Introduction to (Some of) The Puzzles Surrounding the *De Dicto / De Re / De Se* Ambiguity

1. The Basic Facts and Basic Background Assumptions

The sentences in (1) below both seem to be ambiguous. This ambiguity is shown by the fact that (1a) can be interpreted either as true or as false in scenario (2), while (1b) can be interpreted either as true or as false in scenario (3).

- ***It turns out that the ambiguity of (1b) is quite difficult to analyze, and raises deep questions concerning (i) the (conceptual) nature of propositional attitudes, and (ii) the compositional semantics of sentences describing them.***

(1) **Sentences Exhibiting an Ambiguity**
   a. Two unvaccinated children might be in that closet.
   b. Ralph believes that two unvaccinated children are in that closet.

(2) **Scenario Illustrating the Ambiguity of (1a)**

We're babysitting five kids: Andy, Ben, Carol, Dave, and Ethan. We can't find Ben and Dave, and we're looking around the house for them. Ben and Dave are unvaccinated (because their parents don't believe in it). At one point, we hear giggling coming from the linen closet. It's a really narrow closet, and definitely couldn't be holding more than one child. So, we know that one child is in there. The thing is, that child could be either Ben or Dave - we don't know yet.

   a. <u>Paraphrase of True Reading of (1a):</u>
      (i) There are two unvaccinated kids (i.e., Ben and Dave) who (each) might be in that closet.

      (ii) *Rough Formalization:*
      $\exists x$. $|x| = 2$ & unvaccinated.kids(x) & $\forall y \in x$. MIGHT(y is in the closet)

   b. <u>Paraphrase of False Reading of (1a):</u>
      (i) That closet could have two unvaccinated kids in it.

      (ii) *Rough Formalization:*
      MIGHT($\exists x$. $|x| = 2$ & unvaccinated.kids(x) & $\forall y \in x$. y is in the closet)

(3) **Scenario Illustrating the Ambiguity of (1b)**

We're babysitting five kids: Andy, Ben, Carol, Dave, and Ethan. We can't find Ben and Dave, and we're looking around the house for them. Ben and Dave are unvaccinated. **Ralph, however, doesn't know that Ben and Dave are unvaccinated (he just assumes all the kids are).** At one point, Ralph hears giggling coming from the closet in the master bedroom. It's a really large closet, and so could be holding two kids. Ralph is pretty sure that Ben and Dave are both hiding in that closet.

a. Paraphrase of True Reading of (1b):
   (i) There are two unvaccinated kids (i.e., Ben and Dave) who (each) are believed by Ralph to be in the closet.

   (ii) *Rough Formalization:*
   $\exists x.\ |x| = 2\ \&\ \text{unvaccinated.kids}(x)\ \&\ \forall y \in x.\ \text{BEL}(\text{Rph}, y \text{ is in the closet})$

b. Paraphrase of False Reading of (1b):
   (i) Ralph would sincerely assent to "Two unvaccinated kids are in the closet"

   (ii) *Rough Formalization*
   $\text{BEL}(\text{Rph}, \exists x.\ |x| = 2\ \&\ \text{unvaccinated.kids}(x)\ \&\ \forall y \in x.\ y \text{ is in the closet})$

Note: In the case of 'believes' (and other propositional attitude verbs), we can also find scenarios where the (b)-reading is **true** while the (a)-reading is **false**.

(4) **Scenario Illustrating Ambiguity in Question**

Sentence: Ralph believes two unicorns are in his backyard.

Scenario:
Ralph is a goofball, and believes in unicorns. He also took a bunch of hallucinogenics and is hallucinating two unicorns in his backyard. He keeps sincerely asserting "There are two unicorns in my backyard."

a. Paraphrase of False Reading:
   There are two unicorns who (each) are believed by Ralph to be in his backyard.

   Rough Formalization:
   $\exists x.\ |x| = 2\ \&\ \text{unicorns}(x)\ \&\ \forall y \in x.\ \text{BEL}(\text{Rph}, x \text{ is in his backyard})$

b. Paraphrase of True Reading:
   Ralph would sincerely assent to "Two unicorns are in your backyard"

   Rough Formalization:
   $\text{BEL}(\text{Rph}, \exists x.\ |x| = 2\ \&\ \text{unicorns}(x)\ \&\ \forall y \in x.\ x \text{ is in his backyard})$

(5) **Observation**
The (a)-readings seem to carry an existence entailment for the indefinite *two NPs*
- Intuitively, that's why reading (4a) is false in the paired scenario.

The (b)-readings don't seem to carry such an existence entailment.
- Otherwise, reading (4b) would also be false in the paired scenario.

(6) **A Very Natural Conclusion**

As reflected in the paraphrases (and their rough formalizations), the difference between the (a)-readings and the (b)-readings above is a matter of *scope*.

- In the (a)-readings, the indefinite has matrix scope. Hence, the existence entailment.
- In the (b)-readings, the indefinite scopes below some other (intensional) operator.

Let's work out a basic system where we can straightforwardly model this ambiguity as one involving scope. Doing this will also put on the table various semantic assumptions shared throughout most of the readings…

1.1 Background Semantic Assumptions (based on Heim & Kratzer 1998, Yalcin 2015)

(1) **Possible Worlds**
There is an infinite set of possible worlds (universes) W. Our own universe, w_0 or @, is simply one element of W.

(2) **Extensions and Intensions**
Expressions of natural language have two kinds of semantic values.

a. Extension:
The thing 'picked out' by the expression at the world in which it is evaluated.
(~ Fregean 'Reference')

b. Intension:
A function from possible worlds to the extension of the expression at that world
(~ Fregean 'Sense')

Illustration: 'The Drummer for the Beatles'
(i) Extension (in our world): Ringo Starr

(ii) Intension: Function which takes w and returns the individual who plays percussion for the Beatles in w.

(3) **Formalism for Extensions**
$[\![X]\!]^{w,g}$ = the extension of X at world w, relative to variable assignment g

(4) **Variable Assignment** Function from natural numbers (indices) to entities
Used to interpret pronouns (and traces) [more info later]

Illustration: Possible Variable Assignment:
{<1,Seth>, <2,Alejandro>, <3, Vincent>, <4, Phil>, <5, Angelika>, <6, Seth>, … }

(5) **Extensions as Functions**
Some natural language expressions have extensions that are insightfully modeled as functions. To represent such functions, we use lambda notation.

$[\![\text{ smokes }]\!]^{w,g}$ = $[\lambda x_e : x \text{ smokes in } w]$
'the function which takes an entity x, and returns T iff
x smokes in world w'

(6) **Semantic Composition via Function Application**
To compute the extensions of complex expressions (and thus the truth-conditions of sentences), we use the rule of Function Application.

Function Application (FA):
If X is a phrase whose daughters are Y and Z, and if $[\![Y]\!]^{w,g}$ is a function whose domain contains $[\![Z]\!]^{w,g}$, then $[\![X]\!]^{w,g} = [\![Y]\!]^{w,g} ([\![Z]\!]^{w,g})$

Illustration 1
$[\![[_S [_{NP} \text{ Seth }] [_{VP} \text{ smokes }]]\!]^{w,g}$ = (by FA)
$[\![\text{ smokes }]\!]^{w,g} ([\![\text{Seth}]\!]^{w,g})$ = (by Lexicon)
$[\lambda x_e : x \text{ smokes in } w](\text{Seth})$ = T *iff* (by Lambda Conversion (LC))
Seth smokes in w

Illustration 2
$[\![[_S [_{NP} \text{ Every baby }] [_{VP} \text{ smokes }]]\!]^{w,g}$ = (by FA)
$[\![\text{ Every baby }]\!]^{w,g} ([\![\text{smokes}]\!]^{w,g})$ = (by FA, Lexicon)
$[\lambda P_{<et>} : \forall y.\ y \text{ is a baby in } w \rightarrow P(y) = T]([\lambda x_e : x \text{ smokes in } w]) = T$ *iff* (by LC)
$\forall y.\ y \text{ is a bay in } w \rightarrow [\lambda x_e : x \text{ smokes in } w](y) = T$ *iff* (by LC)
$\forall y.\ y \text{ is a baby in } w \rightarrow y \text{ smokes in } w$

(7) **Interpreting Pronouns (and Traces)**
To compute the extensions of pronouns, we don't use the lexicon like a common noun/name, but rather the rule below.

Pronouns and Traces (PR)
If X_n is a pronoun (or trace) bearing the index n, then $[\![X_n]\!]^{w,g} = g(n)$

Illustration:
$[\![[_S [_{NP} \text{ He}_3] [_{VP} \text{ smokes }]]\!]^{w,g}$ = (by FA)
$[\![\text{ smokes }]\!]^{w,g} ([\![\text{He}_3]\!]^{w,g})$ = (by Lexicon)
$[\lambda x_e : x \text{ smokes in } w]([\![\text{He}_3]\!]^{w,g})$ = (by PR)
$[\lambda x_e : x \text{ smokes in } w](g(3))$ = T *iff* (by LC)
g(3) smokes in w

- Thus, this will be T when g(3) = Barack, but F when g(3) = Seth

(8) **Syntactic Assumptions, Part 1: Overt Movement**

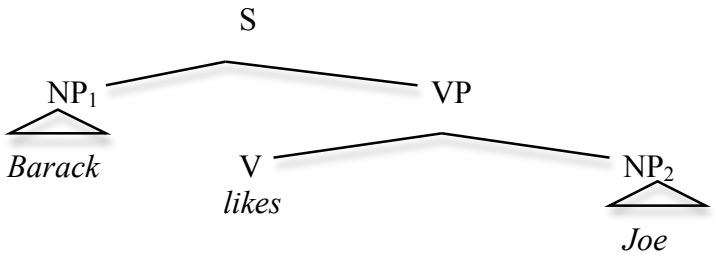
Contentious Claim, but Assumed by Most Work We'll Read:
Sentences of natural language have more than one structure.

- The 'pronounced forms' (PF, S-Structures) of the sentences we speak are derived from more basic structures (D-Structures)
- A key operation deriving one structure from another is **movement**

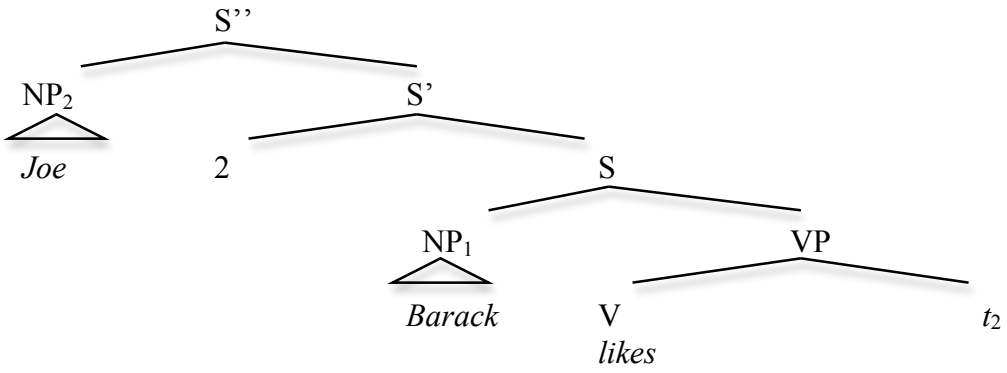
Illustration

a. Sentence (Pronounced Form): Joe, Barack likes.

b. Underlying Structure (D-Structure):



c. Pronounced Form (PF, S-Structure):
The following is the result of 'moving' *Joe* to the left periphery of the clause.



Key Features:

- The VP-internal position formerly occupied by *Joe* is now occupied by an (unpronounced) trace (*t*) element.
  [traces are likes unpronounced pronouns left over after movement]

- The trace bears an index, like a pronoun (2)

- The index born by the trace is 'copied' into the sister of *Joe*.

(9) **Syntactic Assumptions, Part 2: Covert Movement**

Contentious Claim, but Assumed by Most Work We'll Read:
Our semantic system does *not* interpret the pronounced forms (PFs) of sentences.

- Once the PF of a sentence has been determined (in the derivation), further movement operations can take place, altering the tree.
- By definition, these post-PF operations don't affect the pronounced form of the sentence (that's already been determined).
- **Our semantics interprets the structure that results from these post-PF movements. Thus, they can affect the interpretation of a sentence.**

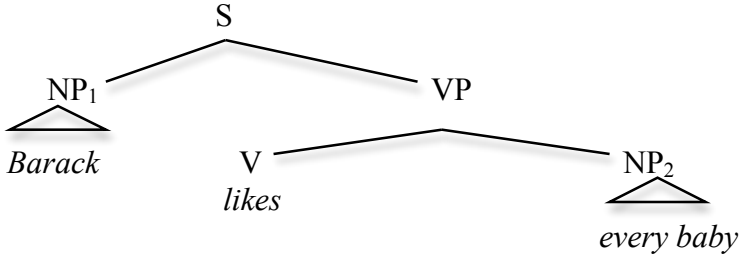
Terminology:

- Overt Movement = Movement taking place 'before' PF is determined
- Covert Movement = Movement taking place 'after' PF is determined
- Logical Form (LF) = The syntactic structure that is input to semantic interpretation

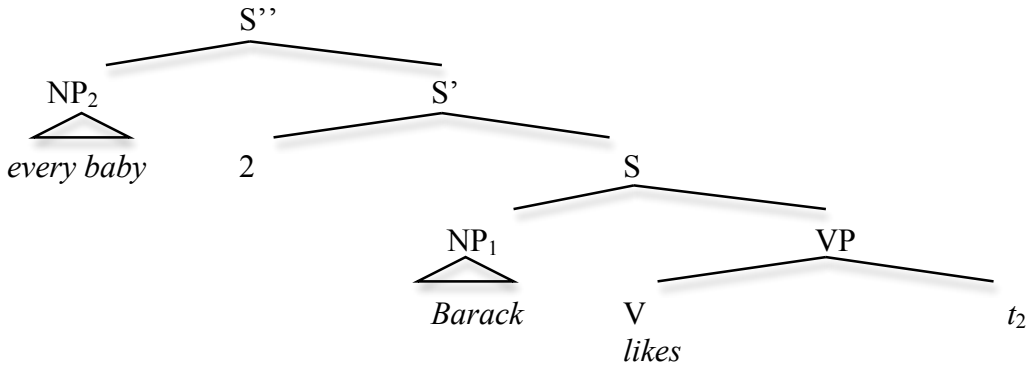
Illustration:

a. Sentence (Pronounced Form): Barack likes every baby.

b. Pronounced Form (PF):



c. Logical Form (LF):



Key Features:

- We cannot use FA to interpret the VP in the pronounced from (b).
- We can, however, covertly move *every boy* to the left periphery of the sentence (after the PF has been determined)
- Doing so will yield a structure that we can interpret via FA

(10) **Interpreting Movement Structures**

To compute the extension of a structure derived by movement, we use the rule of Predicate Abstraction.

- According to this rule, the 'copied index' in a movement structure is interpreted as a lambda operator binding the co-indexed trace.

Preliminary Notation:

If n is an index and g is a variable assignment and x is an entity, then g(n/x) is the variable assignment *just like g* except that the variable n is mapped to the entity x.

Predicate Abstraction (PA):

If X is a phrase whose daughters are Y and the index n, then

$$[\![\text{ X }]\!]^{w,g} = [\ \lambda x_e : [\![\text{ Y }]\!]^{w,g(n/x)}\ ]$$

Illustration, Part 1:

$[\![[\ 2\ [\ \text{Barack}\ [\ \text{likes}\ t_2\ ]]]\ ]]^{w,g}$ = (by PA)

$[\ \lambda x_e : [\![[\text{Barack}\ [\ \text{likes}\ t_2\ ]]\ ]]^{w,g(2/x)}\ ]$ = (by FA, LC)

$[\ \lambda x_e : \text{Barack likes } [\![t_2]\!]^{w,g(2/x)} \text{ in w }]$ = (by PR)

$[\ \lambda x_e : \text{Barack likes g(2/x)(2) in w }]$ = (by notation)

$[\ \lambda x_e : \text{Barack likes x in w }]$

Illustration, Part 2:

$[\![[\ \text{Joe}\ [\ 2\ [\ \text{Barack}\ [\ \text{likes}\ t_2\ ]]]\ ]]^{w,g}$ = (by FA)
$[\![[\ 2\ [\ \text{Barack}\ [\ \text{likes}\ t_2\ ]]]\ ]]^{w,g}([\![\text{Joe}]\!]^{wg})$ = (by calculation above)
$[\ \lambda x_e : \text{Barack likes x in w }]([\![\text{Joe}]\!]^{w,g})$ = (by Lexicon)
$[\ \lambda x_e : \text{Barack likes x in w }](\text{Joe}) = \text{T}$ *iff* (by LC)
Barack likes Joe

Illustration, Part 3:

$[\![[\ \text{Every baby}\ [\ 2\ [\ \text{Barack}\ [\ \text{likes}\ t_2\ ]]]\ ]]^{w,g}$ = (by FA)
$[\![\text{every baby}]\!]^{w,g}\ (\ [\![[\ 2\ [\ \text{Barack}\ [\ \text{likes}\ t_2\ ]]]\ ]]^{w,g}\ )$ = (by calculation above)
$[\![\text{every baby}]\!]^{w,g}\ (\ [\ \lambda x_e : \text{Barack likes x in w }]\ )$ = (by FA, Lexicon)
$[\ \lambda P_{<et>} : \forall y.\ y \text{ is a baby in w} \rightarrow P(y) = T\ ](\ [\ \lambda x_e : \text{Barack likes x in w }]\ )$ = (by LC)
$\forall y.\ y \text{ is a baby in w} \rightarrow [\ \lambda x_e : \text{Barack likes x in w }](y) = T$ *iff* (by LC)
$\forall y.\ y \text{ is a baby in w} \rightarrow$ Barack likes y in w

The Upshot: With the rule PA, we are able to interpret movement structures like (8c) and (9c), assigning them intuitively correct truth-conditions.

(11) **Introducing Intensions**

Given our definition in (2b) and our notation in (3), the *intension* of an expression X can be modeled as: $[\ \lambda w' : [[X]]^{w',g}\ ]$

Illustration: The Intension of "Seth smokes"

$[\ \lambda w' : [[\ [_S\ [_{NP}\ \text{Seth}\ ]\ [_{VP}\ \text{smokes}\ ]\ ]]^{w',g}\ ]$ = (by FA)

$[\ \lambda w' : [[\ \text{smokes}\ ]]^{w',g}\ (\ [[\text{Seth}]]^{w',g}\ )\ ]$ = (by Lexicon)

$[\ \lambda w' : [\ \lambda x_e : x \text{ smokes in } w'\ ](\text{Seth})\ ]$ = (by Lambda Conversion (LC))

$[\ \lambda w' : \text{Seth smokes in } w'\ ]$

> *The function from possible worlds to truth-values, which for any world w', maps w' to T iff Seth smokes in w'*
>
> *The characteristic function of the set of possible worlds where Seth smokes.*

(12) **Motivating Intensions**
It seems that the extensions of some expressions are functions that take as argument the *intensions* of other expressions.

Example: Epistemic 'Might'

$[[\ \textit{might}\ ]]^{w,g}$ = $[\ \lambda p_{<st>} : \exists w'.$ Everything we know in w is true in w' & $p(w') = T\ ]$

- The extension of *might* at w takes as argument a proposition *p* and returns T *iff*
  There's a possible world w' where everything we know in w is true and where *p* is true.
  (*i.e.*, proposition *p* is consistent with our knowledge in w)

(13) **Interpreting Expressions as Intensions**

In order to interpret structures containing intensional expressions like *might*, we need another special rule, Intensional Function Application.

Intensional Function Application (IFA):
If X is a phrase whose daughters are Y and Z, and if $[[\ Y\ ]]^{w,g}$ is a function whose domain contains $[\ \lambda w' : [[\ Z\ ]]^{w',g}\ ]$, then $[[\ X\ ]]^{w,g} = [[\ Y\ ]]^{w,g}\ ([\ \lambda w' : [[\ Z\ ]]^{w',g}\ ])$

(14) **Illustration**

a. Sentence (PF): Seth might be in that closet.

b. LF: [might [Seth [be in that closet]]]

This LF is derived from the PF of (14a) via an operation called 'reconstruction'

c. Predicted Truth-Conditions:

$[[\ [\ \text{might}\ [\ \text{Seth}\ [\ \text{be in that closet}\ ]\ ]\ ]\ ]]^{w,g}$ = (by IFA)

$[[\text{might}]]^{w,g}([\ \lambda w'\text{: }[[\ \text{Seth be in that closet}\ ]]^{w',g}\ ])$ = (by FA, Lexicon, etc.)

$[[\text{might}]]^{w,g}([\ \lambda w'\text{: Seth is in that closet in } w'\ ])$ = (by Lexicon)

$[\ \lambda p_{<st>}\text{ : }\exists w'$. Everything we know in w is true in w' & $p(w') = T\ ]$
$([\ \lambda w'$: Seth is in that closet in w']) = T *iff* (by LC)

$\exists w'$. Everything we know in w is true in w' &
$[\ \lambda w'$: Seth is in that closet in w' $](w') = T\ ]$ *iff* (by LC)

$\exists w'$. Everything we know in w is true in w' & Seth is in that closet in w'
(~ *It is consistent with what we know in w that Seth is in that closet.*)

We now have all the ingredients we need to straightforwardly model the ambiguity in (1a) as being a matter of scope!

1.2 The Ambiguity in (1) as a Scope Ambiguity

(15) **Key Observation:** The PF of sentence (1a) could be mapped to two different LFs, depending upon whether we apply 'reconstruction' (as in (14b)) or not.

(16) **LF of (1a) With No Reconstruction**

a. [[$_{NP}$ Two unvaccinated children] [2 [might [t_2 be in that closet]]]]

b. Predicted Truth-Conditions: $[[(16a)]]^{w,g} = T$ *iff*

$\exists x$. $|x| = 2$ & x is unvaccinated kids in w & $\forall y \in x$.
$\exists w'$. Everything we know in w is true in w' & y is in that closet in w'

'There is a group of two unvaccinated kids, each of whom is such that it's consistent with our knowledge that they are in that closet.'

(17) **LF of (1a) With Reconstruction**

a. [might [two unvaccinated children be in that closet]]

b. Predicted Truth-Conditions: $[[(17a)]]^{w,g} = T$ *iff*

∃w'. Everything we know in w is true in w' &
∃x. |x| = 2 & x is unvaccinated kids in w' & ∀y ∈ x . y is in that closet in w'

'It is consistent with our knowledge that there is a group of two unvaccinated kids each (= both) of whom are in the closet.'

(18) **Key Observation**

- The truth-conditions in (16b) hold in scenario (2).
- The truth-conditions in (17b) *do not* hold in scenario (2)

Thus, it seems that our system generates our earlier '(a)-reading' for (1a) by leaving *two vaccinated children* in a position scoping above *might*.

It also generates the '(b)-reading' for (1a) by reconstructing *two vaccinated children* to a position scoping below *might*.

Can we also use this same general approach to capture the ambiguity of (1b)?

At first glance, it seems that we can!!

(19) **First Main Ingredient: Doxastic Alternatives**

The 'doxastic alternatives' for entity x at world w (Dox-Alt(x,w)) is the set of all those worlds w' that are consistent with the belief-state of x in w

- w' ∈ Dox-Alt(x,w) *iff* given what x believes, they could be in w'

  iff if we could show w' to x, x would sincerely assert 'That could be the possible world that I'm in'

We can use this notion of 'doxastic alternatives' to build a lexical semantics for 'believes'

(20) **Hintikka Semantics for 'Believes'**

$[[believes]]^{w,g} = [\lambda p_{<st>} : [\lambda x_e : \forall w' \in Dox\text{-}Alt(x,w) . p(w') = T]]$

$[[believes]]^{w,g}$ *takes as argument a proposition p and an entity x and yields T iff p is true in all of x's doxastic alternatives in w*

(21) **Illustration**

a. Sentence (PF): Ralph believes it's raining.

b. LF: [Ralph [believes [it's raining]]]

c. Predicted Truth-Conditions:

$[[\ [\ \text{Ralph}\ [\ \text{believes}\ [\ \text{it's raining}\ ]\ ]\ ]\ ]]^{w,g}$ = (by FA)

$[[\ \text{believes}\ [\ \text{it's raining}\ ]\ ]]^{w,g}([[\text{Ralph}]]^{w,g})$ = (by IFA)

$[[\text{believes}]]^{w,g}([\ \lambda w'\text{: }[[\ \text{it's raining}\ ]]^{w',g}\ ])([[\text{Ralph}]]^{w,g})$ = (by FA, Lexicon, etc.)

$[[\text{believes}]]^{w,g}([\lambda w'\text{: it's raining in } w'])(\text{Ralph})$ = (by Lexicon)

$[\ \lambda p_{<st>}\text{ : }[\ \lambda x_e\text{ : }\forall w' \in \text{Dox-Alt}(x,w)\ .\ p(w') = T\ ]\ ]$
$([\lambda w'\text{: it's raining in } w'])(\text{Ralph})$ = (by LC x2)

$\forall w' \in \text{Dox-Alt}(\text{Ralph},w)\ .\ [\lambda w'\text{: it's raining in } w'](w') = T$ *iff* (by LC)

$\forall w' \in \text{Dox-Alt}(\text{Ralph},w)\ .$ it's raining in w'

(~ *In all of Ralph's doxastic alternatives at w, it is raining)*
(~ *If Ralph thinks w' could be the actual world, then it is raining in w'*)
(~ *Ralph believes that it's raining*)

With these ingredients, we could try to model the ambiguity of (1b) in a way similar to how we modeled the ambiguity of (1a)!

(22) **LF of (1b) With Covert Movement**

a. $[\ [_{NP}\ \text{Two unvaccinated children}\ ]\ [\ 2\ [\ \text{Ralph}\ [\ \text{believes}\ [\ t_2\ \text{are in that closet}\ ]\ ]\ ]\ ]$

b. Predicted Truth-Conditions: $[[(22a)]]^{w,g} = T$ *iff*

$\exists x\ .\ |x| = 2\ \&\ x$ is unvaccinated kids in w $\&\ \forall y \in x\ .$
$\forall w' \in \text{Dox-Alt}(\text{Ralph},w)\ .$ y is in that closet w'

'There is a group of two unvaccinated kids, each of whom is such that
In all of Ralph's doxastic alternatives they are in that closet.'
(~*Each is such that Ralph believes that they are in that closet*)

(23) **LF of (1b) With No Covert Movement**

a. [Ralph [believes [two unvaccinated kids [are in that closet]]]]

b Predicted Truth-Conditions: $[[(23a)]]^{w,g} = T$ *iff*

$\forall w' \in$ Dox-Alt(Ralph,w) .
$\exists x$. $|x| = 2$ & x is unvaccinated kids in w' & $\forall y \in x$. y is in that closet in w'

'*In all of Ralph's doxastic alternatives, there are two unvaccinated kids that are in that closet.*'

(24) **Key Observations**

- The truth-conditions in (22b) entail the existence of two unvaccinated kids (at the actual world)
- The truth-conditions in (23b) do *not* have such an entailment.

Thus, it seems like (22b) represents the '(a)-reading' of (1b), while (23b) represents the '(b)-reading'.

Thus, it seems like (1b) gets the '(a)-reading' when it's mapped to LF (22a), and it gets the '(b)-reading' when it's mapped to LF (23a).

Supporting Facts:

- The truth conditions in (23b) clearly don't hold in scenario (3) [like the (b)-reading]
  - After all, Ralph is under the impression that Ben and Dave *are* vaccinated.
  - So, in all his doxastic alternatives, the kids in the closet are vaccinated.

- The truth conditions in (22b) seem like they do hold in scenario (3) [like (a)-reading]

  - After all, since Ralph believes of Ben and Dave that they are in that closet, it seems (at first glance) that it's fair to say that in all Ralph's doxastic alternatives, *Ben and Dave* are in that closet….
    And those two boys do happen to be unvaccinated in our world

(25) **Terminology: *De Re* and *De Dicto***

a. *De Re* Reading:
The (a)-reading of a propositional attitude sentence (with existence entailment)

b. *De Dicto* Reading:
The (b)-reading of a propositional attitude sentence (without existence entailment)

(26) **The Very Natural Starting Point for an Analysis**

- To obtain a *de re* reading of a propositional attitude sentence, an NP must simply undergo movement (alternately, 'scope above') the propositional attitude predicate

- To obtain a *de dicto* reading of a propositional attitude sentence, an NP must remain within (alternately, 'scope below') the propositional attitude predicate.

Complication:
When there's more than one NP in a subordinate clause, we can have one construed *de re* and the other *de dicto*. But, the statement in (26) will suffice for present purposes.

---

2. The Problems and the Puzzles

2.1 The Kaplan-Lewis Analysis of *De Re*

(27) **The Root of the Problem**

As first noted by Quine (1953, 1956), if you poke at them carefully, the truth-conditions in (22b) *don't really* do a good job of representing the *de re* reading of (1b).

- We'll review the issues in detail, but the main difficulty concerns the requirement that at every doxastic alternative of Ralph's:
  there is one-and-the-same, fixed entity from our world (i.e., the pair Ben+Dave) which has the property in question (i.e., being in the closet)

- Long story short, you can rationally believe of *one specific entity* that it has two mutually inconsistent properties, *because you mistakenly believe that it's two different entities*. (The 'Double-Vision' Problem (Klein 1979))

(28) **The Main Upshot**

While the thesis regarding *de dicto* readings in (23)/(26) may well be right…
The analysis given above of the *de re* reading in (22)/(26) is not correct.

(29) **Immediate, Overarching Question (For Linguists and Philosophers)**

So… if that analysis isn't correct, what is the right treatment of the de re reading?

As we'll review, the starting point for most treatments of the de re reading is the following analysis, which some authors refer to as the 'Kaplan-Lewis analysis'

(30) **The Kaplan-Lewis Analysis of the *De Re* Reading (Simplified)**

Under it's *de re* reading, a sentence like (1b) has truth-conditions like the following:

$\exists x$. $|x| = 2$ & x is unvaccinated kids in w & $\forall y \in x$.
$\exists R$. y = the z such that R(Ralph,z,w) &
$\forall w' \in$ Dox-Alt(Ralph,w) . the z such that R(Ralph,z,w') is in that closet in w'

'There are two unvaccinated kids in the actual world (i.e., Ben and Dave), and for each:
There is a relation R which Ralph bears uniquely to them, and
In all Ralph's doxastic alternatives,
The thing that he uniquely bears R to is in the closet.'

The General Idea Here:
In a *de re* reading, the believer has a special relation (R) to the object of belief (the *res*),
and that relation R serves as the *way* that the believer represents the object to themselves…
(R serves as the 'mode of presentation' for the *res*)

Illustration: These truth-conditions *do* hold in the scenario in (3)

- We can imagine that Ralph has encountered Ben and Dave by having them visually presented to him at such-and-such a date/time/location.

- Thus, when he as beliefs about Ben and Dave, he plausibly represents them to himself as 'the z such that I met them at such-and-such a date/time/location'.
(for each kid, though, this representation could be even more complex, and include aspects of their height, appearance, voice quality, etc.)

- So, when Dave believes of *Ben* that he is in the closet, what holds in all his doxastic alternatives w' is: 'The z such that R_{Ben}(Ralph,z,w') is in that closet in w'.
(And similarly *mutatis mutandis* for his belief about *Dave*)

- So, in scenario (3) for each of those two unvaccinated kids – Ben and Dave – there is a relation R such that Ralph bears R uniquely to that kid, and:
In all of Ralph's doxastic alternatives w', the following holds:
the z such that R(Ralph,z,w') is in that closet in w'

(31) **Observation** Under these revised truth-conditions, the indefinite *two unvaccinated kids* still has matrix scope, and so we still (correctly) predict that the *de re* reading should carry an existence entailment (4)-(5)

Again, we will review in much detail the motivation for (30) over (22b)…
Right off the bat, though, we can see that it raises the following key issues!

(32) **First Issue: Compositionality**

It's rather clear how we can derive the truth-conditions in (22b) for sentence (1b). *But, how the heck do we derive truth-conditions like (30)?*

- Where is this relation *R* coming from, exactly? The lexical semantics of "believe"? Then where does it go in the *de dicto* reading? **Is every propositional attitude verb going to have to be lexically ambiguous?** If not, what's the process by which *R* enters into the truth-conditions of the sentence?

- Relatedly, in the PF of (1b), the sentential complement is "*two unvaccinated kids are in that closet"*. In the truth-conditions in (30), however, the 'proposition believed' is [λw' : the z such that R(Ralph,z,w') is in that closet in w'].
    - **How can we end up deriving *that* as the condition on the doxastic alternatives?**
    - **Simple (covert) movement of *two unvaccinated kids* isn't enough.**

Relevant Readings:
Cresswell & von Stechow (1982), Percus & Sauerland (2003), von Stechow & Zimmermann (2004), Maier (2009), Charlow & Sharvit (2014), Yalcin (2015), Santorino (2015)

(33) **Second Issue: The Nature of the Relation 'R'**

The formula in (30) is a rather simplified presentation of the Kaplan-Lewis analysis. The full analysis places various additional constraints on what 'R' can be. *However, clarifying these constraints has proven exceedingly elusive.*

- Moreover, it seems that whether certain constraints are active or not depends on the context.

- Moreover, it seems that it's sometimes wrong to even require 'R' to be a relation (between believer and res), rather than just a property of the res.

- Finally, if we try to straightforwardly extend the analysis in (30) to so-called *counterfactual* attitude verbs (*e.g.* 'imagine', 'hope'), the quantification over 'R' runs into additional difficulties.

Relevant Readings:
Sosa (1970), Bonomi (1995), Aloni (2005a,b), Yanovich (2011), Ninan (2012)

2.2 The Contrast Between *De Re* and *De Se*

The sentences in (34) below contrast subtly in their meaning.

- Both can be interpreted as true in the very natural scenario in (35a).
- However, only (34a) can be read as true in the weird scenario in (35b).

(34) **Sentences Illustrating the *De Re* vs. *De Se* Contrast**

a. John expects that he will win.
b. John expects to win.

(35) **Scenarios Illustrating the Contrast**

a. Natural Scenario: (Both (34a) and (34b) are true.)
John sincerely thinks to himself 'I'm going to win!'

b. Weird, Mistaken-Identity Scenario: (Only (34a) is true)

John is an long-time marathon runner. One day, unbeknownst to him, we play him footage of an old race he ran decades ago. The footage on the recording is pretty grainy, and so he doesn't recognize himself or the race. He thinks that he is watching a race currently going on. Unbeknownst to him, he's actually watching himself on the screen, leaping ahead of all the other runners. Clearly, he's going to win. So, John sincerely asserts, "That guy (pointing unknowingly to himself on the screen) is going to win!"

(36) **Conclusion:** Sentences (34a) and (34b) are not semantically equivalent.

- Sentence (34b) doesn't have a reading that is true in (35b). It's only true in (35a)
- Sentence (35a) *does* have a reading that is true in (35b).

(37) **Terminology: *De Re* and *De Se***

a. *De Se* Reading:
The reading of sentence (34b) which is true in (35a) but not in (35b).

b. *De Re* Reading:
The reading of sentence (34a) which is true in (35b).

Implicit Assumption (Shown Below to be Reasonable):
The so-called *de re* reading of (34a) is the same reading (logically and grammatically) as the *de re* reading of a sentence like (1b).

(38) **Question:** How do we represent the truth-conditions of these two readings, especially the *de se* reading?

(39) **Lewis's (1979) Analysis of *De Se*** [1]

a. Key Ingredient: Reformulation of Doxastic Alternatives
The 'doxastic alternatives' for entity x at world w (Dox-Alt(x,w)) is a set of **pairs** <w',y> consisting of a world w' and an individual y in w' [2]

- <w',y> ∈ Dox-Alt(x,w) *iff* given what x believes, they could y be in w'

  iff if we could show <w',y> to x, x would sincerely assert *I could be y in world w'*

b. Truth-Conditions for the *De Se* Reading of (34b)

∀<w',y> ∈ Dox-Alt(John,w) . y wins in w'

(~ *Every world-individual pair <w',y> such that John thinks he could be y in world w', y wins in world w'*)

(~ *John would sincerely assert 'I'm going to win'*)

c. Important Observation:
- These truth-conditions will clearly hold in the normal scenario in (35a).
- These truth-conditions won't (necessarily) hold in the mistaken-identity scenario in (35b).
  - In scenario (35b), 'the winner' isn't someone that John is identifying as himself…
    So there will be doxastic alternatives <w',y> where y *doesn't* win in w'.

Again, even with just this much on the table, we can identify some key questions/issues this raises

(40) **Question 1: Ambiguity or Generality for Finite Complements?**

As we saw, sentence (34a) is true in both scenario (35a) and (35b). **Does this reflect an ambiguity in (34a), or does it have a single meaning that covers both scenarios?**

Relevant Readings:
Lewis (1979), Cresswell & von Stechow (1982), Percus & Sauerland (2003).

---

[1] Caveat: It's more accurate to say that this is Lewis's (1979) analysis, *as it has come to be formulated and formalized by later authors.*

[2] Following Quine (1969), these sorts of pairs are commonly referred to as 'centered worlds'.

(42) **Question 2: Compositionality of *De Se* Truth-Conditions?**

a. How do we derive truth-conditions like those in (39b) for sentence (34b)?

b. What prevents (34b) from getting whatever reading (34a) has?

c. Across languages, it has been found that a number of constructions only allow *de se* readings.
- Infinitival (Control) complements (34b)
- Long distance reflexives
- (Local ECM reflexives (maybe))
- Shifted indexicals
- 'Conjunct' verbal marking (in Tibeto-Burman languages)

Are the same mechanisms involved in all of these for obtaining only *de se* readings?

(I don't intend to set (42c) as an agenda item for this class, though students are very welcome to present work on it.)

Relevant Readings:
Chierchia (1989), Percus & Sauerland (2003), Anand (2006), *et multa alia*.

(43) **Question 3: What About *De Dicto* Readings Now?**
If doxastic alternatives are 'centered worlds', how do we represent *de dicto* truth-conditions?

The Common Solution (Lewis 1979):
We could represent the *de dicto* reading of "Ralph thinks its raining" via the following truth-conditions (where quantification over 'centers' ends up being vacuous).

$\forall \langle w', y \rangle \in$ Dox-Alt(John,w) it's raining in w'

(44) **Question 4: What about *De Re* Readings Now?**
Again, if doxastic alternatives are 'centered worlds', how do we represent *de re* truth-conditions?

The Kaplan-Lewis Analysis of *De Re* (Less Simplified)

$\exists x$. $|x| = 2$ & x is unvaccinated kids in w & $\forall y \in x$.
$\exists R$. y = the z such that R(Ralph,z,w) &
$\forall \langle \mathbf{w'}, \mathbf{u} \rangle \in$ Dox-Alt(Ralph,w) . the z such that R(**u**,z,**w'**) is in that closet in **w'**

There are two unvaccinated kids in the actual world (i.e., Ben and Dave), and for each:
There is a relation R which Ralph bears uniquely to them, and
For all Ralph's doxastic alternatives ***<w',u>***
The thing that ***u*** *uniquely bears R to* ***in w'*** *is in the closet* ***in w'****.*

(45) **Key Feature of the Revised Truth-Condition**

- The revised truth-conditions in (44) state that at Ralph's doxastic alternatives <w',u>, **The thing that u (the entity that Ralph identifies himself as) bears R to is in the closet.**

- Clearly, this will hold in scenario (3). **Also, for various reasons, it ends up being superior to our earlier formulation in (30).**

Fortunately, we can productively analyze sentence (34a) as having truth-conditions akin to (44).

(46) ***De Re* Analysis of the Truth-Conditions of (34a)**

∃R . John = the z such that R(John,z,w) &
∀<w',u> ∈ Dox-Alt(John,w) . the z such that R(**u**,z,**w'**) wins in **w'**

(~ *There is a relation R that John bears uniquely to himself, and*
For all John's doxastic alternatives ***<w',u>***
The thing that ***u*** *uniquely bears R to* ***in w'*** *wins* ***in w'***.)

Important Note:
In scenario (35b), that relation R could be 'x sees y on the TV at such-and-such a date/time/location'.
- John does bear that relation R uniquely to himself in (35b)
- **And, intuitively, John believes that the person he bears that R to is going to win**

Conclusion: Under the Kaplan-Lewis analysis of *de re* readings in (44), we can view the truth of (34a) in scenario (35b) as being due to a *de re* reading.

2.3 The Problem of the So-Called 'Third Reading'

Given our discussion thus far, we would identify two readings for a sentence like (47a) below, a *de dicto* reading (47b) and a *de re* reading (47c).

(47) a. Sentence: Dave thinks Mary kissed a fireman.

b. De Dicto Reading:
∀<w',y> ∈ Dox-Alt(Dave,w) . ∃x . x is a fireman in w' & Mary kissed x in w'

c. De Re Reading:
∃x . x is a fireman in w & ∃R . x = the z such that R(Dave,z,w) &
∀<w',y> ∈ Dox-Alt(Dave,w) . Mary kissed the z such that R(**y**,z,**w'**) in **w'**

(48) **Major Problem: The Third Reading (Fodor 1970)**

However, a sentence like (47a) also seems to have a *third* reading, one which is true in a scenario like the following.

Scenario:
We are at a party being thrown by the local fire department. At the party, all the firemen are dressed in fancy tuxedos. We brought along our friend Dave, *but didn't tell him any of that*. **In fact, Dave's under the impression that the party is being thrown by the police department, and the people in tuxedos are all policemen.**

At one point later in the party, Dave hears from our friend Sue that Mary had just kissed "one of those guys in tuxedos." Consequently, Dave is now snooping around the firemen, trying to determine which of them Mary was kissing. You ask me why Dave is acting so weird around the fireman. I answer: (47a).

a. De Dicto Reading (47b) Doesn't Hold in This Scenario:
Dave is under the impression that the folks in tuxes are policemen. Consequently, it's not the case that in his doxastic alternatives Mary kisses a *fireman*.

b. De Re Reading (47c) Doesn't Hold in This Scenario:
There isn't any specific fireman that Dave is entertaining a belief about.

- More technically, there is no relation R relating Dave to a fireman that he is using to represent the individual kissed by Mary.
  (If anything, he's trying to discover such a relation R, so that he can identify the dude Mary smooched).

(49) **Key Question:** What, then, is the reading under which (47a) is true in scenario (48)?

(50) **The Most Popular Answer (Fodor 1970, Percus 2000, Keshet 2010)**

- Since there isn't any specific fireman that Dave's belief is about, the existential force of the indefinite should scope *below* that of the propositional attitude verb.

- However, since the entities x so quantified aren't firemen in Dave's doxastic alternatives, *but are firemen in the actual world*, we need the predicate 'fireman' to hold of x in the actual world (not the doxastic alternatives).

Proposed 'Non-Specific / Transparent' Truth-Conditions

$\forall \langle w', y \rangle \in$ Dox-Alt(Dave,w) . $\exists$x . **x is a fireman in w** & Mary kissed x in w'

(~ *In all of Dave's doxastic alternatives, Mary kisses an entity x* ***who is a fireman in the actual world***)

(51) **Terminology**

a. The 'Third Reading':
The reading of a sentence like (47a) whereby it's true in a scenario like (48) (one that validates neither a *de re* nor a *de dicto* reading of the sentence)

b. Non-Specific / Transparent Reading:
A reading where an NP is construed so that its quantificational force scopes below a propositional attitude verb, but the lexical content of the N is evaluated in the actual world (not the doxastic alternatives)

(52) **Popular (Possibly Wrong) Hypothesis:**
Third readings are non-specific/transparent readings.

Once again, we can already identify some key questions for both linguists and philosophers.

(53) **Issue One: The Nature of the Third Reading**

Is the hypothesis in (52) really correct? Recent work has identified key problems for the notion that 'third readings' are (always) cases of non-specific/transparent readings.

Relevant Readings: Schwager (2009), Sudo (2014)

(54) **Issue Two: Compositionality**

If the hypothesis in (52) [or some competitor] is correct, *how do we compositionally derive those truth-conditions from an LF for (47a)?*

- If we follow the simple system from Section 1, we run into a paradox:
  - To get the existential force of the indefinite to scope low, we need the indefinite *not* to undergo covert movement into the matrix clause.
  - But, to get the N in the indefinite to be evaluated in the actual world *w*, we need the NP to covertly move out the subordinate clause into the matrix.

Relevant Readings: Percus (2000), Keshet (2010), Schueler (2010)

(55) **Issue Three: The Possibility of a Fourth Reading**

If the hypothesis in (52) is correct, this suggests that we decouple the scope of an NP from the world at which it is evaluated.

- Consequently, could there be a reading where the NP is 'specific' (scopes above the propositional attitude verb', but the N is 'non-transparent' (interpreted at the doxastic alternatives'?

- Such readings, represented below, are referred to as 'fourth readings':

∃x . ∀<w',y> ∈ Dox-Alt(Dave,w) . **x is a fireman in w'** & Mary kissed x in w'
(~ *There is a (specific) entity x such that in all of Dave's doxastic alternatives,*
x is a firemand and Mary kisses x)

Relevant Readings: Fodor (1970), Ioup (1975), Szabo (2010)

2.4 The Problem of *De Se* Communication

As noted very early on by Stalnaker (1981), there's a deep problem unifying Lewis's (1979) theory of *de se* attitudes with a very natural (and successful) theory of how communication in discourse works.

(56) **Theory of 'Discourse Dynamics', Part 1: Common Ground**

- Participants in a discourse share a 'common ground' (CG) of belief/information.

- This CG is the information that participants take as granted in the conversation.

- The CG can be represented as a set of possible worlds (the worlds where that given information is true).

Illustration: Seth and Vincent are talking about their classes.

CG = { w' : Seth and Vincent are linguistics professors in w' &
Seth and Vincent teach only on weekdays in w' &
Vincent is teaching LING 609 in w' & … }

(57) **Theory of 'Discourse Synamics', Part 2: Assertion = Restricting the CG**

When a participant asserts in discourse a proposition *p*, the following happens:

- The other participants decide whether or not to accept *p*
- If *p* is accepted, it is added to the common ground.
- This addition can be modeled as intersecting the CG with *p*
  (This reduces/restricts the CG to only those worlds where *p* is true)

Illustration: Seth asserts the proposition 'LING 510 satisfies Junior Year Writing'

CG ➔ CG' = { w' : Seth and Vincent are linguistics professors in w' &
Seth and Vincent teach only on weekdays in w' &
Vincent is teaching LING 609 in w' &
LING 510 satisfies Junior Year Writing in w ... }

(58) **The Key Puzzle: Assertion of *De Se* Beliefs**

If we assume the picture in (56)-(57), how should we model a speaker asserting a sentence expressing a *de se* belief?

- What happens, logically speaking, if Seth were to assert "I like teaching 510"?

<u>One Way of Stating the Puzzle:</u>
If such an assertion were to happen, we'd want to say that the following English sentence is true: "*Seth asserted that he likes teaching LING 510*"

- In this sentence, what is the 'object' (internal argument) of the English verb *assert*.

- Under Lewis's (1979) theory, it should be the following set of centered worlds:
  { <w',y> : y likes teaching LING 510 in w' }

- Consequently, one of the two possibilities below must be the case. **Either of them, however, come with difficult challenges.**

(59) **Possibility 1: Updating the Common Ground with Sets of Centered Worlds**

The proposition that Seth actually asserts in the discourse is *the same thing* that serves as the internal argument of the verb "asserts" (i.e., the set of centered worlds).

- Thus, the object {<w',y> : y likes teaching LING 510 in w' } is somehow used to update the CG .

(60) **The Puzzle: How the Heck Would This Work?**

How can a set of centered worlds be used to update the CG? As defined in (56), the CG is a set of (uncentered) possible worlds.

- Maybe we revise our definition in (56) so that the CG is a set of centered worlds?
    - **But how can such an object be used to represent the beliefs *mutually held* by Seth and Vincent?**
    - After all, Seth believes – but Vincent need not – the centered proposition {<w',y> : y likes teaching LING 510 in w'}
    - Intuitively, when Vincent accepts Seth's assertion in (57), he ends up believing the proposition {<w',y>: Seth likes teaching LING 510 in w'}
- Maybe we need some kind of operation which 'converts' the centered proposition which Seth asserts to a non-centered proposition added to the CG? **But what would that look like, exactly?**

(61) **Possibility 2: Object of 'Asserts' is Not Necessarily the Object of Assertion**

The proposition that Seth asserts is *not necessarily* the same thing that serves as the internal argument of the verb "asserts".

- That is, despite the truth-conditions of the English sentence reporting the speech act, the object that Seth actually asserts in the discourse is an uncentered proposition:
  { w' : Seth likes teaching LING 510 in w' }

(62) **The Puzzle: Again, How Does This Work?**

There should be some principled/productive relation between the object of assertion and the internal argument of "*asserts*". **How do we get from one to the other?**

- Moreover, it certainly seems as if we can have discourse anaphora from one to the other!

Illustration:	Seth:	"I like teaching LING 510"
	Vincent:	"Yeah, Barbara told me **that**"

It seems like the pronoun 'that' is referring to the object of Seth's assertion. So, it seems like that thing should be able to serve as the internal argument of an attitude verb.

(63) **Intimately Related Problem: 'Believing the Same Thing' (Perry 1977)**

As noted by philosopher John Perry (1977), we often want to say that a person holding a *de se* belief and another person holding a *de re* belief **believe the 'same thing'.**

a. Scenario:
Dave is delusional and believes he's Barack Obama. Somehow, he's convinced his wife that he is right.

b. Intuitively True Sentence: Dave and his wife believe **the same thing**.

c. The Puzzle:
What is this one object that *both* Dave and his wife believe?

- According to Lewis (1979), what Dave believes is:
  {<w',y> : y is Barack Obama in w'}

- According to Lewis (1979), what Dave's wife believes is:
  {<w',y> : the z such that R(y,z,w') is Barack Obama w' }
  (where R = y is married to z in w')

Relevant Literature:
Stalnaker (1981), Egan (2007), Stalnaker (2008), Torre (2009), Ninan (2010a,b)

---

3. The Roadmap for Study and Discussion

3.1 The Evolution of the Kaplan-Lewis Analysis (and Its Relatives)

- We'll begin by exploring the challenges for our simple 'scope theory' of *de re* readings from Section 1, and how they motivate the Kaplan-Lewis analysis.

- We'll also review ways in which the Kaplan-Lewis analysis have been implemented compositionally in natural language semantics.

In the lists below, '*' marks readings which are recommended for presentation by students.

Key Readings:
Yalcin (2015) "Quantifying In From a Fregean Perspective"
Quine (1956) "Quantifiers and Propositional Attitudes"
Kaplan (1968) "Quantifying In"
Lewis (1979) "Attitudes *De Dicto* and *De Se*"
Cresswell & von Stechow (1982) "*De Re* Belief Generalized"
Percus & Sauerland (2003) "On the LFs of Attitude Reports"

Optional Readings:
* von Stechow & Zimmermann (2004) "A Problem for a Compositional Treatment of *De Re* Attitudes"
* Maier (2009) "Presupposing Acquaintance: A Unified Semantics for *De Dicto, De Re,* and *De Se* Belief Reports"
* Charlow & Sharvit (2014) "Bound *De Re* Pronouns and the LFs of Attitude Reports"

3.2 The Nature and Derivation of the 'Third Reading'

- We'll compare different approaches to the 'third reading', and what they imply for our theory of the syntax/semantics interface.

- We'll also explore the question of whether a 'fourth reading' is ever possible.

Key Readings:
* Percus (2000) "Constraints on Some Other Variables in Syntax"
* Keshet (2011) "Split Intensionality: A New Scope Theory of *De Re* and *De Dicto*."
* Szabo (2011) "Specific, Yet Opaque"
* Schwager (2011) "Speaking of Qualities"
* Sudo (2014) "On *De Re* Predicates"

Optional Readings:
* Schueler (2010) "World Variable Binding and Beta Binding"

3.3 Problems Concerning 'Acquaintance Relations'

- As discussed above, the way in which the Kaplan-Lewis analysis quantifies over relations 'R' (so-called 'acquaintance relations') sometimes runs into problems.

- We'll begin by examining Aloni's (2005b) theory, where *de re* readings don't require quantification over (acquaintance) relations in their semantics, but where this requirement can emerge (in some contexts) as a result of pragmatic constraints.

- We'll then turn to the puzzles noted by Ninan (2012), concerning *de re* readings of sentences with counterfactual attitudes like '*imagines*' or '*hopes*', as well as the proposed solutions for those puzzles.

Key Readings:
Sosa (1970) "Propositional Attitudes *De Dicto* and *De Se*"
* Aloni (2005a) "A Formal Treatment of the Pragmatics of Questions and Attitudes"
* Ninan (2012) "Counterfactual Attitudes and Multi-Centered Worlds"

Optional Readings:
* Aloni (2005b) "Individual Concepts in Modal Predicate Logic"
* Maier (2009) "Iterated *De Re*: A New Puzzle for Relational Report Semantics"
* Yanovich (2011) "The Problem of Counterfactual *De Re* Attitudes"

3.4 The Puzzle of *De Se* Communication

- We'll examine different approaches to how the assertion of *de se* attitudes should be formally modeled, and in what ways this can be unified with a formal semantics for *de se* attitude sentences.

Key Readings:
* Egan (2007) "Epistemic Modals, Relativism, and Assertion."
* Stalnaker (2008) "Notes on Models of Self-Locating Belief" [in *Our Knowledge of the Internal World*]
* Torre (2009) "Centered Assertion"
* Ninan (2010a) "*De Se* Attitudes: Ascription and Communication"
* Ninan (2010b) "Semantics and the Objects of Assertion"

Optional Readings:
* Stalnaker (1981) "Indexical Belief"