

## Predicates and Formulas: Evidence from Ellipsis

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It is nowadays standardly thought that the compositional interpretation of filler-gap dependencies (binding) involves the creation and saturation of a function-denoting expression (the scope term) by an expression that takes that function as its argument (the binder). This idea is implemented in a number of different ways (e.g., Heim and Kratzer’s (1998) rule of Predicate Abstraction, function composition, etc.), but the standard view is that the scope constituent denotes a function from individuals to the type that the constituent would have if there were no gap. My goal in this talk is to revisit an argument from ellipsis, first made by Heim (1997), that the standard view is incorrect, and that instead the scope term denotes an open expression in which the gap introduces a free variable. Heim’s own proposal was shown to be empirically inadequate by Jacobson (1998); in this talk, I provide a new semantics for binding based on Sternefeld 1998 and Kobele 2010 that provides a full account of the facts.

The crucial data involve a pattern of acceptability in antecedent-contained VP deletion (ACD) first discussed in Kennedy 1994. Descriptively, ACD is unacceptable when the argument position bound inside the elided VP (which is part of a relative clause) is associated with a quantificational DP that is distinct from the one that binds the corresponding argument position in the antecedent (matrix) VP. This pattern is illustrated by the pair in (1), and holds across a range of examples involving different internal argument positions.

- (1) a. Polly read every bok Erik did [~~VP-try~~].  
b. \* Polly read every book recommended by someone who wrote a book Erik did [~~VP-read~~].

Using the theory of ellipsis in Rooth 1992, Heim (1997) shows that the standard view of binding fails to explain this pattern. Ellipsis is licensed when two VPs are contained in non-overlapping, contrasting structures, such that the denotation of the constituent containing the antecedent VP is a member of the focus value of the constituent containing the elided VP. In the standard view, the parallel constituents in (1a) are the relative clause restriction of the quantifier and the quantifier’s scope, marked  $R$  and  $S$  in (2). (I will speak in LF-terms in this abstract, but the same reasoning carries over to direct interpretation.)

- (2) [every book [ $R$  wh 1 Erik did [~~VP-read- $t_1$ ]]] [ $S$  2 Polly PAST [~~VP-read- $t_2$ ]]]~~~~

Here the focus semantic value of  $R$  is the set of  $\langle e, t \rangle$  functions true of  $x$  iff  $y$  read  $x$ , where  $y$  is an alternative to Erik.  $S$  denotes a function in this set, and so ellipsis is licensed. The problem is that (1b) also contains instances of  $R$  and  $S$  with exactly the same denotations as in (1a), and so ellipsis is incorrectly licensed. Crucially, the fact that the variables introduced by the VP-internal traces are distinct is irrelevant, because on the standard view these positions correspond to the argument slots of the restriction and scope functions, and so do not introduce variability in meaning across assignment functions.

Heim accounts for the contrast in (1) by revising the semantics of binding in a way that makes  $R$  and  $S$  vary across assignments. Specifically, she proposes that the restriction and scope terms of a quantifier denote open propositions, and that variable-denoting expressions may be coindexed only when co-bound. This gives the following LFs for (1a-b):

- (3) a. [every book [ $R$  Erik did [~~VP-read- $t_1$ ]]] [ $S$  Polly PAST [~~VP-read- $t_1$ ]]]  
b. [every book ... a book [ $R$  Erik did [~~VP-read- $t_1$ ]]] [ $S$  Polly PAST [~~VP-read- $t_2$ ]]]~~~~~~~~

Ellipsis is licensed in (3a), because even though  $R$  and  $S$  have assignment-dependent meanings, coindexation of the VP-internal traces ensures identity across assignments. In contrast, obligatory non-coindexation in (3b) entails lack of identity across assignments, and ellipsis is ruled out. Unfortunately, Heim’s analysis also requires non-coindexation in examples like (4), and so incorrectly predicts that ellipsis should be impossible here (Jacobson 1998).

- (4) [every book [ $R_1$  Erik [~~VP-read- $t_1$ ]]] was longer than [every book [ $R_2$  Polly did [~~VP-read- $t_2$ ]]]~~~~

Intuitively, what we need is an analysis that treats restriction terms in the standard way (if  $R1$  and  $R2$  in (4) denote expressions of type  $\langle e, t \rangle$ , then ellipsis is licensed for the reasons outlined above) but treats scope terms as open propositions, as in Heim’s analysis. This sounds *ad hoc*, but I show that in fact it follows from a semantics for binding in which assignment functions are part of the model (Sternefeld 1998; Kobele 2010). The crucial elements of the analysis are listed in (5), where  $a$  is the type of assignment functions.

- (5) a.  $\beta^i [\alpha \dots t_i \dots]$   
 b. If  $\llbracket \beta \rrbracket^g$  is type  $\langle \langle e, t \rangle, \tau \rangle$ , then  $\llbracket \beta^i \rrbracket^g = \lambda p_{\langle a, t \rangle} . \llbracket \beta \rrbracket^g (\lambda x . p(g[i/x]))$   
 c. If  $\llbracket \beta \rrbracket^g$  is type  $\langle \langle a, t \rangle, t \rangle$  and  $\llbracket \alpha \rrbracket^g$  is type  $t$ , then  $\llbracket \beta \alpha \rrbracket^g = \llbracket \beta \rrbracket^g (\lambda g . \llbracket \alpha \rrbracket^g)$   
 d.  $\llbracket wh \rrbracket^g = \lambda f_{\langle e, t \rangle} . f$

(5a) gives the syntax of filler-gap dependencies for the case of movement of  $\beta$  to  $\alpha$ . The subscript index on the trace is interpreted as usual, but the superscript index on the binder triggers the type-shifting rule in (5b), which maps a second-order property of individuals to a second-order property of assignment functions. (5c) is the composition rule for binding, which can be thought of as a specific version of a more general rule that facilitates function application by abstraction over a parameter of evaluation (cf. von Fintel and Heim’s (2007) rule of Intensional Functional Application). Finally, (5d) analyzes the relative operator as an identity function of type  $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$ . (6) shows the derivation of the denotation of a relative clause; (7) compares the case of binding by a generalized quantifier.

- (6)  $\llbracket wh^i \rrbracket^g (\lambda g . \llbracket Erik \text{ read } t_i \rrbracket^g)$   
 $\llbracket \lambda p_{\langle a, t \rangle} . \lambda f . f (\lambda x . p(g[i/x])) \rrbracket (\lambda g . \mathbf{read}(g(i))(\mathbf{e}))$   
 $\lambda f . f (\lambda x . \llbracket \lambda g . \mathbf{read}(g(i))(\mathbf{e}) \rrbracket (g[i/x]))$   
 $\lambda f . f (\lambda x . \mathbf{read}(g[i/x](i))(\mathbf{e}))$   
 $\lambda f . f (\lambda x . \mathbf{read}(x)(\mathbf{e}))$   
 $\lambda x . \mathbf{read}(x)(\mathbf{e})$
- (7)  $\llbracket every \text{ book}^i \rrbracket^g (\lambda g . \llbracket Polly \text{ read } t_i \rrbracket^g)$   
 $\llbracket \lambda p_{\langle a, t \rangle} . \forall x [\mathbf{book}(x) \rightarrow p(g[i/x])] \rrbracket (\lambda g . \mathbf{read}(g(i))(\mathbf{p}))$   
 $\forall x [\mathbf{book}(x) \rightarrow \llbracket \lambda g . \mathbf{read}(g(i))(\mathbf{p}) \rrbracket (g[i/x])]$   
 $\forall x [\mathbf{book}(x) \rightarrow \mathbf{read}(g[i/x](i))(\mathbf{p})]$   
 $\forall x [\mathbf{book}(x) \rightarrow \mathbf{read}(x)(\mathbf{p})]$

In both cases, the scope of the binder is an open proposition, but in (6) we derive a standard type  $\langle e, t \rangle$  meaning for the relative clause (and potentially for *wh*-structures in general), which gives us what we need to license ellipsis in (4) and other non-overlapping binder-variable constructions. At the same time, because the scope of a binder is assignment-dependent relative to its base position, we also maintain Heim’s analysis of the contrast in (1a-b), which are parsed as in (8a-b), given the additional assumption that all binders bear unique indices, except for relative pronouns, whose indices agree with the DP they modify (cf. agreement of  $\phi$ -features).

- (8) a. [every book  $[_R wh^i$  Erik did  $[_{VP} \text{read } t_i]$ ] $^1$  [ $_S$  Polly PAST  $[_{VP} \text{read } t_i]$ ]  
 b. [every book ... a book  $[_R wh^i$  Erik did  $[_{VP} \text{read } t_i]$ ] $^2$  [ $_S$  Polly PAST  $[_{VP} \text{read } t_2]$ ]

I conclude by showing that the analysis can also handle the interaction of ACD and pied-piping discussed in Jacobson 1998, as well as the “head identity” effects discussed in Sauerland 2004. The general framework that emerges is one in which binding in filler-gap dependencies can be characterized strictly in terms of function application, without the need for syncategorematic rules like Heim and Kratzer’s rule of Predicate Abstraction.

## References

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