# Structural Isomorphism modulo co-valuation: another look at Dahl's many pronouns puzzle

#### 1. Dahl's "many pronouns" puzzle

(1) [AC Mary said she liked her paper]. [EC John did, too].

a.	<said he="" his="" liked="" paper=""></said>	[sloppy, sloppy]
b.	<said her="" liked="" paper="" she=""></said>	[strict, strict]
c.	<said he="" her="" liked="" paper=""></said>	[sloppy, strict]
d.	* <said his="" liked="" paper="" she=""></said>	[strict, sloppy]

Fox (1998): The reading of EC in (1)d is ruled out jointly by:

- (a) **Rule H**: a principle that prefers local variable binding (motivated also by BT) and
- (b) **Parallelism**: the conditions on ellipsis/de-accenting/focus.
- (2) **Rule H**: An index k cannot be bound across a potential binder  $\lambda_i$  if binding by the more local antecedent (changing k to i) yields the same semantic interpretation.
- (3) \*[... $\lambda_k$ ... $\lambda_i$ ...DP<sub>k</sub>], if [... $\lambda_k$ ... $\lambda_i$ ...DP<sub>k</sub>] has the same meaning as [... $\lambda_k$ ... $\lambda_i$ ...DP<sub>i</sub>]
- **Basic Idea**: Rule H blocks an LF for AC in (1) that would license (be *parallel* to) an LF for EC with the meaning in (1)d.

#### **Goals for today**:

- a. To explain the idea in Fox (1998) and its shortcoming, mainly that it was based on a hope rather than a worked-out theory (that it wasn't accompanied with a theory of Parallelism that could work with Rule H to deliver the goods, merely with a characterization of a desideratum for such a theory).
- b. To attempt to realize the hope: to develop the missing theory of Parallelism and attempt to motivate it on independent ground.
- c. Potential Benefits: accounting for conflicting evidence on the questions of whether Parallelism is syntactic or semantic. Bonus (at the very end): account of the restrictor constraint on rebinding (Fiengo and May, Merchant, Abels)

#### Structure:

- a. Begin (anachronistically) with a proposal in Crnič 2017 that allows us to see what a theory of the sort I was hoping for might look like.
- b. Raise issues for Crnič's proposal, in order to motivate the desideratum in Fox 2000.
- c. Present evidence for a new theory of Parallelism which meets the desideratum (structural isomorphism modulo co-valuation).

#### The perspective on the *Many Pronouns Puzzle* we're going to end up with:

a. The antecedent clause in (1), AC, can be associated with only one LF (by Rule H), one in which every pronoun is interpreted as a locally bound variable:

1

[AC Mary  $\lambda_1 t_1$  said  $x_1 \lambda_2 t_2$  liked  $y_2$ 's paper].

b. This LF is structurally isomorphic to only one of the three LFs available for the clause containing ellipsis:

2

[EC John  $\lambda_5$  ts said xs  $\lambda_6$  t6 liked v6's paper].

(So, if we demanded structural isomorphism, we would only derive the [sloppy, sloppy] reading.)

- c. To get other readings, we need to relax structural isomorphism (motivated independently). I'll suggest that SI can be evaluated relative to a structure that is derived from the LF of an antecedent through a *meaning preserving* substitution, substituting a phrase with another phrase interpretable in context (hence, structural isomorphism modulo co-valuation).
- d. This is the general path to strict interpretations and allows 2 additional readings (3 in total), but does not allow the fourth reading.
  - Each of the bound-variables can be replaced by a phrase that refers to *Mary*. Replacing the first one yields the [strict, strict] reading. Replacing the second one (without replacing the first one) yields the [sloppy, strict] reading.
  - The only way to get a [strict, sloppy] reading is if the lowest pronoun could be bound non-locally by the matrix subject (violating Rule H).

# **2.** Crnič 2017<sup>1</sup>

# 2.1. Sag/Williams

# Strict-Sloppy Ambiguity, as a structural ambiguity in the antecedent

(4)	Mary talked about her paper. John	did, too.
	<talk about="" his="" paper=""></talk>	(*sloppy reading*)
	<talk about="" her="" paper=""></talk>	(*strict reading*)

**Co-reference vs Variable Binding**: The antecedent VP (*Mary talked about her paper*) is formally ambiguous (though semantically not). Specifically, it has two different structural descriptions that yield the same truth conditions within the antecedent. However, the two structural descriptions determine (by Parallelism) two distinct interpretations for the sentence that contains ellipsis (Keenan 1971, Sag 1976, Williams 1977).

(4) a.  $LF_1$ :

	Mary	$\lambda_1$ Past t <sub>1</sub> [ <sub>VPa</sub> $\lambda_2$ t <sub>2</sub> talk about pron <sub>2</sub> 's paper ]	
	John	$\lambda_6$ Past t <sub>6</sub> [VPe $\lambda_7$ t <sub>7</sub> talk about pron <sub>7</sub> 's paper]	
I F.·		$[VPe]]^{g_c} = [VPa]]^{g_c} = \lambda x. x \text{ talked about } x's$	s paper
· LI 2.	Mary	$\lambda_1$ Past $t_1 [_{VPa} \lambda_2 t_2 talk about pron_3's paper]$	3→Ma

b

Mary	$\lambda_1$ Past t <sub>1</sub> [VPa $\lambda_2$ t <sub>2</sub> talk about pron <sub>3</sub> 's paper]	3→Mary
John	$\lambda_6$ Past t <sub>6</sub> [VPe $\lambda_7$ t <sub>7</sub> talk about pron <sub>3</sub> 's paper]	3 <b>→</b> Mary

<sup>&</sup>lt;sup>1</sup> <u>http://lukacrnic.com/pdfs/dahl.pdf</u>

# $[VPe]]^{g_c} = [VPa]]^{g_c} = \lambda x. x talked about Mary's paper$

(5) **SW Parallelism**: VP<sub>E</sub> can be elided only if there is an antecedent, VP<sub>A</sub>, and the two VPs have the same meaning [under the contextually given assignment function,  $g_c (\lambda w. [VP_A]]^{w,g_c} = \lambda w. [VP_E]]^{w,g_c}$ ]<sup>2,3</sup>

#### 2.2. Rule H

	d. $\lambda x x$ said she <sub>M</sub> $\lambda y y$ liked x's paper.	[strict, sloppy]; violates Rule H
	c. $\lambda x x \text{ said } x \lambda y y \text{ liked her}_{M} \text{ paper.}$	[sloppy, strict]
	b <sub>1</sub> . $\lambda x x$ said she <sub>M</sub> $\lambda y y$ liked y's paper. b <sub>2</sub> . $\lambda x x$ said she <sub>M</sub> $\lambda y y$ liked her <sub>M</sub> paper.	M→Mary (throughout) [strict, strict]
	a. $\lambda x x \text{ said } x \lambda y y \text{ liked } y \text{'s paper.}$	[sloppy, sloppy]
(1)'	Possible representations of the Antecedent	VP in (1) –

(1)'d is the necessary representation for the unattested [strict, sloppy] reading. This representation is ruled out by Rule H, as more local binding (replacing x with y) would yield the same semantic interpretation.

#### 2.3. Problems

- 1. Rule H is too weak from the perspective of Binding Theory. Once it is strengthened (as proposed by Büring), we lose the result (can only get sloppy readings).
- 2. SW Parallelism in (5) is too strong. Once it is weakened (at least, as proposed by Rooth), we lose the result (can get all four reading even with Rule H).

# 3. Rule H too weak

- (6) a. \*[Every woman]  $\lambda_1$  t<sub>1</sub> praised her<sub>1</sub>.
  - b. [Every woman]  $\lambda_1 t_1$  praised herself<sub>1</sub>.

**Condition B**: A DP, x, cannot bind a pronoun y, if x is dominated by y's local domain.

# Two simple definitions of binding:

- 1. A DP x binds a (pronominal) DP y if y is interpreted as a variable bound by x (i.e. if the sister of x is the constituent  $\lambda_k$  and y has the index k)
- 2. A DP x binds a (pronominal) DP y if x c-commands y and is co-indexed with y.

<sup>&</sup>lt;sup>2</sup> This is an overly simplified version of Heim's (1997) rendition of SW. To allow for "co-binding", we need to talk about extensions of  $g_c$ . Although, I will not go over this in any detail, I adopt Charlow's approach to this problem, namely that we replace talk of  $g_c$  with talk of all assignment functions that need to be accessed in the evaluation of the relevant constituents (assignment functions in *local contexts*, see (29) and (39)).

<sup>&</sup>lt;sup>3</sup> If this formulation of Parallelism is correct, phi features cannot be interpreted on (bound) pronouns in any straightforward way (Kratzer, Heim, and much subsequent work, in particular Bassi 2021). Alternatively, we must allow phi features to be ignored in a more relaxed condition (as suggested by Jacobson and Spathas).

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Challenges:

(7) Coreference (without co-indexation): \*Mary 1  $t_1$  praised her<sub>3</sub>  $3 \rightarrow$  Mary

# (8) Indirect links (Bach and Partee, Higginbotham)

\*[Every woman]  $\lambda_1$  t<sub>1</sub> thought she<sub>1</sub>  $\lambda_2$  t<sub>2</sub> said she<sub>2</sub>  $\lambda_3$  t<sub>3</sub> praised her<sub>1</sub>.

Rule H eliminates the challenge that comes from indirect links but not the one that comes from coreference.

# Rule H should be generalized to a stronger condition (which Büring (2005) calls Have Local Binding)

- (2) **Rule H**: An index k cannot be bound across a potential binder  $\lambda_i$  if binding by the more local antecedent (changing k to i.) yields the same semantic interpretation.
- (3) \*[... $\lambda_k$ ... $\lambda_i$ ...DP<sub>k</sub>], if [... $\lambda_k$ ... $\lambda_i$ ...DP<sub>k</sub>] has the same meaning as [... $\lambda_k$ ... $\lambda_i$ ...DP<sub>i</sub>]
- (9) Have Local Binding (HLB): An index k cannot be free in any constituent  $[\lambda_i Y]$  if changing k to i yields the same semantic interpretation.
- (10) \*[... $\lambda_i$ ...DP<sub>k</sub>], if [... $\lambda_i$ ...DP<sub>k</sub>] has the same meaning as [... $\lambda_i$ ...DP<sub>i</sub>]

**Problem:** Once Rule H is strengthened, co-reference is never allowed and SW parallelism never allows for strict readings (under any circumstances). So, of course we now lose the Crnič account for the many pronouns puzzle. Specifically, only [sloppy, sloppy] interpretations are now allowed.<sup>4</sup>

# 4. SW Parallelism too strong

SW Parallelism is too demanding in two different respects:

- a. Bans "re-binding", which is often attested (as pointed out by many people).
- b. Can't deal with Dahl's "many-clauses puzzle"

# 4.1. Re-Binding

Pronoun Binding

(11) Every sailor<sub>1</sub> thinks Sally loves him<sub>1</sub>, while every soldier<sub>2</sub> thinks Mary does <love him<sub>2</sub>>. (Fiengo and May 1994:107)

Wh-movement

(12) I don't know which  $puppy_1$  you **should** adopt  $t_1$ , but I know which  $one_2$  you **shouldn't** <a dopt  $t_2 >$ . (Schuyler 2001:12)

<sup>&</sup>lt;sup>4</sup>This problem arises also for Drummond (2021), as pointed out in Fleisher (2022).

**Quantifier Raising** 

- (13) a. An American flag is hanging from every building. A Canadian flag is, too.
  - b. A boy admires every teacher. Every teacher A girl does <admires t>, too. (Hirschbühler)

In re-binding cases, the antecedent and elided VP do not have the same semantic value (under the contextually given assignment functions).

#### 4.2. Many clauses puzzle

(14) Mary [VP1 likes her paper]. John does too <VP2 likes his paper>. But, his teacher doesn't <VP3 like John's paper>

Sloppy-to-strict

Under SW parallelism all the VPs need to have the same semantic interpretation  $(SEM(VP_1)=SEM(VP_2)=SEM(VP_3))$ . But VP<sub>1</sub> cannot be identical in meaning to VP<sub>3</sub>. Hence (14) should not have the sloppy-to-strict reading. In fact, sloppy-to-strict should never be possible.

Rooth proposes a weaker version of Parallelism than SW, one which allows re-binding and sloppy-to-strict, but, as we will explain, it is too weak: among other issues, it cannot account for the many pronouns puzzle (even together with HLB/Rule H).

#### 5. Fox 2000

Hope: a general theory of ellipsis will have the condition in (15) as consequence.

(15) NP Parallelism

NPs in the antecedent and elided VPs must either

- a. have the same referential value (Referential Parallelism) or
- b. be linked by identical dependencies (Structural Parallelism)

Advantages (assuming that the hope is realized):

- a. Allows for sloppy-to-strict readings (Captures the many clauses puzzle)
- b. Allows for re-binding
- c. Together with Rule H (or HLB) accounts for the many pronouns puzzle.
- (16) Mary  $\lambda_1 t_1$  said she<sub>1</sub>  $\lambda_2 t_2$  liked her<sub>2</sub> paper. John did, too.

a.	$<\lambda_1 t_1$ said he <sub>1</sub> $\lambda_2 t_2$ liked his <sub>2</sub> paper>	[sloppy, sloppy]
	b b	
b.	$<\lambda_1 t_1$ said Mary $\lambda_2 t_2$ liked her <sub>2</sub> paper>	[strict, strict]
	a a/b	
c.	$<\lambda_1 t_1$ said he <sub>1</sub> $\lambda_2 t_2$ liked Mary's <sub>2</sub> paper>	[sloppy, strict]
	b a	
d.	*< $\lambda_1 t_1$ said Mary $\lambda_2 t_2$ liked her <sub>1</sub> paper>	[strict, sloppy]
	a *a/*b	

### **Questions/Criticism:**

- a. What exactly do we mean by "same referential value"? After all the *DPs she* and *her* in (16) are not referential expressions, but bound variables?
- b. Even if we can answer (a), what could be the theory of ellipsis that would have NP Parallelism as consequence? Rooth's theory, which allows re-binding and sloppy-to-strict, derives something weaker than NP Parallelism and is thus not strong enough to account for the many pronoun puzzle (even with Rule H).
- c. Empirical challenges (to which we will return at the very end)

#### Structure for what comes next:

- 1. Background: Parallelism follows from the theory of Focus (section 6)
- 2. Outline a particular syntactic theory of Focus which demands "structural isomorphism" among focus alternatives and explain why it is too strict (section 7)
- 3. Go over the question of whether the theory of ellipsis (and of focus) is syntactic or semantic (section 8). Conflicting evidence will serve as desiderata for the rest.
- 4. Present "structural isomorphism modulo co-valuation" (section 9)
- 5. Show how we meet the various desiderata, among them the account of the many pronouns puzzle (along the lines outlined in the very beginning, sections 10-12).
- 6. Introduce empirical challenges to Fox 1998 and discuss their ramifications for the current proposal, ending up with a revision that can account for quantificational domain sensitivity (section 13)

# 6. Focus/givenness yields Parallelism

**Rooth/Tancredi thesis**: the semantic restrictions on ellipsis do not require an ellipsis module (e.g. an identity condition on ellipsis). They follow, instead, from the theory of focus.

- (17) Same constraints on interpretation for ellipsis and "phonological deaccenting" strict sloppy...nothing more
  - a. First Mary talked to her best friend, then SUE did <talk to her best friend>.
  - b. First Mary talked to her best friend, then SUE talked to her best friend.
- (18) Same constraints on interpretation for ellipsis and "phonological deaccenting" Parallel Scope (more generally, "ambiguities do not multiply")
  - a. First I talked to a student about every teacher, then YOU did <talked to a student about every teacher >.
  - b. First I talked to a student about every teacher, then YOU *talked to a student about every teacher*.

**Conclusion:** Ellipsis/phonological-deaccenting (E/PD) has consequences for focus structure and much of Parallelism is captured once these consequences are spelled out. **More Specifically:** E/PD phrases cannot (reflexively) dominate an F-marked constituent – a prohibition that restricts the set of possible antecedents.

#### Key properties of the theory of Focus:

every constituent in any sentence must be dominated by *a focus domain* – a phrase, EP, where demands of focus are determined (the  $\sim$  marked phrase, in Rooth's system).

- a. The phrase EP will introduce a set of focus alternative, F(EP).
- b. A member of F(EP) a focus antecedent must be salient in the discourse.

Tancredi's Thesis: In the case of Ellipsis, an antecedent must be pronounced.<sup>5</sup>

#### In short:

- 1. A deleted constituent, XP, (like any other constituent) must be reflexively dominated by a constituent EP (the Parallelism Domain) and there must be a salient AP, such that  $AP \in F(EP)$ .
- 2. By Tancredi's thesis, AP must be a pronounced constituent.
- 3. Because <del>XP</del> is not F-Marked and does not contain an F-marked constituent (just as in the case of PD), EP will have to share more properties with AP than elsewhere.

#### 7. Structural Isomorphism

- (19) **Focus**: The set of focus alternatives of a phrase X is a set of syntactic objects (see Fox 1999, Fox and Katzir 2011, Katzir 2013.) -- the set of *good syntactic antecedents*.
- (20) **Good Syntactic Antecedent**: a constituent A is a good syntactic antecedent for a constituent B if
  - a. A and B are tokens of the same lexical item.
  - b. A and B bear the same index ( $A=X_i \& B=Y_i$ , for some i)
  - c. B is F-marked and A is a syntactic alternative of B.<sup>6</sup>
  - d. A = Merge  $(\alpha, \alpha')$ ; B = Merge  $(\beta, \beta')$ ; and  $\alpha$  is a good syntactic antecedent for  $\beta$  and  $\alpha'$  is a good syntactic antecedent for  $\beta'$ .
  - e.  $A = \lambda_i \alpha$ ;  $B = \lambda_j \beta$ ; and  $\alpha$  is a good syntactic antecedent for  $\beta[i/j]$
  - If none of the conditions in a-e holds, A is not a good syntactic antecedent for B.

#### (21) Focus Values

- a. The Syntactic focus value of a constituent A,  $F_{syn}(A)$ , is the set of phrases that are good antecedents for A.
- b. The Semantic focus value of a constituent A,  $F_{sem}(A)$ , is the set of meanings associated with phrases in  $F_{syn}(A)$ .

<sup>&</sup>lt;sup>5</sup> There are well-known counter-examples (see e.g. Jacobson's talk from last week). What matters for my current purposes is that in the cases I will be looking at an overt phrase is taken to be the actual antecedent (rather than an accommodated phrase).

<sup>&</sup>lt;sup>6</sup> For the relevant syntactic definition of alternatives, see Katzir (2007). For the purposes of this talk, we could also adopt Rooth, though see Fox and Katzir (2011) for arguments in favor of Katzir.

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#### Good consequence:

Allows for re-binding: sloppy readings should be possible as long as binding takes place from parallel positions.

#### **Bad consequences:**

- a. If HLB is assumed, strict readings are completely out (i.e., same problematic situation we were in with WS).
- b. Even if we get rid of HLB and allow for strict readings, sloppy-to-strict would not allowed, and the many clauses problem remains mysterious.
- c. Likewise, we can only account for 1 of the 4 potential readings in the many pronouns puzzle (rather than 3 out of 4).

Structural Isomorphism is obviously too strong...

#### 8. Syntax or Semantics (or both)<sup>7</sup>

We saw that structural isomorphism is too strong a condition on ellipsis. There are other reasons to believe this.

In light of these, we might think that we need a semantic condition on ellipsis, as in the focus component of Rooth's theory (or some of Merchant's work). But, as we will see, this will be too weak.

#### 8.1. Evidence for a semantic condition

#### 8.1.1. Vehicle Change

(22)a. Mary didn't talk to anyone. Yes, she did, <talk to someone>. b. Mary likes John's friends. He<sub>1</sub> doesn't.  $1 \rightarrow John$ 

#### 8.1.2. Strict Readings despite HLB

We saw that the structural definition of focus (S-I) disallows strict readings, if HLB is assumed. This is not the case if focus alternatives are semantic objects as in Rooth's work.<sup>8</sup>

<sup>&</sup>lt;sup>7</sup> I am focusing on VP ellipsis here. For other forms of ellipsis, there are difficulties that I will not be addressing here with quite a bit of important work that I am not in a position to contribute to. <sup>8</sup> Instead of a calculation, here is an abstract explanation:

Fact 1: Rooth's theory is less restrictive than structural isomorphism. If A is a good antecedent for B under SI, it is also a good antecedent under Rooth.

Fact 2: For Rooth, focus values are semantic objects. This means that if AC is a good antecedent for EC under Rooth, the same would hold for any sentence semantically equivalent to AC.

Imagine we lived in a world without HLB, where the antecedent Mary liked her paper could receive a parse in which the pronoun her co-refers with Mary without being a bound variable. Such an antecedent would allow for a strict reading (Fact 1). But, if this antecedent would license the strict reading for EC, so would the antecedent with variable binding (Fact 2).

#### 8.1.3. Strict-to-Sloppy

For the same reason, Rooth's semantic definition of focus values allows strict-to-sloppy thus resolving the many-clauses puzzle.

#### 8.2. Evidence for a syntactic condition

#### 8.2.1. Witten's observation (cited, e.g., in Sag 1976)

- (23) a. Mary's students admire Mary. John's<sub>F</sub> students do, too \*<admire him>
  b. Mary's students admire her. John's<sub>F</sub> students do, too <admire him>.
- (24) a. 7 is greater or equal to 7. 5<sub>F</sub> is, too. \*<greater or equal to itself>
  b. 7 is greater or equal to itself. 5<sub>F</sub> is, too. <greater or equal to itself>

The contrast in (24) is not problematic for the Sag-Williams semantic theory.

However, once we move from conditions on ellipsis to focus theory, we see that if focus values are computed semantically (Roothian focus values), we no longer account for the contrast (since two semantically equivalent sentences have the same *antecedenthood potential* under Rooth's theory).

**Rooth's conclusion**: In addition to semantic focus theory, there is a syntactic condition specifically designed for ellipsis.

- (25) Rooth's syntactic condition on ellipsis: an antecedent and an elided VP must have the same syntactic representation modulo indexation.
- (26) Definition of syntactic identity: X is syntactically identical to Y, if one of the conditions in a-d are met.
  - a. X and Y are tokens of the same lexical item.
  - b. X is a pro form with any index and Y is a pro form with any index

 $(X = pro_i; Y = pro_k)$ 

- c.  $X = Merge (X_1, X_2); Y = Merge (Y_1, Y_2); X_1$  is syntactically identical to  $Y_1$  and  $X_2$  is syntactically identical to  $Y_2$
- d. X = i X'; Y = j Y'; X' is syntactically identical to Y'.
- If none of the conditions in a-d holds, X and Y are not syntactically identical.<sup>9</sup>

In (24), the parallelism condition is satisfied but the identity condition is not, because a pronoun is not identical to a name (there can be no VC from a name to a pronoun)

**Problem**: It is precisely VC from a name to a pronoun that we need in order to account for facts such as (22)b.

**Note**: If a theory of Parallelism would derive what I called "NP Parallelism", Witten's observation would follow.

<sup>&</sup>lt;sup>9</sup> I'm providing a definition to make it clear that it is almost as complex as our syntactic definition of focus values.

# 8.2.2. Scope Economy

A sentence that must have surface scope by Scope Economy is not a good antecedent for inverse scope.

(27)  $\begin{bmatrix} AC \text{ Rob Pensalfini speaks more than 3 of these languages} \\ \begin{bmatrix} EC [Ken Hale]_F \text{ doesn't } ] \\ \hline (\neg > more than 3; *more than 3 > \neg) \end{bmatrix}$ 

Scope Economy: blocks inverse scope in AC. Parallelism: blocks inverse Scope in EC.

But this presupposes a syntactic notion of parallelism: syntactic parallel scope! Under Rooth's theory, Inverse Scope will be licensed in EP even if Scope Economy blocks surface scope in AP (see footnote 8 and Fox 2000, chapter 3, where you can also find further intricacies).

# 8.2.3. Have Local Binding

A sentence that must have local binding by HLB is not a good antecedent for non-localbinding in a parallelism domain. However, such a sentence expresses the same proposition as the one that would be expressed if HLB was not active and non-local binding was licensed.

(1) [AC Mary said she liked her paper] [EP [John]<sub>F</sub> did, too] (\*strict, sloppy)

HLB: blocks non-local binding in AP. Parallelism (we hope): blocks non-local binding in EP.

But this presupposes a syntactic notion of parallelism: syntactic parallel binding!

Desideratum for a theory of Parallelism: to deal with the conflicting evidence.

- a. To be permissive enough to account for VC, strict reading despite HLB, and strict-to-sloppy reading.
- b. To be restrictive enough to account for Witten's Generalization, Scope Economy and the many pronouns puzzle.

#### 9. Syntactic Parallelism modulo co-valuation

#### **Co-valuation (Heim 2009)**

(28) Let x be (an occurrence of) a constituent dominated by a phrase S interpreted under an assignment function g and let y be any constituent. x and y are *co-valued* in S, if S has the same meaning under g as S[x/y].<sup>10,11</sup>

Focus values are syntactic objects as in 6.1., but there is a special exception for co-valuation:

- (29) **Focus**: The set of focus alternative of a phrase X, given an assignment function g, is a set of syntactic objects, the set of *good syntactic antecedents modulo g-co-valuation*.<sup>12</sup>
- (30) **Good Syntactic Antecedent modulo g-co-valuation:** a constituent A is a good syntactic antecedent for a constituent B modulo g-co-valuation, if the following conditions are satisfied:
  - i. there are phrases A' and B' such that A' is a good syntactic antecedent for B' (by the definition in (20)).
  - ii. A' can be derived from A by replacing sub-constituents of A with co-valued expressions (generated by the grammar) that are interpretable under g.
  - iii. B' can be derived from B by replacing sub-constituents of B with co-valued expressions (generated by the grammar) that are interpretable under g.<sup>13</sup>

#### (31) Focus Values

- a. The Syntactic focus value of a constituent A, given g,  $F_{syn}(g, A)$ , is the set of phrases that are good antecedents for A modulo g-co-valuation.
- b. The Semantic focus value of a constituent A,  $F_{sem}(g, A)$ , is the set of meanings, under g, associated with phrases in  $F_{syn}(g, A)$ .

# 10. Strict-Sloppy ambiguity and the many clauses puzzle

#### (4)" a. Sloppy Reading

[AC Mary  $\lambda x$ . x talked about x's paper]. [EC John<sub>F</sub>  $\lambda y$ . y talked about y's paper], too.

AC is a good antecedent directly

<sup>&</sup>lt;sup>10</sup> Heim proposed co-valuation as the core notion governed by Binding Theory, as opposed to variable binding in Reinhart's approach (or simple co-indexation). Heim views the many pronouns puzzle as the only potential argument for Reinhart's approach, but she is also skeptical given the lack of theory of parallelism in Fox (2000).

<sup>&</sup>lt;sup>11</sup> Heim's definition is a bit more involved, as it intends to deal with cases where the reference of a DP is not determined by the common ground. I think that incorporating the added complexity will not affect what I am trying to say here.

<sup>&</sup>lt;sup>12</sup> Following Charlow, I assume that the assignment functions we look at are the same as those we would be looking at in a theory of presupposition projection, e.g. those in the constituent's *local-context*.

<sup>&</sup>lt;sup>13</sup> The phrases that we can substitute an expression by must be generated by the grammar. The result of substitution, however, need not be a grammatical object in its own right (as in Heim 2012).

a. Strict Reading	
[AC Mary $\lambda x$ . x talked about x's paper].	
[ $_{EC}$ John <sub>F</sub> $\lambda y$ . y talked about Mary's paper], too.	AC is not a good antecedent directly
$[AC'$ Mary $\lambda x$ . x talked about Mary's paper].	AC' is a good antecedent (and AC' can be derived from AC by an allowed substitution)

# Because the same AC can be a good antecedent for EC strict and EC Sloppy, we account for the strict-to-sloppy reading in the many clauses environment.

# **11. Many Pronouns Puzzle**

(1)	$[_{AC}$ Mary $\lambda x$ . x said x $\lambda y$ y liked y's paper]. $[_{EC}$ John did, too].			
	a.	[ $_{EC}$ John $\lambda x. x$ said x $\lambda y y$ liked y's paper]	AC is good antecedent	
	b.	$[_{AC'}Mary \lambda x. x \text{ said Mary } \lambda y y \text{ liked } y's \text{ paper}].$ $[_{EC} \text{John } \lambda x. x \text{ said Mary } \lambda y y \text{ liked } y's \text{ paper}]$	Mary co-valued with parallel x in AC AC' is a good antecedent.	
	c.	$[_{AC''}$ Mary $\lambda x. x$ said x $\lambda y$ y liked Mary's paper]. $[_{EC}$ John $\lambda x. x$ said s $\lambda y$ y liked Mary's paper]	Mary co-valued with parallel y in AC AC" is a good antecedent.	
	d. *[ $_{AC''}$ Mary $\lambda x$ . x said Mary $\lambda y$ y liked x's paper].			
		[EC John $\lambda x$ . x said Mary $\lambda y$ y liked x's paper]	AC"' is a good antecedent. But it can't be derived from AC by substitution an expression in the domain of $g_c$ .	

# 12. Other Cases

# 12.1. Vehicle Change

- (22)a [AC Mary didn't talk to anyone]. [EC Yes, she did, <talk to someone>].
   AC is not a good antecedent. But [AC Mary didn't talk to someone] is a good antecedent, and AC' can be derived from AC by a meaning preserving substitution.
- (22)b Mary likes John's friends. He<sub>1</sub> doesn't.  $1 \rightarrow$  John Like (22)a, though here AC might already be a good antecedent without substitution, depending on whether we think *John* is indexed (and if so, on whether it is co-indexed with *he*).

# 12.2. Scope Economy

(27)  $\begin{bmatrix} AP \text{ Rob Pensalfini speaks more than 3 of these languages} \\ \begin{bmatrix} EP [Ken Hale]_F \text{ doesn't }] \\ \hline (\neg > more than 3; *more than 3 > \neg) \end{bmatrix}$ 

By Scope Economy, AC can only receive one LF parse

[AC [Rob Pensalfini]  $\lambda x$ . Affirm [more than 3 of these languages]  $\lambda y$ . x speaks y]

This LF is a good antecedent for the surface scope representation of EC but not for the inverse scope representation.

Moreover, there is no way to convert AC to another LF by substitution of co-valued expressions (generated by the grammar), such that the result is a good antecedent for the inverse scope LF. To see this, go over all constituents of AC and see that they cannot be replaced by other constituents to derive an LF in which the relative c-command relationship between *affirm* and the object QP is reversed.

# 12.3. Witten's Generalization

(24)a. [AC 7 is greater or equal to 7]. [5<sub>F</sub> is, too. \*<greater or equal to itself>]

AC is a good antecedent for a representation of EC that yields the strict reading, but not for one that yields a sloppy reading.

Moreover, there is no way to convert AC to another LF by substitution of co-valued expression interpretable in  $g_c$ , such that the result is a good antecedent for the sloppy reading. We could replace 7 by a bound variable, but that is not an allowed replacement, as it is not interpretable in  $g_c$ .

- Note that replacement with bound variables would destroy our account of the many pronouns puzzle as well.
- Basis idea: when you evaluate whether something is a good antecedent relative to an assignment g, you can only substitute with expressions whose meaning under g is given.

**Prediction:** No strict-to-sloppy readings, as long as we can ensure that Parallelism is examined sequentially (though not obvious that we can).

- (27) a. [AP Mary likes her paper.] [The teacher does too <likes Mary's paper> and his other students don't \*< like their own papers>]
  - a. [AP Mary likes her paper.] [The other students do too <likes their own papers> but the teacher doesn't < like their own papers>]

# **15. Challenges to Fox (1998)**

#### 15.1. Dahl's Puzzle under co-binding (Roelofsen)

(32) Every girl remembers	that she said she likes her paper, and		
	that John, did, too.	(same 3 out of 4 readings).	

This looks like a problem for Fox (1998) as the antecedent of the pronoun *she* is not associated with any reference, so not obvious that we should get any strict reading readings (not obvious how the second clause of NP parallelism can be appealed to).

This is not a problem for the current formulation. We simply look at the focus value of EC under a modified assignment functions that provide a value for the first occurrence of the pronoun *she*, which we can thus substitute for the other occurrences, thereby yielding the appropriate strict readings.

#### 15.2. Referential Parallelism and *Only* (Fleisher)

(33) Only Mary liked her paper, #and Bill does, too.

This, Fleisher claims, is a problem for Fox (1998). NP parallelism, as formulated might appear to suggest that the pronoun can yield the "sloppy" reading for *only* and the strict reading for ellipsis (via referential parallelism).

However, it is not a problem for the current formulation. If we get a sloppy reading for *only*, then the pronoun *her* is not co-valued with *Mary* and we can't get a strict reading for ellipsis.

#### 15.3. Apparent violations of HLB (Roelofsen)

(34) Every girl said that she liked her paper.No girl said that the teacher did <liked her paper>

Roelofsen/Drummond: For Parallelism to be satisfied, HLB must be violated in AC.

My Suggestion: HLB is not violated but a further modification of Parallelism is required motivated also by facts that Klaus Abels focused on in his talk on Vehicle Change (with reference to Fiengo and May and Merchant).

- (35) a. Every girl likes her paper and every girl knows/should-know that the teacher does <likes her paper>, too.
  - b. \*Every girl likes her paper and every boy knows that the teacher does <likes his paper>.

Basic Idea (from Fiengo and May): (35)a does not require looking at a big Focus/Parallelsim domain. One can look only at the VP itself as the relevant domain. And the governing factor (the thing that determines whether you can look at a small domain) is the nature of the quantificational restrictor: you can look at a small domain in cases of re-binding when (and only when) the restrictor of the QP that binds the variable in the ellipsis clause is a sub-set of the restrictor of the QP that binds the variables in the antecedent clause.

I think the same holds for (34):

(36) \*Every girl said that she liked her paper.Every/No boy said that the teacher did <liked his paper>

In light of this, the current proposal for Parallelism needs to be amended.

Before we move to the amendment, I would like to start with a Sag-Williams type theory which would allow for re-binding only in cases such as (35)a and (34) where the domain of quantification for the bound-variables that are free in the elided VP is a subset of the domain of quantification for the corresponding variables in the antecedent.

(37) **SW Restrictor-sensitive Parallelism**: Let X be a constituent and g be an assignment function that needs to be accessed in the interpretation of X (an assignment in the *local context* of X). Y is a good antecedent for X if there is an assignment g' in Y's local context, such that  $\lambda w$ .  $[[Y]]^{w,g'} = \lambda w$ .  $[[VP_E]]^{w,g}$ 

And here is a Roothian weakening of SW that allows for re-binding irrespective of quantificational domains as long as quantification takes place from parallel positions.

- (38) **Roothian Restrictor-sensitive Parallelism** Let X be a domain of focus and g an assignment function that needs to be accessed in the interpretation of X (an assignment in the *local context* of X). Y is a good antecedent for X if there is an assignment g' in Y's local context, such that Y under g' is a member of the focus value of X.
- Key observation: this allows us to choose a small domain of focus for re-binding (one that does not include the binder) when and only when the binder of the variable inside ellipsis is restricted by a subset of the binder in the antecedent.

And now to what currently is my best proposal (I think):

- (39) Requirement imposed by ~: Let X be a domain of focus and g an assignment function that needs to be accessed in the interpretation of X (an assignment in the *local context* of X). Y is a good antecedent for X if there is an assignment g' in Y's local context, such that Y under g' is a good antecedent for X under g modulo g-g'-co-valuation.
- (40) **Good Syntactic Antecedent**: a constituent A under g is a good syntactic antecedent for a constituent B under g' if

- a. A under g has the same meaning as B under g'
- b. B is F-marked and A is a syntactic alternative of B.
- c.  $A = Merge (\alpha, \alpha'); B = Merge (\beta, \beta'); and \alpha under g is a good syntactic$  $antecedent for <math>\beta$  under g' and  $\alpha'$  under g is a good syntactic antecedent for  $\beta'$ under g'.
- d.  $A = \lambda_i \alpha$ ;  $B = \lambda_j \beta$ ; and for all x  $\alpha$  under g[i|x] is a good syntactic antecedent for  $\beta$  under g[j|x]
- If none of the conditions in a-d holds, A is not a good syntactic antecedent for B.
- (41) **Good Syntactic Antecedent modulo g-g'-co-valuation:** a constituent A interpreted under g is a good syntactic antecedent for a constituent B interpreted under g' modulo g-g'-co-valuation, if the following conditions are satisfied:
  - i. there are phrases A' and B' such that A' is a good syntactic antecedent for B' (by the definition in (40)).
  - ii. A' can be derived from A by replacing sub-constituents of A with expressions that are interpretable and receive the same interpretation under both g and g'.
  - **iii.** B' can be derived from B by replacing sub-constituents of B with co-valued expressions that are interpretable and receive the same interpretation under both g and g'.

#### Conclusion (syntactic component of focus values):

- 1. In Fox and Katzir (2011) we provided arguments that the alternatives of a focused phrase are determined by the syntax of the focused phrase (completely independent of the arguments we considered here).
- 2. If F&K's arguments are correct, focus values cannot be determined independently of syntax.
- 3. But where does syntax enter? In a sense we ended up with a system where it enters only at the point of focus-marking, and can be thought of as a simple consequence of the fact that alternatives of focused constituents are determined syntactically.
- 4. We have ended up with a definition of alternatives that is not syntactic elsewhere.
  - a. The base of our recursive definition is semantic (which means that two phrases *of any size* with the same semantic interpretation are automatically alternatives of each other).
  - b. There is, in addition, the modulo co-valuation bit (which is yet another semantic relaxation).
  - c. We ended up quantifying over assignment functions in the local context of EC and AC (as in the modification of SW and Rooth that I just introduced).