Some Background on Principle C

1. Classic Principle C

(1) The Empirical Coverage of Classic Principle C

'Principle C' of the Binding Theory was originally intended to cover (at least) two phenomena.

a. Obviation Effects
A pronoun cannot be co-referent with a non-pronominal that it c-commands.

He said that Bill is funny. (*He* ≠ *Bill*)

b. Strong Cross Over (SCO) Effects
If a (WH-)Operator binds a pronoun and a trace, then the pronoun *cannot* c-command the trace.

Who does he think Mary likes *t*? (≠ Which x. x thinks Mary likes x?)
(≠ Who$_1$ t_1 thinks Mary likes them$_1$?)

Observation: These are *semantic* facts about the structures above.

Classic Binding Theory (classic 'Principle C') sought to capture these facts via

(a) Introducing a syntactic mechanism for encoding these semantic properties

(b) Placing syntactic constraints on the syntactic encoding mechanism

(2) The Syntactic Encoding Mechanism: Co-Indexing

a. Syntax
DPs in the clause are freely assigned 'indices' (DP_1 , DP_2 , DP_3 , …)

b. Semantics
X and Z share the same index *iff*

(i) X and Z refer to the same entity (have same value)
(ii) OR X (semantically) binds Z
Z (semantically) binds X

(3) Classic Principle C (Simplified)

A pronoun cannot be co-indexed with an 'R-expression' that it c-commands.

(4) **R-Expression**

a. Non-pronominal NP (*Dave, the cat, every snowmobile, etc.*)

b. Traces (A-bar Traces)

With these tools in place, we can now derive the phenomena in (1)

(5) **Deriving Obviation Effects**

- Given the semantics of co-indexing (Condition (2bi)), if a pronoun is interpreted as co-referent with a non-pronominal NP, that pronoun must be *co-indexed* with that NP.
- Given the definition of 'R-Expression' (4a), such a co-referent non-pronominal NP is an 'R-Expression'.
- Thus, if a pronoun c-commands a co-referent non-pronominal NP, *it will necessarily be co-indexed with an R-expression that it c-commands*, in violation of Principle C (3).

R-Expression (4a)

[**He$_1$** [said [that [**Bill$_1$** [is funny]]]]].

Co-indexing and C-command

(6) **Deriving SCO Effects**

- Given the semantics of co-indexing (Condition (2bii)), if a (WH-)Operator binds a pronoun *and* a trace, then *all three* have to share the same index.
- Given the definition of 'R-Expression' (4b), such a bound trace is an R-expression.
- Thus, if the bound pronoun c-commands the bound trace, *the pronoun will necessarily be co-indexed with an R-expression that it c-commands*, in violation of Principle C (3).

R-Expression (4a)

[Who$_1$ [did [**he**$_1$ [think [Mary [likes ***t*$_1$**]]]]]]?

Co-indexing and C-command

2. Some Problems for this Classic Theory of Principle C

Right away, people noticed the following glaring issues:

(7) **Some Conceptual Problems**

a. Problem 1: The definition of 'R-Expression' in (4a) is disjunctive.

Why should non-pronominal NPs and (A-bar) traces be classified as the same type of object?

b. Problem 2: The semantics for co-indexing in (2b) is disjunctive.

Two very different kinds of semantic relations (co-reference and binding) are both being encoded by the same mechanism.

(8) **Some Empirical Problems / Puzzles**

a. Problem 1:
Contrary to the predictions of the 'classic' theory, there are some circumstances where a pronoun *can* c-command a non-pronominal NP that it is co-referent with.
… this is especially the case if the pronoun is focused…

Example:
Only SHE_1 (HERSELF) still thinks that $Mary_1$ is nice.

b. Problem 2:
Curiously, such focusing as in (8a) cannot improve SCO violations.

Example
* Who_1 does only HE_1 (HIMSELF) still think Mary likes t_1 ?
(*Cannot mean:* Which x. only x still thinks that Mary likes x?)

Crucial Observation (Reinhart 2006)

The fact that focusing the pronoun mitigates/weakens 'obviation effects' as in (1a) but *doesn't* mitigate/weaken 'SCO' as in (1b) **strongly suggests that these are different phenomena.**

That is, we should move to a picture where the principles responsible for the 'obviation effects' in (1a) are distinct from the principles responsible for SCO effects like (1b).

3. Reinhart's Theory of Obviation Effects and SCO (*circa 2006*)

3.1 Reinhart's Theory of Obviation Effects (*circa 2006*)

General Picture:
The 'strangeness' of the putative co-reference in (1a) is due to there being a 'better' (more 'optimal') way of expressing that same proposition…

… *namely, via a sentence like* 'Bill said that he is funny.'…

3.1.1 Background: The Syntactic Encoding of Binding

In classic Binding Theory, the semantic relation of binding is represented via co-indexing (2bii).

(9) **Semantic Binding in Classic Binding Theory**

[Every boy]$_1$ thinks that he$_1$ is smart.

However, Reinhart (2006) employs a more semantically transparent syntactic encoding, one where lambda operators are directly represented in the syntax (*cf.* Heim & Kratzer (1998))

(10) **A-Binding in Reinhart (2006)**

An NP X *A-binds* pronoun Y *iff* X is sister to lambda operator that is co-indexed with Y.

Example:
[Every boy] [Λ_1 [t_1 thinks that he$_1$ is smart].

(Consequence: only pronouns/traces are given indices, not full non-pronominal DPs)

(11) **Interpretation of (Syntactic) Lambda Operators**

$[\![\Lambda_1 \text{ XP }]\!]^g = \lambda x . [\![\text{XP }]\!]^{g(1 \rightarrow x)}$

(12) **Semantic Interpretation of Syntactic Binding**

a. $[\![[\text{ Every boy }]_1 \textbf{ [} \Lambda_1 \textbf{ [} t_1 \textbf{ thinks that he}_1 \textbf{ is smart] }]\!]^g$ =

b. EVERY (BOY) $\textbf{([[[} \Lambda_1 \textbf{ [} t_1 \textbf{ thinks that he}_1 \textbf{ is smart]]]}^g\textbf{)}$ =

c. EVERY (BOY) $\textbf{(}\lambda x \textbf{ [[[} t_1 \textbf{ thinks that he}_1 \textbf{ is smart]]}^{g(1 \rightarrow x)}\textbf{)}$ =

d. EVERY (BOY) **(λx [x thinks that x is smart])**

3.1.2 The Theory of Obviation Effects

Recall that semantic relation at play in examples like (1a) – repeated below – isn't 'binding', but rather co-reference, sharing the same semantic value…

(13) **Obviation Effects**

He said that Bill is funny. (*He ≠ Bill*)

Thus, Reinhart (2006) introduces a special concept to be able to refer to the property of (i) sharing a semantic value, but (ii) not being bound.

(14) **Co-Valuation**

X and Y are <u>*co-valued*</u> iff neither A-binds the other, and they are assigned the same semantic value.

(15) **Example of Co-Valuation**

[[She$_2$ thinks that Mary is nice]]$^{g(\,2\,\rightarrow\,\text{Mary}\,)}$

- Neither 'she$_2$' no 'Mary' A-bind the other.
  'Mary' doesn't A-bind 'she$_2$'
  ('Mary' doesn't c-command 'she$_2$')
  'She$_2$' doesn't (couldn't) A-bind 'Mary'
  ('Mary' can't be assigned an index, since it's not a pronoun / trace)

- However, relative to the variable assignment *g(2 → Mary)*, both 'she$_2$' and 'Mary' will receive the same semantic value (*i.e.,* Mary).

- **Thus, 'she$_2$' and 'Mary' count as 'co-valued'**

(16) **Core Observation**

The sentence under (15) is observed *not* to allow the reading that would follow from co-valuation of 'she' and 'Mary' (obviation effect).

Thus, to capture such 'obviation effects', we need to find *some way* of ruling out such co-valuation.

That is, we have to some how rule out the ability of interpreting sentence (15) within the variable assignment g(2 → Mary)…

(17) **Rule I (Reinhart 2006)**

X and Y cannot be co-valued in a derivation D, if

a. X c-commands Y

b. X cannot A-bind Y in derivation D

c. The interpretation that results from co-valuation is identical to the interpretation that would result if X A-bound Y (or Y A-bound X).

(18) **Capturing Obviation Effects**

So, how does Rule I above rule out co-valuation of 'she' and 'Mary' below?

[[She$_2$ thinks that Mary is nice]]$^{g(\,2\,\rightarrow\,\text{Mary}\,)}$

- 'She$_2$' c-commands 'Mary' (17a)
- 'She$_2$' cannot A-bind 'Mary' (since Mary can't have an index) (17b)
- The interpretation that would result from co-valuation of 'She$_2$' and 'Mary' is *identical* to the interpretation that would result if 'Mary' A-bound 'she$_2$'. (17c)

Illustration of (17c)

Interpretation of Co-Valuation Structure:

[[She$_2$ thinks that Mary is nice]]$^{g(\,2\,\rightarrow\,\text{Mary}\,)}$ = Mary thinks that Mary is nice.

Interpretation of Binding Structure:

[[Mary [Λ_1 [t_1 thinks that she$_1$ is nice]]]^g =
Mary [[[Λ_1 [t_1 thinks that she$_1$ is nice]]]^g =
Mary λx . [[[t_1 thinks that she$_1$ is nice]]]$^{g(1\rightarrow x)}$ =
Mary λx [x thinks that x is nice] = Mary thinks that Mary is nice.

(19) **Major Achievement of this Approach, Part 1**

We can capture the fact that 'obviation effects' disappear when the pronoun is focused:

Only SHE$_1$ (HERSELF) still thinks that Mary$_1$ is nice.

(20) **No Obviation Effects When the Pronoun is Focused**

Question:
Why is co-valuation permitted in sentences like (19)?

Answer:
Because, in these cases, co-valuation is not semantically equivalent to A-binding!

Interpretation of Co-Valuation Structure

[[Only SHE_2 (HERSELF) still thinks that Mary is nice]]$^{g(2 \rightarrow \text{Mary})}$ =

ONLY (Mary) (λx . x. still thinks that Mary is nice)

Interpretation of Binding Structure

[[Only (Mary) [Λ_1 [t_1 still thinks that she_1 is nice]]]^{g} =

ONLY (Mary) (λx . x. still thinks that x is nice)

Different Properties!

Summary:

Reinhart's (2006) system is able to
capture the 'obviation effects' in sentences like (1a)
capture the special cases where such effects are not observed (8a)
do so in a system with a more 'semantically transparent' representation of binding

... but what about Strong Cross Over (SCO)?...

3.2 Reinhart's Theory of SCO Effects (*circa 2006*)

General Picture:

The impossibility of the 'bound' reading of questions like (21) is due to:
(i) General core principles of logic
(ii) Constraints on co-valuation (Rule I, (17))

(21) **Strong Cross Over Effects**

Who does he think Mary likes *t*? (≠ Which x. x thinks Mary likes x?)
(≠ Who_1 t_1 thinks Mary likes $them_1$?)

3.2.1 Some Preliminaries

(22) **Two Background Assumptions (I Think)**

Both of these are fairly natural, and I think that Reinhart (2006) tacitly assumes them.

a. When a (WH-)Operator is moved, it *must* A-bind its trace

* WH-OP [Λ_1 … t_2 …]

b. Different Λ-operators must have different indices (indices cannot be 'reused')

* [Λ_1 [… Λ_1 […]]

(23) **Lemma**

In a sentence like (21), the c-commanding pronoun *cannot A-bind* the trace of the operator.

Proof:
Suppose that the pronoun did A-bind the trace. By definition (10), this means that the pronoun is sister to a lambda operator co-indexed with the trace.

a. [… he [Λ_1 [t_1 thinks that Mary like t_1]]]

However, recall that the wh-operator *must* also A-bind its trace (22a). By definition (10), this means that the wh-operator is also sister to a lambda operator co-indexed with the trace.

b. [Who [Λ_1 [he [Λ_1 [t_1 thinks that Mary like t_1]]]]

However, such a structure is in conflict with principles regarding indexing (22b).

A Semantic Re-Interpretation of Lemma (23) (What Reinhart (2006) Actually Claims)

The pronoun can't A-bind the trace in such sentences because such a structure would be interpreted as one where the lambda-operator of the wh-word doesn't actually directly bind the trace…

3.2.2 Deriving SCO Effects

Starting Observation:

If sentence (21) were allowed to have the structure in (24a) below, then it would be predicted to have the unattested bound interpretation (*cf.* (24b))

(24) **Structure that Results in Illicit Bound Interpretation**

a. Who [Λ_1 [he$_1$ thinks that Mary like t_1]]]

b. [[Who [Λ_1 [he$_1$ thinks that Mary like t_1]]]]]^g =
WHO [[[Λ_1 [he$_1$ thinks that Mary like t_1]]]]]^g =
WHO [λx [[he$_1$ thinks that Mary like t_1]]$^{g(1\rightarrow x)}$ =
WHO [λx [x thinks that Mary like x] =
Which x. is such that x thinks that Mary likes x.

So, the inability for (21) to have the 'bound interpretation' in (24b) entails that the structure in (24a) must be ruled out.

(25) **Ruling Out Structure (24a), Part 1**

Fact:
In (24a), the pronoun *he$_1$* and the wh-trace t_1 are co-valued.

- Neither A-binds the other (since there is no lambda-operator)
- Both are assigned the same interpretation (in any variable assignment)

THUS: a potential means for ruling out (24a) is to rule out the co-valuation of *he$_1$* and the wh-trace, *via appeal to RULE I (repeated below)*

(26) **Rule I (Reinhart 2006)**

X and Y cannot be co-valued in a derivation D, if

a. X c-commands Y

b. X cannot A-bind Y in derivation D

c. The interpretation that results from co-valuation is identical to the interpretation that would result if X A-bound Y (or Y A-bound X).

(26) **Ruling Out Structure (24a), Part 2**

a. Clearly, the pronoun he_1 c-commands the wh-trace t_1 in (24a)

b. Furthermore, by Lemma (23), the pronoun he_1 also cannot A-bind the wh-trace t_1 in (24a).

c. **However, if the syntax *did* permit the pronoun he_1 to A-bind the wh-trace t_1 in (24a), the result would be an interpretation identical to the co-valued interpretation in (24b)**

Structure just like (24a), but with binding of wh-trace by pronoun:

[Who [Λ_1 [he_1 [Λ_1 [t_1 thinks that Mary like t_1]]]]] (*cf.* (24a), (23b))

Interpretation of Binding Structure:

$[[$ [Who [Λ_1 [he_1 [Λ_1 [t_1 thinks that Mary like t_1]]]]] $]]^g$ =

WHO [λx . x [λx . x thinks that Mary likes x]] =

WHO [λx . x thinks that Mary likes x]

Same Interpretation

Interpretation of Co-Valuation Structure

$[[$ Who [Λ_1 [he_1 thinks that Mary like t_1]]] $]]^g$ =

WHO [λx [x thinks that Mary like x]

Conclusion:
Reinhart's Rule I (26) *would* correctly rule out the co-valuation structure in (24a).

… THIS BASIC RESULT CAN BE FURTHER GENERALIZED AS FOLLOWS…

General Argument:

(i) The illicit bound reading of (21) is one where the pronoun and the wh-trace are assigned the same value (i.e., the variable x).

Who does he think Mary likes t_1 ?
↕ ↕
WHO [λx [x think Mary like x]

(ii) Consequently, this reading *would* be assigned to a structure where the pronoun 'he' *A-binds* the wh-trace. (*cf.* (26))

(iii) However, we've already seen (via Lemma (23)) that the syntax won't allow (21) to have a structure where the pronoun *A-binds* the wh-trace.

(iv) Thus, the illicit bound interpretation of (21) would have to be one where the pronoun and wh-trace are *co-valued*.

(v) However, in virtue of the fact in (ii), such a co-valued interpretation would violate Rule I (since you could, in principle, get the same meaning via binding).

General Conclusion: Reinhart's (2006) system predicts the existence of SCO effects.

A Further Correct Prediction:

The addition of focus / focus-sensitive operator on the c-commanding pronoun will not mitigate SCO Effects.

(27) **SCO Effects Remain When Pronoun is Focused**

* Who_1 does only HE_1 (HIMSELF) still think Mary likes t_1 ?
(*Cannot mean:* Which x. only x still thinks that Mary likes x?)

(28) **Obviation Effects Mitigated When Pronoun is Focused**

Only SHE_1 (HERSELF) still thinks that Mary_1 is nice.

Why?

- We already know that binding of the trace by the pronoun will be impossible in (27) (*cf.* (23)).

- The possibility of co-valuation, then, rests on the question of whether binding – of the trace by the pronoun, or of the pronoun by the trace – would result in a meaning *distinct* from co-valuation (*cf.* the facts surrounding (28))

- As illustrated below, the co-valuation interpretation of (27) is *perfectly equivalent* to the interpretations you'd get if (i) the pronoun bound the trace or (ii) the trace bound the pronoun (upon a permutation of their positions).

Interpretation of Co-Valuation Structure

[[Who$_1$ [Λ_1 [does only HE$_1$ [Λ_2 [t_2 still think Mary likes t_1]]]] ?]]^g =

WHO [λx [ONLY (x) (λy . y thinks that Mary like x)]]

This property, when applied to an entity *a,* yields 1 *iff*
a is the only entity to think that Mary likes *a*

Interpretation of Binding Structure 1

[[Who$_1$ [Λ_1 [does only HE$_1$ [Λ_2 [t_2 still think Mary likes t_2]]]] ?]]^g =

WHO [λx [ONLY (x) (λy . y thinks that Mary like y)]]

This property, when applied to an entity *a*, yields 1 *iff*
a is the only entity to think that Mary likes *a*.

Same!!

Interpretation of Binding Structure 2

[[Who$_1$ [Λ_1 [does only t$_1$ [Λ_2 [t_2 still think Mary likes him$_2$]]]] ?]]^g =

WHO [λx [ONLY (x) (λy . y thinks that Mary like y)]]

This property, when applied to an entity *a*, yields 1 *iff*
a is the only entity to think that Mary likes *a*.

4. Linking Approaches to Anaphora

Thus far, this handout has covered Reinhart's treatment of binding and anaphora.

Another attempt to improve on 'classic Binding Theory' comes from so-called 'Linking Theory', an alternative approach to anaphora.

(29) **The Core Intuition Behind Linking Theory**

Pre-theoretically, we have an 'intuition' that a pronoun depends upon some full DP for its meaning.

That is, in a sentence like that below, the antecedent 'Dave' carries an inherent meaning, while the pronoun only 'borrows' its meaning in context from its antecedent.

Dave_1 thinks that he_1 is nice.

Problem: If we share the core intuition in (29), and want our theory of binding to reflect this fact, then the notation of 'indices' is too weak.

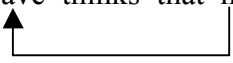
Co-indexing is a *symmetric* relation, whereas anaphora is an *asymmetric* relation.

(…Simply because X and Y are co-indexed, that doesn't on its own 'tell you' which has an inherent meaning and which is the pronoun dependent on something else for its meaning…)

(30) **The Solution: Linking (Higginbotham 1983, Hornstein 1995, Safir 2004)**

A pronoun X that depends on a phrase Y for its meaning is 'linked' to Y.
This 'linking' relation is represented with an arrow.

Dave thinks that he is nice.



OK… This is cute… but so what?

Why People Really Propose This:
There are some ways of 'playing' with the inherent *asymmetry* in the linking relation to account for some otherwise funny facts…

One Example of An Analysis with Linking (Hornstein 1995)

Consider the sentences below:

(31) **'Weakest' Cross Over**

a. * Who$_1$ does [their$_1$ mother] love t_1?

b. Who$_1$ did you interview t_1 [before [their$_1$ boss] had cleared t_1]?

Question:
Why doesn't a WCO violation occur in the 'before'-clause?

(32) **Binding Theoretic Statement of WCO Condition**

If an operator binds a pronoun and a trace, then the trace must c-command the pronoun.

(33) **Linking Theoretic Statement of WCO Condition**

If a pronoun is linked to a trace, then the trace must appear to the left of the pronoun.

Sidenote: (33) a little simpler than (32)

Observation 1: The condition in (32) wrongly predicts that (31b) should be *ill-formed*.

Observation 2: The Linking Theoretic condition in (33) would correctly allow (31b), while still ruling out (31a)

(34) **Linking Theoretic Representation of (31a) vs. (31b)**

a. * Who does [their mother] love *t*?
Pronoun must be linked to following trace
Violation of (33)

b. Who did you interview *t* [before [their boss] had cleared *t*]?

Pronoun can be linked to a preceding trace
Condition (33) satisfied!!!