On Donald Davidson’s “The logical form of action sentences”

Suppose that yesterday, Miss Scarlet poked Colonel Mustard with a pencil in the library at noon and then at dusk, poked him again in the kitchen with a spoon. Given this scenario, any of the seven sentences listed below can be used to describe something that happened yesterday.

1. Patterns of Implication

Intuitively, (1) implies both (2) and (3), each of which imply (4). Likewise, (7) implies (6) and (5), both of which imply (4). But the conjunction of (2) and (5) does not imply (8), which implies both (2) and (5). Nor does the conjunction of (3) and (6) imply (9), which implies (6) and (3).

1. Scarlet poked Mustard with a pencil in the library.
2. Scarlet poked Mustard with a pencil.
4. Scarlet poked Mustard.
5. Scarlet poked Mustard in the kitchen.
7. Scarlet poked Mustard in the kitchen with a spoon.

Similarly, (1) is logically stronger than the mere conjunction of (2) and (3). Sentence (1) cannot be used to correctly describe a scenario in which Scarlet poked Mustard with a pencil in the kitchen and again in the library with a spoon, but never with a pencil in the library. Likewise, (7) is stronger than the mere conjunction of (5) and (6). This interesting pattern of implications and non-implications can be indicated with diagrams like the one below.

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  (1)  
  ⇐  ⇐
  (2)  (3)  
  ⇒  ⇒  ⇒
  (8)  (4)  (9)
  ⇒  ⇒  ⇒  
  (5)  (6)  
  ⇐  ⇒  
  (7)
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This same pattern is exhibited by endlessly many sets of sentences like (1-9), in which a “basic” clause like (4) is extended with certain adverbial modifiers. It is also exhibited by sentences (1’-9’), each of which might be used in talking about a certain dinner party.

1. There was a banker from Dallas who wore a hat.
2. There was a banker from Dallas.
3. There was a banker who wore a hat.
4. There was a banker.
5. There was a banker who wore suspenders.
6. There was a banker from Manhattan.
7. There was a banker from Manhattan who wore suspenders.
8. There was a banker from Dallas who wore suspenders.
9. There was a banker from Manhattan who wore a hat.
The systematicity of this pattern presumably reflects some aspect of how speakers of English understand such sentences, whose constituents include expressions like ‘with a pencil’ and ‘from Dallas’ that appear as modifiers of other constituents like ‘poke Mustard’ and ‘banker’.

For (1'-9'), there is an obvious initial hypothesis. Suppose that if N is a noun or noun phrase—like ‘banker’ or ‘banker from Dallas who wore a hat’—and S is the sentence formed by adding ‘There was a’ before N, then S is understood as an existential generalization according to which (the relevant portion of) the world included an entity of the sort specified by N. And suppose that modification with a relative clause or a prepositional phrase signifies a kind of conjunctive restriction, as indicated with the simplified “logical forms” below.

\begin{align*}
(1'L) & \exists e [\text{Banker}(e) \land \text{From-Dallas}(e) \land \text{Wore-a-hat}(e)] \\
(2'L) & \exists e [\text{Banker}(e) \land \text{From-Dallas}(e)] \\
(3'L) & \exists e [\text{Banker}(e) \land \text{Wore-a-hat}(e)] \\
(4'L) & \exists e [\text{Banker}(e)] \\
(4'L) & \exists e [\text{Banker}(e) \land \text{Wore-suspenders}(e)] \\
(6'L) & \exists e [\text{Banker}(e) \land \text{From-Manhattan}(e)] \\
(7'L) & \exists e [\text{Banker}(e) \land \text{From-Manhattan}(e) \land \text{Wore-suspenders}(e)] \\
(8'L) & \exists e [\text{Banker}(e) \land \text{From-Dallas}(e) \land \text{Wore-suspenders}(e)] \\
(9'L) & \exists e [\text{Banker}(e) \land \text{From-Manhattan}(e) \land \text{Wore-a-hat}(e)]
\end{align*}

This would explain the implications, since inferences of the form ‘\(\exists e \Phi(e) \land \Psi(e)\)’, so \(\exists e \Phi(e)\)’ are obviously valid. If something satisfies two conditions, something satisfies the first condition.

This invites Davidson’s (1967a) corresponding hypothesis about sentences like (1).

(1) Scarlet poked Mustard with a pencil in the library.

Perhaps this “action report” is understood as an existential generalization, with the basic clause (i.e., the verb and its arguments) corresponding to a predicate—‘Poked(Scarlet, Mustard, e)’—that applies to something if and only if it was an event of Mustard being poked by Scarlet. Then the adverbial modifiers in (1-9) correspond to conjunctive restrictions as in (1L-9L) below:

\begin{align*}
(1L) & \exists e [\text{Poked}(e) \land \text{Wore-a-hat}(e) \land \text{From-Dallas}(e) \land \text{In-the-library}(e)] \\
(2L) & \exists e [\text{Poked}(e) \land \text{Wore-a-hat}(e) \land \text{From-Dallas}(e)] \\
(3L) & \exists e [\text{Poked}(e) \land \text{Wore-a-hat}(e) \land \text{In-the-library}(e)] \\
(4L) & \exists e [\text{Poked}(e) \land \text{Wore-suspenders}(e)] \\
(5L) & \exists e [\text{Poked}(e) \land \text{Wore-suspenders}(e) \land \text{From-Dallas}(e)] \\
(6L) & \exists e [\text{Poked}(e) \land \text{Wore-suspenders}(e)] \\
(7L) & \exists e [\text{Poked}(e) \land \text{Wore-suspenders}(e) \land \text{In-the-library}(e) \land \text{With-a-spoon}(e)] \\
(8L) & \exists e [\text{Poked}(e) \land \text{Wore-suspenders}(e) \land \text{In-the-library}(e)] \\
(9L) & \exists e [\text{Poked}(e) \land \text{Wore-suspenders}(e) \land \text{In-the-library}(e) \land \text{With-a-spoon}(e)]
\end{align*}

Initially, it might seem odd to posit variables corresponding to verbs, in addition to any variables corresponding to nouns like ‘Scarlet’ or ‘banker’. But consider (4) and (10).

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1 The linear order of modifiers is often irrelevant, but not always. In ‘banker who wore suspenders from Manhattan’, ‘from Manhattan’ presumably modifies ‘suspenders’. Though we would typically ignore the possibility of using ‘with a pencil in the library’ to describe an action of manipulating a pencil that was in the library by remote control (e.g., from the conservatory). Likewise ‘in the kitchen with a spoon’ has a reading—not relevant here—on which ‘with a spoon’ modifies ‘kitchen’ instead of ‘poked Mustard in the kitchen’.

2 Perhaps every such event was done with something, like a pencil or a finger, in some place at some time. But generalizations concerning pokings (or bankers) can be true without following from the meaning of ‘poke’ (or ‘banker’).
(4) Scarlet poked Mustard.
(10) Scarlet will poke Mustard.

Such examples already suggest that at least often, tensed sentences are understood as existential generalizations over things that are temporally ordered. Both (4) and (10) seem to imply that some time $t$ is such that Mustard gets poked by Scarlet at $t$, with each sentence imposing a further restriction on $t$. And as Davidson notes, examples like (11-13) point in the same direction.

(11) The clock chimed after Scarlet poked Mustard.
(12) Scarlet poked Mustard and then the clock chimed.
(13) Scarlet poked Mustard before the clock chimed.

If ‘after’ indicates a temporal relation, clauses can presumably specify the relata as in (11L).

(11L) $\exists f[\text{Chimed}(f, \text{the clock}) \land \exists e[\text{After}(f, e) \land \text{Poked}(\text{Scarlet, Mustard}, e)]]$

It does not follow that (4L) must be elaborated as (4L*) rather than (4L**);

(4L) $\exists e[\text{Poked}(\text{Scarlet, Mustard}, e)]$
(4L*) $\exists e[\text{Poke-of-by}(\text{Scarlet, Mustard}, e) \land \text{Past}(e)]$
(4L**) $\exists t[\text{Pokes-at}(\text{Scarlet, Mustard, t}) \land \text{Past}(t)]$

where ‘Poke-of-by(Scarlet, Mustard, e)’ applies to any poke of Mustard done by Scarlet, and ‘Pokes-at(Scarlet, Mustard, t)’ applies to any time at which Scarlet pokes Mustard. But phrases like ‘with a pencil’ and ‘in the library’ are not predicates of times; they seem to be understood as predicates of events that occur at times. And as Higginbotham (1983) noted, the untensed clause ‘Scarlet poke Mustard’ can be used to describe witnessed events, as in (14); see section two.

(14) Prof. Plum saw Scarlet poke Mustard with a pencil, and Mrs. White saw Scarlet poke Mustard with a spoon.

As our initial example highlights, (4) is a not a name for any event. Scarlet may have poked Mustard several times. But temporal order is not crucial to the example. Suppose that in the kitchen at dusk, Scarlet poked Mustard gently with a blue spoon and simultaneously poked him sharply with a red spoon. Then (15-20) are all correct partial descriptions of what happened.

(15) Scarlet poked Mustard gently with a blue spoon.
(16) Scarlet poked Mustard gently.
(17) Scarlet poked Mustard with a blue spoon.
(18) Scarlet poked Mustard with a red spoon.
(19) Scarlet poked Mustard sharply.
(20) Scarlet poked Mustard sharply with a red spoon.

But (21) and (22) are not implied. Scarlet may have poked Mustard with a spoon exactly twice.

(21) Scarlet poked Mustard gently with a red spoon.
(22) Scarlet poked Mustard sharply with a blue spoon.

No two pokings have exactly the same spatiotemporal properties, down to the details of where they began and ended. But two such events can occur in the same kitchen at the same time.4

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3 According to Davidson (p. 64), “We may think of ‘before’ and ‘after’ as relating events as easily as times. For most purposes, if not all, times are like lengths—convenient abstractions with which we can dispense in favour of the concreta that have them.” We can also introduce notions of reference time and speech time to accommodate complex tenses as in ‘By noon tomorrow, Mustard will have departed’; see Reichenbach (1947), Hornstein (1990).
4 Likewise, ‘a banker from Dallas who wore a hat’ is not a name, even if only one person fits the indefinite description; cp. Davidson’s discussion of von Wright (pp. 43-4) and reference to Ramsey (p. 61). While Davidson’s own examples do not involve simultaneous actions that fit a common description, he clearly assumes that such cases are possible. Taylor (1985) offers examples like (15-22), citing Gareth Evans (via Christopher Arnold).
2. Implication and Composition

Let’s grant that action reports like (3) and (4) are interestingly similar to (3L) and (4L).

(3) Scarlet poked Mustard in the library.
(3L) $\exists e \{ \text{Poked(Scarlet, Mustard, e)} \in \text{In-the-library(e)} \}$

(4) Scarlet poked Mustard.
(4L) $\exists e \{ \text{Poked(Scarlet, Mustard, e)} \}$

This does not yet show that sentences of a naturally acquirable language, like spoken English or ASL, have logical forms—much less that (3) and (4) have logical forms that are correctly depicted with the invented formalism of (3L) and (4L). We would not say that (3L) has the grammatical form of (3). So one wants to hear more about Davidson’s conception of what it is for a natural sentence, composed of pronounceable words, to have a logical form.

For Davidson, a crucial point is that the same verb appears in (3) and (4). By way of contrast, note that unlike (23), (24) implies (4).

(23) Professor Plum thinks that Scarlet poked Mustard.
(24) Professor Plum knows that Scarlet poked Mustard.

This implication is due to a feature of ‘knows’ that is not shared by verbs like ‘thinks’, ‘hopes’, and ‘fears’. Similarly, while (25) implies (4), replacing ‘and’ with ‘or’ spoils the inference.

(25) Scarlet poked Mustard and Mustard shrieked.

And while (4) implies (26), (4) does not imply (27).

(26) Someone poked Mustard.
(27) Everyone poked Mustard.

These contrasts reflect distinct word meanings—‘knows’ vs. ‘thinks’, ‘and’ vs. ‘or’, ‘someone’ vs. ‘everyone’. But with regard to sentences like (3) and (4), Davidson wanted to “give an account of the logical or grammatical role of the parts or words” in such sentences that is “consistent with the entailment relations between such sentences and with what is known of the role of those same parts or words in other (non-action) sentences.” He identifies this project with that of “showing how the meanings of action sentences depend on their structure,” and goes on to say that he is “not concerned with the meaning analysis of logically simple expressions in so far as this goes beyond the question of logical form” (p. 37, my emphases).

Davidson held that characterizing the logical relations exhibited by natural sentences, including those used to report actions, is part and parcel of characterizing the sentence meanings in a way that reveals how they are determined by word meanings and grammatical structure; see his “Reply to Cargile” (pp. 62-65). From this perspective, the goal is to specify the contributions of expressions like ‘poked’ and ‘in the library’ to the meanings of the endlessly many sentences in which such expressions appear. If these sentences exhibit the logical relations that Davidson describes in terms of conjunct reduction, then ‘poked’ and ‘in the library’ are like the conjuncts in ‘Poke-of-by(x, y, e) & Past-Event(e) & In-the-library(e)’—as opposed to, say, the conjuncts in ‘Pokes-in-at(x, y, z, t) & Past-Time(t) & The-library(z)’.

It can be tempting to describe the meaning of a verb as “variably polyadic:” in some sentences, ‘poke’ expresses a relation exhibited (at times) by pairs of individuals; in other sentences, ‘poke’ expresses a relation exhibited by triples consisting of two individuals and a place, or two individuals and an instrument; in other sentences, the same verb expresses a relation exhibited by quadruples consisting of two individuals, a place, and an instrument; etc. But prima facie, this abandons the idea that ‘pok’ has a sentence-invariant meaning that it contributes to these many sentences; cp. Kenny (1963), Davidson (1967b, 1968).
Absent an account of how a single variably-polyadic meaning for ‘poke’ could accommodate so many different cases of adverbial modification, it seems reasonable to explore the model suggested by (1'-4'), whose constituents seem to have sentence-invariant meanings.

(1') There was a banker from Dallas who wore a hat.
(2') There was a banker from Dallas.
(3') There was a banker who wore a hat.
(4') There was a banker.

Still, one might doubt that grammatical modification is logically significant in a way that is like the explicit conjunctions in (28) and (29).

(28) Someone was both a banker and from Dallas.
(29) Something was both a poking of Mustard by Scarlet and done in the library.

A skeptic might challenge Davidson’s claim that our pronounceable sentences—as opposed to certain thoughts that we can somehow indicate in contexts—exhibit logical relations that are not indicated with special lexical meanings; cp. (23-27). For not all cases of grammatical modification are cases of conjunctive restriction. A fake diamond is not a thing that is both a diamond and fake. So if ‘fake diamond’ has a logical form, it is not ‘Fake(e) & Diamond(e)’. Put another way, argument (30) is not an instance of the valid form (31).

(30) There is a fake diamond in the library.
There is a diamond in the library.

So if ‘fake diamond’ and ‘blue diamond’ are instances of the same grammatical/logical form, then ‘blue diamond’ is not a simple conjunction, and (32) is not an instance of (31).

(32) There is a blue diamond in the library.
There is a diamond in the library.

Perhaps pace Davidson, (32) seems valid because of what we know about ‘blue’ as opposed to ‘fake’; cp. ‘and’ versus ‘or’. Similarly, (33) does not imply (4).

(33) Scarlet allegedly poked Mustard.
(4) Scarlet poked Mustard.

So if (33) and (34) have the same grammatical/logical form, (34) does not imply (4),

(34) Scarlet deliberately poked Mustard.

at least not by virtue of its form; cp. ‘knows’ versus ‘thinks’. One can develop this response to Davidson, in a way that hints at variable adicity, via the following conjecture: an adjective can be a predicate that combines with tense as in ‘was blue’, in which the logical form of the adjective is ‘Blue-at(x, t)’, with ‘x’ and ‘t’ ranging over entities and times; or it can complicate a predicate as in ‘blue diamond’, in which the logical form of the adjective is ‘BLUE[Δ]’, with ‘Δ’ ranging over predicates like ‘Diamond-at(x, t)’. Then one can say that ‘BLUE[Diamond-at(x, t)]’ is like ‘Diamond-at(x, t) & Blue-at(x, t)’—or ‘Diamond-at(x, t) & Blue-for-a-diamond-at(x, t)’—while ‘FAKE[Diamond-at(x, t)]’ is more like ‘~Diamond-at(x, t) & Made-to-look-diamondish(x)’. The idea here is that unlike ‘fake’, ‘blue’ complicates ‘diamond’ in a relatively simple and restricting way, but ‘blue diamond’ and ‘fake diamond’ do not differ in form. On this view, the contrast reflects the different meanings of ‘blue’ and ‘fake’; see Parsons (1970), Kamp (1975).

Davidsonians will reply that ‘fake diamond’ and ‘blue diamond’ are not grammatically type-identical, and that the logical complexity masked by ‘FAKE[Diamond-At(x, t)]’ mirrors the complexity of ‘fake diamond’; cp. ‘faked to look like a diamond’. Perhaps this reply is wrong. But it still seems that endlessly many cases of modification are understood conjunctively, even if some cases are not; and see Higginbotham (1985). If the logical form of ‘banker from Dallas’ is
'FROM-DALLAS[Banker-At(x, t)]', one wants to know why it seems so clear that the modifying phrases in (1') and (7') can be validly deleted, but not recombined as in (8') or (9').

(1') There was a banker from Dallas who wore a hat.
(7') There was a banker from Manhattan who wore suspenders.
(8') There was a banker from Dallas who wore suspenders.
(9') There was a banker from Manhattan who wore a hat.

It does not help to say that the logical form of ‘banker from Dallas who wore a hat’ is ‘WHO-WORE-A-HAT[FROM-DALLAS[Banker-At(x, t)]]’, and likewise for ‘banker from Manhattan who wore suspenders’, unless this formalism is cashed out in a way that explains the apparent implications and non-imlications. Similarly, if the logical form of ‘poked Mustard with a pencil in the library’ is ‘IN-THE-LIBRARY[WITH-A-PENCIL[Poked(x, Mustard)]]’, why do (1) and (7) seem to have Davidsonian implications without jointly implying (8) or (9)?

(1) Scarlet poked Mustard with a pencil in the library.
(7) Scarlet poked Mustard in the kitchen with a spoon.
(8) Scarlet poked Mustard with a pencil in the kitchen.
(9) Scarlet poked Mustard in the library with a spoon.

In these examples, the modifiers do not merely complicate simpler predicates, they seem to restrict simpler predicates in a specific systematic way. This suggests that ‘fake’ and ‘alleged’ are special cases, which carry their own implications of fakings and allegations.

As Davidson notes, he can accommodate the obvious fact that while a big ant is an ant, nothing is big simpliciter—and while a gentle deliberate poking is a poking, nothing is gentle or deliberate simpliciter. For he can still say that (35) is an instance of the logical form (36),

(35) There is a big ant in the library.
(36) ∃x[Ant(x) & Φ(x) & In-the-library(x)]

leaving room for various hypotheses about the conjunct corresponding to ‘big’, which is somehow comparative. Perhaps the logical form of ‘is a big ant’ is complex in a way hinted at with ‘is an ant and a big one’. One can likewise say that (37) has the logical form shown in (38),

(37) Scarlet poked Mustard gently.
(38) ∃e[Poked(Scarlet, Mustard, e) & Φ(e)]

but grant that ‘gently’ is comparative, as hinted at with ‘a poking of Mustard and a gentle one’.

Evidently, ‘deliberately’ is more complex, since (34) and (39) do not jointly imply (40);

(34) Scarlet deliberately poked Mustard.
(39) Mustard is Batman.
(40) Scarlet deliberately poked Batman.

cp. ‘wants to visit Hesperus’ versus ‘wants to visit Phosphorus’. Yet deleting ‘deliberately’ from (34) still seems valid, as if (34) has the logical form shown in (41).

(41) ∃e[Poked(Scarlet, Mustard, e) & Φ(e)]

So perhaps ‘deliberately’ is comparative and intentional in a way hinted at with ‘a poking of Mustard and one done by an agent who represented it as such’; cp. (42).

(42) Scarlet poked Mustard because she wanted to do so.

The complexity of ‘because she wanted to do so’ does not show that (42) does not have the logical form shown in (41). The question is whether ‘deliberately’, ‘gently’, and ‘allegedly’ differ grammatically in ways that plausibly correlate with how these words differ logically. If these modifiers are grammatically type-identical (cp. ‘red’, ‘green’, and ‘blue’), then deleting the adverb from (34) or (37) is not licensed by virtue of logical form in Davidson’s sense; cp. (33). But if modifiers vary typologically, it seems that many are understood as Davidsonian conjuncts.
This highlights questions about how events are individuated; see, e.g., Davidson (1969), Goldman (1970), Kim (1976). Suppose that Mustard would not have shrieked at dusk had he not been poked sharply. If it follows that the event of poking him sharply at dusk differs from the event of poking him at dusk, then analogies to adjectival modification are misleading. Each blue diamond is identical with some diamond. And if the event of Scarlet poking Mustard sharply at dusk is not identical with an event of her poking him at dusk, the validity of (31) is irrelevant.  

\[ \exists e [D(e) & \Phi(e) & \Psi(e)] \]
\[ \exists e [\Delta(e) & \Psi(e)] \]

These points have ramifications for truth-theoretic conceptions of meaning; see Pietroski (2018). But here, let me simply note that Davidson (1967a) wanted a theory that preserves several desiderata: (i) verbs have sentence-invariant meanings; (ii) action reports are existential generalizations, not names for actions; (iii) adverbial modifiers should be accommodated without resorting to variable polyadicity; (iv) an action can be described in endlessly many ways; so (v) actions should not be individuated as finely as action descriptions, or in any way that would invalidate valid inferences; but (vi) actions should not be individuated so coarsely that Scarlet’s gentle poking with a red spoon and her ungentle poking with a blue spoon guarantees a gentle poking with a blue spoon or an ungentle poking with a red spoon.

### 3. Some Further Evidence and Developments

Davidson’s paper prompted a search for more evidence in support of event analyses, along with a literature that included objections, replies, and emendations of the initial proposal. This is not the place for a review; see, e.g., Pietroski (2003, 2018) and references there. But perceptual reports like (43-46) illustrate several Davidsonian points; see Higginbotham (1983), Vlach (1983).

(43) Plum saw Scarlet poke Mustard.
(44) Plum heard Mustard shriek.
(45) Plum heard a shriek, and White heard a shriek.
(46) White heard Mustard shriek.

First, ‘Mustard shriek’ is not a name for a particular event. Suppose that Prof. Plum heard Mustard shriek at noon, while Mrs. White heard him shriek at dusk. Second, ‘Mustard shriek’ seems to be referentially transparent in (44). Given (39), (44) implies (47).

(39) Mustard is Batman.
(47) Plum heard Batman shriek.

By contrast, (39) and (48) do not imply (49).

(48) Plum heard Mustard shrieked.
(49) Plum heard Batman shrieked.

Sentence (48) has the meaning of (50); cp. (51).

(50) Plum heard that Mustard shrieked.
(51) Plum was told that Mustard shrieked.

But (44) is more like (52). Given (39), (52) implies (53).

(52) Plum heard a shriek by Mustard.
(53) Plum heard a shriek by Batman.

The grammatical distinction between (44) and (48) is subtle. Nonetheless, it is correlated with an important logical distinction, as if (44L) is logical form of (44).

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5 But as Davidson notes (p.41), in signing a check, he may be writing his name on a piece of paper and paying a debt. He adds that it is “hard to imagine how we can have a coherent theory of action” if corresponding sentential reports are not “made true by the same action.” This invites further discussion of ‘by’, since one can pay by signing, yet not sign by paying; see Hornsby (1980) for discussion of intentional vs. causal ordering.
(44L) \( \exists e \exists f \{ \text{Heard}(\text{Plum}, e, f) \& \text{Shriek}(f, \text{Mustard}) \} \)

This suggests a simple diagnosis for the ambiguity of (54).

(54) Plum heard Mustard shriek in the library.

(54a) \( \exists e \exists f \{ \text{Heard}(\text{Plum}, e, f) \& \text{Shriek}(f, \text{Mustard}) \& \text{In-the-library}(f) \} \)

(54b) \( \exists e \exists f \{ \text{Heard}(\text{Plum}, e, f) \& \text{Shriek}(f, \text{Mustard}) \& \text{In-the-library}(e) \} \)

According to (54a), Plum heard a shriek that occurred in the library; but he may have been in hall. According to (54b), the event of Plum hearing a shriek occurred in the library; but the shriek may have been in hall. This argument for treating ‘in the library’ as a predicate of events also interacts with the others discussed above. We want some explanation for the apparent network of implications and non-implications for each reading of (55).

(55) Plum heard Mustard’s loud shriek in the library
and then heard Scarlet laugh softly in the hall.

With these points in mind, let’s return to the idea of elaborating (4L) as in (4L*).

(4L) \( \exists e \{ \text{Poked} (\text{Scarlet, Mustard, } e) \} \)

(4L*) \( \exists e \{ \text{Poke-of-by}(\text{Scarlet, Mustard, } e) \& \text{Past}(e) \} \)

Initially, one might not see how ‘poked’ could be logically triadic, given that combining ‘poked’ with two names can yield a complete sentence. But if ‘Scarlet poke Mustard’ is a logically monadic predicate like ‘Poke-of-by(Scarlet, Mustard, e)’, it can be conjoined with a tense restriction and existential closure as in (4L*). Indeed, (4L*) can be viewed as the result of spelling out ‘Poked(Scarlet, Mustard)’ in accord with a principle like the following:

\[ \forall x \forall y \{ \text{Poked}(x, y) \equiv \exists e \{ \text{Poke-of-by}(x, y, e) \& \text{Past}(e) \} \} \]

So perhaps ‘Poke-of-by(x, y, e)’ can be further analyzed in accord with (56); cp. Castañeda (1967), Carlson (1984), Parsons (1990).

(56) \( \forall x \forall y \forall e \{ \text{Poke-of-by}(x, y, e) \equiv \text{Poke}(e) \& \text{Patient-of}(e, y) \& \text{Agent-of}(e, x) \} \)

Davidson (1985) adopted this view, according to which (4) implies that Scarlet did something, and that something happened to Mustard—and more strongly, that the poking was both something Scarlet did and something that befell Mustard, as if Scarlet acted and thereby Mustard was stabbed. This preserves a sense in which ‘poke’ is semantically binary: its meaning is specified in terms of two thematic relations, corresponding to the pokee and pokee; cp. (57).

(57) There was a poking of Mustard by Scarlet.

By contrast, the meanings of ‘shriek’ and ‘give’ might be specified as thematically unary or ternary. But the details remain matters of debate, in part because of examples like (58-61), which raise questions about how thematically uniform verbs are across sentences.

(58) Scarlet kicked the box.
(59) The box was kicked.
(60) The baby kicked.
(61) Scarlet kicked Mustard the box.

Given (58), one might expect the logical form of ‘kick’ to be ‘Kick-of-by(x, y, e)’. But this predicts covert constituents in (59) and (60), corresponding to ‘x’ and ‘y’ respectively; and these claims about grammar are tendentious. In this regard, examples like (61) are potentially instructive. The indirect object ‘Mustard’ is not a grammatically essential argument of the verb ‘kick’; cp. (62). So it is plausible that the logical form of both (61) and (62) is (62L*);

(62) Scarlet kicked the box to Mustard.
(62L*) \( \exists e \{ \text{Kick-of-by}(\text{Scarlet, the box, } e) \& \text{Past}(e) \& \text{To-Mustard}(e) \} \)

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6 Or as Leibniz might have put it, Scarlet poked and eo ipso Mustard was poked; cp. Kratzer (1996).
where Mustard is represented as a recipient (of the box), and not as the thing Scarlet kicked. So given (59), perhaps the subject of (58) is not an argument of the lexical verb ‘kick’, as opposed to a covert verbal element that is akin to ‘made’ in (63), which implies (64); cp. (65) and (66).

(63) Scarlet made the box move.

(64) The box moved.

(65) Scarlet moved the box.

(66) Scarlet saw the box move.

Maybe the logical form of ‘kick’ is ‘Kick(e)’ or ‘Kick-of(y, e)’—Schein (1993) suggests the former, Kratzer (1996) suggests the latter—with ‘Agent-of(e, x)’ perhaps reflecting a covert verb akin to ‘made’. Then the logical form of (4) is the “thematically separated” (4S*) or (4S**), as opposed to any alternative that includes a ternary predicate like ‘Poke(Scarlet, Mustard, e)’.

(4S*) ∃e[Past(e) & Agent(e, Scarlet) & Poke-of(e, Mustard)]

(4S**) ∃e[Past(e) & Agent(e, Scarlet) & Poke(e) & Patient(e, Mustard)]

This raises questions about how often verbs are associated with grammatical configurations that have thematic significance, in ways that can make logically monadic or dyadic verbs seem more polyadic. This in turn highlights questions about plurality.

Consider the collective reading of (67)—

(67) Three musicians pushed five pianos yesterday.

according to which three musicians did the work of getting five pianos pushed, with no implication regarding any degree of cooperation—as opposed to the distributive reading which implies that each of three musicians pushed five pianos. One might hope to capture the first reading as follows: ∃e∃s∃e*[Collection-of-three-musicians(s) & Collection-of-five-pianos(s*) & Push-of-by(s, s*, e) & Yesterday(e)]. But Schein (1993) argues that we need to posit thematically separated logical forms to accommodate variants like (68).

(68) Three artists gave four museums five sculptures.

Note that (68) has a reading according to which three artists were (together) the agents of some events in which each of four museums was given five sculptures, for a total of twenty donations.

This leads us back to questions about what logical forms are, and how they are related to sentences of any invented language, especially given Davidson’s preference for first-order quantification and Tarski-style semantics. These issues remain unsettled, though illuminated by Davidson’s seminal proposal regarding sentences like (1).

(1) Scarlet poked Mustard with a pencil in the library.

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7 Let’s bracket the worry that (67) does not logically imply that there are any collections of musicians or pianos, much less collections that push or get pushed; cp. Boolos (1998).

8 Thanks to Zoltan Szabo for helpful comments.
References