**A unified explanation for crossover and superiority in a theory of binding by generalized predicate abstraction**

We introduce a theory of quantificational binding in which the relationship between a binder and a bindee is established by covert (i.e., semantic) movement of the bindee to a position adjacent to the binder. This theory requires little of the semantic interpretation machinery beyond the standard assumption (Heim and Kratzer 1998) that movement corresponds to semantic abstraction. By relating binding to movement, our theory unifies crossover effects in the domain of quantificational binding and superiority effects in the domain of *wh*-movement.

To spell out what we mean by *generalized predicate abstraction* (henceforth "GPA"), suppose that one element $\alpha$ moves to adjoin to another element $\beta$, forming $\beta'$ as in (1). The semantic type of $\alpha$ must be of the form $(\tau \to \omega) \to \omega'$, where $\tau$, $\omega$, and $\omega'$ are types. At the tail of its chain, $\alpha$ is interpreted as a variable of type $\tau$, over which $\beta$ denotes a $\lambda$-abstraction of type $\tau \to \omega$. At the head of the chain, $\alpha$ is interpreted a functional of type $(\tau \to \omega) \to \omega'$, and combines with $\beta$ by function application to give $\beta'$, which has semantic type $\omega'$.

For example, quantifier raising, as shown in (2), is a special case of GPA where the types $\tau$, $\omega$, and $\omega'$ are $e$, $t$, and $t$, respectively; thus quantificational NPs take type $(e \to t) \to t$. The key to the analogy between quantificational binding and *wh*-questions is that Karttunen's (1977) semantics for questions can also be implemented with GPA, as in (3). Here we set $\tau$ to $t$ and $\omega = \omega'$ to the semantic type of questions, say $q$. Thus interrogative NPs take type $(e \to q) \to q$.

Quantificational binding is illustrated in (4). Pronouns like *him* and *her* denote $\lambda c.\, \lambda x.\, c(x)(x)$, of type $(e \to (e \to \alpha)) \to (e \to \alpha)$ where $\alpha$ is any type. In (4a), *him* moves to adjoin above V, giving the clause its type $e \to t$. This is an instance of GPA where $\omega$ and $\omega'$ are both $e \to t$. Among the types for a quantificational NP is $(e \to (e \to t)) \to t$; for example, *every boy* might denote $\lambda c.\, \forall x.\, \textsc{boy}(x) \Rightarrow c(x)(x)$. It is a theorem of the system that, in order for binding to take place, the binder must move across the bindee. In other words, the binder's target position must c-command the bindee's, forming what Richards (1997) calls a *tucking in* configuration.

The analogy is now straightforward between weak crossover and superiority: Weak crossover is failure to tuck in when adjoining to V (as in (5)), whereas superiority is failure to tuck in when adjoining to Q (as in (6)). Furthermore, quantificational NPs in this analysis behave like referring expressions for the purposes of predicate-argument structure; if predicate-argument structure is where Condition B is active, then strong crossover (as in (7)) violates Condition B in addition to being a special case of weak crossover. Thus we expect, as is borne out, that strong crossover is worse than weak crossover.

The resulting analysis bears a superficial resemblance to Chomsky's (1986) proposal that (part of) a reflexive anaphora must move to a position near its binder. However, our approach is much closer in spirit and in many details to Jacobson's (1999) variable-free semantics, in which a bound pronoun affects the semantic type of each constituent that contains it up to the position of the binder, and also to Dowty's (1999) type-logical theory of quantificational binding, on which bound pronouns must defer their interpretation until the point in the composition immediately preceding combination with the binder. Our analysis, of course, explicitly generalizes to *wh*-questions, and we will discuss other important differences.

## Examples

(1) $[_{\beta'}\ \alpha\ [_{\beta} \ldots\ t \ldots]]$

(2) a. $[_{\beta'}$ $[_{\alpha}$ most people] $[_{\beta}$ Alice loves t]]  b. [someone [everyone [t loves t]]]

(3) a. $[_{\beta'}$ $[_{\alpha}$ who] $[_{\beta}$ Q [Alice loves t]]]  b. [who [what [Q [t loves t]]]]

(Q is a silent morpheme that maps each proposition to a trivial question. Its type is $t \to q$.)

(4) a. Every boy$_{\mathrm{i}}$ loves his$_{\mathrm{i}}$ mother.  b. [every boy [his [V [t loves t mother]]]]

(V is a silent morpheme. It denotes $\lambda x.\ \lambda y.\ x$, of type $t \to (e \to t)$.)

(5) a. *His$_{\mathrm{i}}$ mother loves every boy$_{\mathrm{i}}$.  b. *[every boy [his [V [t mother loves t]]]]

(6) a. *What does who love?  b. *[what [who [Q [t loves t]]]]

(7) a. *He$_{\mathrm{i}}$ loves every boy$_{\mathrm{i}}$.  b. *[every boy [he [V [t loves t]]]]

## References


Chomsky, Noam. 1986. *Knowledge of language: Its nature, origin, and use*. Westport, CT: Praeger.

Dowty, David. 1999. Anaphora and type logical grammar. Stanford linguistics colloquium; `http://ling.ohio-state.edu/~dowty/`.

Heim, Irene, and Angelika Kratzer. 1998. *Semantics in generative grammar*. Oxford: Blackwell.

Jacobson, Pauline. 1999. Towards a variable-free semantics. *Linguistics and Philosophy* 22(2):117–184.

Karttunen, Lauri. 1977. Syntax and semantics of questions. *Linguistics and Philosophy* 1(1):3–44.

Richards, Norvin W. 1997. What moves where when in which language? Ph.D. thesis, Department of Linguistics and Philosophy, MIT.