Function Composition, Movement Structures, and Quantifier Scope

In these notes, you will be introduced to a system that can interpret quantificational DPs without making use of either (i) covert movement, or (ii) type shifters, *and* which can capture certain aspects of the 'Movement-Scope Generalization'.

1. Syntactic Background: Right Node Raising

Thus far, we've assumed that sentences like (1a) have the (surface) structure in (1b), where the verb and the object form a constituent to the exclusion of the subject.

(1) a. *Sentence:* Barack likes Joe.
b. *(Surface) Structure:* [$_S$ Barack [$_{VP}$ likes Joe]]

A potential problem for the syntax in (1b) is so-called 'Right Node Raising' (RNR) structures like those in (2a), where it seems as if the *subject* and the verb form a constituent to the exclusion of the *object* (2b).

(2) a. *Sentence:* Barack likes, but Michelle hates, Joe.
b. *(Surface) Structure:* [[**[Barack likes]** and **[Michelle hates]**] Joe]

Now, such RNR structures have been studied for decades. There are at least two possible views as to what's going on in these structure.

(3) **Two Possible Views of Right Node Raising**

a. Rightward (Across the Board) Movement:
In the RNR structure, the direct object undergoes rightward (across-the-board) movement from the conjunction:

[[**[**$_S$ **Barack [likes** t_1 **]]** and **[**$_S$ **Michelle [hates** t_1 **]]**] Joe$_1$]

b. The Verb and the Subject form a Constituent:
In the RNR structure, there is a *special rule* that allows the verb and the subject to form a constituent to the exclusion of the object.
- That is, these are normal conjunction structures, without any movement.

[[**[Barack likes]** and **[Michelle hates]**] Joe]

Let's put aside the analysis in (3a), and pursue the view in (3b). This view implies that there is a special syntactic rule that allows the subject *Barack* and the verb *likes* to form a constituent.

- Thus, this view would imply that sentence (1a) is actually syntactically ambiguous, and could (optionally) be parsed as in (4) below.

(4) **Alternate Parse for (1a)** [$_S$ [Barack likes] Joe]

2. Semantic Background: The Rule of Function Composition

Now, if (4) is a possible structure for (1a), *how does it get interpreted?*

- Notice that we need the structure in (4) to have the same truth-conditions as (1b).

(5) **Desired Semantic Result:** [[[$_S$ [Barack likes] Joe]]] = T *iff* Barack likes Joe

Our first key ingredient here will be the following type-shifting operator from Problem Set 7.

(6) **Type Shifting Operator for Proper Names**
[[$SHIFT_{Names}$]] = [λx_e : [$\lambda f_{<et>}$: f(x) = T]]

Now, let us introduce the following new semantic interpretation rule.

(7) **The Rule of Function Composition (FC)**
If X is a node whose daughters are Y and Z, and if [[Y]] is of type <α,β>, while [[Z]] is of type < β,γ > then [[X]] is the following function of type <α,γ>:

[[X]] = [λf_α : [[Z]]([[Y]](f))]

What This Function Does:
[[X]] takes an argument *f* of type α and then does the following:

(i) it inputs *f* into the extension of Y
(ii) it inputs the result of [[Y]](f) – which is of type β - into the extension of [[Z]]

With this rule, we can obtain the desired semantic result in (5)…

(8) **Derivation of the Truth-Conditions in (5)**

a. [[Barack $SHIFT_{Names}$]] = [$\lambda f_{<et>}$: f(Barack) = T]] (by TN, FA, LC)

b. [[likes]] = [λx_e : [λy_e : y likes x]] (by TN)

c. [[[[Barack $SHIFT_{Names}$] likes]]] = (by FC)

[λx_e : [[Barack $SHIFT_{Names}$]]([[likes]](x))] = (by 8b, LC)

[λx_e : [[Barack $SHIFT_{Names}$]]([λy_e : y likes x])] = **(by 8a)**

[λx_e : [$\lambda f_{<et>}$: f(Barack) = T]([λy_e : y likes x])] = **(by LC)**

[λx_e : [λy_e : y likes x](Barack) = T] = **(by LC)**

[λx_e : Barack likes x]

d. [[Joe]] = Joe (by TN)

e. [[[[[Barack SHIFT$_{Names}$] likes] Joe]]] = (by FA, (8c-d))

[λx_e : Barack likes x](Joe) = T *iff* (by LC)

Barack likes Joe.

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3. Applying the Machinery to Movement Structures

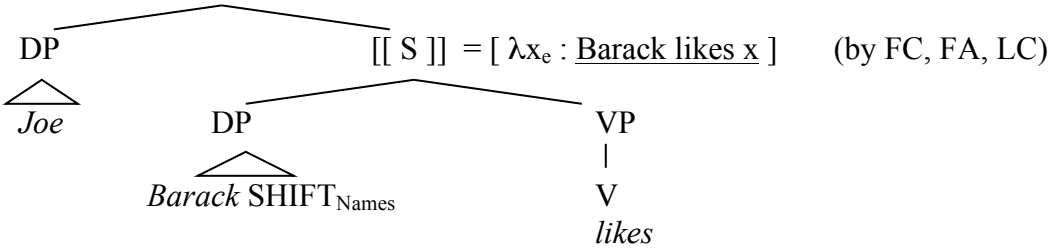
With our rule of Function Composition, we can also interpret topicalization structures like (9a), by assuming that they simply have the structure in (9b).

- *Note that in the assumed structure in (9b), there are no traces or copied indices*

(9) **Interpreting Topicalization via Function Composition**

a. Sentence: Joe, Barack likes.

b. [[S']] = T *iff* Barack likes Joe (by FA, LC)



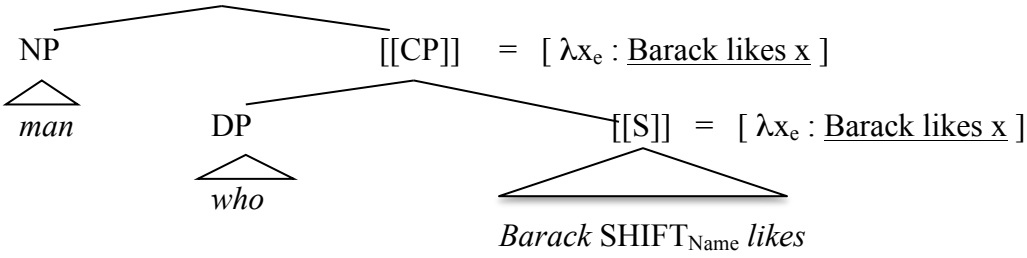
This rule will also allow us to interpret relative clauses like (10a), by assuming that they simply have the structure in (10b)

- *Note again that the assumed structure in (10b) has no traces or copied indices*

(10) **Interpreting Relativization via Function Composition**

a. Relative Clause: man who Barack likes

b. [[NP]] = [λx_e : x is a man and Barack likes x] (by PM, LC)



4. Applying the Machinery to Quantificational DPs in Non-Subject Position

Just as sentence (11a) is ambiguous between the parses in (11b,c), we can suppose that sentence (12a) is ambiguous between parses (12b) and (12c).

(11) **Assumed Syntactic Ambiguity of Transitive Sentences**

a. Sentence: Barack likes Joe.

b. VP-Parse: [Barack [likes Joe]]

c. FC-Parse: [[Barack SHIFT likes] Joe]

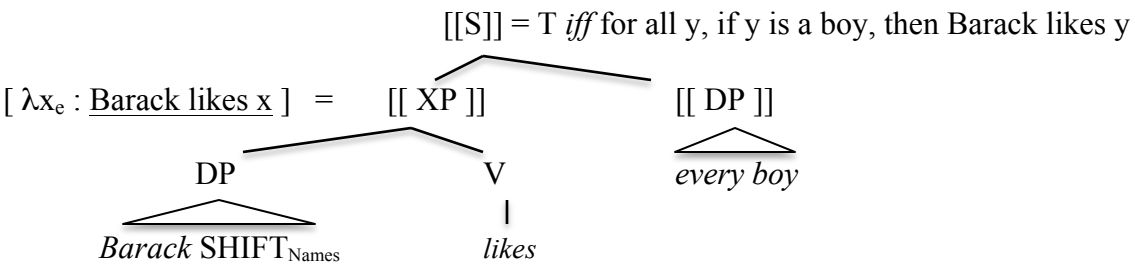
(12) **Assumed Syntactic Ambiguity of Transitive Sentences**

a. Sentence: Barack likes every boy.

b. VP-Parse: [Barack [likes every boy]]

c. FC-Parse: [[Barack SHIFT likes] every boy]

(13) **Key Observation**
Under the FC-based parse in (12c), the sentence in (12a) is interpretable, *even though we don't make use of any covert movement or type shifters on the quantificational DP (or V).*



Similarly, we can assume that sentence (14a) is ambiguous between the parses in (14b) and (14c)

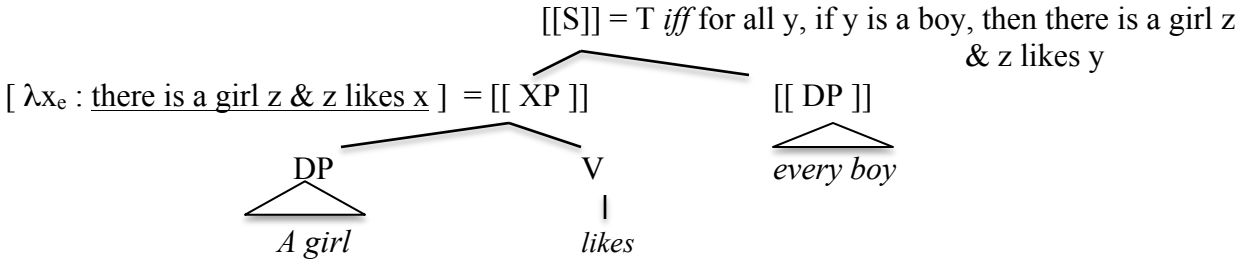
(14) **Assumed Syntactic Ambiguity of Transitive Sentences**

a. Sentence: A girl likes every boy.

b. VP-Parse: [A girl [likes every boy]]

c. FC-Parse: [[A girl likes] every boy]

(15) **Key Observation**
Under the FC-based parse in (14c), sentence (14a) is interpretable, *and it receives a reading where the object 'every boy' has scope above the subject 'a girl'.*



(16) **Interim Summary**
We have a single 'mechanism' – the rule of Function Composition (FC) – which can be used to both (i) interpret movement structures, and (ii) interpret structures where a quantificational DP occupies a non-subject position.

- Moreover, this mechanism does not appeal to covert movement.
- Nor does this mechanism require a type shifter on the quantificational DP or the verb

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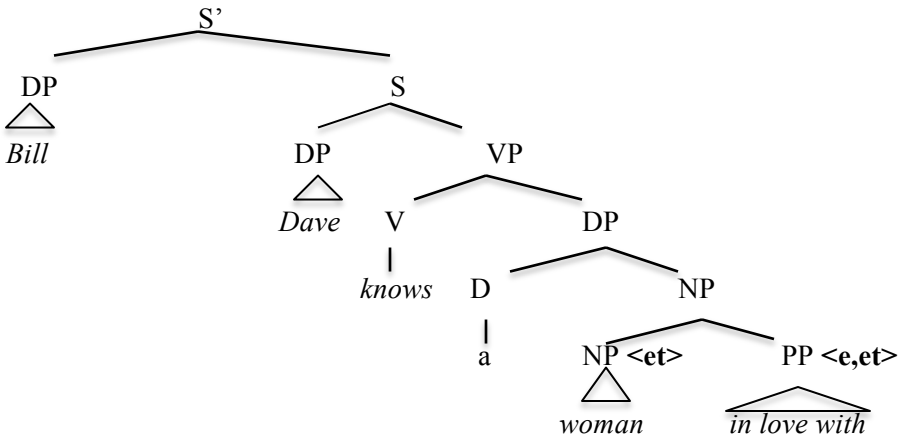
5. Major Consequence: No Movement or Scoping Out of Adjunct Modifiers

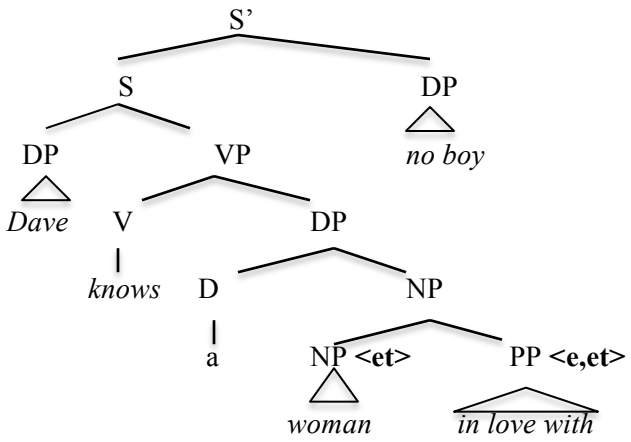
(17) **No Movement Out of Adjunct Modifiers**
Even if we could somehow generate the 'movement structure' below syntactically, *our semantics would not be able to interpret it.*



The Problem: There's no way of combining the PP *in love with* with the NP *woman…*

- **Function Composition won't work here (the types aren't right)**
- **Predicate Modification can't work either (the types aren't right)**

(18) **No Scoping Out of Adjunct Modifiers**
Even if we could somehow generate the 'inverse scope structure' below syntactically, *our semantics would not be able to interpret it.*



The Problem: There's no way of combining the PP *in love with* with the NP *woman*…

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- **Predicate Modification can't work either (the types aren't right)**

(19) **The Main Upshot**

a. In the system that we've just developed, we predict that neither of the following things are possible:

(i) A DP 'moving' from inside an NP modifier to a position outside the NP modifier
(ii) A quantificational DP pronounced inside an NP modifier being interpreted as scoping outside the NP modifier.

b. In a similar way, our system will predict that neither of the following things are possible:

(i) A DP 'moving' from inside a clausal adjunct to a position outside the clausal adjunct.
(ii) A quantificational DP pronounced inside a clausal adjunct being interpreted as scoping outside the adjunct.

c. **Our system thus captures an important sub-part of our Movement-Scope Generalization.**

d. It does this without postulating *covert movement* in sentences like *Barack likes every boy*.

e. **However, as in the covert movement analysis, one-and-the-same mechanism is being used to interpret 'movement structures' and structures where quantificational DPs occupy non-subject position…**

For more on the use of function composition in semantics, see:
Jacobson, Pauline. 2014. *Compositional Semantics: An Introduction to the Syntax/Semantics Interface*. Oxford University Press.