

Temporal Binding in the Event Analysis

One of the most powerful arguments raised by proponents of *truth-conditional semantics* (as I will understand it here, the view that the role of context is to provide elements in the truth-conditions of utterances by means of providing values to hidden variables found in the logical form of the sentences uttered) against *truth-conditional pragmatics* (as I will understand it here, the view that the role of context is the provision of elements in the truth-conditions of utterances by essentially pragmatic means without requiring the postulation of hidden variables in the logical form of the sentences uttered) is “the argument from binding”, or the Binding Argument, as I will call it. In a nutshell, the argument starts from the existence of bound readings of complex sentences that contain simpler sentences to conclude, using several semantic assumptions, that the simple, embedded sentences themselves harbour certain variables in their logical form. Here I will be concerned with a certain instance of this argument involving locations. Thus, Stanley (2000) has noted that sentence

- (1) Every time John lights a cigarette, it rains

has a reading according to which every time John lights a cigarette at time t , it rains at time t *at the location in which John lights a cigarette*. The location of rain in (1) is bound by the quantifier “every time John lights a cigarette”. Using this reading of (1), Stanley’s (2000) argument against truth-conditional pragmatics about locations could be put as follows:

1. Truth-conditional pragmatists say that in the simple statement “It is raining”, the location of rain is unarticulated.
2. In (1), binding occurs: the location of rain varies with the values introduced by the quantifier “every time John lights a cigarette”.
3. There is no binding without a bindable variable.
4. Therefore, in “It is raining” there is a variable for the location of rain.
5. It follows that the truth-conditional pragmatist is mistaken: in the simple statement “It is raining”, the location of rain is articulated. It is the (contextually assigned)

value of a free variable in logical form, which variable can also be bound (as in the complex sentence (1)).¹

Several lines of response to this instance of the Binding Argument have been pursued. One strategy was to retort to quantification over more encompassing entities in the meta-language. Thus, Pagin (2005) has proposed replacing quantification over locations with quantification over contexts, whereas Lasersohn (2008) has proposed replacing quantification over locations with quantification over indices. A more radical solution consists in getting rid of variables altogether (in variable-free frameworks such as Jacobson's (1999)) and mimicking binding by type-shift operations. In this paper, however, I want to engage with a less radical solution that involves replacing quantification over locations with quantification over events in the object language – a solution proposed by Cappelen and Hawthorne (2007)².

The response to the instance of the Binding Argument above proposed by Cappelen and Hawthorne – what they call “the event analysis” – is meant to be an alternative to Stanley's (2000) treatment of sentences such as (1) and consists in putting together two familiar ideas. The first is Davidson's (1967) idea that verbs should be conceived of as predicates of events, an idea whose development has lead to the framework known as event semantics. The second is the idea that there are domain restrictions that are attached to certain phrases. The latter idea has found its most vivid defence in Stanley and Szabo 2000, where it is argued that domain restrictions are attached to noun phrases. According to Cappelen and Hawthorne's analysis, however, the relevant domain restrictions are not attached to noun phrases, but to verbs, thus restricting the sets of events that the verb is a predicate of. In this framework, binding phenomena such as those exhibited by the bound reading of (1) are understood in terms of domain restriction of events where the restrictor on the set of events is bound by a higher quantifier. In the case at hand the relevant type of higher quantifier is a temporal quantifier.

Let me illustrate the account by giving an example taken from Cappelen and Hawthorne's paper. The bound reading of sentence

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

¹ This argument is the result of replacing the original sentence “Everywhere I go, it rains” in a similar argument given by Recanati (2002: 328-329) with Stanley's example, sentence (1).

² A similar, more “orthodox” solution would be to replace quantification over locations with quantification over situations – in the way, for example, in which Elbourne (2005) uses situations to account for donkey sentences. The possibility of replacing location variables with variables for either situations or events is mentioned, but not fully developed, in Stanley (2000: 416).

according to which whenever Sam goes to the park at time t , Nina is walking her dog at time t at the location (the park) where Sam is at t . The location of Nina's walking of her dog in (2) is bound by the quantifier "whenever Sam goes to the park". Under the event analysis, (2) is represented as

- (3) 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 ,

where $f(t)$ is a function from times to the set of events going on in the park where Sam is at those times. Function f thus takes care of the restriction on the domain of events associated with the verb "walk", restricting them to events that take place in the park where Sam is at the times he is there. Note that there is no variable for locations in (3): the variable for events e and the restriction function f make the postulation of variables for locations unnecessary.

Returning to our problematic sentence, (1) is represented in the event analysis as

- (4) For every time t , if John lights a cigarette at t , then there is an event e that is a raining _{$f(t)$} at t ,³

where $f(t)$ is a function from times to the set of events going on at the locations where John lights a cigarette at those times. Function f thus takes care of the restriction on the domain of events associated with the verb "rain", restricting them to events that take place at the location where John lights a cigarette at the times he does it. Thus, the binding effect of the quantifier "every time John lights a cigarette" is accomplished by quantifying over events in the object language (which also has the result of restricting the events associated with the bound verb), and thus no binding of any object language variable for locations takes place. As with (3), there is no variable for locations in (4): the variable for events e and the restriction function f make the postulation of variables for locations unnecessary.

It is worth specifying in more detail how is it that this treatment of (1) avoids the conclusion of the instance of the Binding Argument dealt with here. The peculiarity of this answer is that, while all three premises of the argument hold, the conclusion doesn't follow.

³ Cappelen and Hawthorne represent (1) slightly differently, by putting an event variable in the antecedent of (4), which stands for the event of John lighting a cigarette. Strictly speaking they are right (but then there should be an event variable in the antecedent of (3) as well), but I think this is an unnecessary complication that could create confusion, and so I will drop it for convenience in the representation of the sentences below.

One could think that premise 3 (the premise saying that there is no binding without a bindable variable) is the one that fails, according to this account, but this is not so. Since there is a variable that is bindable (namely, the variable for events), premise 3 of the argument does hold. However, the problem with the argument is that conclusion 4 (namely, that the location of rain needs to be represented at the level of the logical form of “It is raining”) doesn’t follow: although there is a bindable variable (the variable for events), and although it appears at the same linguistic level, it is not the same kind of variable than the one the conclusion urges us to postulate.⁴

I find Cappelen and Hawthorne’s answer to the present instance of the Binding Argument convincing, when the aim is to avoid the conclusion of the argument; however, I have some worries about the account of quantification involving temporal quantifiers they propose. In particular, the restriction on the domain of events that is a result of the condition that the events quantified over should take place at the same time as the times specified by the temporal quantifier is in many cases incorrect. As we have seen above, the examples given by Cappelen and Hawthorne were accounted for by taking the restrictor function f to be a function from times to sets of events that take place at those times. But in some cases this function is not the right one. Moreover, as I will try to show below, if one departs from the original view and agrees to modify the function as initially conceived, one soon loses any way to constrain it, and this renders the account useless.

Let’s start building up the case by first considering an example in which the sentence contains temporal expressions that influence the time at which the events quantified over by the temporal quantifier. Thus, in sentence

- (5) Whenever John does a bad deed, somebody will suffer later,

the suffering caused by John’s bad deed takes place at a later time than the time of the deed itself. The temporal order could also be reversed: in sentence

- (6) Whenever John does a bad deed, somebody has hurt John earlier,

⁴ What about conclusion 5? Does Cappelen and Hawthorne’s analysis support truth-conditional pragmatics? At the end of their paper they make it clear that they want to remain neutral with respect to the best way to implement the event analysis. One choice would be to claim that events and the domain restrictions on them are part of the logical form of the sentences investigated. Another would be to claim that they are contributed by pragmatic processes. This latter option would be consistent with a truth-conditional pragmatic view about domain restriction – a view that is contemplated in Recanati (2007). In this paper, however, I interpreted their analysis as being committed to the existence of events in the syntax of sentences such as (1). For a view arguing that events should be part of the syntax of sentences, see Higginbotham (2000).

the hurting that John has been subject to takes place before John's bad deed itself. Now, one particularly bad way to represent (5) and (6) in Cappelen and Hawthorne's system is as follows, (7) representing (5) and (8) representing (6):

- (7) For all times t , if John does a bad deed at t , there is a future event e that is a later suffering $_{f(t)}$ by a person at t .
- (8) For all times t , if John does a bad deed at t , there is a past event e that is an earlier hurting $_{f(t)}$ of John by a person at t .

The reason why this way of representing (5) and (6) is bad is that it makes appeal to future and past events, which are ontologically alright only under a certain view of time, namely eternalism; however, no commitment to any such view is part of Cappelen and Hawthorne's analysis. Also, it is unclear what the events "latter suffering" and "earlier hurting" could be. But a more reasonable solution is easy to provide, which in essence consists in factoring in the semantic effect of the tenses and the temporal expressions present in the two sentences (the future tense and "later" in (5), the past tense and "earlier" in (6)). Although Cappelen and Hawthorne don't discuss such cases, I think there are at least two strategies available to them. The first consists in conceiving function f as before, as a function from times to the set of events that take place at those times, and then have tenses and temporal expressions (conceived as operators of sorts) interact with the function in order to obtain the required semantic effects. The second strategy would be to conceive function f in a different way than before, as a function from times to events that take place earlier or later than those times – to build in the semantic effect of the tenses and temporal expressions in the function itself, as it were.

In connection to the second strategy, note that, even if it were acceptable, it actually amounts to modifying the initial account, and to admit that the restrictor function f cannot be always a function from times to sets of events that take place at those times. But the strategy is far from being acceptable, since it has the very undesirable consequence of indefinitely multiplying postulation of functions: since function f will need to be different for any type of interaction between verbs, tenses and temporal expressions (as we have seen, we needed two different functions to account for examples (5) and (6)), and since these interactions are virtually indefinite, we will end up with a host of restrictor functions – a result that I take Cappelen and Hawthorne would be glad to avoid.

It is the failure of the second strategy, then, that pushes us towards adopting the first. But things are not straightforward here either. One should note that the right account of sentences such as (5) and (6) is no trivial matter and that a number of complications are expected to arise – some having to do with scope interactions, for example. In any case, in the absence of a fully developed account the viability of this strategy could hardly be evaluated, and it is Cappelen and Hawthorne's duty to provide one. But even if the details are not worked out yet, one could argue, such a move will nevertheless be enough to save Cappelen and Hawthorne's initial claim about the nature of the function f . However, I don't think that the initial claim could be sustained. The case that the restrictor function f cannot be always a function from times to sets of events that take place at those times can be strengthened by considering cases in which there is no explicit mention of future or past tense, nor of any temporal expressions whose semantic effect should be factored in. Consider thus the following example:

- (9) Whenever there is a major solar eruption, the artificial satellites orbiting the Earth break down.

(9) will be represented in Cappelen and Hawthorne's view as (10):

- (10) For all times t , if there is a major solar eruption at t , there is an event e that is a breaking down _{$f(t)$} of the artificial satellites orbiting Earth at t .

But in (10), function f cannot be a function from times to the set of events that take place at those times, the reason being that it is simply not true that the events bound by the temporal quantifier take place at the times quantifier over. The breaking down of the artificial satellites orbiting Earth takes place after the solar eruption has taken place. However, there is binding in (9). So, while there is a connection between the times quantified over by the temporal quantifier and the events bound by it, the connection is *not* that the bound events take place at the times quantified over in the antecedent. But, according to Cappelen and Hawthorne's analysis, the connection they propose is precisely this. So the account needs to be modified.

One reply to the example above would be to claim that even if the connection between the times quantified over by the temporal quantifier and the bound events is not the one proposed by Cappelen and Hawthorne, one could detect, perhaps by bringing in world knowledge, a certain regularity in the appearance of the bound events, a regularity that in this

case is the mark of the existence of a causation relation between events. Thus, we know that artificial satellites orbiting the Earth break down after, say, three days after major solar eruptions, and we know that they do so *because* of such eruptions. This leads to the idea that the account could be modified by introducing a different constraint on function f that would then operate the required restriction on the set of events, a constraint that is specific to causal relations. So the response would be that when a causal relation is involved, then there is a specific restrictor function that reflects this, and thus that the initial claim remains untouched.

However, the case could be made by appeal to examples in which no causal relation is involved. Consider, for example, sentence (11):

- (11) Whenever John gets wet from the rain, he drinks a hot cup of tea.

(11) will be represented in Cappelen and Hawthorne's view as (12):

- (12) For all times t , if John gets wet from the rain, there is an event e that is a drinking _{$f(t)$} of a hot cup of tea by John at t .

Again, in (12) function f cannot be a function from times to the set of events that take place at those times, for the same reason as in the case of (10). John's drinking of a hot cup of tea takes place after his getting wet from the rain. And, again, there is binding in (11). So, while there is a connection between the times quantified over by the temporal quantifier and the events bound by it, the connection is *not* that the bound events take place at the times quantified over in the antecedent. So, Cappelen and Hawthorne's analysis needs to be modified. If, on the other hand, the modification consists in allowing a different restriction function f , then we will have the problem that I pointed out in connection to examples (5) and (6), namely a proliferation of restrictor functions: for each for each type of (non-causal) regularity we would need to postulate a different function. Again, this result seems unsatisfactory.⁵

Sentences (9) and (11) were found presupposing certain regularities (causal or not) on which the constraint on the restrictor function f could be based. But the point could be made by appeal to cases in which no such regularities exist. Thus, to illustrate, imagine that a serial killer has been arrested several times but never convicted for his crimes for lack of decisive

⁵ An example in which the temporal order is reversed and in which a non-causal regularity is involved is the sentence "Whenever John takes a shower, he takes his clothes off".

evidence. Sadly, as soon as the killer is released, he strikes again. However, the time that passes between each release and his next kill varies considerably. Once he strike the very next day; another time he waited for 3 years – with no predictable pattern. Given this context, sentence

- (13) Whenever the serial killer is released, he kills again,

poses the same problem to Cappelen and Hawthorne's analysis as (9) or (11). Moreover, the example shows that there is no foreseeable way to specify the function f , since there is no regularity to base the constraint on function f on. In such cases, the constraint will amount to an useless and uninformative claim that f is a function from times to the set of events that take place some time later.⁶

Let me close with rehearsing the dialectic of the paper. I started with pointing out that what is missing from Cappelen and Hawthorne's analysis of temporal binding is an account of sentences in which tenses and temporal expressions interact with the verb (examples (5) and (6)). I then sketched two strategies the authors could adopt. The second has lead to the multiplication of functions; the first, although not developed in Cappelen and Hawthorne's paper, could save the way they conceive of function f in cases of temporal binding. I then showed, by means of examples (9) and (11), that this way of conceiving function f cannot be always right. I then considered a way to amend the view, which relies on tying the constraints on function f to regularities found in the world. However, with example (13), I showed that the case could be made by appeal to cases in which no such regularity exists. As a last response, Cappelen and Hawthorne could adopt a mixed strategy: claim that in cases in which there is explicit interaction between verbs, tenses and temporal expressions, function f is as initially conceived (as a function from times to sets of events that take place at those times); claim that in cases in which there past or future tenses or temporal expressions don't appear in the target sentences, function f is conceived differently. I trust that they would agree that such an answer would severely damage the unity of their approach.

⁶ An example in which the temporal order is reversed and in which there is no regularity involved is the sentence "Whenever John has dinner, he cooks" (as opposed, say, to going to a restaurant). The cooking could take place at different (irregular) times before the having of the dinner.

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