Quantification and scope

1 Class updates

- **Schedule updates:** The syllabus is updated online. Next week we'll discuss ellipsis.

- **Final papers** are due April 15. "Should be approximately 10 pages. The paper should identify an original puzzle, in a language you speak or in another language by working with a native speaker consultant. Use the skills developed in class to carefully diagnose and describe the issue, and sketch a possible solution."

  Advice for finding a topic: Look around your language for functional morphology or constructions whose meanings are not immediately obvious. Using the Principle of Compositionality, figure out what its semantic contribution is.

  A sample outline:

  1. Introduction: I am studying X and I will propose that it means X.
  2. Some basic data: Comparing minimal pairs of sentences with X and without X, we see that X must contribute Y meaning. X is grammatical in these sentences but not those others. A generalization for X's meaning and/or distribution is Z.
  3. Proposal: I propose X's denotation is $[\![X]\!]$. Here are trees and computations for a couple examples above, showing that my proposed denotation yields the desired meaning.
  4. Conclusion / open questions / problems with this analysis

  This is just one sample; your paper does not have to follow it closely.

  Advice for writing: Follow the advice in this short set of guidelines to writing Linguistics papers: `https://mitcho.com/teaching/newmeyer1988.pdf`.

  If you want to work on another language, through elicitation: I would suggest looking at expressions for universal quantifiers (*every student*) or words like 'only,' 'also,' 'again.'

  Talk to me or email me about your topic by March 15 and I can give you some comments and/or references.

- **Extra session?** I'd like to schedule an (optional) extra session to answer any technical questions and go over problems from the problem sets. Is this better sooner? Or later, before the final?

2 Subject quantifiers

The DPs we have studied so far have generally been of type e. Let's now consider subject DPs like *everyone*, *no one*,[1] and *someone*.

(1) Everyone sleeps.

Option 1: Include "plurals" in D_e, including a symbol that refers to 'nothing,' ϵ. *Everyone* is type e, the sum of all individuals.

(2) a. $D_e = \left\{ \begin{array}{c} \epsilon\text{, John, Mary, Kara,} \\ \text{John + Mary, John + Kara, Mary + Kara,} \\ \text{John + Mary + Kara} \end{array} \right\}$

b. $[\![\text{everyone}]\!]$ = John + Mary + Kara (type e)

c. $[\![\text{everyone sleeps}]\!]$ = 1 iff (John + Mary + Kara) sleeps

This sort of works for *everyone*, but it does not work for *no one* and *someone*. Why?

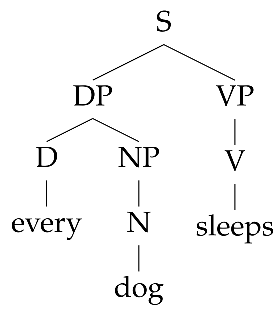
Option 2: *Everyone* is not type e.

(3) a. $[\![\text{everyone}]\!] = \lambda Q_{\langle e,t \rangle} \,.\, \forall x \in D_e\ [x \text{ is animate} \rightarrow Q(x)]$[2]

b. $[\![\text{everyone sleeps}]\!] = 1$ iff $\forall x \in D_e\ [x \text{ is animate} \rightarrow x \text{ sleeps}]$

3 Quantificational determiners

Let's now consider quantificational determiners:



(4) **Example quantifiers as set-relations, from Week 2:**

a. $every(A)(B) = 1$ iff $A \subseteq B$

b. $a/some(A)(B) = 1$ iff $A \cap B \neq \emptyset$

c. $more\text{-}than\text{-}two(A)(B) = 1$ iff $|A \cap B| > 2$

Because we normally work with truth conditions and functions, not sets, we have to translate (4a) into non-set terms:

(5) $[\![\text{every dog sleeps}]\!] = \{x : x \text{ is a dog}\} \subseteq \{y : y \text{ sleeps}\}$

$\Leftrightarrow \forall z \in \{x : x \text{ is a dog}\}\ [z \in \{y : y \text{ sleeps}\}]$

$\Leftrightarrow \forall z \in D_e\ [\ \underbrace{z \text{ is a dog}}_{\text{D's first argument}} \rightarrow \underbrace{z \text{ sleeps}}_{\text{D's second argument}}\ ]$

(6) $[\![\text{every}]\!] = \lambda P_{\langle e,t \rangle} \,.\, \lambda Q_{\langle e,t \rangle} \,.\, \forall x[P(x) \rightarrow Q(x)]$

[1]Although we spell this as two words, "no one," we will treat it as one word, just like *nothing*.
[2]Think of "→" as *if...then*.

4 Quantifier scope

(7) Everyone does not sleep (during class).

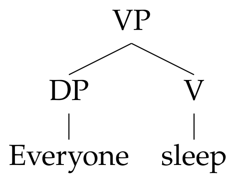
a. $$1 \text{ iff } \forall x \in D_e \underbrace{\left[x \text{ is animate} \rightarrow \text{it's not that } \underbrace{[x \text{ sleeps (during class)}]}_{\text{scope of } not} \right]}_{\text{scope of } \forall} \qquad (\forall > not)$$

b. $$1 \text{ iff it's not that } \underbrace{\left[\forall x \in D_e \ \underbrace{[x \text{ is animate} \rightarrow x \text{ sleeps (during class)}]}_{\text{scope of } \forall} \right]}_{\text{scope of } not} \qquad (not > \forall)$$

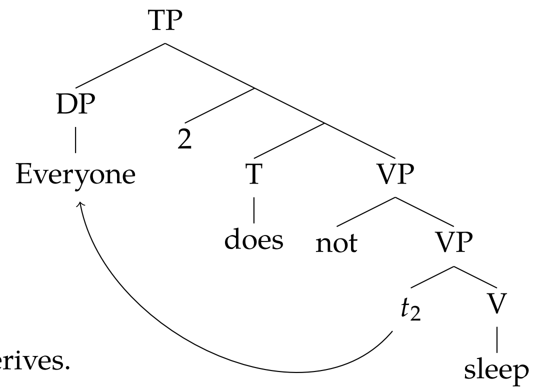
The two readings in (7) represent a *scope ambiguity*. There are two operators that "take scope"—∀ and negation—and one scope contains the other. We say ∀ in (7a) takes *wider* scope, and write ∀ > *not* to indicate this.

Recall from PS5 that there are advantages to adopting a VP-internal subject, interpreted through movement. We will adopt this here.

Step 1: Build subject in Spec,VP



Step 2: Add *not* + T, move subject DP to Spec,TP



Exercise: Let's see what meaning this tree derives.

Tools repeated from last time:

(8) **The interpretation of movement:**

Pick an arbitrary index i.

a. The base position of movement is replaced with a *trace* with index i: t_i.

b. A *binder index i* is adjoined right under the target position of the movement chain.

(9) **Traces and Pronouns Rule (T&P):**

If α is a pronoun or trace, g is a variable assignment, and $g(i)$ is defined, then $[\![\alpha_i]\!]^g = g(i)$.

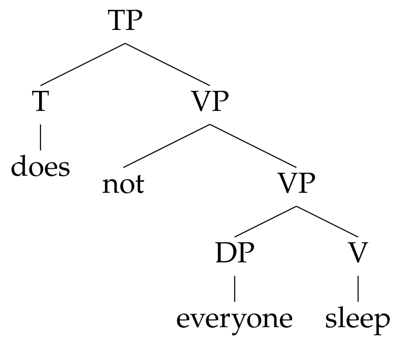
(10) **Predicate Abstraction (PA):** (H&K p. 186 version)

Let α be a branching node with daughters β and γ, where β dominates only a numerical index i. Then, for any assignment g, $[\![\alpha]\!]^g = \lambda x\ .\ [\![\gamma]\!]^{[i \mapsto x]]g}$.

We call the meaning that is reflected on the surface form—here, (7a)—a *surface scope* reading.

How do we get reading (7b)? One option: *pretend the movement didn't take place*.

At Logical Form (LF): Pretend the movement didn't happen

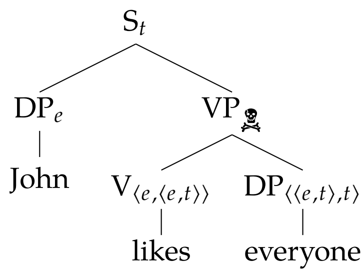


Exercise: Interpret this tree.

We call this the *inverse scope* interpretation. The process of "ignoring" movement at LF is called *syntactic reconstruction*.

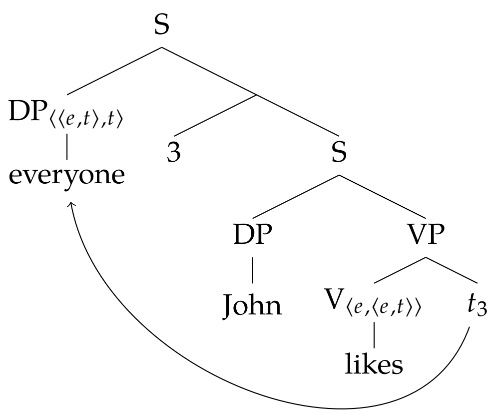
5 Quantifiers in object position

(11) John likes everyone.



Recall from PS5 that DPs of type $\langle\langle e,t\rangle,t\rangle$ can be interpreted easily if they are moved:

(12) Everyone, John likes ____.



Exercise: Make sure this works.

A solution to the problem of quantifiers in object position, like (11), is to *pretend this movement happened anyway*. The arrow is dashed because it's a *covert* movement, not reflected in pronunciation.

(13) LF for (11): everyone, John likes ____.

We call this movement *Quantifier Raising* (QR) (May, 1977). QR is required for quantifiers that are not in subject position, in order to avoid the type problem in (11).

6 Logical Form

In the past two sections we've proposed a lot of "pretending"... pretending movement happened or pretending movement didn't happen. We have opened up the possibility that *what we pronounce* is different than *what we interpret*.

(14) Structure is built in Syntax. Syntax has two outputs:

a. Phonological Form (PF): what is pronounced

b. Logical Form (PF): what is interpreted

Additional operators may take place at these "interfaces"—in particular, covert movement (like QR) and reconstruction may take place at LF.

A hypothesis developed by May (1977); Huang (1982) and others is that operations at LF are *syntactic* operations, (generally) subject to the same constraints as visible syntax. For example:

(15) **The Coordinate Structure Constraint (Ross, 1967):**

a. Which professor does John like ___?

b. * Which professor does John [[like ___] and [hate the dean]]?

(16) **Coordination and scope:** (examples from (Fox, 2003))

a. A (different) student likes every professor. $\exists > \forall, \forall > \exists$

b. A (#different) student [[likes every professor] and [hates the dean]]. $\exists > \forall, {*}\forall > \exists$

References

Fox, Danny. 2003. On logical form. In *Minimalist syntax*, 82–123. Blackwell.

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May, Robert Carlen. 1977. The grammar of quantification. Doctoral Dissertation, Massachusetts Institute of Technology.

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