***De Re* vs. *De Dicto*, Part 2:** [1] **Explicit Binding of World Variables**

1. The Challenge

We need to augment our syntactic and semantic theory so that sentences like (1a) can receive readings like that in (1b), readings with the core characteristics in (2).

(1) **The 'Third' Reading**

a. John believes Mary kissed a fisherman.

b. $\forall$w'$\in$ Beliefs(John,w_0): $\exists$x. x is a fisherman **in w_0** & Mary kissed x in w'

(2) **Core Properties of the 'Third Reading'**

a. <u>The indefinite is non-specific</u>
The quantificational force of the indefinite does not have scope above "believe".

b. <u>The indefinite is 'transparent'</u>
The NP-predicate in the indefinite is interpreted relative to the actual world.

(3) **The Problem**

As our system now stands, the NP in the indefinite can be interpreted relative to the actual world *only if* the indefinite takes scope above the intensional verb "believes".

a. Suppose the DP stays within the complement of "believe" at LF.

[John believes [$_{CP}$ [a fisherman] [Mary kissed *t*]]

b. Given the meaning of "believes", the entire subordinate CP will be interpreted relative to the 'belief-worlds' of John, and not the actual world

- λp. $\forall$w'$\in$ Beliefs(John,w_0): p(w')=1 (λw''[[CP]]$^{w''}$)
- $\forall$w'$\in$ Beliefs(John,w_0): [λw''[[CP]]$^{w''}$](w') = 1
- $\forall$w'$\in$ Beliefs(John,w_0): [[CP]]$^{w'}$

c. **(Key Issue) In our current system, the evaluation world of an NP will necessarily be the evaluation world of the CP that minimally dominates it (as long as no other intensional operator intervenes).**

[[CP]]$^{w'}$ = $\exists$x. x is a fisherman **in w'** & Mary kissed x in w'

[1] These notes are based upon material in von Fintel (2007; Chapter 7).

(4) **The Goal (Restated)**

Somehow, we need to allow the intension of the subordinate CP in (1) to be the following

λw' [$\exists$x. x is a fisherman **in w_0** & Mary kissed x in w']

Somehow, we need to eliminate the prediction/constraint in (3c), that the evaluation world of the CP is necessarily the evaluation world of the NPs it contains.

2. One Solution: World Pronouns and Indices

(5) **The Analogy with Quantificational DPs**

In our system, a quantificational DP needn't bind all the pronouns within its scope.
(A sentence like (5a) can have either of the readings in (5b))

a. Every boy likes a girl who likes him.

b. *Possible Readings*

(i) $\forall$**x**. **x** is a boy → $\exists$y. y is a girl & y likes **x**
(ii) $\forall$**x**. **x** is a boy → $\exists$y. y is a girl & y likes **Dave**

The means by which our system accomplishes this feat is *indexing.*
Lambda operators and pronouns bear *indices*, and a given lambda only binds those pronouns that share its *index*.

c. Possible LFs for (5a)

(i) *Bound Reading*
[Every boy] [Λ**1** [[some girl that likes him$_{\mathbf{1}}$] [Λ2 [t_1 likes t_2]]]]

(ii) *Referential Reading*
[Every boy] [Λ**1** [[some girl that likes him$_{\mathbf{3}}$] [Λ2 [t_1 likes t_2]]]]

(6) **The Idea: World Pronouns and Indices**

What if we were to introduce indices for *possible worlds* and the *lambda operators* over possible worlds?

- A particular lambda operator over possible worlds could then perhaps bind only *some* of the possible world variables in its scope.

- And so, we would perhaps obtain the goal in (4)!

2.1 World Pronouns and Indices: One Popular Implementation

(7) **Step One: Phonologically Null World Pronouns**

- The lexicon of English includes a phonologically null pronoun, W.
- Qua pronoun, W bears an index: W_1, W_2, W_3, …. W_{96}, …
- The value of W is determined by a special assignment function *w* from indices to possible worlds.

$$[[\ W_i\ ]]^w \quad = \quad w(i) \in W$$

Side-Note 1:

- Recall how our earlier theory made use of the null pronoun BASE
- Recall also how appeal to this null pronoun was not, strictly speaking, necessary for the general account we developed (its work could be done via an index on the modal itself).
- The same is also true for the null pronoun 'W' of the present account….

(8) **Step Two: A Semantic Readjustment to the Predicates (Ns/Vs)**

Predicates (Ns and Vs) are functions of type <s,τ>. They take as their first argument a possible world.

a. Some Sample Lexical Entries

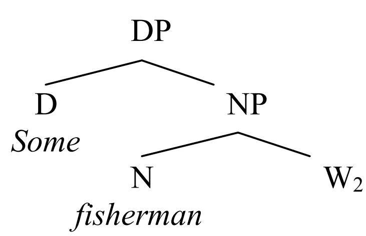
(i) $[[\text{ fisherman }]]^w$ = λw. λx. x is a fisherman in w
(ii) $[[\text{ smokes }]]^w$ = λw. λx. x smokes in w
(iii) $[[\text{ kissed }]]^w$ = λw. λy . λx. x kissed y in w
(iv) $[[\text{believes}]]^w$ = λw. λp. λx. ∀w' ∈ Beliefs(x,w): p(w')=1

(9) **Step Three: A Syntactic Readjustment to the Predicates (NPs/VPs)**

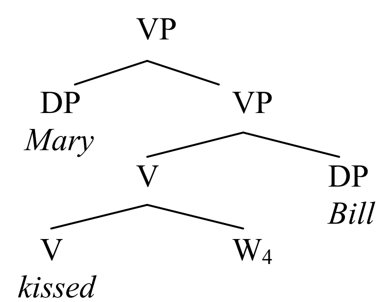
As functions of type <s,τ>, every N and V has as its sister the pronoun W.

a. Some Sample Syntactic Structures

(i)



(ii)



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(10) **Step Four: Lambdas Binding World Pronouns**

a. Every CP is sister to the special (object-language) lambda operator ‘Λw’.

b. Qua lambda operator, ‘Λw’ bears an index: Λw_1, Λw_2, … Λw_{34}, …

c. The operator ‘Λw’ is interpreted according to the following rule:

$$[[\ \Lambda w_i\ XP\ ]]^{w} = \lambda w'.\ [[\ XP\ ]]^{w(i \rightarrow w')}$$

(11) **Last Major Step: Form of Truth-Conditional Statement**

Given the condition in (10a), the semantic-value of a given (matrix) clause will *always* be some propositional function (of type <st>), rather than a particular truth-value.

Consequently, the truth-conditional statements we want our theory to derive are of the following form:

$$\mathbf{[[S]]^{w}\ (w_0) = T}\ \ \textit{\textbf{iff}}\ \ \ldots$$

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3. Deriving the ‘Third Reading’

We now have enough to derive the goal in (4), and thereby the targeted truth-conditions in (1b).

As illustrated below, in the system constructed in Section 2, the evaluation world of a given NP needn’t any longer be the evaluation world of the other predicates in the clause (such as the VP)

- The LF in (12) below is one that the theory sketched above generates for Sentence (1a).

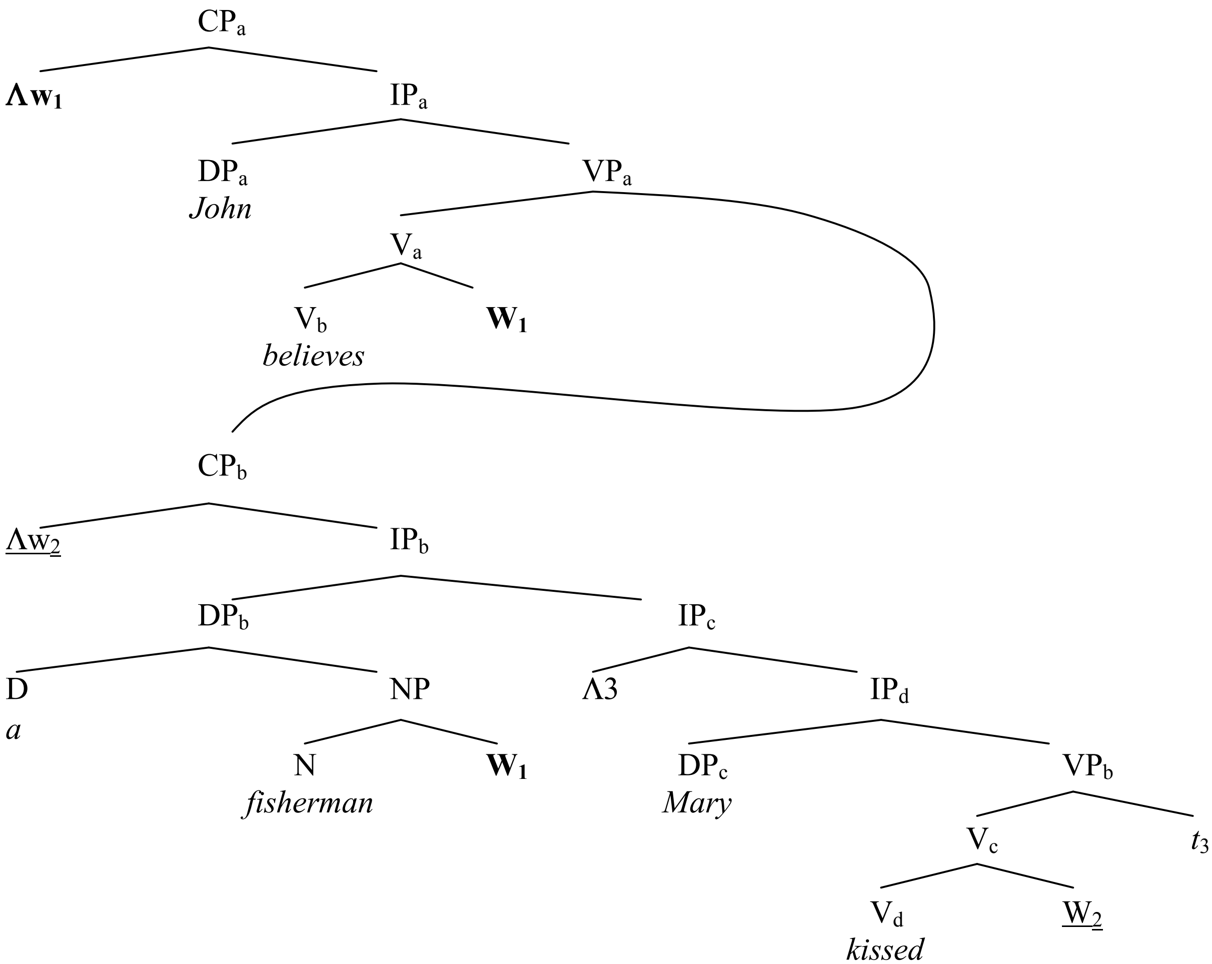
- As we will see, this LF is predicted by our system to have the truth-conditions in (1b).

(12) **A Possible LF for Sentence (1a)**

a. The Core Properties of this LF

(i) The indefinite *a fisherman* occupies a position internal to the subordinate CP, and so its quantificational force takes scope **below** the intensional verb *believes*.

(ii) The NP *fisherman* takes as argument a world pronoun *that is bound by the matrix lambda operator (rather than the lambda operator of the subordinate clause).*



The following derivation sketches how our system interprets this LF.

(13) **The Interpretation of LF (12)**

i. $[[CP_a]]^{w}$ = (by (10))

ii. $\lambda w.\ [[\ IP_a\ ]]^{w(1 \rightarrow w)}$ = (by FA, Lex)

iii. $\lambda w.\ [\lambda w'.\ \lambda p.\ \lambda x.\ \forall w'' \in Beliefs(x,w'): p(w'')=1]([[W_1]]^{w(1 \rightarrow w)})([[CP_b]]^{w(1 \rightarrow w)})(John)$
= (by (7))

iv. $\lambda w.\ [\lambda w'.\ \lambda p.\ \lambda x.\ \forall w'' \in Beliefs(x,w'): p(w'')=1](w)([[CP_b]]^{w(1 \rightarrow w)})(John)$ = (by LC)

v. $\lambda w.\ \forall w' \in Beliefs(John,w): [[CP_b]]^{w(1 \rightarrow w)}(w')=1$ = (by (10))

vi. $\lambda w.\ \forall w' \in Beliefs(John,w): [\lambda w''[[\ IP_b\ ]]^{w(1 \rightarrow w;\ 2 \rightarrow w'')}](w')=1$ = (by LC)

vii. $\lambda w.\ \forall w' \in Beliefs(John,w): [[\ IP_b\ ]]^{w(1 \rightarrow w;\ 2 \rightarrow w')}$ = (by FA, Lex)

viii. $\lambda w.\ \forall w' \in Beliefs(John,w):$
$[\lambda P.\lambda Q.\ \exists x.\ P(x)\ \&\ Q(x)]([[NP]]^{w(1 \rightarrow w;\ 2 \rightarrow w')})([[IP_c]]^{w(1 \rightarrow w;\ 2 \rightarrow w')})$ = (by FA, Lex)

ix. $\lambda w.\ \forall w' \in Beliefs(John,w): [\lambda P.\ \lambda Q.\ \exists x.\ P(x)\ \&\ Q(x)]$
$[\lambda w''.\ \lambda y.\ y \text{ is a fisherman in } w''](
[[W_1]]^{w(1 \rightarrow w;\ 2 \rightarrow w')})([[IP_c]]^{w(1 \rightarrow w;\ 2 \rightarrow w')})$
= (by (7))

x. $\lambda w.\ \forall w' \in Beliefs(John,w): [\lambda P.\ \lambda Q.\ \exists x.\ P(x)\ \&\ Q(x)]$
$[\lambda w''.\ \lambda y.\ y \text{ is a fisherman in } w''](w)([[IP_c]]^{w(1 \rightarrow w;\ 2 \rightarrow w')})$ = (by LC)

xi. $\lambda w.\ \forall w' \in Beliefs(John,w): [\lambda P.\ \lambda Q.\ \exists x.\ P(x)\ \&\ Q(x)]$
$[\lambda y.\ y \text{ is a fisherman in } w]([[IP_c]]^{w(1 \rightarrow w;\ 2 \rightarrow w')})$ = (by LC)

xii. $\lambda w.\ \forall w' \in Beliefs(John,w): [\lambda Q.\ \exists x.\ x \text{ is a fisherman in } w\ \&\ Q(x)]([[IP_c]]^{w(1 \rightarrow w;\ 2 \rightarrow w')})$
= (by Lambda Rule, FA, LC, Lex., (7), Pronouns Rule)

xiii. **$\lambda w.\ \forall w' \in Beliefs(John,w): \exists x.\ x \text{ is a fisherman in } w\ \&\ Mary \text{ kissed } x \text{ in } w'$.**

(14) **Derived Truth Conditional Statement**

$[[CP_a]]^{w,g}(w_0) = T$ *iff*

$[\lambda w.\ \forall w' \in Beliefs(John,w): \exists x.\ x \text{ is a fisherman in } w\ \&\ Mary \text{ kissed } x \text{ in } w'](w_0) = T$ *iff*

$\forall w' \in Beliefs(John, \underline{\mathbf{w_0}}): \exists x.\ x \text{ is a fisherman in } \underline{\mathbf{w_0}}\ \&\ Mary \text{ kissed } x \text{ in } w'$

(15) **Summary**

- In the system developed in Section 2, because world variables bear explicit indices in the syntax, it is possible for the world argument of a particular NP *not* to be bound by the most local lambda operator.

- Thus, it is possible for a DP to have scope within a subordinate clause, but for its NP argument to be interpreted relative to the 'evaluation world' of the main clause.

- Thus, in this system, we easily derive the 'third reading' in (1b) as a possible interpretation of Sentence (1a).

- *However, we can also still easily derive the classic 'De Re' and 'De Dicto' readings:*

a. The System Generates Classic *De Dicto* Reading

(i) *LF Structure*

[Λw_1 [John [[believes W_1] [$\boldsymbol{\Lambda w_2}$ [[a [fisherman $\mathbf{W_2}$]] [$\Lambda 3$ [Mary [[kissed $\mathbf{W_2}$] t_3]]]]]]]]

(ii) *Predicted Truth-Conditions*

$\underline{\forall \mathbf{w'}} \in$ Beliefs(John, w_0): $\exists$x. x is a fisherman in $\underline{\mathbf{w'}}$ & Mary kissed x in $\underline{\mathbf{w'}}$

b. LF Producing Classic *De Re* Reading

(i) *LF Structure*

[$\boldsymbol{\Lambda w_1}$ [[a [fisherman $\mathbf{W_1}$]] [$\Lambda 3$ [John [[believes $\mathbf{W_1}$] [Λw_2 [Mary [[kissed W_2] t_3]]]]]]]

(ii) *Predicted Truth-Conditions*

$\exists$x. x is a fisherman in $\underline{\mathbf{w_0}}$ & $\forall$w' $\in$ Beliefs(John, $\underline{\mathbf{w_0}}$): Mary kissed x in w'

(16) **General Conclusion**

The 'transparency' or 'opacity' of an NP is not a matter of its 'scope' or position LF.

- An NP does *not* have to undergo QR in order to receive a 'transparent' reading.

All that matters for 'transparency' or 'opacity' is *what lambda operator binds the world argument of the NP…*

- An NP can be located in a deeply embedded position, but its world argument still be bound by the *matrix* lambda, and the NP receive a 'transparent' reading.

4. Further Discussion and Results

4.1 Results for Conditionals (and Other Intensional Operators)

Recall that such 'non-specific, transparent readings' occur for any indefinite in the scope of *any* intensional operator, including conditionals.

(17) **'Non-Specific, Transparent' Readings in Conditionals**

a. Intuitively True Conditional
If some rich people were poor, there would be fewer rich people.

b. Targeted (True) Interpretation
$\forall$w' [$\exists$x. x is rich **in w_0** & x is poor **in w'** → there are fewer rich people in w']
*In any world w', if there are rich people **in w_0** who are poor **in w'**, then there are fewer rich people in w'.*

The system developed here also easily predicts these other 'non-specific, transparent' readings.

- All that's required is that the NP in the scope of these operators take as argument a world pronoun (W) co-indexed with the matrix lambda operator…

(18) LF Which Could be Assigned the Interpretation in (17b)

[**Λw_1**
[Λw_2 [if [some [rich people **W_1**]] were [poor W_2]]]
[Λw_3 [there would [[be W_3] [fewer rich people W_3]]]]]

4.2 Binding Theory for World Variables

We've seen above that the theory developed in Section 2 predicts the observed readings of sentences like (1a)…
… so we know that – unlike the 'classic QR account' – our analysis doesn't *under*-generate…

QUESTION: Does our account from Section 2 *over*-generate?...

PROBLEM:

Without the introduction of further constraints on the binding of world variables (*i.e.* a 'binding theory for the world variables'), *it does*...

(19) **Constraint 1: No Vacuous Quantification**

A lambda operator over possible worlds Λw_i must bind *some* world pronoun W_i

(20) **Motivation for the Constraint**

Without 'Constraint 1', our syntax would generate LFs like (20a) which would be assigned 'bizarre' truth-conditions like (20b).

a. A Possible LF without 'Constraint 1'

[$\mathbf{\Lambda w_1}$ [John [[believes W_1] [Λw_2 [[a [fisherman $\mathbf{W_1}$]] [$\Lambda 3$ [Mary [[kissed $\mathbf{W_1}$] t_3]]]]]]]]

b. Predicted Truth Conditions of (20b)

$\forall w' \in$ Beliefs(John, $\mathbf{w_0}$): $\exists$x. x is a fisherman in $\mathbf{w_0}$ & Mary kissed x in $\mathbf{w_0}$

For all of John's belief worlds w', the following is true:
There is some fisherman in $\mathbf{w_0}$ *such that Mary kissed him in* $\mathbf{w_0}$

Of course, the truth-conditions in (20b) are rather bizarre, in that the quantification over John's belief worlds ends up being vacuous… and for that reason LFs like (20a) might be ruled out on general pragmatic grounds…

(21) **Constraint 2: No Free World Pronouns**

A world pronoun W_i must be bound by *some* lambda operator Λw_i

(22) **Motivation for the Constraint**

Without 'Constraint 2', our syntax would generate LFs like (22a) which would (relative to the assigment function *w*) be assigned the truth-conditions in (22b).

a. [$\mathbf{\Lambda w_1}$ [some [fisherman $\underline{W_3}$]] [smokes $\mathbf{W_1}$]]

b. $\exists$x. x is a fisherman in $\mathbf{w'''}$ & x smokes in $\mathbf{w_0}$
There is some fisherman in the <u>specific possible world w'''</u> who smokes in the actual world.

That is, without Constraint 2, our syntax would predict that sentences could be interpreted to make reference to *specific (non-actual) possible worlds…*

… of course, our inability to actually refer to such worlds may be for general cognitive/metaphysical reasons, and so such LFs might again be ruled out on general semantic/pragmatic grounds…

(23) **Constraint 3: "Generalization X" (Percus 2000)**

A world pronoun that is sister to a V (selected by the V) must be bound by the nearest lambda operator that c-commands it.

a. Legitimate LF (Representing the 'Third Reading')

[$\underline{\Lambda w_1}$ [John [[believes W_1] [$\boldsymbol{\Lambda w_2}$ [[a [fisherman $\underline{W_1}$]] [smokes $\mathbf{W_2}$]]]]]]

b. Illegitimate LF

[$\underline{\Lambda w_1}$ [John [[believes W_1] [$\boldsymbol{\Lambda w_2}$ [[a [fisherman $\mathbf{W_2}$]] [smokes $\underline{W_1}$]]]]]]

(24) **Motivation for the Constraint**

Without 'Constraint 3', our syntax would generate LFs like (23b). Such LFs receive truth-conditions like the following.

a. Truth-Conditions of the LF in (23b)

$\forall$**w'** $\in$ Beliefs(John, $\underline{w_0}$): $\exists$x. x is a fisherman in **w'** & x smokes in $\underline{w_0}$

In all of John's belief worlds w', there is some x such that x is a fisherman in w' and x smokes ***in the actual world.***

In all of John's belief worlds w', there is some ***actual smoker*** *who is a fisherman in w'.*

Thus, without 'Constraint 3', our system would predict that the sentence "John believes that a fisherman smokes" could receive the reading in (24a), ***which it can't***…
… and, there is nothing obviously 'pragmatically ill-formed' with such a reading…
… therefore, we must appeal to 'Constraint 3' in our account…

(25) **Completely Open Question**

What accounts for the existence of 'Constraint 3' (Generalization X)?

Why are the world-arguments of *__verbs__* *more restricted in their choice of binder than the world-arguments of* *__nouns__*?

4.3 Parallels to Tense Interpretation of NPs

A core property of the 'third reading' (non-specific transparent reading), is that the NP is not interpreted relative to the same evaluation world as the VP it is argument to.

- The VP is interpreted relative to the worlds quantified over by the intensional operator.
- The NP is interpreted relative to the **actual world**

Though we've not yet discussed the semantics of tense, we can nevertheless observe a certain *prima facie* parallel in the interpretation of NPs within the scope of certain tense operators.

Researchers working on the semantics of tense, have independently noted that it is possible for sentences to have readings with the following characteristics:

- The VP is interpreted relative to ***times*** quantified over by a tense operator.
- An NP argument of the VP is interpreted relative to the **actual (present) time**

(26) **An Illustrative Example**

a. Sentence
In the 1980's, some homeless men were millionaires.

b. Interpretation

$\forall \boldsymbol{t} \in$ The 1980's: $\exists$x. x is a homeless man **now**, and x is a millionaire at ***t***

*For any time **t** in the 1980's, there was some x such that x is a homeless man **now** and x is a millionaire at time **t***

The *prima facie* similarity between readings of the kind in (26b) and the 'third reading' observed in (1b) is rather clear (and interesting)…

… Interestingly, these readings (and related ones in more complex sentences) have lead some to posit the existence of phonologically empty *temporal arguments* to NPs and VPs…

4.4 Any Role for QR in the Classic *De Re* vs. *De Dicto* Ambiguity?

The following has been a major point in our discussion of the *De Re* vs. *De Dicto* ambiguity:

(27) **General Conclusion**
The 'transparency' or 'opacity' of an NP is not a matter of its 'scope' or position LF.
An NP does *not* have to undergo QR in order to receive a 'transparent' reading.

Recall, however, that the original 'classic' ambiguity concerned a pair of readings that differ with respect to *two* properties:

- Transparency
- *Specificity*

(28) **The Characteristic Properties of the *De Re* Reading**

a. The indefinite is **specific.**
b. The indefinite is **transparent.**

(29) **The Characteristic Properties of the *De Dicto* Reading**

a. The indefinite is **non-specific**
b. The indefinite is **non-transparent (opaque).**

While we've concluded that a contrast in *transparency* needn't be due to the application of QR, ***perhaps the contrast in specificity <u>is</u>…***

(30) **Question**

In as much as the indefinite under the *de re* reading is 'specific', must we appeal to QR in order to capture the *de re* reading?

(31) **Answer:**
Yes…*as long as our system only generates 'specific' readings of indefinites via QR…*
…but there **is** some reason for thinking that this is the **wrong** approach to specificity…

(32) **The General Problem with the QR Approach to Specific Indefinites**

If an indefinite can only receive a 'specific reading' via QR, then we predict that the availability of a 'specific reading' should be limited by the constraints on QR (and on movement more generally).

…***but its not!...***

(33) **Problem 1: Finite Clauses**

The *de re* reading of (33a) shows that indefinites inside of finite clauses can receive 'specific readings' (their quantificational force can take scope over the matrix CP).

a. John believes that Mary kissed a fisherman.
b. $\exists$x. x is a fisherman in w_0 & $\forall$w' $\in$ Beliefs(John, w_0): Mary kissed x in w'

If such a reading could only be generated from the LF in (33c), then we must conclude that QR can generally move a DP across a finite clause.

c. LF Which Derives (33b) via Long-Distance QR

[Λw_1 [[a [fisherman W_1]] [$\Lambda 3$ [John [[believes W_1] [Λw_2 [Mary [[kissed W_2] t_3]]]]]]]]

However, if QR could apply across finite clauses, then we would generally expect that sentences like (33d) would admit of readings like (33e), ***which they do not.***

d. John believes that Mary kissed few fisherman.

e. FEW({x : x is a fisherman in w_0 })
({x: $\forall$w' $\in$ Beliefs(John, w_0): Mary kissed x in w'})
There are few fishermen x such that John believes Mary kissed x.

(34) **Problem 2: Movement Islands**

The *de re* reading of sentence (34a) shows that indefinites inside the antecedent of a conditional can receive 'specific readings' (their force can take scope over the matrix CP)

a. If an in-law of mine dies, I'll inherit a fortune.
b. $\exists$x. x is an in-law of mine in w_0 & $\forall$w' [x dies in w' $\rightarrow$ I inherit a fortune in w']

However, if such a reading could only be generated from the LF in (33c), then we must conclude that QR can generally extract a DP from inside a conditional antecedent.

c. LF Which Derives (34b) via Long-Distance QR
[[an in-law of mine] [$\Lambda 3$ [if t_3 dies, I'll inherit a fortune]]]

However, if QR could apply across conditional antecedents, then (i) it wouldn't be subject to movement constraints like that seen in (34d), and (ii) we'd generally expect that sentences like (34e) would admit of readings like (34f), ***which they do not.***

d. * Who will I inherit a fortune [if __ dies]?
e. If few in-laws of mine die, I'll inherit a fortune.
f. FEW({x : x is an in-law of mine in w_0 })
({x: $\forall$w' [x dies in w' $\rightarrow$ I inherit a fortune in w'})

(35) **One Possible Answer to These Data**

Perhaps QR is simply – for reasons we don't yet understand – able to apply across islands and finite clauses when it applying to an indefinite…

(36) **Problems with this View**

a. It seems conceptually 'weird' to say that QR should be less constrained with indefinites…

b. In fact, allowing QR to be less constrained with indefinites ends up making various incorrect predictions (Reinhart 1997).

(37) **The Preferred Perspective**

- As we can see from the data in (33d,e) and (34e,f), QR is never able to apply across finite clauses or islands.
- However, what distinguishes indefinites from other DP is that ***the scope of an indefinite is not fixed by its LF position (i.e., by QR).***
- That is, there are grammatical mechanisms other than 'movement' (QR) by which the quantificational force of an indefinite can take scope *above* the position at which the indefinite is overtly pronounced.
- In brief, ***just because an indefinite takes scope over an operator X, that doesn't mean that the indefinite underwent QR to a position above X!***

(38) **Consequences for the *De Re* Reading**

- The specificity of the indefinite under the *de re* reading needn't be due to the indefinite undergoing QR to a position above the intensional operator.
- Indeed, in sentences like (33a) and (34a), it *can't* be due to such QR.
- **Thus, the existence of a *de re* reading is <u>completely independent</u> of whether the indefinite in the sentence has undergone QR.**

(39) **General Conclusion (Crucial 'Take Home Message')**

Contrary to the 'classic' QR-analysis, QR (and movement) ultimately has *no role* to play in the analysis of the *de re* vs. *de dicto* ambiguity…

(…and thus whether such an ambiguity exists tells us nothing about whether QR/movement from a particular domain is possible…)