, just carries no water.<sup>46</sup>

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<sup>46</sup> In Krifka (1989, 1992, 1998), the incrementalist theory assumes a particular form, which is subject to further objections. Telicity for a predicate  $P(e)$  requires a thematic relation  $\theta$  such that for  $\theta(x,e)$ : if  $e' \leq e$ , then for some  $x'$ ,  $x' \leq x$  and  $\theta(x',e')$ ; and if  $x' \leq x$ , then for some  $e'$ ,  $e' \leq e$  and  $\theta(x',e')$ ; and if  $e' \leq e$  &  $e'' \leq e$  &  $e' \neq e''$ , then  $(\theta(x',e') \& \theta(x'',e'')) \rightarrow x' \neq x''$ ; and  $\theta(x',e') \& \theta(x'',e') \rightarrow x' = x''$ . That is, with a telic predicate, a thematic relation expresses an isomorphism between parts of the event and parts of an object.

It works for eating an apple. Other examples, as several have noted (Tenny 1987, Dowty 1991, Verkuyl 1993, Jackendoff 1996, Hay, Kennedy and Levin 1999 among others) challenge the mapping into parts:

- (i) Sam's cheeks reddened in ten seconds.
- (ii) Sam's mood brightened in ten seconds.

What parts of Sam's cheeks or his mood map to events? I suppose we could advance a metaphysical doctrine that all qualities of an object are emergent from properties of its atoms, and the relevant parts of Sam's cheeks are its capillaries as they engorge with blood, and I suppose something could be said about Sam's endorphin-receptors when his mood brightens.

Further examples challenge even the more elaborate view:

- (iii) Sam filled the balloon with helium in two minutes.

There are no naive parts of the balloon that undergo some incremental change. No atoms either. Suppose we thought of the balloon as a *potential* volume, with regions of that volume as its parts. If the helium molecules marched in and assumed a fixed position in that volume, then filling the balloon would be no worse than cheeks reddening. But, of course, those molecules are in constant flux. We cannot say that the filling of the balloon corresponds to a succession of filling events that happen to parts of the volume.

Even where it is plausible to relate incremental events to parts of the object, it can be shown that the relation to parts is not the same as the relation to the object. That is, the isomorphism is not to be defined in these cases in terms of a thematic relation.

Consider:

- (iv) Sam walked the dog in ten minutes

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Any pet-owner knows that the (iv) is equivalent to:

(v) Sam walked the dog empty in ten minutes

The incremental parts appropriate for (iv) and (v) are exactly those of (vi).

(vi) Sam emptied the dog

Every part of the walking event corresponds to some part of the emptying event. The emptying event can correspond to dog parts. For Krifka, the thematic relation itself should provide the correspondence.

(vii)  $\theta(e,x) \leftrightarrow [\forall e': e' \leq e][\exists x': x' \leq x] \theta(e',x') \ \& \ [\forall x': x' \leq x][\exists e': e' \leq e] \theta(e',x')$

Even if we allow that the thematic relation in (iv) is distinct from the one in *Sam walked the dog for ten minutes*, it must still express that the dog walked. Perhaps, the telic thematic relation occurring in (iv) is something like (viii).

(viii)  $\theta(e,x) \leftrightarrow \text{walker}(e,x) \ \& \ \text{emptied}(e,x)$

But, if (viii) is the theta role of (iv), then the mapping of dog parts to events must be to events in which the dog part is a walker and is emptied. It is unreasonable to suppose that the (sub-)parts of a dog that walk, if there are any, are identical to the parts that are progressively becoming empty.

A similar example:

(ix) Sam was massaged in two hours.

(ix) is equivalent to (x):

(x) Sam was rubbed down in two hours

A body is massaged when and only when it has been massaged more or less all over. We allow that Sam is rubbed down only if every part of Sam is rubbed (atelic). But, it is not true that Sam is rubbed down only if every part is rubbed down. Similarly, it is not true that Sam is massaged only if every part is massaged. In a proper rub-down or massage, the body is covered by strokes that grab ten percent of the surface area. Any grosser manipulation is not thorough enough. Now it is clear that a rub-down of Sam, even if sustained attention is given to his shoulder, does not include a rub-down of his shoulder. Thoroughness requires the latter to be done with the fingertips-- ten percent of the shoulder is smaller than ten percent of Sam. As these remarks suggest, it is possible to approximate graduality or measuring-out as in (xi):

(xi)  $\text{rub-down}(e,x) \leftrightarrow [\forall e': e' \leq e][\exists x': x' \leq x \wedge x' = 10\%(x)] \text{rub}(e',x') \ \wedge \ [\forall x': x' \leq x \wedge x' = 10\%(x)][\exists e': e' \leq e] \text{rub}(e',x')$

What is impossible is (xii):

(xii)  $\text{rub-down}(e,x) \leftrightarrow [\forall e': e' \leq e][\exists x': x' \leq x \wedge x' = 10\%(x)] \text{rub-down}(e',x') \ \wedge \ [\forall x': x' \leq x \wedge x' = 10\%(x)][\exists e': e' \leq e] \text{rub-down}(e',x')$

That is, the incremental progress cannot be defined in terms of the thematic relation itself.

### 3.5. Telicity and the Syntax of Telo

Often the expression of a tacit or overt target state (Parsons 1990: 235) makes the difference in a judgment of telicity (Dowty 1979, Hoekstra 1988, 1992, Levin and Rappaport Hovav 1995, Pustejovsky 1991, Tenny 1987, 1992, Van Valin 1990). Despite enumerable fluctuations in the water level, at a certain point the bucket is filled up, that is, filled *full*. Given the leak, it will soon slip out of that state, but there has been an event large enough to have reached that state and such that lesser events won't have-- a least event of filling the bucket full. Similarly, there is a least event of polishing the apple *up*

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These particular objections can be answered by returning to Tenny's (1987:105ff.) original understanding of 'measuring-out', (and more recently in Hay, Kennedy and Levin 1999), where, as the paraphrases (v) for (iv) and (x) for (ix) suggest, the incremental change is measured by some scalar property of objects that is not necessarily concerned with the object's parts and independent of the object's thematic relation to the event. So, we have *fill the balloon (full to n-degree(psi))*, *walk the dog (empty)*, *massage Sam=rub Sam down*, *redden=become red to n-degree*, etc. Jackendoff 1996 provides the most insightful discussion of the range of dimensions that can measure out events.

The more general objection in the text to incrementalist theories of any kind remains. Recognizing that not every part of building a house maps onto the house (e.g., erecting the scaffolding), Krifka (1998) comments, "First, we can say that we are just interested in conceptual structures, not in reality. Events that do not contribute to parts of the house like erecting the scaffold may not play any role in conceptual structures, and can be disregarded. Or we can refine the notion of mapping to objects in the following way: If  $\theta(x,e)$  and  $e' \leq e$ , then it is either the case that  $e'$  can be related to a part  $x'$  of  $x$  such that  $\theta(x',e')$ , or  $e'$  is a necessary preparatory event for an event  $e$ ",  $e' \leq e$ , which in turn is related to a part  $x'$  of  $x$  such that  $\theta(x',e')$ ". Given an adequate definition of the notion 'necessary preparatory event', it is possible to show that a predicate like *build a house* is telic. (219)"

I suppose one could chart the divorce of reality and conceptual structure in the present instance as follows. Imagine counterfactually that the parts of the building levitated into place or better that the actual construction scene was edited so as to bleach out any detail that was not the motion of some house part. Of course the erecting of the scaffolding would now appear as an uneventful lull in construction, but no particular level of activity is implied by the notion of building the house and what remains of the original event would count for the perceiver as the house being built somehow. Thus only the motions of the house parts are essential to the event. The extent of an event may also be enlarged by events that are necessarily preparatory for any of its essential parts, to the extent that one is inclined to think of the erection of scaffolding and the like as also part of building the house.

None of this will fill the leaky bucket, and it is difficult to see what other flights from reality could admit *polish the apple* as telic under the circumstances described in the text while still classifying *fondle the apple* as atelic.

so that it shines all over. The difference between polishing the apple and fondling it is that the latter is not understood to have a comparable telos.

The expression of a telos is however neither necessary nor sufficient for the felicity of *in* NP. It is not necessary since there are contexts without it where (92) is felicitous. Recall that the temporal adverbial is infelicitous when the seven stars are sighted simultaneously (91); but it becomes felicitous when the sightings are not simultaneous, as imagined for (92).

(91) \*Herschel saw seven stars in 20 seconds.

(92) Herschel saw seven shooting stars in 20 seconds.

The contexts diverge in no other respect, and in particular, no target state is intended by either.<sup>47</sup>

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<sup>47</sup> Nor can it be supposed, if one considers any independent means for discriminating a plurality of events from singular events, that *in 20 seconds* requires a plurality of events, which it finds in (92) but not in (91), where it finds only a single sighting. Suppose, for example, that seven astronomers were widely separated on the globe and unaware of each other. There is no reason not to regard their sightings as separate events if necessary, and yet the facts for (i) are the same:

(i) Seven astronomers saw/thought of seven stars in 20 minutes.

The sentence (i) is felicitous only if the sightings or thoughts are not simultaneous. Another indication of a plurality of events comes from Gillon's (1987) example of *Gilbert, Hammerstein, Hart, Rogers and Sullivan collaborated on light operas*, which is true only if we consider several distinct collaborations (v. §1.2 above). Suppose thirty astronomers can be divided into subgroups where photos are exchanged, but it is not the case that the thirty astronomers exchanged photos with every one of the other twenty-nine. The truth of (ii) depends on there being a plurality of events within each of which the fewer than 30 astronomers do exchange photos:

(iii) Thirty astronomers saw photos of each other.

(iv) Thirty astronomers saw photos of each other in 20 minutes.

Simultaneity is still excluded despite the plurality of events. For discussion of this point, I thank Fabio Pianesi.

Nor is the expression of a telos sufficient. I don't mean only to recall to mind the contrast between (77) and (78), where the scope effect can undermine the temporal adverbial despite the explicit resultative *up*:

(77) Jim drank some beers up in nothing less than an hour.

(78) \*Jim drank beers up in nothing less than an hour.

The expression of a telos is insufficient even in cases where the scope effect plays no role. The crucial observation relies on a cross-linguistically widespread phenomenon (v. Rosen 1984, Hoekstra, 1984, 1988, 1992, Hoekstra and Mulder 1990, Zaenen 1993, Levin and Rappaport Hovav 1995, Borer 1994, 1998ab among others) where the occurrence of a resultative phrase changes the auxiliary from *have* to *be*, as it does in Dutch:

(154) a. Hij heeft gelopen.  
He has run  
'He ran.' (Zaenen 1993)

b. \*Hij is gelopen.  
He is run  
'He ran.' (Zaenen 1993)

(155) a. ?Hij heeft naar huis gelopen.  
He has to home run  
'He ran home.' (Zaenen 1993)

b. Hij is naar huis gelopen.  
He is to home run  
'He ran home.' (Zaenen 1993)

(156) a. Deze bloem heeft het hele jaar gebloeid.  
this flower has the whole year bloomed  
'This flower bloomed for the whole year'. (Levin & Hovav 1995: 161)

(157) a. Het boompje is helemaal op-gebloeid toen ik het regelmatig mest gaf.  
the little-tree is completely up-bloomed when I it regularly fertilizer gave  
'The little tree completely flourished when I regularly gave it fertilizer.'  
(Levin & Hovav 1995: 162)

Despite the resultative phrase and its effect on auxiliary change in (159), the adverbial *in* NP remains infelicitous unless, again, there is an appropriate least event<sup>48</sup>:

- (158) Jan is in tien minuten naar de stad gelopen.  
 Jan is in ten minutes to the town run  
 ‘Jan ran to the town in ten minutes’ (H. Koopman p.c.)
- (159) Jan is (?\*in tien minuten) naar de stad toe gelopen.  
 Jan is in ten minutes to the town to run  
 ‘Jan ran towards the town in ten minutes.’ (H. Koopman p.c.)
- (160) Jan heeft op de treadmill/ in het bos gelopen.  
 Jan has on the treadmill/in the woods run  
 ‘Jan ran on the treadmill/ in the woods’ (H. Koopman p.c.)
- (161) \*Jan is op de treadmill/ in het bos gelopen.  
 Jan is on the treadmill/in the woods run  
 ‘Jan ran on the treadmill/ in the woods’ (H. Koopman p.c.)

Although in telling cases it is neither necessary nor sufficient to license *in NP*, the expression of a telos often does make a difference as noted above. In so far as the resultative phrase expresses a property, such as *full* in *fill the bucket full*, its subject must be a direct object, as a point of syntax (v. Williams 1980, Schein 1982/1995, Simpson 1983, Rothstein 1983, 1992, Hoekstra 1988, 1992, Rapoport 1990, Carrier and Randall 1992, Levin & Hovav 1995 among others):

- (166) a. They shot him dead.  
 b. \*They shot at him dead.
- (167) a. He was shot  $t_i$  dead.  
 b. He was shot at  $t_i$  dead.

Thus the direct object is often, or even typically, mixed up in judgments of telicity, but this carries no implication for the meaning of Theme or any particular thematic relation

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<sup>48</sup> Borer 1998a n. 24 notes that auxiliary selection and resultative formation as well as other related syntactic effects are insensitive to the presence of adverbial modification, negation or progressive.

other than the resultative phrase itself. This becomes apparent where the direct object either bears no direct thematic relation to the matrix event or a relation that is atypical in the absence of the resultative phrase (v. Hoekstra 1988, 1992, Carrier and Randall 1992, Jackendoff 1990, Levin & Hovav 1995):

- (168) The DA proved some/three defendants guilty in three hours.  
 (169) \*The DA proved defendants guilty in three hours.<sup>49</sup>
- (170) Moths will eat twenty holes in that sweater in twenty days.  
 (171) \*Moths will eat (some) holes in that sweater in twenty days.<sup>50</sup>
- (172) The hot poker burned twenty holes in the wood (one after the other) in twenty minutes.  
 (173) \*The hot poker burned (some) holes in the wood (one after the other) in twenty minutes.
- (174) The rocket punched three holes in the atmosphere in thirty minutes.  
 (175) \*The rocket punched (some) holes in the atmosphere in thirty minutes.
- (176) Moses squeezed three drops of water out of rocks in three days.  
 (177) \*Moses squeezed water out of rocks in three days.
- (178) Sam shaved some/razors dull in three weeks.  
 (179) \*Sam shaved razors dull in three weeks.
- (180) The sheriff talked/sang/crowed/wept/laughed some/three drunks awake in a week.  
 (181) \*The sheriff talked/sang/crowed/wept/laughed drunks awake in a week.
- (182) Fred and Barney ate some/twenty fridges empty in half a day.  
 (183) \* Fred and Barney ate fridges empty in half a day.<sup>51</sup>

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<sup>49</sup> The sentence is acceptable on the irrelevant, generic reading, where it is asserted that any defendant is proven guilty in three hours; but, crucially (169) has no equivalent to (168).

<sup>50</sup> A *notional* predicate from which the quantifier cannot be exported. Cf. \*Moths will eat those holes in that sweater. See (83) above.

<sup>51</sup> Again it should be noted that the scope effect is not confined to direct objects:

- (i) \*The DA proved defendants guilty of crimes against financial institutions in twenty hours.  
 (ii) The DA proved defendants guilty of crimes against twenty financial institutions in twenty hours.  
 (iii) \*Moths will eat holes in sweaters in 10 days (where they eat at a rate of a sweater a day, v. n. 24).  
 (iv) Moths will eat holes in 10 sweaters in 10 days.

### 3.5.1. Direct object ‘holism’

The syntax of resultative phrases also suffices to explain what has been called the ‘holism’ of direct objects appearing in the locative alternation (Anderson 1971, Tenny 1987, 1992, 1994, Levin & Hovav 1995, Jackendoff 1996. v. also Parsons 1990: 84ff.):

(184) John loaded the wagon (full) with hay in two hours. (Williams 1980)

(185) \*John loaded hay into the wagon (full) in two hours. (Williams 1980)

Note first that for (184) and (185), there is the least event of loading the wagon with hay (as the temporal adverbial requires) only if there is an event of loading the wagon *full*, whether the resultative is tacit or overt. Since, the syntax of resultative phrases precludes oblique subjects, (185) is unacceptable. The resultative phrase is likewise excluded from (187), but there is in this case a least event of loading wagons with *the* hay, when the hay is all on wagons, which licenses the temporal adverbial (v. (102)-(106)).

(186) John loaded the hay up on wagons in two hours.

(187) John loaded wagons with the hay (\*up) in two hours.

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(v) \*John wore holes in shoes in three weeks.

(vi) John wore holes in three shoes in three weeks.

Similarly for *burn holes into wood panels*, *punch holes through clouds*, etc.

(vii) \*Moses squeezed water out of rocks in three days.

(viii) Moses squeezed water out of three rocks in three days.

(ix) \*The sheriff talked jailbirds awake from drunken stupors in three weeks.

(x) The sheriff talked jailbirds awake from twenty drunken stupors in three weeks.



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- (vii) a. János rámaázolta a festéket a falra.  
John onto-smearred-he-it the paint-ACC the wall-onto  
'John smeared paint on the wall.
- b. János bemaázolta a falat festékkal.  
John in-smearred-he-it the wall-ACC paint-with  
'John smeared the wall with paint.'  
(Hungarian, Moravcsik 1978:257 cited in Levin & Hovav 1995: 181)
- (viii) a. a paraszt rárakta a szénát a szekérre.  
the peasant onto-loaded-he-it the hay-ACC the wagon-SUBL  
'The peasant loaded the hay onto the wagon.
- b. a paraszt megrakta a szekeret szénával.  
the peasant PERF-loaded-he-it the wagon-ACC hay-INSTR  
'The peasant loaded the wagon with hay.'
- c. . a paraszt telegrakta a szekeret szénával.  
the peasant full-loaded-he-it the wagon-ACC hay-INSTR  
'The peasant loaded the wagon full with hay.'  
(Hungarian, Ackerman 1992: 59)

For our purposes, it is not the end of the story to declare that verbs participating in an alternation are distinct in both form and meaning, as in (ix) and (x) where *G*- is the conjectured zero morpheme.

- (ix) The peasant loaded the hay onto the wagon in twenty minutes.  
(x) The peasant (*G*-)loaded the wagon with the hay in twenty minutes.

Despite a difference meaning, it may be that on some occasion the alternation describes the very same event, as we may imagine for (ix) and (x) when the hay and the wagon are an exact fit and it took exactly twenty minutes to load.

If ever the same event is described, it cannot be allowed that the hay is the Theme for the loading and the wagon is the Theme for the *G*-loading, since, as before, the hay and the wagon cannot both be the unique Theme to the same event. The occurrence of *G*- must instead token a difference in thematic relations (xi) or a difference (xii) in the (sub-)events to which the thematic relation applies (if for some reason both the hay and the wagon are felt to be Themes):

- (xi) a.  $\exists e(\text{Agent}[e, p] \ \& \ \text{load}(e) \ \& \ \text{Theme}[e, h] \ \& \ \text{Onto}[e, w] \dots)$   
b.  $\exists e(\text{Agent}[e, p] \ \& \ \text{load}(e) \ \& \ G[e, w] \ \& \ \text{With}[e, h] \dots)$
- (xii) a.  $\exists e \exists e'(\text{Agent}[e, p] \ \& \ \text{load}[e, e'] \ \& \ \text{Theme}[e', w] \dots)$   
b.  $\exists e \exists e'(\text{Agent}[e, p] \ \& \ \text{load}[e, e'] \ \& \ G(e') \ \& \ \text{Theme}[e', w] \dots)$

(Were alternative (xii) to be developed, 'load[e,e']' would have to be further articulated. The identical events would presumably be the value of *e*. See Pietroski 1998 for a discussion of the issues.)

Given the essential separation of thematic relations into their own syntactic constituents (see the discussion above surrounding examples (4), (5) and (75)), the above amounts to the observation that a zero-morpheme appears on the verb iff *G* shows up at a remote location. Thus various considerations arising from the semantics, medium-grained event identities, the exhaustivity of Davidsonian thematic relations and their essential separation lead to an endorsement of a theory of grammar that calculates morphological well-formedness over whole syntactic structures (v. Baker 1988, Pesetsky 1995).

### 3.6. Plural Reference to Events: Ballistic and Continuous Causation

The semantics of the adverbial *in NP* includes reference to *the least event(s) that*  $\Phi$ , where the content of  $\Phi$  is fixed by what the adverbial phrase modifies. Much of what is understood about the distribution and meaning of such adverbial phrases follows from the semantics and pragmatics of definite description and the scope effects of fixing  $\Phi$ . There is however an important restriction on *in NP* that so far escapes the current account.

A celebrated example (v. Beardsley 1975, Bennett 1988, Fodor 1970, Lombard 1985, Pietroski 1998, Thomson 1971ab, 1977 among others) contrasts (188) and (189).

(188) Lincoln died in two days.

(189) #Booth killed Lincoln in two days.

Booth shoots Lincoln in the Ford Theatre on April 13, 1865 and immediately flees the scene. Lincoln suffers a mortal wound and dies on April 14. Sentence (188) is true, but not (189). Sidestepping the vagaries of human agency, let's look more at the mechanics

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N.B. The alternative (xiib) opens a lacuna in the argument. Essential separation concerns thematic relations and not something like ' $G(e')$ '. Essential separation provides no argument against a lexical item  $G\text{-load}[e,e']$  such that  $G\text{-load}[e,e']$  is true of  $\langle e,e' \rangle$  iff  $\text{load}[e,e'] \ \& \ G[e']$ , with such lexical items derived strictly by morphological rule. Of course what (xiib) represents is where  $G$  is taken to be the lexical head of a full-blown small clause complement as in, e.g., *load the wagon full of hay to the top*. The analysis now entertained is that the morphology delivers  $\text{full-load}[e,e']$ , without *full* ever being directly predicated of *the wagon* or in construction with *of hay to the top*. (Why not let the morphology serialize all sorts of verbs, *want-try-go-load[e,e',e'',e''']*?) Perhaps there is a cross-linguistic argument to close the lacuna, e.g., that auxiliary selection of 'be' requires a resultative phrase and this requirement is invariant across languages with and without the apparent morphological incorporation. Failing such an argument, it is in itself an interesting irony that essential separation drives the morphological account towards (xii) rather than (xi). It thus eschews the more abstract morphosyntax only by embracing the more abstract logical form.

and assume that Booth's bullet passed through Lincoln's body and lay spent on the stage floor. In that case, we find a minimal contrast between (190) and (191):

- (190) The wound killed Lincoln in two days.  
 (191) #The bullet killed Lincoln in two days.

If, on the other hand, the bullet remains inside Lincoln, then (191) also becomes acceptable. The difference is that what is inside Lincoln's body can be understood to exert a continuous force aimed at Lincoln's deterioration and death, whereas the bullet that lay on the stage, a ballistic cause, cannot. It appears that the adverbial *in NP* requires continuous rather than ballistic causation<sup>53</sup>, further illustrations of which are provided below:

- (192) a. #A single act of carelessness killed him in 15 years.<sup>54</sup>  
 b. HIV killed him in 15 years/ #in 15 seconds.  
 c. A pulmonary embolism killed him in 15 seconds.
- (193) a. The Vietnam War gave Secretary of Defense McNamara a headache in eight years. [I.e, the headache culminates McNamara's administration of the war.]  
 b. #The Vietnam War gave former Secretary of Defense McNamara a book in thirty years.
- (194) a. #The decline and fall of the Roman Empire gave Gibbon a book in twenty years.  
 b. The Watergate hearings/John Dean gave CBS footage for the evening news in ten minutes.

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<sup>53</sup> The terms 'continuous' vs. 'ballistic' causation is from Pinker 1989. Pinker 1989 and Pesetsky 1995 discuss double object alternations whose acceptability seems to turn on whether causation is continuous or ballistic. See below in the text for further discussion. Kiparsky 1997 invokes a related notion to explain conditions on transitivity alternations.

<sup>54</sup> (192a) is acceptable on the irrelevant reading that a single act of carelessness killed him 15 years later. That is 15 years later than the careless act. An analogous reading of *Booth killed Lincoln in 2 days* is unavailable: '2 days later than Booth' and '2 days later than the killing' make no sense, but '2 days later than Booth's (triggering) action' would be plausible and must be excluded on other grounds.

Of course there is both the least event of the wound's killing Lincoln and the least event of the bullet's killing Lincoln, even in the circumstance where it passes through him, and thus the semantics of *in NP* as presented so far does nothing to illuminate the distinction. It should not however be taken to signal victory for the incrementalist account. For here too there is no isomorphism between the action over two days and Lincoln dying in two days, between what the wound does and the measure of Lincoln's morbidity. With the counterefforts of his immune system, surgery and primitive antiseptics, Lincoln's morbidity fluctuates as much as the water level in a leaky bucket. Moreover, whatever the distinction turns out to be, it does not concern telic predicates in general but only causatives.

Our native concept of causation is a relation between events, ' $C(e,e')$ ', where causes are prior to effects,  $C(e,e') \rightarrow e < e'$ . Yet, in apparent contradiction, we do say that the swarming of locusts destroyed the field of barley, that is, that the swarming of locusts caused the field's destruction, although the events are nearly simultaneous, with many parts of the effect preceding parts of the cause. All causation is at bottom ballistic, but in saying such things we recognize that causes and effects may exist at a finer-grain than we discern and so attribute relations of cause and effect to aggregates and continua of events. Aggregate causation arises just from second-order quantification (plurality) of a first-order relation,

$$C[E,E'] \leftrightarrow (\forall e \exists e' (Ee \rightarrow (E'e' \& C(e,e'))) \& \forall e' \exists e (E'e' \rightarrow (Ee \& C(e,e')))).$$

The swarming of locusts is said to cause the field's destruction in that *the swarming of locusts* is taken as a second-order term, a mass term, that denotes any event that constitutes the swarming of the locusts much as *the water* denotes any quantity of water that constitutes the water<sup>55</sup>, and similarly for *the field's destruction*, whereupon causes do strictly precede their effects.

In explaining the contrast between (190) and (191), I will propose that *in NP* is a predicate of events that is, like some other natural language predicates, strictly collective. Think of it as measuring the distance between or among some events<sup>56</sup>. Decomposing (190) and (191) as causative constructions, stipulate for the moment that *in NP* measures the causes:

(195)  $\exists E (\text{Agent}[E,w] \ \& \ \exists E' (C[E,E'] \ \& \ \text{die}[E'] \ \& \ \text{Theme}[E',l]) \ \& \ [\text{the least } E'': E'' \leq E \ \& \ \text{Agent}[E'',w] \ \& \ \exists E'' (C[E'',E''] \ \& \ \text{die}[E''] \ \& \ \text{Theme}[E'',l])])$   
*In(E'', two days)*

“Some events<sup>57</sup> that are the wound's action caused Lincoln's death, and the least such events among them spread over two days.”

(196)  $\exists E (\text{Agent}[E,b] \ \& \ \exists E' (C[E,E'] \ \& \ \text{die}[E'] \ \& \ \text{Theme}[E',l]) \ \& \ [\text{the least } E'': E'' \leq E \ \& \ \text{Agent}[E'',b] \ \& \ \exists E'' (C[E'',E''] \ \& \ \text{die}[E''] \ \& \ \text{Theme}[E'',l])])$   
*In(E'', two days)*

<sup>55</sup> v. Cartwright 1963, 1965, 1970, Burge 1972, Montague 1973, Pelletier 1974, Bennett 1977, Sharvy 1980, Pelletier & Schubert 1989, Higginbotham 1994, Koslicki 1999.

<sup>56</sup> The proposal is reminiscent of Higginbotham's 1999 ditransitive *in*, 'in(*e*,*e'*,*x*)', where *x* measures the distance between *e* and *e'*.

<sup>57</sup> The plural should not be read as sortal to the exclusion of a mass term. It would not be more accurate to say 'some event-stuff' or 'enough event is such...' since I don't believe I need to presuppose the structure of a mass term either. A neutral term, such as 'some events or event-stuff' provides the more accurate paraphrase-- a plurality of events that may or may not be as dense as an event mass.

Pietroski 1998 offers an alternative causative analysis that relates actions and their effects as parts of a superordinate event that covers the whole causal chain. If I can pluralize the superordinate events, the actions and effects, the proposal in the text should be able to accommodate this alternative *mutatis mutandis*.

“Some events that are the bullet’s action caused Lincoln’s death, and the least such events among them spread over two days.”

Now between the events that are the wound’s action and the events that are Lincoln’s death, there are causes and effects, as  $C[E,E']$  requires. There are causal laws that relate any amount of infection progressing at any given velocity under any given conditions-- the presence of antipathogenic agents to such-and-such a degree, etc.-- to certain amounts of tissue death, and certain amounts of tissue death would constitute Lincoln’s death.

The same cannot be said for a plurality of events constituting the bullet’s action when the bullet ends up on the stage floor. The adverbial *in two days* is now understood to require reference to such a plurality, but we are reluctant to think of two events let alone a continuum of such events that are causes to effects constituting Lincoln’s death. We can of course resolve, say, the bullet’s trajectory through Lincoln’s body into any number of events, including the continuum, but without any thought for a relevant effect that each of these may have caused as that  $C[E,E']$  requires. Some trajectories are rather harmless as far as our understanding is concerned of how bullets kill. This one killed because something vital was nicked along the way. That nick makes a cause out of any trajectory that contains it, but the parts of the trajectory that do not, have no considered effect.

These remarks observe that continuous causation, the wound, provides a plurality of causes, but ballistic causation, the bullet, does not.<sup>58</sup> The proposal that refers to such a

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<sup>58</sup>This is somewhat misleading. The construction is in fact too weak to distinguish the bullet and the wound, since all the trajectories that do contain the one lethal nick are in fact a plurality of causal events.

plurality is a step towards explaining the contrast between (190) and (191), but more needs to be said. If (191) is simply as (196) represents, with *in two days* demanding reference to a plurality of causes, then why can't it be understood to demand that the bullet's action be divided into, say, two nicks, each of which causes a hemorrhage, neither of which is lethal on its own but together overwhelm the President? According to (196), *in two days*, should measure the distance between these two causes, which is mistaken, but an accurate measure does not produce a better sentence:

(197) #The bullet killed Lincoln in 500 milliseconds.<sup>59</sup>

The problem that (196) and (197) now raise is better illustrated with an example that provides a minimal contrast with the wound's continuous causation. Suppose there is a tree rot that first infects a tree and propagates until it reaches maturity. Throughout its lifespan, it secretes a toxin, the effect of which is strictly local on the surrounding tissue. Propagation to maturity takes a few weeks, and tree death takes between ten and twenty years depending on the extent of the infection, the health of the tree and the climate.

(198) #The rot's propagation killed the tree in a few weeks. (*cf.* (197))

(199) #The rot's propagation killed the tree in fifteen years. (*cf.* (191))

(200) The secretion of toxin killed the tree in fifteen years.

(201) The tree rot killed the tree in fifteen years.

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Something further would have to be said along the lines that distinct causes do not have the same causal force under the causal laws being considered. All the trajectories that share the same nick have exactly the force of that nick and therefore fail to be distinct causes. The solution to the more general problem next taken up will however make this refinement unnecessary.

<sup>59</sup> *Pace* the 'as-good-as-dead' reading, "I am dead, Horatio" (*Hamlet* V.2).

Like the wound, there is continuous cause and effect in theory between the rot's propagation and the tree's death: any amount of propagation establishes some amount of tree rot which under given conditions secretes toxin at some rate, exerting a necrotic force against local tissue, and local effects in tissue death constitute the tree's death.

What distinguishes (198) and (197) from (190) is the remoteness of the effects from their causes. The tree dies long after the rot has propagated, and Lincoln succumbs long after the bullet's mortal nicks. Let us then suppose that  $C(e,e')$  means not only that  $e$  precedes  $e'$  but also that  $e'$  is a proximate effect of  $e$ . If  $C(E,E')$ , then the  $E'$  are proximate effects of their respective  $E$ . In this context, the proximate effects of the events constituting propagation amount to a doomed but still healthy tree, with years of toxic accumulation to intervene before its death. What counts as proximate is of course entirely dependent on the causal theory entertained, and, in particular, on its resolution or scaling of events. In rejecting (197), I am not saying that speakers refuse the theory that bullets kill or that a bullet's action may have as its proximate effect a slow death, which is a death all the same. It is rather that such a thought is embedded in a causal theory that scales events coarsely. So to say that the bullet killed Lincoln is to find a proximate effect of a single action:

(202)  $\exists e(\text{Agent}(e,b) \ \& \ \exists e'(C(e,e') \ \& \ \text{die}(e') \ \& \ \text{Theme}(e',l))$

The temporal adverbial *in 500ms* demands however plural reference to events, as in (196), which scales down and resolves the bullet's action into a plurality of events. The proximate effects of these events are various tears and ruptures, and it takes another

theory, fluid dynamics, and subsequent events, hemorrhage, to kill off the President.<sup>60</sup> In contrast, the wound's infection for two days and the tree rot's secretion for fifteen years, resolved even into microscopic events, have proximate effects of microscopic tissue death that constitute their host's death.

In accounting for the contrast between (190) and (191), it would be better not to say that the temporal adverbial *in NP* "selects" a predicate that describes continuous causation when applied to a causative construction. Instead, what needs to be said is that *in NP* is a strictly collective predicate. The underlying causative relation expresses proximate causation, and the interaction between plural reference to events and what speakers understand about causation then suffice to explain the contrast.<sup>61</sup>

#### 4. Final Remarks

So at the end of the day Jim's drinking some beers was the very same event as his drinking beer. Speakers' judgments about event identities are not doctrine but data to be explained along with other instances of verbal behavior that arise from some combination of linguistic, rational and practical competence. The explanation on offer happens to accept some judgments of event identity at face value and the medium-grained events they imply. Like other things and as we might expect, it turns out to be possible to provide alternative descriptions of the same event. Inference patterns, such as (31)

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<sup>60</sup> To ensure this result, one may wish to strengthen plural reference to mass reference, *the least event-stuff that...* . Cf. n. 57.

Note that with causes and effects so tightly interleaved, it may be unnecessary to stipulate that *in NP* measures the causes.

above, that suggest the contrary-- inference patterns that are themselves among the data to be explained-- call out instead for refinements in logical form. Here we need to recognize that temporal adverbials, *in NP*, conceal a plural definite description of events, from which follows several of the phenomena associated with telicity.

Speakers are also sound in their judgment that Carnegie Hall sitting opposite the Carnegie Deli is the same event as the Carnegie Deli sitting opposite Carnegie Hall and that my weighing the Volvo's parts by weighing the Volvo is the same event as my weighing the Volvo. Appearances to the contrary dissolve when logical form is further refined to include scenes and their perspectives and reticules. With these refinements, medium-grained events no longer threaten absolute thematic relations. With a little more abstract syntax, (76) above, absolute thematic relations may yet survive the remaining argument against them (p. 35ff.), which is all for the good since their generalization across the lexicon and extensibility to novel utterances strongly recommend them. Both thematic relations and events are robust and not too finicky. All of this however is purchased with frank appeals to psychology (perspectives) and to the structure of the special concepts such as causation that underlie lexical competence.

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<sup>61</sup> I leave it open whether these ideas extend to other constructions that appear to discriminate between continuous and ballistic causation. See n. 53.

**Appendix: Comitative and instrumental *with* NP**

Comitative and instrumental *with*-NP phrases present special problems of their own for a naïve decomposition into conjuncts.<sup>62</sup> First, note that comitative phrases (ii,iii) also instantiate the problem of exhaustivity that we have seen in connection with (i) (v. p.22f.):

- (i) The Carnegie Deli sits opposite Carnegie Hall.
- (ii) a. Brutus killed Caesar with Cassius.  
b. Brutus, with Cassius, killed Caesar.
- (iii) a. Brutus was ushered into the Senate with Cassius.  
b. Brutus, with Cassius, was ushered into the Senate.

The problem and the solution are robust enough that it matters little what exactly comitative *with* means. Perhaps it occurs as a proform for thematic relations, taking on the meaning of Agent in (ii) and Theme in (iii), or perhaps it has a fixed meaning (cf. *opposite* in (i)) and one infers from the event the nature of the comitative participation. Either way, if one discovers that Cassius did everything that Brutus did in equal measure in the same event, then Brutus is not the unique and exhaustive agent in (ii) and Cassius is not the unique and exhaustive accomplice. However the comitative phrase is understood, we still need to appeal to scenes and reticules, and the solution for the problem of exhaustivity works as well here as it did for (i).

A problem special to comitative phrases is that (ii) does not entail that Brutus killed Caesar. The problem is clearer in (iii) modeled after an example due to Lasersohn (1995: 70):

- (iv) a. Russell wrote the whole of *Principia Mathematica* with Whitehead.  
 b. Russell, with Whitehead, wrote the whole of *Principia Mathematica*.

The sentences in (iv) do not entail that Russell wrote the whole of *Principia Mathematica*. Yet, it is unexpected that the entailment should fail if *with Whitehead* is just the usual conjunct "...& *With(e, Whitehead)*". Even dressed up with scenes and reticules, dropping the comitative phrase should leave behind a sentence that continues to be true.

The simple conjunction that underlies this expectation must therefore be mistaken, and further cause to doubt that analysis comes from an unexpected scope interaction in (v) and (vi) (modelled after examples discussed in Parsons 1990 and Pietroski 1998) where Nora uses her lens to focus sunlight on the chocolate:

- (v) a. Nora melted the chocolate with her lens with Willy Wonka.  
 b. Nora, with Willy Wonka, melted the chocolate with her lens.
- (vi) a. Nora melted the chocolate with Willy Wonka with her lens.  
 b. Nora, with her lens, melted the chocolate with Willy Wonka.

In (v), Willy Wonka is an accomplice to melting the chocolate with her lens. Perhaps he steadied her hand. In (vi), he is an accomplice to melting the chocolate but without any necessary connection to the lens. Perhaps he used a burner to heat the chocolate from below. It is as if *With Willy Wonka* scopes 'melt chocolate with her lens' in (v) but only 'melt chocolate' in (vi). The contrast is unexpected, and, in fact, Parsons (1990) offers the

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<sup>62</sup> I thank José Camacho for bringing the problem to my attention and both him and Paul Pietroski for further discussion.

absence of such scope effects among locative and temporal adverbials as an argument in favor of their analysis as simple conjuncts.<sup>63</sup>

The apparent scope effect in (v) and (vi) and the failure of the comitative phrase to drop *salva veritate* can be treated by causal ‘chaining’, where *with* is analyzed as ditransitive (suppressing the argument place for scenes which would make it tritransitive, v. Higginbotham 1999 for ditransitive *in*). As a first approximation, consider (v’) and (vi’) as candidate logical forms for (v) and (vi) respectively (Ignore for the moment that the preposition *with* is being treated as ambiguous between a ditransitive (comitative) *With* and a transitive *Instrument*):

(v’)  $\exists e \exists e' \exists e'' (\text{Agent}(e, n) \ \& \ \text{With}(e, e', ww) \ \& \ \text{Cause}(e', e'') \ \& \ \text{melt}(e'') \ \& \ \text{Patient}(e'', c) \ \& \ \text{Instrument}(e', l))$

(vi’)  $\exists e \exists e' \exists e'' (\text{Agent}(e, n) \ \& \ \text{Instrument}(e, l) \ \& \ \text{With}(e, e', ww) \ \& \ \text{Cause}(e', e'') \ \& \ \text{melt}(e'') \ \& \ \text{Patient}(e'', c))$

In both (v’) and (vi’), what melted the chocolate is an event  $e'$  that is Nora with Willy Wonka. The truth of (v’) or (vi’) provides no reason to expect melting in an event of Nora without Willy Wonka, and thus the comitative cannot be dropped *salva veritate*.

The scope effect also receives a preliminary treatment in that the lens is instrument to an event of Nora with Willy Wonka in (v’), but in (vi) it is the instrument of Nora’s action.

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<sup>63</sup> There is a small confound for the reported judgments. ‘With’ also occurs in absolutive constructions, and it seems to me that varying the intonation, one can parse (v) as something like ‘Nora melted the chocolate with her lens, with Willy Wonka (helping)’ or like ‘Nora melted the chocolate with her lens, (doing it) with Willy Wonka’, and thereby excuse Willy Wonka from a connection to the lens. Absent the varied intonation, the judgment is however as reported. It also remains that (vi), unlike (v), cannot be used to assert Willy Wonka’s assistance with the lens. Note that even if it were the case that (v) and (vi) could

The logical forms in (v') and (vi') also capture an important distinction between comitative *with* and instrumental *with*. The instrumental does drop *salva veritate*:

- (vii)a. Nora melted the chocolate with her lens. Therefore, Nora melted the chocolate.
- b. Nora melted the chocolate with her lens with Willy Wonka. Therefore, Nora melted the chocolate with Willy Wonka.

The logical forms in (v') and (vi') will however require revision in order to accommodate the semantics of instrumental phrases. As Pietroski (1998) argues (v. also Lombard 1985), there is a compelling sense in which Nora's holding the lens is the same action as her melting the chocolate (this time without Willy Wonka):

- (viii) Nora melted the chocolate.  
 $\exists e \exists e' (\text{Agent}(e, n) \ \& \ \text{Cause}(e, e') \ \& \ \text{melt}(e') \ \& \ \text{Patient}(e', c))$
- (ix) Nora held the lens.  
 $\exists e \exists e' (\text{Agent}(e, n) \ \& \ \text{Cause}(e, e') \ \& \ \text{hold}(e') \ \& \ \text{Patient}(e', l))$

The lens being held and the chocolate melting are of course different events, but what Nora does to bring these about,  $e$  in (viii) and (ix) is ostensibly the same in both instances. We can however say (x) but not (xi):

- (x) Nora melted the chocolate with her lens.
- (xi) \*Nora held the lens with her lens.

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freely support either interpretation, the fact that speakers can use these sentences to intend one or the other interpretation is more than a simple conjunction of *with*-phrases could allow for.

This presents a dilemma (Parsons 1990: 164f., Pietroski 1998) for the conjunct that is taken to analyze “with her lens”, *Instrument(e,l)*. On the one hand, the instrumental cannot be applied to the embedded caused event  $e'$ , since it is simply ungrammatical to say (xii):

(xii) \*The chocolate melted with the lens.

On the other hand, if one applies it to the action and these are the same in both instances, one would expect no contrast between (x) and (xi). Instead, Pietroski (1998) proposes that the instrumental apply to a larger event that combines cause and effect and concomitantly that the sentential event quantifier quantifies over the larger, combined events, while cause and effect are segmented out in the analysis of the constituent thematic relations. Taking some liberties, we get (x') and (xi') for (x) and (xi') respectively:

(x')  $\exists e(\exists e'\exists e''(e = c(e', e'') \& \text{Agent}(e', n)) \& \text{melt}(e) \& \exists e'\exists e''(e = c(e', e'') \& \text{Patient}(e'', c)) \& \text{Instrument}(e, l))$

(xi')  $\exists e(\exists e'\exists e''(e = c(e', e'') \& \text{Agent}(e', n)) \& \text{hold}(e) \& \exists e'\exists e''(e = c(e', e'') \& \text{Patient}(e'', l)) \& \text{Instrument}(e, l))$

So that it is clear that the quantification over the larger events is what relates one conjunct to another, abbreviate (x') and (xi') as:

(x'')  $\exists e(\text{Ag}[e, n] \ \& \ \text{melt}(e) \ \& \ \text{Pa}[e, c] \ \& \ \text{Instrument}(e, l))$

(xi'')  $\exists e(\text{Ag}[e, n] \ \& \ \text{hold}(e) \ \& \ \text{Pa}[e, c] \ \& \ \text{Instrument}(e, l))$

Under this analysis, (x) and (xi) show only that the larger event, the cause-and-effect melting,  $e$  in (x''), is not the same as the holding, which we already knew. Their constituent actions,  $e'$  in (x') and (xi'), can now be identified, without running up against (xi).

No doubt that (x)-(xii) show that the instrumental applies to more than the actions alone, if they are the same in both instances, or the effects alone, as Pietroski concludes. But, if the instrumental phrase is replaced with a ditransitive,  $\text{Instrument}(e, e', l)$ , the evidence of (x)-(xii) fits an alternative to Pietroski's formulation that neither quantifies over the larger events that combine cause and effect nor leaves the analysis of cause and effect internal to the thematic relations:

(x''')  $\exists e \exists e'(\text{Agent}(e, n) \ \& \ \text{Cause}(e, e') \ \& \ \text{melt}(e') \ \& \ \text{Patient}(e', c) \ \& \ \text{Instrument}(e, e', l))$

(xi''')  $\exists e \exists e'(\text{Agent}(e, n) \ \& \ \text{Cause}(e, e') \ \& \ \text{hold}(e') \ \& \ \text{Patient}(e', l) \ \& \ \text{Instrument}(e, e', l))$

Here too we can identify the actions,  $e$  in (x''') and (xi'''), without fear that (x''') will then entail (xi''').

There may not appear to be much to choose between the alternatives. Notice however that Parsons' and Pietroski's dilemma carries over to comitative phrases. That is, let us suppose that Nora keeps on exactly as before, holding her lens to focus sunlight on the chocolate. Willy Wonka, without interfering with the lens, assists her in some other way with the melting. If Nora's actions in (viii) and (ix) are judged the same, then so are they in (xiii) and (xiv) (holding the lens is all she ever does). Yet (xv) (cf. (xi)) is false:

- (xiii) Nora melted the chocolate with Willy Wonka.
- (xiv) Nora held the lens.
- (xv) \*Nora held the lens with Willy Wonka.

We should seek a common resolution. But, if we extend Pietroski's proposal (x')-(xi'') to the comitative, (xiii) will mistakenly entail that Nora melted the chocolate. The proposal works as formulated for instrumentals because of their peculiarity that they, unlike comitatives, drop *salva veritate*. Gloss the account of the instrumental construction this way: there is a causal chain that begins with Nora's action and ends with the chocolate melting and the causal chain's instrument is the lens. Extending the gloss to the comitative construction delivers: there is a causal chain that begins with Nora's action and ends with the chocolate melting and the causal chain's accomplice is Willy Wonka. This last entails that there is a causal chain that begins with Nora's action and ends with the chocolate melting, i.e., that Nora melted the chocolate. We want instead that Nora's action combines with Willy Wonka's participation so that the result causes the chocolate

to melt, which is not to say that Nora's action caused the chocolate to melt. The logical syntax has to directly reflect the comitative's intervention in the causal chain so that dropping it will not be truth-preserving, as in (v') (repeated below). Thus it cannot be as in (x''), that only a larger combined event is what connects the conjuncts.

(v')  $\exists e \exists e' \exists e'' (\text{Agent}(e, n) \ \& \ \text{With}(e, e', ww) \ \& \ \text{Cause}(e', e'') \ \& \ \text{melt}(e'') \ \& \ \text{Patient}(e'', c))$

(x'')  $\exists e (\text{Ag}[e, n] \ \& \ \text{melt}(e) \ \& \ \text{Pa}[e, c] \ \& \ \text{With}(e, ww))$

Given that the comitative phrase is ditransitive, a unified treatment then compels that the instrumental phrase is too, which recommends the alternative advanced in (xi''') and (xi''').

Now that the instrumental phrase is also ditransitive, we should revisit the account of the comitative's scope effects and its failure to drop *salva veritate*:

(v')  $\exists e \exists e' \exists e'' (\text{Agent}(e, n) \ \& \ \text{With}(e, e', ww) \ \& \ \text{Cause}(e', e'') \ \& \ \text{melt}(e'') \ \& \ \text{Patient}(e'', c) \ \& \ \text{Instrument}(e', l))$

Nora, with Willy Wonka, melted the chocolate with her lens.  
Nora melted the chocolate with her lens with Willy Wonka.

(vi')  $\exists e \exists e' \exists e'' (\text{Agent}(e, n) \ \& \ \text{Instrument}(e, l) \ \& \ \text{With}(e, e', ww) \ \& \ \text{Cause}(e', e'') \ \& \ \text{melt}(e'') \ \& \ \text{Patient}(e'', c))$

Nora, with her lens, melted the chocolate with Willy Wonka.  
Nora melted the chocolate with Willy Wonka with her lens.

For (v'), simply replacing the instrumental phrase with its ditransitive counterpart carries over Pietroski's insight that the lens is the instrument for cause and effect taken together:

(v'')  $\exists e \exists e' \exists e'' (\text{Agent}(e, n) \ \& \ \text{With}(e, e', ww) \ \& \ \text{Cause}(e', e'') \ \& \ \text{melt}(e'') \ \& \ \text{Patient}(e'', c) \ \& \ \text{Instrument}(e', e'', l))$

In (v''), the instrumental phrase drops *salva veritate*, the comitative phrase does not, and the lens is the instrument for a cause in which Willy Wonka joins Nora.

Fitting (vi') with a ditransitive instrumental is less straightforward, and I will canvass two alternatives. What first comes to mind is that the lens is the instrument of Nora's action and the adjacent event:

(xvi)  $\exists e \exists e' \exists e'' (\text{Agent}(e, n) \ \& \ \text{Instrument}(e, e', l) \ \& \ \text{With}(e, e', ww) \ \& \ \text{Cause}(e', e'') \ \& \ \text{melt}(e'') \ \& \ \text{Patient}(e'', c))$

Yet, given the formal similarity of the instrumental and comitative phrases, (xvi) looks as if it will license both the comitative and the instrumental to drop *salva veritate*, although it would be mistaken to allow (xvii) to entail (xviii).

(xvii) Nora, with her lens, melted the chocolate with Willy Wonka.

(xviii) \*Therefore, Nora, with her lens, melted the chocolate.

An appeal to syntax can however prop up the logical form (xvi). What (xvi) in fact entails is (xix):

(xix)  $\exists e \exists e' \exists e'' (\text{Agent}(e, n) \ \& \ \text{Instrument}(e, e', l) \ \& \ \text{Cause}(e', e'') \ \& \ \text{melt}(e'') \ \& \ \text{Patient}(e'', c))$

Syntax should deny that (xix) is the logical form for (xviii), which instead translates as

(xx):

(xx)  $\exists e \exists e' (\text{Agent}(e, n) \ \& \ \text{Instrument}(e, e', l) \ \& \ \text{Cause}(e, e') \ \& \ \text{melt}(e') \ \& \ \text{Patient}(e', c))$

According to (xx), Nora's action is sufficient to melt the chocolate, and (xvi) does not entail this. Thus (xvi) may serve as the logical form for (xvii) provided that (xx) rather than (xix) stand for (xviii). To this end, the translation can be stipulated as follows. An instrumental phrase is a narrow modifier—it can apply only to such event arguments as it finds projected by other elements in the sentence. Thus, in (xviii) and (xx),  $e$  and  $e'$  are given by the causative analysis of *melt* and the instrumental phrase applies to these. In contrast, (xix) cannot translate (xviii), because it contains a further event argument, which a narrow modifier does not have the power to introduce on its own. With this account of instrumental phrases, note that comitative phrases cannot be narrow modifiers. On the contrary, they must introduce, as in (xvi), a novel event that intervenes in the causal chain melting the chocolate.

The second alternative and the one I prefer for fitting (vi') with a ditransitive instrumental phrase takes a different view of its role there.

- (vi') Nora, with her lens, melted the chocolate with Willy Wonka.  
Nora melted the chocolate with Willy Wonka with her lens.

- (xxi)  $\exists e \exists e' \exists e'' \exists e''' (\text{Agent}(e, n) \ \& \ \text{Instrument}(e, e', l) \ \& \ \text{Cause}(e, e') \ \& \ \text{With}(e', e'', ww) \ \& \ \text{Cause}(e'', e''') \ \& \ \text{melt}(e''') \ \& \ \text{Patient}(e''', c))$

According to (xxi), Nora uses the lens to some effect, and it is this effect of hers that combines with Willy Wonka's intervention to melt the chocolate. The instrumental phrase here relates a cause and an effect exactly as it did in the more straightforward (v'')

- (v'')  $\exists e \exists e' \exists e'' (\text{Agent}(e, n) \ \& \ \text{With}(e, e', ww) \ \& \ \text{Cause}(e', e'') \ \& \ \text{melt}(e'') \ \& \ \text{Patient}(e'', c) \ \& \ \text{Instrument}(e', e'', l))$

Nora, with Willy Wonka, melted the chocolate with her lens.  
Nora melted the chocolate with her lens with Willy Wonka.

As before, the comitative phrase in (xxi) does not drop *salva veritate*, since neither  $e$ , Nora's initial action, nor its proximate effect  $e'$  suffice to cause the chocolate to melt. The scope of the comitative phrase, which excludes the instrumental in (vi'), is also represented by (xxi): the instrumental does not relate any cause and effect that involves Willy Wonka. In contrast, in (v'') where Willy Wonka assists with the lens, the instrument relates to a cause that does involve him.

- (xxii)  $\exists e \exists e'' \exists e''' (\text{Agent}(e, n) \ \& \ \text{With}(e, e'', ww) \ \& \ \text{Cause}(e'', e''') \ \& \ \text{melt}(e''') \ \& \ \text{Patient}(e''', c))$

Nora melted the chocolate with Willy Wonka.

The instrumental phrase, as before, should drop *salva veritate*; but, it will not be a logical consequence of (xxi) that it entails (xxii). The entailment goes through when supplemented with a transitive closure principle of some kind: either that (xxiii) to enlarge the effect of an action as its accomplice is the same as enlarging the action itself as an accomplice, or that (xxiv) if an effect of Nora's action combines with Willy Wonka's participation in a causal chain that ends with a certain event (the chocolate's melting), then Nora's action itself combines with Willy Wonka's participation in a causal chain ending with the same event.

(xxiii)  $\forall e \forall e' \forall e'' \forall x (\text{Cause}(e, e') \rightarrow (\text{With}(e', e'', x) \rightarrow \text{With}(e, e'', x)))$

(xxiv)  $\forall e \forall e' \forall e'' \forall e''' \forall x (\text{Cause}(e, e') \rightarrow (\text{With}(e', e'', x) \rightarrow (\text{Cause}(e'', e''') \rightarrow \exists e''' (\text{With}(e, e'', x) \& \text{Cause}(e'', e''')))))$

Presumably, such closure principles are false of remote causes and their effects. The point of a comitative phrase is, after all, to assert that things were done within a certain proximity—together. Yet, it seems part and parcel of a notion of *proximate* causation that it support such principles, and that is exactly what the causative analysis of verbs, instrumental and comitative phrases intends. Speakers' *a priori* grasp of the concepts involved includes (xxiii) or (xxiv) or the like, and thus they judge that the instrumental phrase drops from (vi') *salva veritate*.

It is, as we have seen, a basic difference between comitative phrases and instrumental phrases that the latter drop *salva veritate* but the former do not. The difference derives from the formal differences in their application to events. In (xxv), the

comitative construction rolls up Nora's action and Willy Wonka's assistance in a single cause  $e''$ . The instrumental construction in (xxvi) relates cause  $e$  and effect  $e''$ :

(xxv)  $\exists e \exists e'' \exists e''' (\text{Agent}(e, n) \ \& \ \text{With}(e, e'', ww) \ \& \ \text{Cause}(e'', e''') \ \& \ \text{melt}(e''') \ \& \ \text{Patient}(e''', c))$

Nora melted the chocolate with Willy Wonka.

(xxvi)  $\exists e \exists e'' (\text{Agent}(e, n) \ \& \ \text{Instrument}(e, e'', l) \ \& \ \text{Cause}(e, e'') \ \& \ \text{melt}(e'') \ \& \ \text{Patient}(e'', c))$

Nora melted the chocolate with her lens.

The point of these remarks has been to argue for these logical forms. Now given the formal distinction, the lexical one withers away. All there is is *With*. Such differences as there are between the comitative and instrumental constructions become a matter of form:

(xxvii)  $\exists e \exists e'' \exists e''' (\text{Agent}(e, n) \ \& \ \text{With}(e, e'', ww) \ \& \ \text{Cause}(e'', e''') \ \& \ \text{melt}(e''') \ \& \ \text{Patient}(e''', c))$

Nora melted the chocolate with Willy Wonka.

(xxviii)  $\exists e \exists e'' (\text{Agent}(e, n) \ \& \ \text{With}(e, e'', l) \ \& \ \text{Cause}(e, e'') \ \& \ \text{melt}(e'') \ \& \ \text{Patient}(e'', c))$

Nora melted the chocolate with her lens.

This is a welcome result to the extent that, across languages, both meanings are persistently translated by the same lexical item. If not, lexical ambiguity always beckons.

In support of the formal difference between (xxvii) and (xxviii), José Camacho has reminded me of an observation that can be culled from the literature on comitatives (e.g., McNally 1993, Camacho 1996, 1997, 1999, Dalrymple *et al* 1998 and earlier references cited therein). A comitative phrase in Spanish supports plural number agreement on the verb but an instrumental phrase in ostensibly the same position does not:

(xxix) Nora, con Willy Wonka, derritieron el chocolate.  
Nora, with Willy Wonka, melted.3pl the chocolate.

(xxx) \*Nora, con su lente, derritieron el chocolate.  
Nora, with her lens, melted.3pl the chocolate.

Suppose the subject event,  $e$  of  $Cause(e, e')$ , determines verbal number agreement. With the comitative phrase in (xxx) analyzed as in (xxvii), the subject event  $e$  has two participants, Nora and Willy Wonka, and plural number agreement is hence possible. In contrast, the subject event of (xxx),  $e$  according to the analysis in (xxviii), has only Nora, and so the plural is ruled out.

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