Semantics and Pragmatics 1 — Fall 2011
Assignment 6 — Due November 8

Quantifier Scope Ambiguity

In class, we assumed that quantificational determiners (QDets) have the basic semantic type $\langle\langle e,t\rangle,\langle\langle e,t\rangle,t\rangle\rangle$, and denotations along the lines of (1), where f_S and g_S represent the sets of things that satisfy f and g, respectively:

(1) $[\![QDet]\!] = [\lambda f_{\langle e,t\rangle}[\lambda g_{\langle e,t\rangle}.f_S\ \mathbf{R}\ g_S]]$

On this view, QDets express relations between the set of things that satisfy the function provided by the nominal material (the "restriction" of the quantifier) and the set of things that satisfy a function computed on the basis of the meaning of the rest of the sentence (the "scope" of the quantifier).

For example, *every* requires the set of things that satisfy its restriction to be a subset of the set of things that satisfy its scope, as in (2a); *two* requires the cardinality of the intersection of the sets of things that satisfy its restriction and scope to be equal to (or at least as great as) 2, as in (2b).[1]

(2) a. $[\![every]\!] = [\lambda f_{\langle e,t\rangle}[\lambda g_{\langle e,t\rangle}.f_S \subseteq g_S]]$
b. $[\![two]\!] = [\lambda f_{\langle e,t\rangle}[\lambda g_{\langle e,t\rangle}.\mid f_S \cap g_S \mid= 2]]$

Quantified NPs (QNPs), which consist of a QDet plus its nominal complement, are thus of type $\langle\langle e,t\rangle,t\rangle$. This semantic type straightforwardly accounts for sentences in which QNPs occur in subject position, since they can compose directly with the main predicate (assuming as we have been that it is type $\langle e,t\rangle$), but we run into problems with QNPs in direct object position (and other internal argument positions). In class, we considered two ways to repair the resulting type mismatch:

1. We can shift the type of the quantifier (or, in principle, that of the verb) in such a way as to make composition possible. In the case of the QDet *every* in direct object position, the type-shifted version of the basic meaning would be as shown in (3a), which is equivalent to (3b), once we plut in the basic denotation in (2a).

   (3) a. $[\![every_{Obj}]\!] = [\lambda f_{\langle e,t\rangle}[\lambda g_{\langle e,et\rangle}[\lambda x.[\![every]\!](f)((\lambda z.g(z)(x))]]]$
   b. $[\![every_{Obj}]\!] = [\lambda f_{\langle e,t\rangle}[\lambda g_{\langle e,et\rangle}[\lambda x.f_S \subseteq [\lambda z.g(z)(x)]_S]]]$

2. We can posit a syntactic object (or objects, possibly associated with case morphology) which mediates between the QNP and the verb, ensuring type compatibility in a way that gets the meaning right. In the case of direct objects,

[1] As we saw in class, for some quantifiers (like *every*), we can also use predicate logic as a metalanguage for representing truth conditions, but for others (like *most*), we need to characterize the meaning in terms of relations between sets. For the purpose of this assignment, you can choose whichever representations you want, though if you choose to use predicate logic make sure that you define any new expressions you introduce. (E.g., if you want to introduce a special quantifier for numerals.)

the relevant syntactic expression "F_{QObj}" would have the denotation in (4a). Composition with a direct object QNP like *every dog* would then produce the denotation in (4b).

(4) a. $[\![\text{F}_{QObj}]\!] = [\lambda Q_{\langle et,t\rangle}[\lambda g_{\langle e,et\rangle}[\lambda x.Q(\lambda z.g(z)(x))]]]$

b. $[\![\text{F}_{QObj}]\!]([\![\text{every dog}]\!]) =$
$[\lambda Q_{\langle et,t\rangle}[\lambda g_{\langle e,et\rangle}[\lambda x.Q(\lambda z.g(z)(x))]]]([\lambda h_{\langle et,t\rangle}.[\![dog]\!]_S \subseteq h_S]) =$
$[\lambda g_{\langle e,et\rangle}[\lambda x.[\lambda h_{\langle et,t\rangle}.[\![dog]\!]_S \subseteq h_S](\lambda z.g(z)(x))]] =$
$[\lambda g_{\langle e,et\rangle}[\lambda x.[\lambda h_{\langle et,t\rangle}.[\![dog]\!]_S \subseteq [\lambda z.g(z)(x)]_S]]]$

A Adopt one of the two analyses of object QNPs listed above and show how the analysis derives the correct truth conditions for (5).

(5) Kim accompanied every diplomat.

B Now consider (6), which is just like (5) except that the subject is also a QNP. (6) is also ambiguous: its truth conditions can be paraphrased either as in (6a) or as in (6b). (You should be able to convince yourself that these are not equivalent.) This is an example of a "quantifier scope ambiguity".

(6) Two aides accompanied every diplomat.

a. Two aides are such that they accompanied every diplomat.

b. Every diplomat is such that s/he was accompanied by two (possibly different) aides.

Do the assumptions about subject and object quantifier types that we made in class (and which are summarized above) correctly predict the ambiguity of (6)? In other words, do these assumptions derive *two* sets of truth conditions for (6), equivalent to the paraphrases in (6a-b), or do they fail to account for the existence of these two interpretations? Show the crucial part(s) of the semantic derivation of (6) that does or does not give us the outputs we want. You may abbreviate anything that is the same as what you did for (5), but be sure to go through any new bits of semantic derivation, in particular the integration of the quantificational subject into the structure.

C If you determined that our current set of assumptions fails to correctly account for the ambiguity of (6), propose a modification to our assumptions that does account for the facts. In thinking about this problem, you should also consider other types of sentences, involving QNPs in other syntactic positions. Your aim should be to construct an analysis that provides an account for as broad a range of facts as possible, in as general a way as possible.