LOCATIONS AND BINDING[1]

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§1   An Intuitive Difference

It is natural to think that the relationship between 'rain' and the location of rain is different from the relationship between 'dance' and the location of dancing. Utterances of (1) are typically interpreted as, in some sense, *being about* a location in which it rains. (2) is, typically, not interpreted as being about a location in which the dancing takes place.

(1) It's raining
(2) She's dancing

A number of theories have been proposed to explain the difference. Some think that the so-called 'binding argument' shows that there's a syntactically realized argument place for location in the logical form of 'rain', but not for 'dance' (see Stanley 2000). Others, while demurring from such syntactic hypotheses, agree that the meaning of the verb 'rain' somehow requires a location to figure in propositions expressed by sentences in which that verb occurs, while the meaning of the verb 'dance' imposes no such requirement (for one version of this view, see Taylor (2001)). Contrary to both these views, we'll argue for a) – d)

a)   The so-called Binding Argument generalizes: if it shows that (or provides evidence that) there is an argument place for location in (1), it also shows this for a large number of other verbs, including 'dance', 'play, 'eat', and 'chirp'. So if the argument is good, the presence of an argument place for location is not what explains our sense of a contrast between (1) and (2).

b)   What explains the difference between (1) and (2) is, roughly, the conversational expectation of informativeness, not a difference in argument structure.

c)   What we call *the Event Analysis* explains all the data appealed to by proponents of the binding argument and, moreover, handles data that make trouble for some other standard approaches.

d)   The binding argument generalizes far beyond the cases Stanley (2000) applies it to, but when correctly interpreted, it doesn't wildly overgenerate hidden semantic structure. At this point we are in disagreement with e.g. Cappelen and Lepore (2002) and Recanati (2002).

§2   Binding Argument applied to 'rain' and 'dance'

The binding argument, as applied to the verb ' to rain', appeals to sentences like (3) (see Stanley (2000) p.415):

(3) Every time John lights a cigarette, it rains.

Of particular relevance is the reading of (3) that is made more explicit by (4)

(4) For every time t at which John lights a cigarette, it rains at t *at the location in which John lights a cigarette at t.*

According to the so called binding argument, the availability of this reading is best explained by positing syntactic binding on an argument of 'rain'. Stanley's suggests (5):

(5) Every time t at which John lights a cigarette, it rains <f(t), g(t)>.

where the first function

> …maps entities to times, and the second function maps entities to locations. … in examples such as [5], context supplies a function different from the identity function to one of the higher-order variables. In the case of [5], the temporal node contains a complex variable 'f(t)' and the location node contains a complex variable 'g(t)'. When [5] is evaluated with respect to a context, 'f' is assigned the identity function, and 'g' is assigned a function from times to locations." (Stanley, 2000, p.416-7)

On this view, the function denoted in context by 'g' maps a given time t to the speaker's location at t. If (something like) this is the best explanation of the reading given by (4), we have evidence of a location argument on 'rain'.

This constitutes a prima facie promising explanation of why we think there is a close relationship between 'rain' and location. It would provide an explanation of the perceived difference between 'rain' and 'dance', and between (1) and (2), only if the argument didn't apply equally to 'dance'. But it does. Consider (6):

(6) Whenever Sam goes to the park, Nina is walking her dog

There's a reading of (6) analogous to the bound reading in (4):

(7) For every time t at which Sam goes to the park, Nina walks her dog at t *in the location where Sam goes for a walk at t.*

If (4) captures a semantically available reading of (3), it is natural to think that (7) stands in a similar relation to (6). More generally, it is very easy to find sentences that seem to have a reading that coordinates locations in a way analogous to (4), as in (8) – (9) and (10)-(11).

(8) Whenever I am at a disco, Nina is dancing

(9) For every time t that I am at a disco, Nina is dancing at t at the location of the disco I am in at t.

(10) Whenever I throw a party, Jason drinks too much.

(11) For every period t at which I throw a party, Jason drinks too much at the location where I throw a party during t.

So if the reading of (3) given by (4) provides evidence of an argument place for a location attached to 'rain', then it also provides such evidence for 'dance' and 'walk', and for verbs more generally. Hence, the argument fails to explain the intuitive difference between (1) and (2).

§3. The Event Analysis

In conversation, Stanley has responded by suggesting an alternative analysis of (6)[2]. According to this proposal, there is a bound event variable in (6) that generates the bound reading (this is a version of a proposal found in Cappelen and Lepore (2002)). We like this suggestion – indeed we indicate a marked advantage for it in §4 below. But, we'll argue, it doesn't point to a disanalogy between 'rain' and 'dance.' Again, if this is a good explanation of (6), it is also a good explanation of how we get the relevant reading of (3).

One implementation of this proposal uses a version of Davidson's suggestion in "The Logical Form of Action Sentences" (Davidson (1967)), combined with the view that there are domain restrictions attached to noun phrases (a view developed in e.g. Westertahl (1985), Stanley and Szabo (2000), and Stanley (2000)). On the account that we have in mind, the binding phenomenon in (6) is to be understood in terms of domain restriction on events, and in particular as a case where a restrictor on events is bound by a higher (temporal) quantifier. Thus the relevant structure in (6) can be made perspicuous by (12):

(12) For all times t, if Sam goes to the park at t, there is an event e that is a walking$_{f(t)}$ of a dog by Nina at t.[3]

Here f(t) is a function from times to the set of events going on in the park where Sam is at that time.[4] This indeed gives us the intuitive truth conditions. And it does so without positing a location argument for events: we merely exploit the possibility of domain restriction and in particular domain restriction that is dependent on a higher quantifier. Call this 'the Event Analysis'.

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[2] It is also gestured at in Stanley (2000). Stanley says that the alternative to analyze (3) as (5) is to "…replace the assumption that "rain" introduces a hidden temporal variable with the assumption that it introduces a hidden situation or event variable, which can either be bound, as in (14), or free, as in (15). The situation variable brings with it information about the time and place at which it occurs." (Stanley, 2000, p.416).

[3] To make this perspicuous, we simplify enormous, e.g. by not giving an event analysis of 'goes'.

[4] See e.g. Stanley and Szabo 2000 for a thorough discussion of the phenomenon whereby domain restriction can vary according to various values of a variable introduced by a higher quantifier.

Suppose (something like) the event analysis is the correct account of (6). Do we then have a difference between (6) and (3)? Only if the same account can't be used to account for the 'bound' reading of (3). But it can: if we can recover the relevant reading of (6) by a suitably structured restrictor on 'walking, we can just as easily recover the relevant reading of (3) by a similar strategy:

(3.1)   For every time t, if there is an e that is a cigarette-lighting event by John at t, then there is a event that is a raining f(t) at t

Here f(t) is a function from times to the set of events going on where the speaker is at those times.

§4.   Two Arguments for the Event Analysis

Not only is the event analysis of (3) perfectly adequate; there are powerful reasons to prefer it to Stanley's original regimentation. (a) and (b) are two such reasons:

(a)   The Event Analysis and Existentially Quantified Versions of (3)

One advantage of the event analysis is revealed by considering the existentially quantified version of (3):

(14) Whenever someone smokes it rains

The reading that we are interested in is made more explicit by

(14.1) Whenever someone x smokes, it rains at the place where x smokes

It is hard to see how these truth conditions can be generated using Stanley's original resources. For consider the existentially generalized version of (5), viz:

(15) For every time t, if someone smokes at t, then it rains at f(t).

It is hard to find a value for the function variable that will work here, since there is nothing in the consequent for the determiner phrase 'someone smokes' to bind into. Intuitively, relative to each smoking event, we wish to consider the location where that smoking occurs. But no function from times to locations will give us this.
Suppose we instead represent (14) by

(16) For all times t, for all events e, for all people p, if e is a smoking by p at t, there is an event at t that is a raining $_{f(e)}$.

Let 'f' denote a function from events e to events in the same location as e. Now we get the desired reading.

(b)   The Event Analysis and Overflowing Rivers

Consider a related problem raised by:

(17) Whenever the river overflows, there is panic.

Intuitively, we want this to tell us that whenever the river overflows there is panicking at the very place that it is overflowing. It is not easy to recover this reading using Stanley's original resources. Suppose we were to represent (17) by

(18) For all times t, if the river overflows at t, there is panic at f(t) at t.

What is the value of 'f' to be here? One might naturally think that it is a function from times to the place where the river overflows at those times. But this would be to forget that the river can overflow in two places at the same time. The attempt to fix for this by treating f as a function from times to the union of places where the river overflows generates truth conditions that are too weak. After all, there may be panic within the union of places where the river overflows even if there is no panic at each place.

By contrast, the event analysis does very well:

(19) For all times t and all events e, if e is an overflowing of the river at t, there is an event that is a panicking f(e) at t

(where 'f' denotes a function from events to other events in the same location)

Thus there is positive reason to prefer the event analysis as the overarching account of both (3) and (6). The binding argument in these cases points to binding into an event restrictor. No special structure is posited for 'rains' as against 'dances' and other verbs: we have structural symmetry.

§5. The Negation-Test: Further Evidence of an Analogy Between 'rain' and 'dance'

Stanley has attempted to bolster the semantic reality of the bound reading we seem to hear in (3) by appealing to what we can call 'the negation test' (found in Marti, 2006). This test, he claims, provides some additional evidence that 'rain' claims tend to be semantically tied to locations even if that tie is not overtly voiced. The key piece of data that Stanley appeal to – data presented in Marti (2006) -- is that it's easy to get a true reading of the second sentence in (20):
     (20)   It's raining. No, it's raining over there.
If the first sentence is semantically tied to a location, then we would predict contexts in which the sequence of sentences in (10) are both true– contexts where the location selected by the first 'raining' sentence isn't the referent of 'there' in the second sentence.
     Marti and Stanley appeal to the negation test in response to Recanati's charge that the binding argument over-generalizes, i.e. that it forces us to postulate too many argument places in a single verb (see Recanati 2002). We endorse that use of the negation test below. However, what bears emphasis here is that the negation test reinforces the hypothesis that a wide range of verbs can be semantically tied to a location in rather the way that 'Its raining' achieves this. The approach in the previous section predicts (21) – (24) should be natural, and they are.

(21)   [Contemplating a weekend in the countryside, she asks:] Will the crickets be chirping? No, they've hopped south.

(22)   [Preparing a move to an apartment close to the old train lines]: Will the Orient Express be making a lot of noise every night? No, they've redirected it.

(23)   [Before a weekend by the sea:] Is the Ocean making noise? No, it only does further down the coast

(24)   [Before a dance performance, where the it's unclear whether Nina will be on stage, someone ask:] Will Nina dance tonight? No, she'll dance somewhere else.

In all these cases, one natural reading is that the verb in the first sentence is indexed to a location other than the location the same verb in the second sentence is indexed to. That's how we get the true readings.

In sum, both the so-called binding argument and the negation test provide evidence that for a wide range of verbs, locations enter the semantic picture even though not overtly referred to.

§6.   What Explains the Intuitive Difference Between 'Rain' and 'Dance'?

So what does explain the felt difference between (1) and (2)? Why does (1) seem to require a location for its interpretation, while (2) doesn't? That there is a difference might seem even more puzzling if we are right that there is no deep structural difference between 'rain' and 'dance', at least as far as locations are concerned.

Here's a proposal: 'it rains' is *uninformative* if we don't restrict the event quantification to a particular locale. To be told, for example, that there is a raining event going on at *some* place in the universe is, in most contexts not a useful piece of information. (2), on the other hand, has a subject, and the claim that there is a dancing by that subject at a certain time is in itself informative – even if we're given no indication of where that dancing takes place. To be told that Nina is dancing somewhere or other is often quite informative.

To see this, note that when one removes the subject from 'dance', the need for a location becomes more pressing. For illustration, compare the pairs (25) and (26), and (27) and (28):

(25)   They will dance
(26)   There will be dancing
(27)   They will sing
(28)   There will be singing

It is not *un*natural to read (26) and (28) as requiring *specific* location in order to be informative. If we don't supply a specific location, then all we're told is that there will be dancing and singing going on somewhere in the universe. Then it is, typically, hard to see the point of the utterance. Not so for (25) and (27). Hence in (26) and (28), we expect the speaker to have fixed on a more specific location and the audience will introduce that location into the interpretation of the utterance, much as they do for typical utterances of (1).

On the flip side of this, consider sentences about rain where there is a subject. In those cases the need for a specific location is much less pressing, as in (29):

(29)   There's rain pouring from that cloud

Of course, in cases where the subject is ubiquitous enough, there is still a felt need for the sentence to be about a location. Consider the contrast between 'My car will be making a noise' and 'The ocean will be making a noise' and between 'Rain will pour from the sky' and 'Rain will pour from that cloud'. The more ubiquitous the subject, the more the felt need for a location for the sentence to be about.

Consider also contexts where the topic is rain in general, i.e. rain as a phenomenon. Here, the felt need for a specific location is alleviated. The question in (30) and the answer in (31) don't seem to need specific locations for their proper interpretation.

(30)   Why does it rain?
(31)   It rains because skies release humidity

This is predicted by the informativeness account: (31) is informative even if it is not about any location in particular.

There are other contexts in which uses of 'rain' carries highly significant information even in the absence of locational information:

(32)   On the day of judgment, dead people will rain from the sky/it will rain dead people.

Note in this connection that it is easy to imagine uses of (32) that fail the negation test. If a preacher were to utter (32), it will likely be infelicitous to respond by 'No they won't. It will rain dead people over there'.

In sum, what explains the difference between (1) and (2) is not a general semantic contrast between the verbs 'to rain' and 'to dance', but rather the need for a specific location in order to achieve the appropriate level of informativeness. Put within the framework of the event based approach: it is true enough that there is typically domain restriction on the raining events in 'It was raining yesterday' but not so typically such a restriction in 'Nina danced with Joseph yesterday', yet this can be explained without positing any special structure that divides 'rain' from 'dance'.

§6.   *Are Time and Place Special?*

We have suggested that the binding argument is best handled by positing domain restrictions on event quantifiers. Is there a risk that the line of thought will overgeneralize, generating all sorts of exotic kinds of tacit restrictors? Of course, there's no *in principle* way to rule this out, given the event analysis. However, it is worth noting that it is hard to get readings that tacitly limit to anything other than time and place.

We have noticed that some use examples like (33) – (36) in trying to generalize the binding argument:

(33)   Whichever way I danced, she danced
(34)   With ever tool in my tool box, I attacked him

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(35)   Whichever way I eat, she eats
(36)   At whatever speed I run, she runs

We should not conclude from these examples that 'dance' talk typically involves a restrictor for *ways of dancing*, 'attack' a restrictor for *instrument*, 'eat' a restrictor for *a manner of eating*, and 'run' a restrictor for *speed*. That's not to deny that we can get true readings of (33) – (36). We can, but simply as a result of fronting: we get (33) to (36) by moving an adjunct in (37) – (40) to the front:

(37)   She danced whichever way I danced
(38)   I attacked him with every tool in my tool box
(39)   She eats whichever way I eat
(40)   She runs at whatever speed I run

So these kinds of examples cannot be used to generalize the binding argument. (It bears emphasis here that one cannot explain the semantic tie between the location of lighting a cigarette and the location of raining in (3) on this basis, since 'It rains whenever I light a cigarette' does not superficially require such a tie any more than (3) does.)

It is worth noting, moreover, that ways of dancing, instruments of attack, manners of eating and speed of running also fail the negation test, as evidenced by the unacceptability of (41) – (44):

(41)   Did she dance? No, she danced tango.
(42)   Did she attack him? No, she attacked him with a hammer.
(43)   Did she eat? No, she ate with her fingers.
(44)   Did she run? No, she ran at 9mph.

Clearly, the formal machinery that we have introduced does not by itself preclude the possibility of, say, tacit manner restrictions on dancing claims. After all, if one accepts that there is a domain restrictor on the underlying event quantifier then there is no prohibition in principle on domain restriction to dancing events of a certain manner. What seems true, however, is that it is a natural part of our communicative practice to impose tacit restrictions on our event quantifiers by spatio-temporal restriction, in a way that contrasts with various other kinds of *conceivable* tacit restrictors. It is in this sense that space and time are special.

§7 Conclusion

There are some very general theoretical issues about the syntax-semantics interface that we could not pretend to handle in a short essay such as this one. Let us briefly return to 3.1:

(3.1)   For every time t, if there is an e that is a cigarette-lighting event by John at t, then there is a raining event at t at f(t)

Some may prefer to think of this as a perspicuous depiction of a structured proposition, but deny that there is any isomorphic syntactic representation at 'LF' or in the belief box, when someone uses (3) to express that proposition. Others will go further and endorse (3) as a promising account of the deep logical form, manifest in

the language organ, that underlies that use of (3).[5] The first category of philosophers might admit that the relevant use of (3) involves event quantification and a restrictor, so long as such quantifiers and restrictors are construed as elements in structured propositions and not as bits of syntax in the head. In giving a systematic account of the truth conditions of various sentences in various contexts, such philosophers will use a metalanguage that enjoys a syntax of event quantification and so on. But such philosophers will not claim any syntactic isomorphism between the metalanguage and the deep psychology of the language users that are described using that metalanguage. The second category of philosopher may be more willing to adopt a more syntactically committal version of an event-based semantics. It is obviously beyond the scope of this essay to adjudicate between these versions of an event-based approach. In particular, then, we make no claim here as to which syntactic proposals should accompany the semantic suggestions that we have made. There are other loose ends. For one thing, we realize that there are variations on an event based approach that differ subtly from the implementation that we discussed here, and make no claim here as to their relative merits. (One relevant issue is whether domain restriction always proceeds via a restrictor on a nominal.) Second, we realize that it would be nice to have a deeper understanding of the special role that we have posited for location-based restrictors in communicated content. That said, we hope to have made a fairly strong case for the power of event based semantics to handle a range of binding data, for discarding the hypothesis of a deep, location-theoretic, structural difference between 'rain' and 'dance', and finally, to have provided a very natural account of the felt contrast with which we began.

REFERENCES

Cappelen, H. and E. Lepore: 2002, 'Indexicality, Binding, Anaphora and *a priori* Truth', *Analysis* **62**, 271-81.

Davidson, D,: 1967 "The Logical form of Action Sentences", in *The Logic Decision and Action*, Pittsburgh University Press.

Marti, L.: (2006) "Unarticulated Constituents Revisited", Linguistics and Philosophy, 29, 2, 135-166

Recanati, F.: 2002, 'Unarticulated Constituents', *Linguistics and Philosophy* **25**, 299-345.

Stanley, J.: 2000, 'Context and Logical Form', *Linguistics and Philosophy* **23**, 391-434.

Stanley, J. and Z. Szabó: 2000, 'On Quantifier Domain Restriction', *Mind and Language* **15**, 219-61.

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[5] Perhaps others will claim that event syntax is 'in the head' but deny that it appears at the level that linguists call 'LF'. Yet others will deploy an event-ridden metalanguage to provide a systematic account of the truth conditions of the relevant use of (3) and so on, but will deny both the metaphysics of structured propositions and the syntactic reality of event quantifiers in the deep psychology associated with that use of (3).

Taylor, K.: 2001, 'Sex, Breakfast, and Descriptus Interruptus', *Synthese* **128**, 45-61.

Westertahl, D. 1985 Determiners and Context sets. In Natural Language, Ed J. van Benthem and A. ter Meulen, 45 - 71. Dordrecht: Foris.