

Danny Fox's On Logical Form

3rd session

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Goals: read one example of LF-literature, learn the arguments in favor of Quantifier Raising, identify the kind of problems that the classical view raises, learn a possible way to solve them (and give some hints on how to make a handout for this class).

1 Paper

1.1 Reference

Fox, Danny (2003) On Logical Form. Randall Hendrick (ed) *Minimalist Syntax*, Blackwell.

1.2 Assignment

- What are the arguments in favor of the existence of LF?
- Why do we need to assume (covert) quantifier raising?
- What is the relevant set of data?
- Which mechanisms are theory-dependent and which are not?
- Why does Fox depart from the classical assumptions?
- Which problems does he solve?
- Which are the additional assumptions that we have to make to account for the data?

2 Introduction

2.1 Goals

Discuss the syntactic position of Quantified Noun Phrases (QNPs) and its interpretive consequences. In order to do so, Fox presents the leading idea and introduces some evidence in favor of it (but does not compare his approach with the competing ones).

2.2 Claims

- QR is justified and gives evidence in favor of LF, where covert movement takes place.
- QR is more restricted than *wh*-movement.
- Contrary to the classical view, QR is seen as rightward movement.
- The copy theory of movement and the assumption that late merger of adjunct clauses exists account for the differences between *wh*-clauses and QR wrt violations of the binding conditions and the satisfaction of parallelism.

2.3 Structure

- Stand of the theory: relevance of movement and justification of covert movement
- Danny Fox's own research: binding theory and antecedent contained deletion

3 The relevance of movement

“A Logical Form (LF) is a syntactic structure that is interpreted by the semantic component. For a particular structure to be a possible LF it has to be possible for syntax to generate it and for semantics to interpret it.”

3.1 The denotation of a Quantified Noun Phrase

The data:

- (1)
- a. A girl is tall.
 - b. Many girls are tall.
 - c. Every girl is tall.
 - d. No girl is tall.

Semantic composition: *Tall* is a predicate, i.e., a property of individuals. Properties are standardly viewed as functions that map individuals to truth values (i.e., $\langle e, t \rangle$). If the subject of a predicate is an individual, the predicate can take the subject as its argument. Problem: there is no easy way to obtain an individual out of a QNP.

(2)

- | | |
|---|---|
| <p>a.</p> <div style="text-align: center;"> $\begin{array}{c} \text{John is tall: } t \\ \swarrow \quad \searrow \\ \text{John: } e \quad \text{tall: } \langle e, t \rangle \end{array}$ </div> | <p>b.</p> <div style="text-align: center;"> $\begin{array}{c} \text{A girl is tall: } t \\ \swarrow \quad \searrow \\ \text{A girl: } ??? \quad \text{tall: } \langle e, t \rangle \end{array}$ </div> |
|---|---|

One possibility: QNPs are second order predicates, i.e., they take predicates as input, which means that they tell us something about first order predicates like *tall*, namely something about the set of individuals the first order predicates are true of.

(3)

- $$\begin{array}{c} \text{A girl is tall: } t \\ \swarrow \quad \searrow \\ \text{A girl: } \langle \langle e, t \rangle, t \rangle \quad \text{tall: } \langle e, t \rangle \end{array}$$

In the example above, the QNP *a girl* tells us that the set *tall* is true of at least one girl.

The semantics of examples in (1):

- (4) a. *a girl* denotes a function f (from predicates to truth values) that maps a predicate P to TRUE iff there is at least one girl g such that $P(g) = \text{TRUE}$.
- b. *many girls* denotes a function f (from predicates to truth values) that maps a predicate P to TRUE iff there are many girls g such that $P(g) = \text{TRUE}$.
- c. *every girl* denotes a function f (from predicates to truth values) that maps a predicate P to TRUE iff every girl g is such that $P(g) = \text{TRUE}$.
- d. *no girl* denotes a function f (from predicates to truth values) that maps a predicate P to TRUE iff no girl g is such that $P(g) = \text{TRUE}$.

Mapping of syntax and semantics: how is the argument P of a QNP determined?

The semantic composition of QNPs faces two problems: (i) QNPs in object position (i.e., when they must combine with two-place predicates) and (ii) QNPs in both subject and object position (i.e., when scope ambiguities arise).

- o Case 1: how do we compose semantically a QNP in object position?

- (5) a. A girl is tall: the argument of the QNP is its sister.
- b. I climbed every tree: ??

(6)



The interpretation we are after: QNP is a function that maps its argument P to a truth value TRUE iff P is true of every tree. In the example above, P should correspond to the predicate that is true of exactly those things that I climbed, namely $\lambda x. \text{I climbed } x$. **Problem:** its sister (i.e., *climbed*) does not have this denotation.

- o Case 2: how do we account for scope ambiguity?

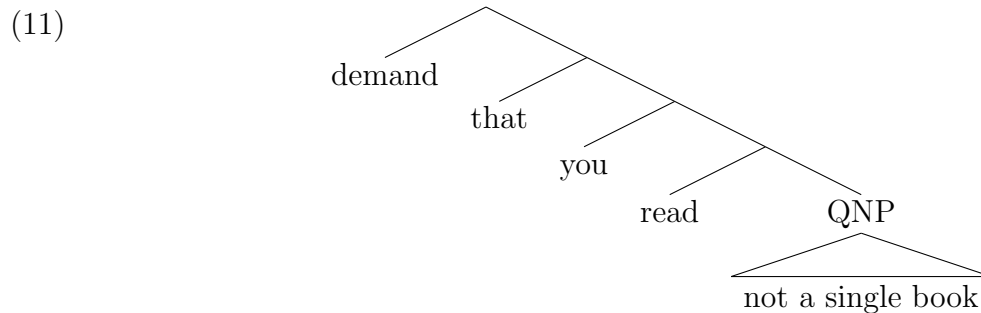
- (7) A boy climbed every tree.
 - a. A boy $\rightsquigarrow \lambda P. \text{a boy } P$.
 - b. Every tree $\rightsquigarrow \lambda Q. Q \text{ every tree}$.
- (8) a. Wide scope of the subject: A boy $>$ every tree \rightsquigarrow *a boy* has as argument the predicate P that is true of exactly those individuals who climbed every tree (i.e., $\lambda x. x \text{ climbed every tree}$).
- b. Wide scope of the object: Every tree $>$ a boy \rightsquigarrow *every tree* has as argument the predicate Q that is true of those things that a boy climbed (i.e., $\lambda x. \text{a boy climbed } x$).

Possible solutions: (i) we can relax our assumptions about the syntax-semantics interface, (ii) we can revise our assumptions about the meaning of various constituents or (iii) we can search for answers that keep the fairly minimal assumptions about the system. Fox assumes (iii).

3.2 Movement mapping scope

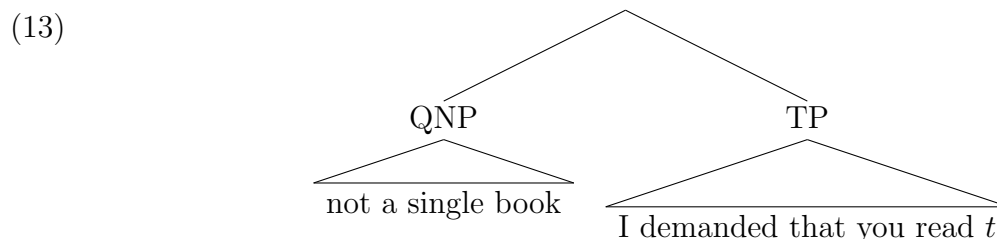
A similar case as (7): a sentence with two interpretations depending on the scope relationship between the QNP *not a single book* and the modal verb *demand*. The difference is that we have evidence that by overtly moving the DP to the left, we disambiguate the sentence.

- (9) I demanded that you read not a single book.
 a. I demanded you that you don't read any books.
 b. There isn't a single thing that I demanded you to read.
- (10) a. Demand > not a single book \rightsquigarrow the QNP takes as argument the predicate $P\lambda x$. you read x . (9-a)
 b. Not a single book > demand \rightsquigarrow the QNP takes as argument the predicate $P\lambda x$. I demanded that you read x . (9-b)



Now we move the QNP to the left, and we only obtain one interpretation, namely the one where the QNP has wide scope.

- (12) Not a single book did I demand that you read t \rightsquigarrow there isn't a single book that I demanded that you read.



- (14) a. QNP \rightsquigarrow $\lambda P.P$ not a single book.
 b. TP \rightsquigarrow λx . I demanded that you read x .

Fox proposes the following generalization for the computation of the structure above:

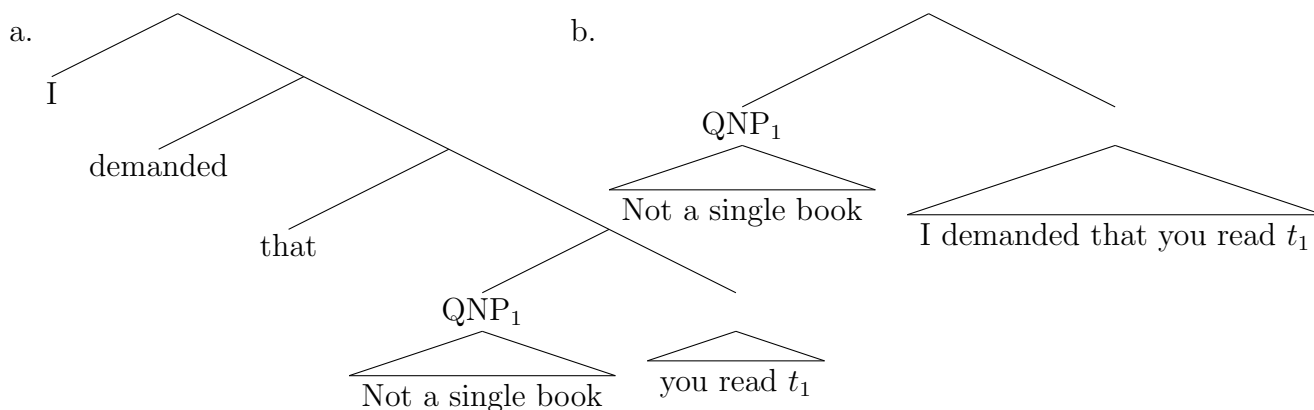
- (15) In a structure formed by DP movement, $DP_n [\phi \dots t_n \dots]$, the derived sister of DP, ϕ , is interpreted as a function that maps an individual x to the meaning of $\phi[x/n]$.
 Where $\phi[x/n]$ is the result of substituting every constituent with the index n in ϕ with some NP referring to the individual x .

Note that this is a procedure that turns the sister of the QNP into a one-place predicate, which involves no theoretical problems (i.e., we have a structure similar to *A girl is tall*). Applying this rule in cases without overt movement: we have seen that overt movement of a QNP triggers a structure where its sister is a one-place predicate. This can help us explain the cases in (5-b) and (7) as long as we accept that there is covert movement of the QNP, i.e., Quantifier Raising (QR).

- (16) a. I climbed every tree.
 b. [every tree]₁ [I climbed t₁]

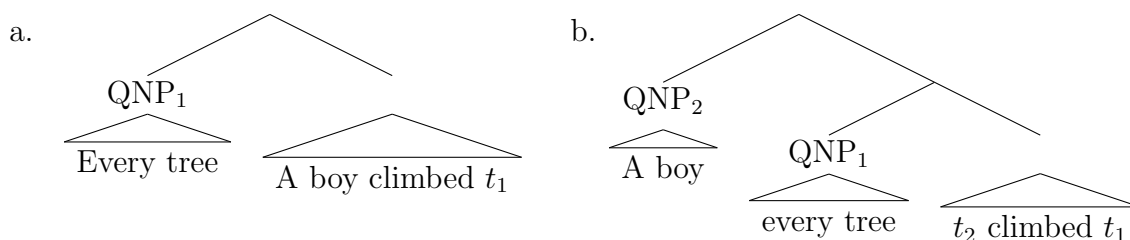


- (18) I demanded that you read not a single book.



Given present assumptions, if we want one QNP to have wide scope over the other, the former must c-command the latter. So far, this produces the following structures:

- (19) A boy climbed every tree.



- (20) a. Object-wide-scope interpretation (aka Inverse Scope): the QNP *every tree* takes as argument the predicate $P\lambda x$. a boy climbed x .
 b. Subject-wide-scope interpretation (aka Surface Scope): the QNP *a boy* takes as argument the predicate Q which is true of an individual y if the QNP *every tree* yields true when it combines with the predicate $P\lambda x.N$ climbed x , where N is some name for y .

Recap: we have made two assumptions which have yielded the desired interpretations given a restricted notion of the mapping between syntax and semantics, namely sisterhood. We have accepted that (i) QNPs are second order predicates, and (ii) QNPs move

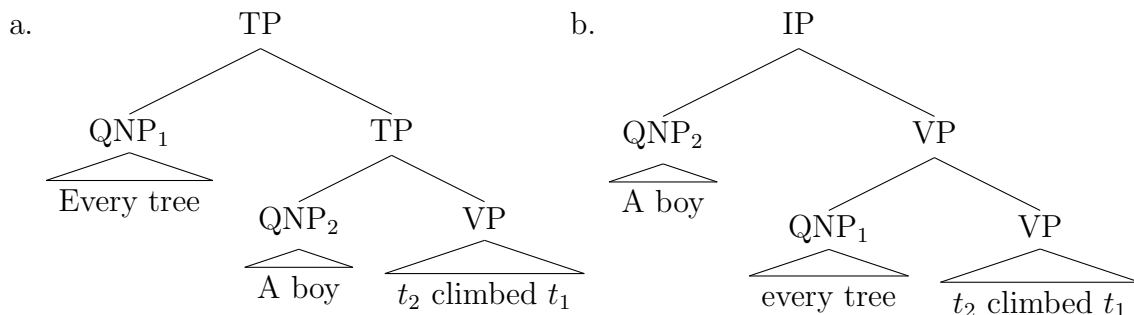
to the left, either overtly or covertly, for scope considerations.

Important remark: assuming the **VP internal subject hypothesis** (i.e., that subjects always move to a position higher than their base position, independently of scope considerations), (21) is not a possible LF.

(21) [every tree]₁ [a boy climbed *t*₁]

The two possible LFs are the ones below:

(22)



4 Arguments in favor of covert movement

What implications does QR have? To begin with, being a covert operation, it is predicted that it does not have any phonological consequences. We need to ask ourselves whether there are any predicted consequences given properties of semantics and syntax (beyond the possibility of interpreting QNPs in object position and of capturing scope ambiguities).

Strategy: "...identify additional principles of syntax and semantics that could tell us whether or not movement has taken place when there are no consequences for phonology."

- Movement detectors (see subsection 4.1)
- Structure diagnostics (see subsections 4.2 and 4.3).

4.1 Properties of movement

Fundamental assumption: we expect QR to show the same movement constraints as overt movement.

Coordinate Structure Constraint Ross (1967): movement out of two coordinated conjuncts.

(23) a. What professor does John like *t*?
b. *Which professor does John [[like *t*] and [hate the dean]]?

(24) QR instead *wh*-movement (Lakoff 1970, Rodman 1976)
a. A (different) student likes every professor. ($\exists > \forall$) ($\forall > \exists$)
b. A (# different) student [[likes every professor] and [hates the dean]] ($\exists > \forall$)
*($\forall > \exists$)

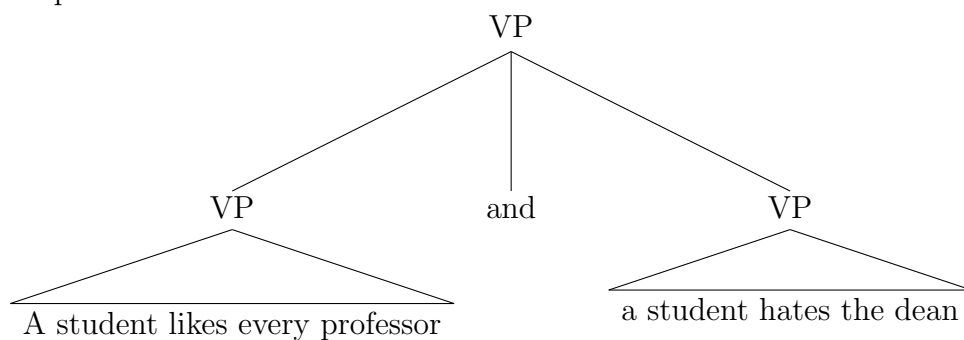
- Possible interpretation: there is a single student who likes all the professor and who also hates the dean.
- Impossible interpretation: for every professor there is one student who likes this professor and hates the dean.

Results (so far)

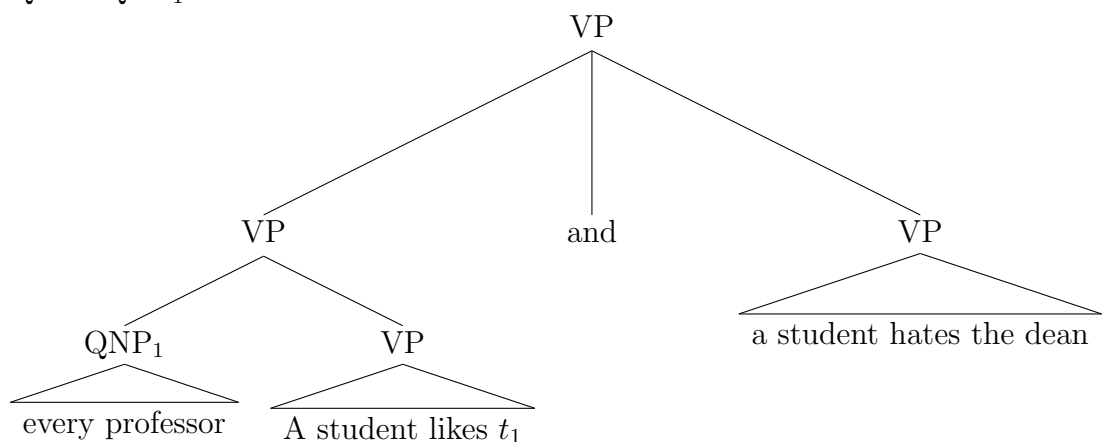
- The contrast in (24-b) can be explained by assuming that the object cannot move to get wide scope and, hence, we have evidence in favor of QR.
- We still need to account for surface scope in (24-b).

(25) Derivation of (24-a) stepwise

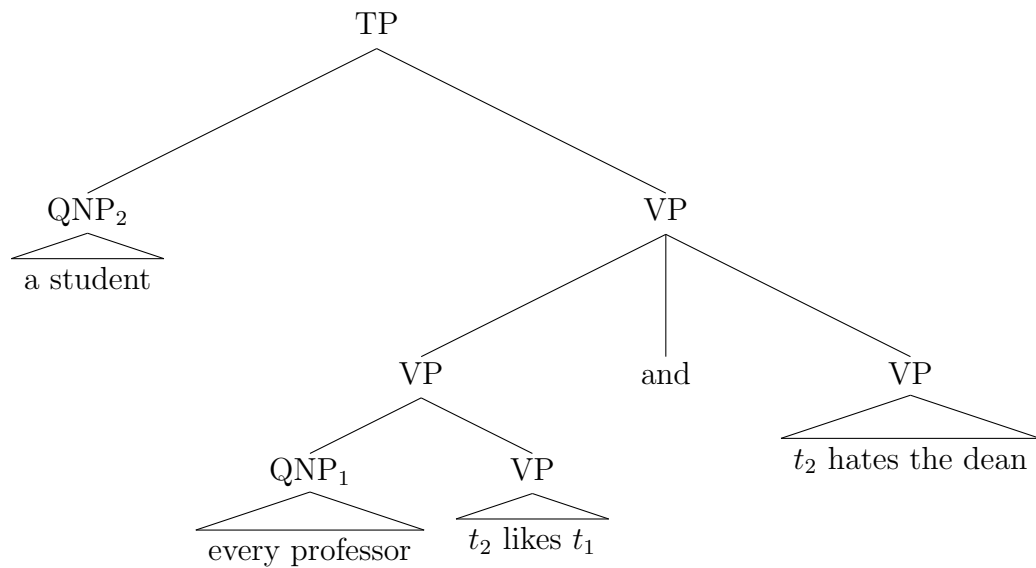
a. Step 0



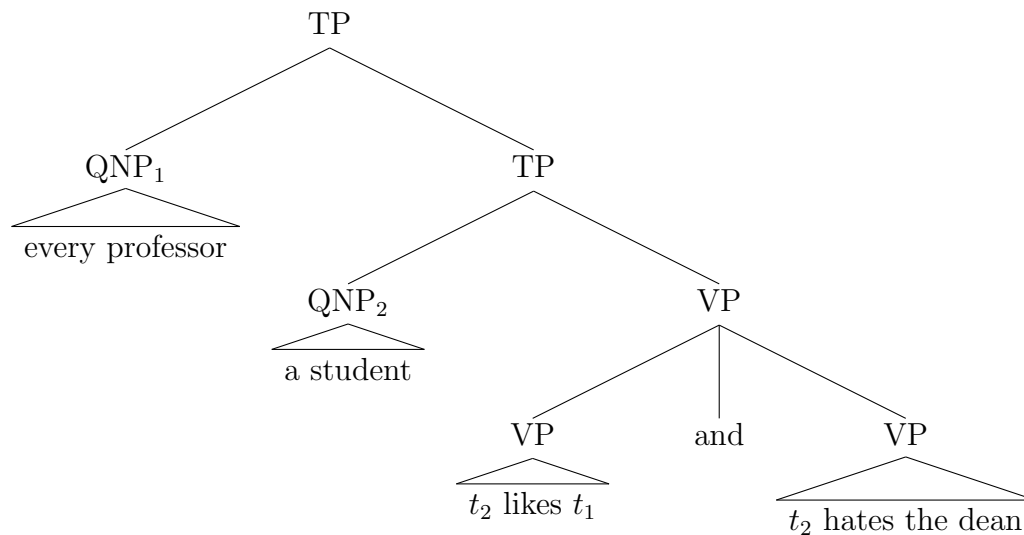
b. QR of QNP₁ within VP



c. Across the Board Movement



(26) Violation of CSC in (24-b)



Open issues: it has been argued that QR might not mirror overt movement completely (see references on page 16).

4.2 Parallelism as a structure diagnostic

Parallelism is treated as a structure diagnostic inasmuch it prevents us from analyzing Antecedent Contained Deletion as really involving antecedent containment. If we take QR to be part of our system, then Parallelism – which is supposed to be a theory-independent factor – is respected.

Example (27-a) is interpreted as if a phonologically visible VP was missing. That is, (27-a) is interpreted as (27-b), which is to say that (27-a) contains a **VP identical to the VP of the previous sentence**.

- (27) a. First, John talked to Mary. Then, Bill did.
b. First, John talked to Mary. Then, Bill talked to Mary.

Parallelism: VP_1 can be deleted only if the discourse contains a pronounced VP_2 (the antecedent VP) such that VP_2 is syntactically identical to VP_1 .

Antecedent Contained Deletion (ACD): the deleted VP is contained within its antecedent. This phenomenon seems to challenge parallelism, because a syntactic constituent cannot be identical to one of its sub-constituents.

- (28)
- a. I [$VP_{antecedent}$ read [a book [that you did <read t >]]]].
 - b. I [$VP_{antecedent}$ gave [every book [that you did <give t > to Mary]] to Mary].
 - c. I [$VP_{antecedent}$ wanted to be in [the city [that you did <wanted to be in t >]]]].

This suggests that the structure above is not a proper LF. Try the following alternative, provided by QR:

- (29)
- a. [a book [that you did <read t >]]
I [$VP_{antecedent}$ read t].
 - b. [every book [that you did <give t > to Mary]]
I [$VP_{antecedent}$ gave t to Mary].
 - c. [the city [that you did <wanted to be in t >]]
I [$VP_{antecedent}$ wanted to be in t].

Further predictions: what happens when we combine ACD and QNPs? This theory (correctly) predicts that even if two constituents can raise for scope considerations, we can only get one reading for parallelism considerations.

Let us first take a model example without ACL:

- (30) John refused PRO to read every book that I recommended.
- a. [[every book that I recommended]₁ [John refused PRO to read t_1]].
 - b. John refused [[every book that I recommended]₁ [PRO to read t_1]].
- (31) Interpretation of (30-a)
- a. Wide scope: the QNP takes as object the predicate $P\lambda x$. John refused to read x .
 - b. Paraphrase: every book that I recommended to read is a book that John refused to read.
- (32) Interpretation of (30-b)
- a. Narrow scope: the QNP takes as object the predicate $Q\lambda x$. N read x .
 - b. Paraphrase: John refused to the suggestion that he read all the books that I recommended.

Now consider a similar sentence with two possible interpretations of what constitutes the deleted material:

- (33) I [refused to read [every book [that you did <read t > / <refused to read t >]]]].

Prediction: "...the matrix VP can be the antecedent, only if the QNP is interpreted outside this VP. (This prediction follows since the QNP must move by QR outside the antecedent VP for Parallelism to be satisfied.) I.e., we predict that the QNP must outscope the verb *refuse*, (30-a), if the elided VP is *refuse to read*."

- (34) a. John refused to read EVERY book that we thought he HAD <read>. He was willing to read only some of them.
b. Narrow scope of the QNP, compatible with the deletion of the embedded VP.
- (35) a. John refused to read EVERY book that we thought he would <refused to read>. # He was willing to read only some of them.
b. Wide scope of the QNP, compatible with the deletion of the matrix VP (and thus incompatible with the follow-up).

Recap: (i) ACD is a diagnostic in favor of QR, (ii) ACD does not really involve antecedent containment (i.e., parallelism is satisfied), and (iii) QR predicts a correlation between scope and the size of the elided material.

4.3 Binding Theory as a structure diagnostic

Binding Theory is a counter-example for the arguments provided by Parallelism and Movement constraints.

Condition A: An anaphoric expression (himself/each other) must co-refer with (or be bound by) a locally c-commanding antecedent.

Condition C: A name and a pronoun cannot co-refer if the pronoun c-commands the name.

- (36) Condition A violation
a. ??John and Bill said that [Mary bought every picture of each other/themselves].
b. The subject is outside the local domain for the binding of the anaphor.
- (37) Condition B violation
a. *He₁ likes every picture that John₁ saw.
b. The subject c-commands the object.

Problem: once QR is assumed, these violations cease to be such. We see it first with overt movement and then, with QR (i.e., covert movement).

- (38) a. John and Bill know [[which picture of each other/themselves] Mary bought *t*].
b. The *wh*-clause has moved over the embedded subject and now the anaphor is closed enough to its antecedent for Condition A to be satisfied.
- (39) a. (Guess) [which picture that John₁ saw] he₁ likes *t*.
b. *Wh*-movement removes the name from the c-commanding domain of the pronoun and, thus, Condition C is respected.
- (40) LFs for the sentences (36-a) and (37-b) respectively.
a. John and Bill said that [[every picture of each other/themselves] Mary bought *t*].
b. [Every picture that John₁ saw] He likes *t*₁.

Conclusion: at this moment, we have strong evidence to believe that QR is not real or else that Binding Theory does not concern LF.

5 Binding Theory and Quantifier Raising

Description of the problem: Binding Theory provides evidence against QR, which is supported by its movement constraints. Claiming that binding is not an LF phenomenon (cf. Chomsky 1981) is not satisfactory enough and, as for Fox’s concerns, “the postulation of two syntactic representations each corresponding to a subset of the data is not much more than a restatement of the problem.”

Plan: provide evidence in favor of a single syntactic representation that captures all the data and, thus, show that Binding Theory is a “pretty reliable diagnostic of LF structures and as such it provides further evidence for a theory that incorporates QR.’

5.1 Condition A and the position of QNPs

QR is not able to account for the unacceptability of (41):

(41) ??John and Bill said that [Mary bought every picture of each other/themselves].

The wrong null hypothesis: this conclusion follows under the assumption that QR has the same properties as *wh*-movement. If we can demonstrate that this claim is false on independent grounds, there can be a reason why (41) is unacceptable.

Approach: QR exhibits more constraints than *wh*-movement, but when QR is possible, then it does comply with Condition A.

Evidence in favor of specific constraints on QR: scope of QNPs in constructions that involve VP ellipsis.

In (42), the relative scope of subject and object is identical in both sentences, which implies that if the object outscopes the subject in one of the sentences, it must do so in the other.

(42) A boy admires every teacher. A girl does, too <admire every teacher>.

That is:

(43) a. $(\exists > \forall)$. # $(\forall > \exists)$
b. $(\forall > \exists)$. # $(\exists > \forall)$

This requirement does not follow from the definition of parallelism (its restrictions are not strong enough) but they do follow from the theory of ellipsis (Fox 2000).

(44) A boy admires every teacher. Mary does, too <admire every teacher>.

Interestingly, in (44) only the interpretation of the subject scoping over the object is possible in the first sentence, i.e., it cannot mean that for every teacher, there is one boy who admires him.

The trick: this constraint would follow from parallelism only if there is an independent restriction on QR in the second sentence. That is, if we have an additional condition that prevents us from moving the object over the subject in the second sentence, then we can obtain that only surface scope is possible in the first sentence.

<p>Independent condition on QR: An object QNP can move over the object when the subject is an indefinite but not when the subject is a name.</p>

Let us go back to (41): *every picture of each other/themselves* must move by QR in order to be interpreted (constraint 1) but it cannot outscope *Mary* according to the preceding rule (constraint 2). The two requirements can be satisfied given the VP internal subject hypothesis, and “assuming an appropriate definition of locality, Condition A of the binding theory would still be violated”.

(45) ??John and Bill said that [_{TP} Mary₁ [_{VP} [every picture of each other/themselves]₂ [_t₁ bought _t₂]]]

Result: the subject of the embedded clause (i.e., *Mary*) still intervenes between the anaphor (i.e., *each other/themselves*) and its antecedent (i.e., *John and Bill*).

Additional prediction 1: there should not be a violation of Condition A if instead of a name we had an indefinite, which is borne out:

(46) a. ??The two rivals hoped that Bill would hurt (every one of) each-other’s operations.
b. Binding is impossible due to violation of Condition A and the specific condition on QR.

(47) a. The two rivals hoped that someone would hurt (every one of) each-other’s operations.
b. Binding is possible because the object QNP of the second sentence can outscope the subject, because it is not a name.

Additional prediction 2: we only have the inverse scope interpretation in the second sentence in order to satisfy the binding relation between *the two rivals* and *each other*, which is also borne out. Let us go step by step.

(48) a. ($\forall > \exists$): the hopes of the rivals are satisfied if every one of the rivals’ operations are hurt.
b. $*(\exists > \forall)$: the hopes of the rivals are satisfied if the same person hurts every one of the rivals’ operations.

The difference between *a.* and *b.* is difficult to test, but we can use easier examples. The strategy consists in placing a variable to be bound within the object QNP. Since it is predicted that the QNP will outscope the subject for interpretive considerations (namely QR), then Condition A will be violated.

(49) a. The two friends hoped that someone would buy each-other’s pictures of Mary.
b. *The two friends hoped that someone_{*i*} would buy each-other’s pictures of himself_{*i*}.
c. *The two friends hoped that someone_{*i*} would buy each-other’s pictures of his_{*i*} mother.

The sentences above show that the object always outscoops the subject. Otherwise, (49-b) and (49-c) should be possible under the surface scope interpretation. This provides evidence that the same should happen in (47).

5.2 The problem with Condition C

First-sight problem: *wh*-movement erases the violation of Condition C, unlike QR.

- (50) a. John likes the pictures of himself.
b. *He₁ likes John's₁ pictures.
- (51) (Guess) [which picture that John₁ saw] he₁ likes.

But under the independent condition, the resulting LF is unacceptable.

- (52) a. *He₁ likes every picture that John₁ saw.
b. [Every picture that John₁ saw] He₁ likes *t*₁.

Problem after the independent condition has been stated: (53) still incurs a violation of Condition C and, thus, it is not a possible LF.

- (53) He₁ [Every picture that John₁ saw]₂ *t*₁ likes *t*₂.

Puzzle: under the independent constraint, the dative is predicted to be able to outscope the object, but the violation persists.

- (54) a. *Someone introduced him₁ to every friend of John's₁.
b. *[every friend of John's₁]₂ Someone introduced him₁ to *t*₂.

Note, though, that this problem does not arise in the example below, where inverse scope is possible:

- (55) Someone introduced John₁ to every friend of his₁.

Solution: copy theory of movement + Belletti and Rizzi (1988)

If we appeal to the copy theory of movement (Chomsky 1993), we can show that movement is never capable to circumvent Condition C (in the example below, *John* is not eliminated from its base position).

- (56) *[every friend of John's₁]₂ Someone introduced him₁ to [every friend of John's₁]₂.

We face three challenges: (*i*) how do we account for the violations of Condition A? (*ii*) how do we account for the repairing behavior of *wh*-movement? (*iii*) how do we provide a representation for ACD sentences compatible with the theory of VP deletion?

As for (*i*), we accept Belletti and Rizzi (1988)'s theory with minor adjustments:

One copy of an anaphor must meet the locality condition A, while every copy of a name must meet the anti-co-reference condition C.

As for (*ii*), we need to assume, in line with Chomsky (1993), that relative clauses can merge **counter-cyclically**:

- (57) a. He₁ likes [which picture]–*wh*-movement ⇒
b. [which picture] He₁ likes [which picture] –adjunct merger ⇒
c. [which picture that John₁ saw] He₁ likes [which picture]

Why doesn't late merger apply to QR? (i) covert movement occurs after spell out (i.e., after all constituents have been merged), so it cannot feed late merger of a constituent that dominates a name; (ii) following Lebeaux (1988) late merger is restricted to adjuncts.

As for (iii), the problem is illustrated below and considered in depth in the following section:

- (58) a. I [_{VP_{antecedent}} read [a book [that you did <read *t*>]]].
 b. [a book [that you did <read *t*>]]
 I [_{VP_{antecedent}} read *t*]
 c. [a book [that you did <read *t*>]]
 I [_{VP_{antecedent}} read [a book [that you did <read *t*>]]]

Note that in (58-c), the antecedent and the elided VP are not identical. So we have fairly good evidence for QR from ACD, but not from the effects of Condition C, which forces us to assume the copy theory of movement, which is problematic for ACD.

6 Late Merger and Antecedent Contained Deletion

Basic idea: with QR alone we cannot circumvent a violation of parallelism. "An ACD construction is possible due to a combination of QR and the late merger of a relative clause."

Crucially, in (59), it has been assumed that we circumvent a violation of Condition C by applying movement + late merger. Fox proposes the same mechanism for ACD.

- (59) (Guess) [which picture that John₁ saw] He₁ likes *t*₁.

Some auxiliary assumptions: late merger can follow covert operations, interpretation of structures derived by movement and the representation of relative clauses.

6.1 QR and late merger

By assumption, QR is covert because it occurs after spell out (i.e., it has no phonological effects). Let us proceed by ignoring the claim according to which after QR nothing can be merged. Fox's aim is to show that we can derive the fact that the movement in QR is covert by another means.

- (60) First, movement (*wh* or QR) and then, adjunct merger.

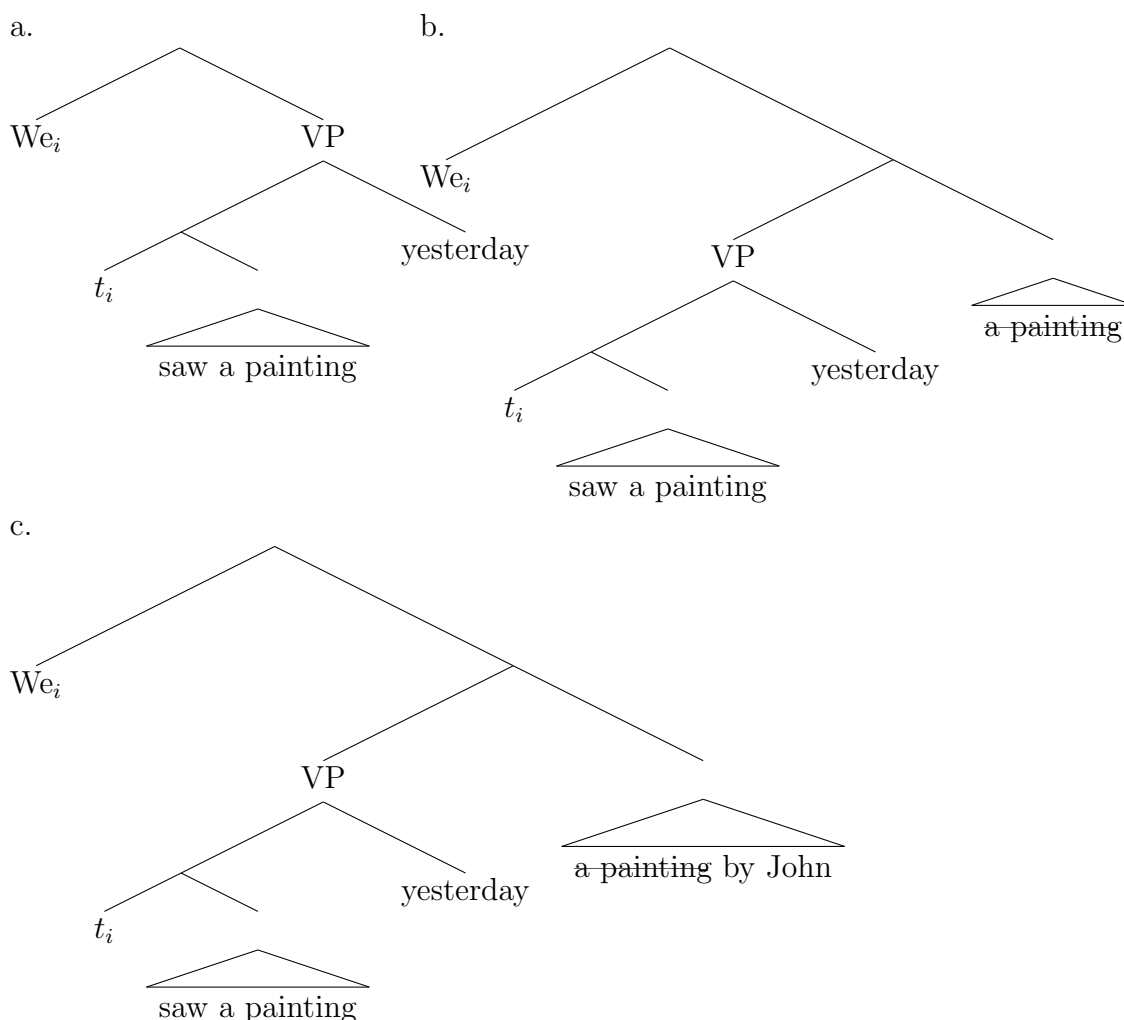
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|--|--|
| a1. Mary likes [which picture] | b1. Mary likes [every picture] |
| a2. [which picture] Mary likes [which picture] | b2. [every picture] Mary likes [every picture] |
| a3. [which picture that John saw] Mary likes [which picture] | b3. [every picture that John saw] Mary likes [every picture] |

In a2. we have the *wh*-phrase in two positions, left (head of the chain) and right (tail of the chain). If the derivation stopped at this point, the head (but not the tail) would be pronounced, by the rules of English phonology. If the derivation goes on, the relative clause merges and we obtain *which picture that John saw Mary likes*.

In b2. the situation is different. QR is covert, which means that if the derivation stops at this point, we have to pronounce the tail (and not the head). Interestingly, if the derivation goes on, at b3. we should pronounce *that John saw, Mary likes every picture*, which is not the case. This suggests that late merger cannot follow QR.

An alternative (Fox and Nissenbaum 1999): (i) QR applies to the right and that is the explanation for the missing pronunciation, and (ii) the derivation above is reminiscent to the structures that involve extraposition from NP (with the correction that QR targets VP).

(61) We saw a painting yesterday by John.



Derivation: a. is the surface structure. In b., the *source DP a painting* undergoes QR to the VP (to the right). Finally, in c., the DP is merged with the adjunct *by John*. "The pronunciation is expected under the assumption that QR is a rightward covert operation."

Argument 1 -- scope: it is predicted that the scope of the source DP be at least as high as the extraposition site.

Williams' generalization: When an adjunct β is extraposed from a source DP α , the scope of α is at least as high as the attachment site of β (the extraposition site).

- (62) John must teach no book about evolution in order to please the school committee.
- a. Surface scope modal $>$ DP (intolerance): in order to please the committee, it must not be the case that John teaches a book about evolution.
 - b. Inverse scope DP $>$ modal (indifference): there is no (particular) book such that John must teach in order to please the committee.

Under the current theory, we expect the extraposition of an adjunct to a position dominating the rationale clause will trigger an interpretation where the DP outscopes the modal (i.e., it will disambiguate in favor of inverse scope). This is borne out, because in (63-b) the intolerance reading is pragmatically odd.

- (63)
- a. John must miss no assignment that is required by his math teacher in order to stay in school.
 - b. #John must miss no assignment in order to stay in school that is required by his math teacher.
 - c. John must hand in no assignment in order to stay in school that is required by his math teacher.

The fact that (63-c) is pragmatically adequate reinforces this idea.

Argument 2 -- Condition C: "because extraposition involves post QR merger of adjuncts, it is predicted to have effects on Condition C ..." (identical to those on *wh*-movement). Specifically, Condition C is obviated because the name is not c-commanded by the pronoun.

- (64)
- a. I gave him_i a book yesterday that John_i liked.
 - b. I [[_{VP} *t* gave him_i [a book] yesterday] [~~a book~~ that John_i liked]].

Predictions: (i) the problematic pronoun must not be contained within the source DP (cf. (65) and (66)), (ii) what applies to adjunct phrases is not expected to apply to complement clauses (cf. (67)), and (iii) there is a correlation between the ability of extraposition to circumvent Condition C and the scope of the source DP (cf. (68)).

- (65)
- a. I told him_i about your new argument the other day that supports John's_i theory.
 - b. I [[told him_i about [your new argument] the other day] [~~your new argument~~ that supports John's_i theory]].
- (66)
- a. I told you about his_i new argument the other day that supports John's_i theory.
 - b. I [[told him_i about [his_i new argument] the other day] [~~his_i new argument~~ that supports John's_i theory]].

Crucially, the complement clause does not involve late merger but rightward movement, which, following the copy theory of movement, does not obviate Condition C.

- (67) a. I gave him_i an argument yesterday **that supports John's_i theory**.
b. ??/*I gave him_i an argument yesterday **that John's_i theory is correct**.
- (68) The indefinite must scope over both negation and the verb *want*
a. ?I wanted him_i not to talk to a (certain) girl yesterday that John_i has known for years.
- (69) Outscope of the DP makes it impossible for *to* be licensed by negation
a. *I wanted him_i not to talk to any girl yesterday that John_i has known for years.

Expectedly, in the example below Condition C does not apply and, thus, the DP must not be interpreted at the merger site of the relative clause. Alternatively, it QRs to the VP position, where it is interpreted.

- (70) I wanted John_i not to talk to any girl yesterday that he_i has known for years.

Recap: Fox has shown the advantages of claiming that QR occurs to the right and that late merger of adjunct clauses is possible. This accounts for scope considerations and Condition C obviation. However, at this point it is not clear how this theory deals with the lack of parallelism in ACD contexts (cf.(71)). This is his assignment for the last section.

- (71) a. I [_{VP_{antecedent}} read [a book [that you did <read *t* >]]].
b. I [_{VP_{antecedent}} read [a book]] -QR⇒
c. I [[_{VP_{antecedent}} read a book] a-book] -late merger⇒
d. I [[_{VP_{antecedent}} read a book] a-book [that you did <read *t* >]]].

6.2 Movement and interpretation

Overview: semantically there seems to be no differences between traces and copies (although copies involve less apparatus and simplify syntactic operations). Cf. (72) vs. (73):

- (72) In a structure formed by DP movement, DP_n[_φ...*t*_n...], the derived sister of DP, *φ*, is interpreted as a function that maps an individual, *x*, to the meaning of *φ*[*x*/*n*].
φ[*x*/*n*] is the result of substituting every constituent with the index *n* in *φ* with *him*_{*x*}, a pronoun that denotes the individual *x*.
- (73) In a structure formed by DP movement, DP_n[_φ...DP_n...], the derived sister of DP, *φ*, is interpreted as a function that maps an individual, *x*, to the meaning of *φ*[*x*/*n*].
φ[*x*/*n*] is the result of substituting every constituent with the index *n* in *φ* with *him*_{*x*}, a pronoun that denotes the individual *x*.

Both (72) and (73) treat traces the way that we treat variables in logic. Hence, it is "...surprising that Condition C "sees" something which is richer than a variable."

Proposal: Fox postulates the existence of a syntactic rule called *Trace Conversion* that converts lower traces/copies into structures that contain variables. In order to do so, the rule treats the trace as a definite description, with the result in (74).

- (74) every boy A girl talked to every boy.
Paraphrase: For every boy x , there is a girl who talked to **the boy** x .
- (75) Trace Conversion
- Variable Insertion: (Det) Pred \Rightarrow (Det) [Pred λy ($y = him_n$)]
 - Determiner Replacement: (Det) [Pred λy ($y = him_n$)] \Rightarrow *the* [Pred λy ($y = him_n$)]

This syntactic rule is interpreted by the semantic rule in (73) such that: the derived sister of *every boy* in (74) (i.e., *A girl talked to every boy*) is converted into *A girl talked to the boy (identical to) him_n* , "... which is interpreted by the relevant semantic rules as λx . A girl talked to the boy x ."

Explanation for Condition C effects

- (76) The name *John* is *semantically interpreted* within the c-command domain of the pronoun
- *A boy introduced him_1 to every friend of John's₁.
 - [every friend of John's₁]
 λx . A boy introduced him_1 to [the friend of John's₁ identical to x].

6.3 Relative Clauses

Assumption 1 (see references on page 47): relative clauses are both head internal and head external (matching analysis). Their derivation "... involves movement to Comp of a CP internal NP, which is deleted under identity with a CP internal NP."

- (77) Every boy [_{CP} boy Mary likes boy]

Assumption 2: "... the NP in [Spec,CP] is not interpreted but that movement turns the relative clause into a predicate that combines with the CP external NP by predicate modification."

- (78) Every [boy λx . Mary likes the boy x].

6.4 Explaining Antecedent Contained Deletion

Putting the pieces together: we can finally see how Trace Conversion is useful to maintain the Copy Theory of movement, parallelism and the effects of Condition C.

- (79) John likes every boy that Mary does <likes boy>.
- [_{VP} John likes every boy] -QR \Rightarrow
 - [[_{VP} John likes every boy] **every boy** -adjunct merger \Rightarrow
 - [[_{VP} John likes every boy] every boy **that Mary does** <likes boy>].

Now Trace Conversion applies, yielding the expected parallelism:

- (80) [every boy λx . Mary does <likes the boy>]
[λy . John likes the boy y].

7 Conclusions

In the first part of the paper, Fox discusses the syntactic position of QNPs under the classical assumption of how QNPs are dealt with in minimalist syntax. In doing so, he introduces the topics and operations that are part of Logical Form (ACD, Binding Principles, Quantifier Raising), and he also highlights a few problematic issues. In the second half of the paper, he provides additional evidence to show that QR as it is stated is problematic, and makes a proposal according to which QR adjoins a QNP to the right, where it can be combined with an adjunct clause via late merger.

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