

EVENTS AND “LOGICAL FORM”

In his paper ‘The Logic of Perceptual Reports: An Extensional Alternative to Situation Semantics’¹ James Higginbotham proposes to account for a variety of facts concerning the semantics of “Naked-Infinitive” perceptual reports by quantifying over events at a level of logico-syntactic representation. Higginbotham’s paper is interesting for two reasons. First, it is (as far as I can tell) the only published alternative to the *situation semantics* treatment of these facts, first put forward by Jon Barwise in his paper “Scenes and Other Situations”.² And second, it aims to account for the relevant data by combining Davidson’s analysis of the logical form of action sentences with some of the insights of a multi-levelled Chomskyan syntax.³ The resulting theory is a somewhat curious blend; nevertheless it has enjoyed a large degree of uncritical acceptance. It is the purpose of the present paper to examine Higginbotham’s theory in some detail. My conclusions may be stated at the outset. Contrary to what is claimed, the theory makes no desirable empirical predictions over and above those made by Barwise’s original proposal. Moreover, once it is made fully explicit the prospects of the theory simultaneously fulfilling its syntactic and semantic obligations look remarkably grim.

1. BARWISE ON PERCEPTUAL REPORTS

One task of semantics is commonly supposed to be that of capturing the validity of certain inferences, of providing an account of how the truth of some statement α can be guaranteed by the truth of some other statement β , or set of statements $\beta_1 \dots \beta_n$. Model-theoretic semantics faces this task by constructing abstract mathematical models of those entities which are the semantic values of the expressions of a language, a strategy that goes hand in hand with the view that semantics concerns itself with the relations between linguistic symbols and the world, and that valid inferences are consequences of the way language hooks up to the world, and the way the world is.

Barwise sketches a model-theoretic account of the semantics of Naked-Infinitive (NI) perceptual reports like (1):

Linguistics and Philosophy 11 (1988) 303–321.

© 1988 by Kluwer Academic Publishers.

- (1) Psmith saw Maja leave.

The complement of *see* in such sentences is assumed to be clausal, with the quirk that its main verb is neither tensed nor fully infinitival. Barwise uncovers a variety of semantic generalizations that need to be accounted for, including the following:

- (A) *Veridicality*: If A sees ϕ then ϕ .
 (B) *Substitutivity*: If A sees $\phi(a)$ and $a = b$, then A sees $\phi(b)$.
 (C) *Exportability*: If A sees some x (be) such that $\phi(x)$, then there is some x such that A sees $\phi(x)$.

Barwise's idea is to capture these (and other) generalizations by focussing on *situations*, understood as portions of reality. Situations are: individuals standing in relations at space-time locations. For instance, Maja's winking at 2:25 p.m. on Tuesday, June 17, 1985, in Tanner Library is a situation.⁴ His main claim is that once certain reasonable constraints are imposed on the structure of reality, then by construing SEEING as a relation between individuals and situations, these generalizations drop out. For instance, *Veridicality* is said to hold because a sentence like (1) describes a situation in which Psmith saw a situation "supporting the truth of" the sentence *Maja left*, the tensed counterpart of the embedded clause *Maja leave*. Roughly, a situation s supports the truth of a sentence ϕ if, and only if, s is a situation of the sort described by ϕ . (The reader is referred to chapter 8 of *Situations and Attitudes* for a fully worked version of this thesis.) If we now take M to denote the world and $[\phi]^M$ to denote the set of all situations in M supporting the truth of the sentence ϕ , we can characterize the situation described by (1) as (2):⁵

- (2) (Psmith sees s) & $s \in [\text{Maja leave}]^M$

Since the semantic value of the object of *see* is taken to be a situation, the analysis captures the fact that *see* does not create opaque contexts. If Psmith saw Maja leave, and Maja is the U.S. President, then Psmith saw the U.S. President leave. That is, any situation supporting the truth of *Maja left* will also be a situation supporting the truth of *The U.S. President left*. Thus *Substitutivity* also drops out.

Similarly for *Exportability*. From (3) we can infer (4):

- (3) Psmith saw someone rob Maja
 (4) There is someone whom Psmith saw rob Maja.⁶

If Psmith saw a situation in which someone robbed Maja, then the situation he saw contains not only Maja but whoever robbed her.

2. HIGGINBOTHAM ON PERCEPTUAL REPORTS

In direct response to Barwise's proposal, Higginbotham presents an analysis of NI perceptual reports based on Davidson's proposal to quantify over events in making explicit the logical form of action sentences. One of the most interesting features of Higginbotham's proposal is the way it combines Davidson's idea with some of the mechanisms of an eminent syntactic theory. Essentially, the idea is to use independently motivated syntactic machinery to map superficial sentence forms into quasi-first-order representations at the syntactic level known as LF (read "Logical Form") in Chomsky's Government-Binding theory. Barwise's generalizations are then to be captured as a matter of first-order logic.

Higginbotham's main claim seems to be based on the following sub-claims: (i) with respect to interpretation, NI clauses are indefinite descriptions of individual events, (ii) indefinite descriptions have an existential character that triggers explicit quantification at LF, and (iii) events are particulars and hence bona fide objects of first-order quantification.⁷ The main claim is that by allowing quantification to range over events at LF, Barwise's semantic generalizations can all be captured.

The first-order representations Higginbotham uses to make explicit quantification over events are not in the same syntactic format as typical LF representations, so, for the sake of precision, I want to dub these representations "LR's", and defer discussion of the relation between LF's and LR's until Section 5.

On Davidson's account, an action verb contains an additional argument place for an individual event. The verb *leave*, for example, is interpreted as a two-place predicate, and the fact that *Maja left at 6 a.m.* entails *Maja left* is then captured by representing the logical forms of these sentences as (5) and (6) respectively,

(5) $\exists e$ (leave (Mary, e) & at 6 a.m.(e))

(6) $\exists e$ (leave (Mary, e))

(6) being a logical consequence of (5). Higginbotham claims to be able to capture Barwise's generalizations for NI perceptual reports in much the same way. The implicit quantification present in NI perceptual reports is to be captured by an appeal to Davidson's extra argument place in certain predicates. Thus (7) is to be represented as (8),

- (7) Psmith saw Maja leave
 (8) $\exists e$ (leave(Maja, e) & saw(Psmith, e))

which in Higginbotham's restricted quantifier notation comes out as (9):

- (9) $[\exists e: \text{leave}(\text{Maja}, e)]$ Psmith saw e .

Let's briefly look at how this proposal captures (A)–(C).

(A) *Veridicality*. The fact that if Psmith saw Maja leave, then Maja left, is captured by the fact that the logical representation for *Maja left* is (10), which is a first-order consequence of (9),

- (9) $[\exists e: \text{leave}(\text{Maja}, e)]$ Psmith saw e
 (10) $[\exists e]$ leave(Maja, e).

Higginbotham notes that *Veridicality* does not hold in all quantificational contexts. For instance, although (11) is valid, (12) is not:

- (11) If Psmith saw someone leave, then someone left
 (12) If Psmith saw no one leave, then no one left.

And so, Higginbotham claims, "...it would be a mistake to attribute veridicality to the epistemic character of the verb *see*."⁸ Rather, the relevant implication holds only where the relevant embedded quantifier is monotone increasing.⁹ This fact is presented as if it poses a problem for Barwise, but in fact it does not: *Veridicality* is not an *axiom* in Barwise's analysis of *see*, it is just a *fact* concerning a variety of structures which has to be accounted for. And indeed Barwise's analysis makes exactly the right prediction: If Psmith saw no one leave, then what Psmith saw was a situation supporting the truth of the sentence *No one left*. Since the situation Psmith saw does not encompass the whole of reality, it does not follow that no one left simpliciter. Barwise's analysis, like Higginbotham's, correctly predicts *Veridicality* only where the quantifier is monotone increasing.

(B) *Substitutivity*. this is handled easily enough: any singular term appearing in an extensional context within a sentence S will still appear in an extensional context when the corresponding NI clause S^* is embedded in a simple perceptual report.

(C) *Exportability*. This, Higginbotham claims, is a "trivial consequence" of his analysis: (14) follows from (13),

- (13) Psmith saw some student leave
 (14) There is some student whom Psmith saw leave

since the LR for (14), is a "logical consequence" of the LR for (13). In

fact, it is not only a *consequence* of the representation for (13), it just is it:

(15) $[\exists x: \text{student}(x)][\exists e: \text{leave}(x, e)] \text{Psmith saw } e$

I want to defer discussion of the syntactic machinery of GB theory until Section 5 but I need to say a little here. Since LF representations are derived directly from “surface” structures by, e.g., a scoping transformation, the possibility exists that (13) and (14) have the same LR but different LF’s. Indeed on Higginbotham’s account the LF’s for (13) and (14) will be something like (16) and (17) respectively, where t_x represents a “trace” or variable left by the moved quantifier phrase with the same subscript:

(16) $[[\text{Some student}]_i, [[t_i \text{ leave}]_j, [\text{Psmith saw } t_j]]]$

(17) $[[\text{Some student}]_i, [t_i \text{ leave}]_j, [\text{Psmith saw } t_j]_k t_k \text{ is}]$

If the LF’s for (13) and (14) differ in this way then the first-order representation (15) is perhaps just a rendering of them both at some other level of representation or in some interpretive metalanguage. Not until one has an account of how (16) and (17) are both interpreted as (15) can one explain the inference from (13) to (14). If, as Higginbotham suggests, (13) and (14) have different LF’s then to say that (14) follows from (13) is indeed to say something substantial; but since the suggested LF’s (17) and (16) are not in the sort of form to which first-order rules of inference apply, to be without an account of the relation between LF’s and LR’s is to be without an account of *Exportability*. This is not, of course, an objection of principle: the mapping from LF to LR may turn out to be straight-forward.

3. NEGATION

A fourth generalization Barwise notes in his discussion of *see* concerns the exportability of negation:

(D) *Negation*: If A sees $\neg\phi$, then $\neg(A \text{ sees } \phi)$.

For Barwise, in the case of non-quantificational NP’s (D) follows from the fact that *Veridicality* holds, and from a structural constraint on reality to the effect that no world can contain two incompatible situations. Since there are no situations in which Maja both winks and doesn’t wink, and since (as both Barwise and Higginbotham maintain) we are restricted to seeing single scenes at any one time, it is impossible to see a situation

in which Maja both winks and doesn't wink. Therefore if (18) is true, so is (19):

- (18) Psmith saw Maja not wink
 (19) Psmith didn't see Maja wink.

Higginbotham notes that there is a *prima facie* problem for him as there is no obvious LR for (18) that will do justice to its meaning. Although there are three candidate places for overt negation, insertion of the negation operator in none of these places produces a reading which entails (19):

- (a) $\neg[\exists e: \text{wink}(\text{Maja}, e)] \text{saw}(\text{Psmith}, e)$
 (b) $[\exists e: \neg \text{wink}(\text{Maja}, e)] \text{saw}(\text{Psmith}, e)$
 (c) $\exists e: \text{wink}(\text{Maja}, e) \neg \text{saw}(\text{Psmith}, e)$

(a) simply represents *Psmith didn't see Maja wink*. From (b) all that follows is that some situation in which Maja did not wink was seen by Psmith, for instance a scene in which Jane sneezed but which Maja is not in. From (c) it follows only that Maja winked but Psmith didn't see it. Higginbotham's solution to this is to posit the existence of an antonymic predicate *wink'* in the LR for (18), which will then be (20):

- (20) $[\exists e: \text{wink}'(\text{Maja}, e)] \text{saw}(\text{Psmith}, e)$

The following three points should be noted:

(i) If there is to be some sort of logico-syntactic relation between *wink* and *wink'* captured at LR, then something must be said about natural antonyms such as *leave* and *stay* at this level too. They can't simply be left out because they are lexicalized. And this would seem to require the use of decompositional tools or some sort of meaning postulate to relate *leave* and *stay* in order to capture the relationship between (21) and (22), which is what (D) is all about if one takes the antonym idea seriously:

- (21) Psmith saw Maja not leave
 (22) Psmith didn't see Maja leave.

But one of the major motivations for Higginbotham's analysis – and indeed for Davidson's original proposal – is the possibility of showing how certain relations between sentences can be characterized as a matter of first-order logic. Either *stay* and *leave* are related at LR, or the idea that *leave* and *leave'* are related at LR must be given up. Neither alternative is very appealing, but the only way to avoid having to make this choice, and still adhere to the spirit of the analysis, is to deny that the relation between natural pairs of antonyms and the relation between e.g., *wink* and *wink'* are really the same relation.

(ii) A similar problem arises in capturing *Veridicality*. If (21) is true then Maja didn't leave. But this fact must be captured elsewhere (e.g. by decomposition or meaning postulate) since the logical representation of *Maja didn't leave* contains the predicate *leave* while the LR of (21) contains *stay* (or *leave'*).

(iii) As evidence for the existence of antonymic predicates at LR, Higginbotham appeals to the fact that in cases where there is no natural antonym, as in (21), there is an implication of "refrain", e.g., that Maja refrained from winking. However, although Higginbotham is careful not to claim that the implication in question is semantical/logical, it certainly needs to be for his point to have any real force. However, the implication is clearly cancellable suggesting it is simply a conversational implicature. Indeed Higginbotham seems to be aware of this, noting that in a sentence like (23),

(23) I saw the car not start

there is an implication not of refrain but of failure. The content of any implication thus appears not to be attributable to the syntactic nature of the embedded construction and its negative character. Higginbotham appears to be trying to get syntactic and/or semantic mileage out of pragmatic facts here and his observation, interesting as it is, does not contribute to his overall argument.

All this makes Higginbotham's account of *Negation* look a bit ad hoc. For Barwise, on the other hand, the generalization follows from (a) treating SEEING as a relation between individuals and situations, (b) the fact of *Veridicality*, (c) a structural constraint on the world, and (d) a constraint on perception to the effect that we see single scenes. Thus once the semantics of a sentence like (18) *Psmith saw Maja not leave* has been characterized, an account of why the truth of (18) guarantees the truth of (19) *Psmith didn't see Maja wink* comes in wake: since there can be no situation in which Maja both winked and didn't wink, there can be no situation in which Psmith saw Maja wink and saw her not wink. This is a fact about the *world* and a fact about *seeing*.

4. SYNTACTIC SUPPORT

Higginbotham claims that his analysis explains certain syntactic facts, and is supported by others. For instance, the reason (25) is ill-formed

(25) *Psmith imagined Maja leave

is, according to Higginbotham, that if *imagine* were to admit NI complements then the logical representation of (25) would be (26)

(26) $[\exists e: \text{leave}(\text{Maja}, e)]$ Psmith imagined *e*

and hence *imagine* would give rise to *Veridicality* judgments with respect to embedded NI clauses. But *imagine* clearly doesn't give rise to these judgments therefore it cannot take NI complements. The same fact is, however, also a consequence of the situation semantics analysis: NI complements describe *actual* situations and since IMAGINING is not a relation between individuals and *actual* situations, *imagine* does not take NI complements.

Support for Higginbotham's analysis is supposed to be drawn from the behaviour of the causative verbs *help*, *let*, *make*, and *have*, the only other verbs that appear to admit NI complements.¹⁰ Thus we get sentences like *Psmith made Maja leave*. On the basis of this fact Higginbotham claims that "The NI complements to these verbs show all the key semantic properties associated with NI complements to perception verbs" and "... what is made happen, let happen, helped to happen, had happen are, plausibly events." Barwise's generalizations (A)–(D) above do indeed seem to hold for these verbs; but in his initial motivation for quantifying over situations, Barwise acknowledges the important observation that a pronoun may be anaphoric on an NI clause as in (27),

- (27) Psmith saw [Maja leave]_i and Ed saw it_i too

where co-subscripting indicates the anaphoric relation in question. But notice that the corresponding anaphoric relation is illicit when *see* is replaced by one of the causatives:

- (28) *Psmith helped [Maja leave]_i and Ed helped it_i too.

This asymmetry is suggestive of an important difference between the complements of perception verbs and the afore-mentioned causatives.¹¹

Moreover, the causatives Higginbotham mentions diverge in important ways in their syntactic properties. For instance, only *help* may take a fully infinitival complement,

- (29) Psmith helped Maja to leave
 (30) *Psmith let/had/made/saw Maja to leave.

Yet despite the ungrammaticality of (30), *make* and the verbs of perception – but not *let* and *have* – pattern with *help* in allowing passivization with a full infinitival embedded clause as in (31):

- (31) Maja was seen/made/helped to leave.

There are complications with *Veridicality* here too. Like the verbs of perception, *make*, *have* and *help* yield veridical judgments only with monotone increasing quantifiers, but *let* appears to do the same thing

generally. Thus unlike (12), (32) appears to be valid:

- (12) If Psmith saw no one leave then no one left
 (32) If Psmith let no one leave then no one left.¹²

On Higginbotham's account the validity of (32) does not follow as a matter of logic alone as the quantifier phrase *no one* is monotone decreasing, so some sort of meaning postulate is required if the inference is to be accommodated.

Higginbotham argues that his analysis derives support from the fact that derived nominals such as *Maja's departure*, seem to be singular terms describing events. The difference between *Psmith saw Maja's departure* and *Psmith saw Maja depart*, Higginbotham argues, is that from the point of view of interpretation, the former contains a definite description, and the latter an indefinite description.¹³ But noticeably, the causatives misbehave and again thwart a syntactically motivated account of the semantics of NI complements: witness the ungrammaticality of (33) despite the grammaticality of (34),

- (33) *Psmith made/let/helped/had Maja's departure
 (34) Psmith made/let/helped/had Maja depart.

Clearly there is some serious syntactic and semantic spadework to be done here if one is to establish just how apparently NI causative constructions are related to NI perceptual reports. What does seem clear, however, is that the range of facts so far uncovered cannot be accounted for by a simple *syntactical* triggering of event quantification.

5. LOGICAL REPRESENTATIONS AND LF

We now turn to the relationship between LR's and LF's. Following Chomsky, Higginbotham assumes that syntax is organized into three distinct levels of representation as in (E),¹⁴

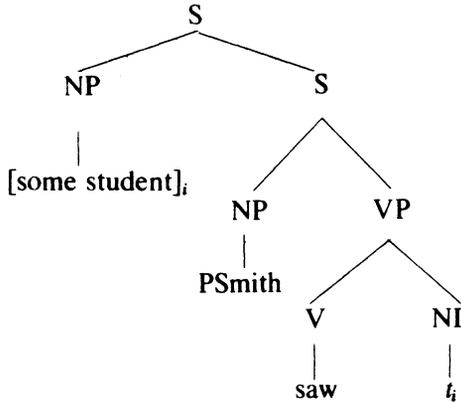
- (E) DS—SS—LF

where DS is D-structure (Deep Structure), SS is S-structure (Surface Structure¹⁵), and LF is "Logical Form", the syntactic level relevant to semantic interpretation. LF representations are derived directly from S-structures by various types of application of the general transformational rule "move α ".

Of concern to us here is the precise relation between S-structure and LF. Following Robert May, Higginbotham assumes that Quantificational NP's (QP's) are preposed at LF by a rule of scope assignment called

Quantifier Raising (QR).¹⁶ For example, the S-structure underlying (35) will be mapped into the LF (36), which we can represent as (F)

- (35) Psmith saw some student
 (36) [[Some student]_i Psmith saw *t_i*]
 (F)



The *t_i* in object position is a “trace” of the QP *some student* which has been Chomsky-adjoined to the S node by QR.¹⁷ QR is triggered by the presence of the QP at S-structure, and the *scope* of the raised QP at LF is the S node to which it has been Chomsky-adjoined, i.e., its *c-command* domain.¹⁸ In (F) The trace left by QR is within the scope of the raised QP *Some student* and is interpreted as a bound variable. Adjoined QP’s become restricted quantifiers and so (36) comes out as (37):

- (37) [∃*x*: student(*x*)] Psmith saw *x*

Both the general idea and the details are very clear with standard QP’s. When it comes to NI clauses only the general idea is clear: NI clauses are raised by QR. Higginbotham provides us with few details, so let me now try to fill in some of the important ones. Although Higginbotham makes room for event variables in the LR’s he provides, the exact status of event variables at LF is unclear. If events are not explicitly quantified over at LF, an account is needed of how LF’s are related to LR’s, which we might then view as renderings of LF’s in some interpretive metalanguage. That is, if the LF for (38) were just (39),

- (38) Psmith saw some student leave
 (39) [Some student]_i Psmith saw *t_i* leave

then an account would be needed of how (39) – derived from S-Structure by QR – is related to the LR (40) which makes explicit the event quantification:

$$(40) \quad [\exists x: \text{student}(x)][\exists e: \text{leave}(x, e)] \text{saw}(\text{Psmith}, e).$$

From a purely technical point of view this may or may not be a difficult task, but the details need to be spelled out if we are to capture Barwise’s generalizations. Of course, if such an account were forthcoming it could not be construed as playing a role in theory advertized as a *syntactically* based alternative to Barwise’s because the whole weight of explanation would have shifted to the interpretation of LF’s which, by hypothesis, would not make event quantification formally explicit. Higginbotham, however, is surely claiming that individual events *are* quantified over at LF for he says on p. 123 that “. . . at the syntactic level LF,” a sentence like (1) “. . . might be expected to undergo the scope assignment rule [QR]” and so “come out as[41], and on the individual event analysis eventually as[42]”:

- (1) Psmith saw Maja leave
 (41) [[Maja leave]_i, [Psmith saw *t_i]]
 (42) [∃*e*: leave(Maja, *e*)] saw(Psmith, *e*)*

Only (41) would standardly qualify as an LF in GB theory, so the precise relations between (1), (41), and (42) need to be spelled out. There seem to be three viable options: (i) allow (42) to be a bona fide LF in some new variant of GB theory; (ii) posit (42) as a representation at some new level within the theory – call it “LR” – the true LF being (41); or (iii) view (42) as a rendering in some interpretive metalanguage and provide a set of rules which ensure that (41) is interpreted as (42).

Let’s investigate the way LF’s will be related to S-Structures on these accounts. If (42) is the LF for (1) then the theory will have to be augmented by some syntactic machinery for mapping intermediary structures like (41) – obtained by QR applied to S-Structure – onto representations like (42) where the valency of *leave* has been overtly augmented and an existential quantifier introduced to bind both the occurrence of the variable *e* which now functions as an argument of *leave*, and the occurrence left by QR. It is not enough to simply claim that QR takes care of everything. If (41) is the LF for (1) then some specification is needed of how it is that (41) is *interpreted* as (42).¹⁹ Options (ii) and (iii) both require this if Barwise’s generalizations are to be captured. Take *Veridicality* for instance. We know that if Psmith saw

Maja leave, then Maja left; but the whole point of the individual events analysis is to show that the consequent in this conditional is a first-order consequence of the antecedent. To do this [*Maja left*] must be shown to be a first-order consequence of the LF $[[\textit{Maja leave}]_i [\textit{Psmith saw } t_i]]$. Although it's clear that the LR $[\exists e] \textit{left}(\textit{Maja}, e)$ is a first-order consequence of the LR $[\exists e: \textit{leave}(\textit{Maja}, e)] \textit{saw}(\textit{Psmith}, e)$ (allowing for tense transfer), we have no account of *Veridicality* until either the relation between LFs and LRs is made explicit, or a set of inference rules is supplied that shows the logical relationships between LFs.

I should stress that I am not simply highlighting a technical detail. Suppose we are supplied with either some syntactic machinery that gets us from (41) to (42), or a set of rules that enable us to interpret (41) as (42), would we then have a working theory? I think not. What would still be needed is a specification of where and how which verbs are augmented in valency to make room for quantification over events, and an account of how quantification is actually triggered, Higginbotham has something to say only about part of this. He suggests that we should distinguish between *stative* and *transient* predicates on the grounds that only the latter contain the extra quantifiable argument place. So in sentences like (43) and (44).

(43) Psmith owned a house

(44) Psmith bought a house

implicit quantification only occurs in the latter, *buy* being a transient predicate. This, according to Higginbotham, is what accounts for the fact that (45) is “anomalous”:

(45) I saw Psmith own a house.

While not explicitly claiming that (45) violates any *grammatical* condition, Higginbotham does claim that only the transients contain the extra place quantified at LF. Indeed, I suggest that any oddity one feels about (45) is pragmatic, rather than syntactic (or semantic): given enough context it is possible to get a perfectly sensible reading for (45). Consider a fast-moving high-stakes poker game where jewels, cars and deeds to houses are changing hands every few minutes. It would be quite reasonable to report on the evening's proceedings by uttering (45). Modification is not a problem either: just as I can say “I saw Psmith cry for an hour”, I might report on the game by saying “I saw Psmith own a house for forty seconds”, or “I saw Psmith own a house three times tonight”. The point is, we use NI perceptual reports to report what we,

e.g., see, and we tend to move around a lot and see a lot of things of shortish duration. But what seems like a state to us might be an event as far as, e.g., God is concerned. It would be perfectly reasonable for God to say "I saw Psmith own a house" when chatting about some of the less memorable happenings of a particular millenium. These examples suggest that, at least some of the time, *own* needs to contain the extra argument place, so I think it's just a mistake to think that Higginbotham is focussing on an important logico-syntactic bifurcation among the verbs of English.²⁰

In addition to an account of *which* verbs contain the extra quantifiable argument place, we still need an account of just *when* or *where* this position manifests itself in syntactic representations. Since Higginbotham's analysis centres around the idea that NI complements are to be interpreted not as sentences but as indefinite descriptions of individual events, his original proposal seems to be that event quantification is triggered by NI (and perhaps gerundive) complements in virtue of their existential characters, and hence that verb valency is only augmented in such syntactic environments. How might such a proposal mesh with the interactive sub-components of GB theory such as the Empty Category Principle (ECP), the θ -criterion and the Projection Principle?²¹ If event quantification is explicit at LF, then the combined force of the ECP, the Projection Principle and the θ -criterion ensure that (i) all verbs triggering QR (which seems to mean *all* verbs) must be subcategorized for the extra argument place at *all* syntactic levels (i.e., D-Structure, S-Structure and LF) and (ii) the variable left by QR (and hence bound by the event quantifier) is properly governed. From a purely technical point of view (i) and (ii) do not at first seem to present any insurmountable difficulties. Take the sentence (1) *Psmith saw Maja leave* and the proposed LF (41),

(41) [[Maja leave]_i] [Psmith saw t_i]].

Here the ECP is satisfied as the trace of *Maja leave* is properly governed by the matrix verb *saw*. In cases where there is an overt QP as in (38), presumably QR will take place cyclically yielding the LF (38'):

(38) Psmith saw some student leave
 (38') [Some student]_i[[t_i leave]_j] [Psmith saw t_j].

Here the variable t_i is properly governed since it is co-indexed with the QP *Some student* which governs it; and the variable t_j is properly governed by the matrix verb *saw*, so again no ECP violation arises.

But we have not yet addressed the third question: What triggers the raising of event quantifiers? And I fear it is answering this, while putting

together the rest of the syntactic and logical machinery that seems to be required, that we get into serious trouble. With standard QP's like *someone* or *every boy*, the idea is that QR is triggered by the presence of the QP at S-structure. Higginbotham's claim with respect to NI clauses is that they are "...from the point of view of interpretation, indefinite descriptions of individual events." Thus the existential character of NI clauses triggers QR in the same way as a standard QP does. So it seems that every n -place predicate becomes an $n + 1$ -place predicate when, and only when, it is in an NI clause. Even on the assumption that NI clauses are quantificational this is ad hoc as it requires us to view the number of thematic roles assigned by a verb as determined, at least in part, by whether or not it appears in its NI form. Not only does this go against the very spirit of θ -theory, but, as we have already seen, the syntactically driven account of event quantification that it engenders is thwarted by the existence and behaviour of NI complements to certain causative verbs.

The obvious way out of both difficulties is to make event quantification general. After all, on Davidson's original proposal the logical form of a simple sentence like *Maja left* will represent *leave* as a two-place predicate; i.e., *leave* will contain an extra quantifiable argument place. Indeed Higginbotham's claim that a sentence like (44) *Psmith bought a house* contains an implicit event quantification suggests that this is exactly what he has in mind. On this account there is a suppressed quantification in each of the LR's we have considered. SEEINGS are just as much events as LEAVINGS, and so by hypothesis the valency of *see* must be augmented to make room for quantification over SEEINGS. In the other words, one who makes this move will be recommending not (9) but (9') as the LF for (1):

- (1) Psmith saw Maja leave
- (9) $[\exists e: \text{leave}(\text{Maja}, e)]$ Psmith saw e .
- (9') $\exists e \exists e' [\text{leave}(\text{Maja}, e) \ \& \ \text{see}(\text{Psmith}, e, e')]$

But notice that once we decide to quantify over main verb events we lose the original character of Higginbotham's proposal in two ways. First, there seems to be no way of representing (9') in Higginbotham's favoured restricted quantifier notation, which is why I resorted to the more nearly predicate calculus formula above. From a *semantic* point of view (9') is impeccable, but now an account is needed of how it can be derived from S-structure. It's clear that QR alone will not do the trick. Second, the theory now has nothing to do with NI constructions per se. The original idea was to represent the logical forms of NI perceptual reports in such a

way as to make explicit a hidden quantification in such sentences. The triggering of QR was thus attributable to the existential character of the embedded NI clause. But if event quantification is general then the syntactic, logical, and interpretive character of NI clauses is quite superfluous.

A final problem with Higginbotham's analysis is that it predicts that quantified phrases in perceptual reports will have wide scope over event quantifiers. Consider a sentence like (46):

(46) Psmith saw every student leave.

On Barwise's account we see a single scene. Thus (46) might be used to describe a situation s as characterized in (47):

(47) $s \in \llbracket \text{see}(\text{Psmith}, s') \rrbracket^M \ \& \ \forall x (s' \in \llbracket \text{student}(x) \rrbracket^M \Rightarrow s' \in \llbracket \text{leave}(x) \rrbracket^M)$.

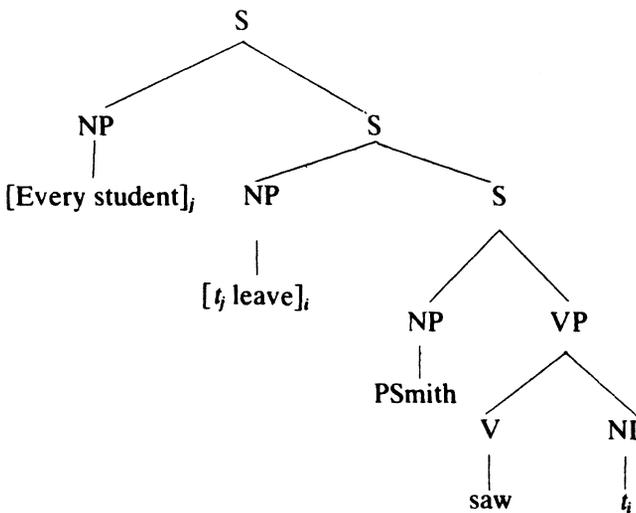
On Higginbotham's account, however, the S-structure underlying (46) will, by successive application of QR, be mapped into (47)a, then ((47)b,

(47)a. $\llbracket \text{Every student leave} \rrbracket_i \llbracket \text{Psmith saw } t_i \rrbracket$

(47)b. $\llbracket \text{Every student} \rrbracket_j \llbracket t_j \text{ leave} \rrbracket_i \llbracket \text{Psmith saw } t_i \rrbracket$

As we can see from the tree for the resulting LF, the traces left by QR are correctly within the scope of their respective QP's which have been Chomsky-adjoined to the S node immediately dominating prior to the relevant application.

(G)



The LR for (47)b is presumably (48),

(48) $[\forall x: \text{student}(x)] [\exists e: \text{leave}(x, e)]$ Psmith saw e .

Note that (48) entails that Psmith saw a collection of individual leaving events. Moreover, the scope of the quantifiers has to be this way as there is no reversal compatible with both (i) the strict restricted quantifier notation Higginbotham adopts (in order to derive the LF from S-Structure by QR), and (ii) the implementing of QR by Chomsky-adjunction to S. As long as QR does not have to take place cyclically it is *syntactically* possible to derive (48) with the order of the quantifiers reversed; but the resulting LF is uninterpretable because the variable x in the event quantifier will not be within the scope of the universal quantifier that is supposed to bind it. Alternatively, one might attempt to reverse the order of the quantifiers by analysing the internal structure of preposed QP's in such a way as to produce an LR something like (48'),

(48') $[\exists e: [\forall x: \text{student}(x)] \text{leave}(x, e)]$ Psmith saw e

The creation of a complex restricted quantifier does not by itself appear to be objectionable, but the required LF cannot be created by Chomsky-adjunction of *every student*. So it seems that Higginbotham's analysis makes a claim about the sorts of entities to be quantified over: events described by sentences like *Everybody left*, on a collective reading, are not, for syntactic reasons, admitted to the domain of quantification. Consequently the analysis will not make explicit the anaphoric relation possible in a sentence like (49):

(49) Psmith saw [every student leave]_{*i*} and Maja saw it_{*i*} too.²²

6. CONCLUSION

We saw in Sections 2 and 3 that Higginbotham's analysis of NI constructions not only makes no desirable empirical predictions beyond those made by Barwise's, it can only fully capture Barwise's *Negation* and *Veridicality* generalizations by postulating antonymic predicates at some level of logico-syntactic representation and introducing meaning postulates, roughly one for each predicate in the language.

In Section 4 we saw that Higginbotham's commitment to a syntactically motivated treatment of NI constructions leads his account to make two incorrect predictions concerning causative verbs, which, he notes,

appear to take NI complements. Contrary to Higginbotham's proposal, this seems to suggest that the sorts of generalizations that Barwise notes are not attributable to the superficial syntactic form of NI constructions alone.

In Section 5 we saw that the relation between LF and the first-order representations that Higginbotham makes use of is left thoroughly unclear. Attempts to spell out any sort of detailed proposal in a syntactic vein run into trouble with NI causative constructions. Although a central feature of the analysis is the use of the independently motivated logico-syntactic rule QR, we saw that its application to NI clauses creates substantial syntactic difficulties elsewhere in the GB framework. And to the extent that the syntax remains intact, serious problems emerge to do with valency incrementation, the triggering of QR, quantifier scope, and the number of events seen.

Although Higginbotham criticizes Barwise's account on the grounds of vagueness, we are really in no position to explore his alternative because it is inexplicit on so many important questions. Without some concrete proposals that make clear the relationships between *both* S-Structures and LF's *and* LF's and their interpretations there is no reason to regard it as a satisfactory alternative to a situation semantics treatment of NI perceptual reports.

NOTES

* The research for this paper was supported by NSF grant IST83-14396 and by a grant from the System Development Foundation to the Center for the Study of Language and Information. An earlier version was presented in a seminar at Stanford University and to a meeting of the Linguistics Association of Great Britain at the University of Liverpool in September 1985. I am indebted to Jon Barwise, James Higginbotham, Stanley Peters, and two anonymous referees for extensive comments. Thanks are also due to Martin Davies, John Etchemendy, Janet Fodor, Mark Johnson, Bill Ladusaw, Emma Pease, and Peter Sells.

¹ *Journal of Philosophy* 80, (February 1983), 100-127.

² *Journal of Philosophy* 77, (July 1981), pp. 269-397.

³ See Donald Davidson, 'The Logical Form of Action Sentences', in Nicholas Rescher (ed.), *The Logic of Decision and Action*, University Press, Pittsburgh, Pa., 1967, pp. 81-95, and Noam Chomsky, *Lectures on Government and Binding*, Foris, Dordrecht, 1981.

⁴ This idea was subsequently developed by Barwise and John Perry in their *Situations and Attitudes*, MIT Press, Cambridge, Mass., 1983.

⁵ The semi-formalism employed is not meant to suggest that logical representations play any role in Barwise's analysis; it's purpose is purely expository.

⁶ In the same way that substitutivity is generally assumed to fail in propositional attitude contexts, so exportability fails in the general case. For instance, one cannot infer from the truth of (i) *Psmith believes that someone robbed Maja*, to the truth of (ii) *There is someone whom Psmith believes robbed Maja*. The reason for this is that (i) is ambiguous with respect to de re and de dicto readings. *Exportability* is really the point that *see* does not admit of the relevant de dicto reading.

⁷ On Davidson's account, events are particulars identified by reference to their causal properties: for events e and e' , $e = e'$ if, and only if, e and e' have the same causes and effects. (See Donald Davidson, 'The Individuation of Events,' in *Essays on Actions and Events*, Oxford University Press, Oxford, 1980, pp. 163–180.) Nothing Higginbotham says commits him to Davidson's identity criterion; his proposal would be compatible with, e.g., a more discriminating criterion based on, e.g., necessity of spatio-temporal location.

⁸ *Ibid.*, p. 106.

⁹ A quantifier Q is monotone increasing just in case it is true that if (i) $Q(A, B)$, and (ii) $B \subseteq C$, then (iii) $Q(A, C)$, where A, B and C are predicate extensions.

¹⁰ I include what we might call *epistemically active* verbs like *watch, listen to, witness, notice, observe* etc. amongst the verbs of perception.

¹¹ The difference is perhaps that the latter subcategorize for NP S (or NP S'), and only superficially appear to take NI clauses. In fact, there might be good reasons for viewing verbs of perception as subcategorizing for just NP, and NI constituents as complex NP's. On such a view the S-structure of (1) might be [Psmith saw [_{NP} Maja_i [_S e_i leave]]], where e_i is an empty category co-indexed with the head NP *Maja*. Consider the following sentences:

- (i) Psmith saw Maja shoot Jones
- (ii) Psmith saw Jones shot by Maja

Neither (i) nor (ii) entails the other. If the active and passive embedded constituents really are clausal, the existence of such pairs poses a problem for Davidson, and for Barwise and Perry: both clauses are connected to the same truth supporting circumstances.

¹² The validity of (32) is disputed by some speakers. The same problem appears to come up with *allow*. There seem to be two interpretations of e.g., *Psmith allowed the specialist to examine Maja*, where *allowed* is understood as either "gave permission to (for)", or "did nothing to prevent". (See Susan Schmerling, 'Synonymy Judgments as Syntactic Evidence', in P. Cole, (ed.), *Syntax and Semantics, vol 9: Pragmatics*, Academic Press, New York, 1978, pp. 299–313.) I suspect the same is true for *let*, and that on the first reading (32) is invalid, whereas on the second, where there is a negation in the scope of a monotone decreasing quantifier, it is valid.

¹³ *Ibid.*, p. 107. I am in agreement with Higginbotham that derived nominals such as *Maja's departure* are definite descriptions. The claim that both derived and gerundive nominals (e.g. *Maja's leaving*) exhibit all the key syntactic and semantic characteristics of genuine Russellian definite descriptions is defended in my *Descriptions and Descriptive Thoughts*, PhD. dissertation, Stanford University (in preparation).

¹⁴ See, E.G., Chomsky, op. cit. and Higginbotham's, 'Pronouns and Bound Variables', *Linguistic Inquiry*, 11, (1980), 679–708.

¹⁵ Although it plays a very similar role in GB to the role *surface structure* played in earlier transformational grammar, strictly speaking S-structure is not the same as surface structure. For present purposes the differences are immaterial.

¹⁶ R. May: 1977, *The Grammar of Quantification*, Ph.D. dissertation, MIT, Cambridge, Mass.

¹⁷ Chomsky-adjunction of a constituent β to a node α creates a new node of the same type as α that immediately dominates both α and β . Thus in (F) a new S node has been created that dominates the original S node as well as the QP *some student*.

¹⁸ A constituent α *c-commands* a constituent β if, and only if, the first branching node dominating α also dominates β and neither α nor β dominates the other.

¹⁹ Incidentally, if (42) rather than (41) is the LF for *Psmith saw Maja leave*, then Higginbotham cannot hold onto the idea mentioned in Section 2 that sentences (13) *Psmith saw some student leave*, and (14) *There is some student whom Psmith saw leave*, have different LF's but a common first-order LR that makes explicit the *Exportability relation*.

²⁰ Higginbotham has since explicitly abandoned this distinction in favour of a uniform treatment in which all predicates contain the additional event place. See his, 'On Semantics', *Linguistic Inquiry*, 16, (1985), 547–593.

²¹ The following may be assumed as working definitions of these notions:

- (1) The ECP is a condition on well-formedness at LF. It dictates that if e is an empty category – such as the variable bound by a preposed NP or WH-phrase – then it must be *properly governed*.
- (2) Government is (roughly) the relation that the head of a phrase bears to its sister constituents. Constituent α *properly governs* constituent β if and only if (i) α governs β , and (ii) either (a) α is of one of the major lexical categories (noun, adjective, preposition or verb), or (b) α is co-indexed with β .
- (3) The θ -*criterion* requires that all thematic roles assigned by predicates be uniquely assigned to arguments at LF, and that all arguments be assigned unique thematic roles at LF. For instance the verb *hit* assigns agent and patient thematic roles to its subject and object respectively.
- (4) The *Projection Principle* requires that the thematic properties of each lexical item be represented categorially at each syntactic level, i.e., at D-Structure, S-Structure and LF.

²² Note the unacceptability of (50) **Psmith saw [every student leave]_i* and *Maja saw them_i too*, despite the acceptability of (49). Higginbotham has pointed out to me that in general it does not seem possible to interpret *Maja saw them* as meaning Maja saw two events, clausally described. For instance, we cannot get sentences like *I saw Psmith dance and Maja faint, but you didn't see either of them*, meaning that you saw neither Psmith dance nor Maja faint. This is curious as there is nothing wrong with *I saw Psmith dance and Maja faint, but you didn't see either*, interpreted as required.

Department of Philosophy
Stanford University
Stanford CA 94305
U.S.A.