Split Intensionality:
A New Scope Theory of *De re* and *De dicto*[*]

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The traditional scope theory of intensionality (STI) (see Russell 1905, Montague 1973, Ladusaw 1977, Ogihara 1992, 1996, Stowell 1993) is simple, elegant, and, for the most part, empirically adequate. However, a few quite troubling counterexamples to this theory have lead researchers to propose alternatives, such as positing null situation pronouns (Percus 2000) or actuality operators (Kamp 1971, Cresswell 1990) in the syntax of natural language. These innovative theories do correct the undergeneration of the original scope theory, but at a cost: the situation pronoun and operator theories overgenerate, as argued extensively by Percus (2000) and Keshet (to appeara).

This paper presents new data consistent with a scope theory of intensionality, mostly structures where DPs lose their *de re* reading in positions where syntactic movement is blocked. These data represent yet another case where the situation pronoun and operator theories overgenerate, but they are also just as puzzling for the original STI as for the new theories. One class of counterexamples to the STI involve structures where a DP must seemingly escape a syntactic island to become *de re*. However, the data presented below represent cases where the very same islands seem to prevent *de re* readings. The resolution of this puzzle points the way to a new theory of intensionality.

This new theory, which I will call split intensionality, is a modification of the STI that solves the problems raised for the original scope theory without overgenerating. The proposal calls for an additional intensional abstraction operator that creates an intension from an extension. When a DP moves to a position above this operator, it will be interpreted *de re*; otherwise it will be *de dicto*. The trick is that a DP may move above this operator and yet remain below the intensional operator itself. Therefore, a DP within an island for syntactic movement may be *de re* and yet not move out of the island when the intensional abstraction operator is also within the island. But when this new operator is outside of the island, the phrase may not be *de re*.

1 Problems for the STI

Under the traditional scope theory of *de re* and *de dicto*, a DP must move above an intensional operator ω in order to receive a *de re* reading relative to ω, as schematized in (1):

(1)   a. *De dicto*:   b. *De re*:

ω ... DP DP_1 ... ω ... t_1
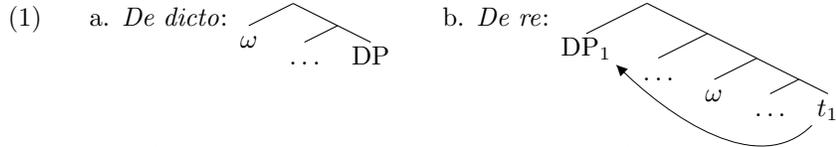
This simple fact makes two predictions. Given a DP δ and an intensional operator ω:

(2)   a.   If δ is trapped below ω within an island for syntactic movement, δ may not be *de re* relative to ω.

        b.   The quantificational force of δ will scope above the quantificational force of ω if δ is *de re* relative to ω and below the quantificational force of ω if δ is *de dicto* relative to ω.

Counterexamples have been raised for both of these predictions.

1.1 May: Finite Clauses

One counterexample to the prediction in (2-a) is due to May (1977). May points out that quantificational DPs inside finite clauses cannot scope outside of these clauses.[1] For instance, in (3-a), the DP *every rally in John's district* can scope above *some politician*, yielding a reading where a different politician will speak at each rally. However, this reading – and hence, presumably, this scoping – is unavailable in (3-b). Based on such data, May calls into question whether a DP like *everyone in this room* in (4-a) could move to the position it holds in (4-b), as it must in the traditional scope theory in order to receive a *de re* reading.[2]

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[1]Wilder (1997) later refutes the strongest form of this claim. However, it still seems that the subject of a finite clause cannot scope out of that clause.

[2]Interestingly enough, this ties in with ACD facts (Sag 1976) involving the subjects of finite clauses:

(i)   Mary wants to report everyone that Bill does.

        a.   ... Bill reports.
        b.   ... Bill wants to report.

(ii)   Mary thinks that she reported everyone that Jill did/*does.

        a.   ... Jill reported.
        b. #... Jill thinks she reported.

In (i), where the DP with an elided phrase is not inside a finite clause, the ellipsis can refer to the entire clause, as shown. However, in (ii), where the DP is inside a finite clause, the ellipsis can only refer to the inner clause, presumably because the DP may not raise to the top of the sentence.

(3)   (= von Fintel and Heim (2008) (170))
  a.   Some politician will address every rally in John's district.
  b.   Some politician thinks that he will address every rally in John's district.

(4)   a.   Mary thinks that everyone in this room is outside.
      b.   [everyone in this room]$_x$ [Mary thinks that x is outside]

This poses a problem for the STI, but one conceivable way to reconcile this evidence with the theory would be to make an exception to allow quantificational DPs to scope out of islands under certain circumstances. For instance, perhaps such a DP is allowed to move to become *de re*, but not allowed to move for (other) scope reasons. As seen in the next section, though, such a relaxation of the rules is not enough to solve the problem.

1.2   *De re* DPs in *If*-clauses

Another island for syntactic movement is an *if*-clause:

(5)   Some politician will be happy if everyone votes for him.

Similar to the example in the previous section, (5) lacks the reading where the DP *everyone* scopes above the DP *some politician* – i.e., where each person x is such that there is a particular politician who will be happy if x votes for him. And yet, despite this restriction on DPs within *if*-clauses, such DPs may be *de re*:
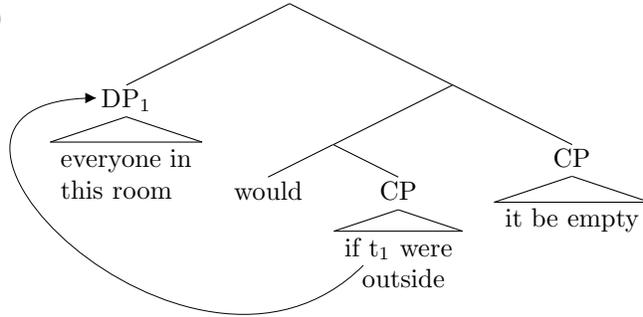
(6)   If everyone in this room were outside, it would be empty.

Since no one can be in this room and outside in the same world, the DP *everyone in this room* must be *de re* relative to the modal governing the conditional in order for (6) to make sense. Therefore, in order to maintain the STI, one would have to add *if*-clauses to the list of islands[3] that DPs may escape just in case they will be *de re* afterwards.

Relaxing the rules on when DPs may move out of syntactic islands does not solve all of the problems with the STI, though. As described in (2-b), the STI predicts that the quantificational force a *de re* DP will scope in a position above the relevant intensional operator. Consider the following structure for (6), though (see Lewis (1975), Kratzer (1986)):

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[3]In fact, since an *if*-clause is a finite clause and a complement, this may be another instance of the type of island discovered by May.

(7)

The scope theory predicts that the quantificational force of *everyone in this room* takes scope above that of the modal *would*. A paraphrase of the meaning of this structure is *everyone x in this room is such that if x were outside, this room would be empty*. However, under this reading it is sufficient for any one person in the room to be missing in order to make the room empty. As several researchers have pointed out (von Stechow (1984), Abusch (1994), and Percus (2000)), the sentence actually only makes sense if it is the totality of the people actually in the room who are outside, not just one.

A similar sentence for times is given in (8):

(8)   When everyone in this room was outside, it was empty.

In (8), the items being quantified over are presumably times, not possible worlds, but the problem remains. (8) does not mean that for everyone in this room x, when x was outside, the room was empty. These examples reveal that merely relaxing the rules on movement out of syntactic islands is not enough to solve the problems of the STI.

1.3   Fodor: Specific vs. Transparent

Another case where the quantificational force of a *de re* DP takes scope below the relevant intensional operator was pointed out by Fodor (1970), who argues that sentences like (9) have more than two readings:

(9)   Mary wants to buy an inexpensive coat.
    a.   **Non-specific, Opaque** (*de dicto*): Mary has a preference for whatever coat she ends up buying: she wants it to be inexpensive.
    b.   **Specific, Transparent** (*de re*): There's a specific coat, say on a rack at Macy's, that Mary wants. The coat is inexpensive, but Mary may or may not know its price.
    c.   **Non-specific, Transparent**: Mary wants an Old Navy pea coat, although she does not have one picked out yet. Old Navy pea coats are inexpensive, although Mary may or may not know this.

(9-a) and (9-b) describe what we have been calling the *de dicto* and *de re* readings. However, Fodor claims that there is another reading, given in (9-c)[4]. She argues that the quantificational force of an indefinite like *an inexpensive coat* can scope separately from its intensional status. She calls readings where the quantificational force scopes above the intensional operator *specific* and those where it scopes below *non-specific*. For instance, in (9-b), there is a specific coat in the actual world that the speaker could point to, whereas this is not the case in (9-a) and (9-c). Fodor calls readings where the intensional status scopes above the intensional operator *transparent* and those where it scopes below *opaque*.

Fodor's three readings do carry over to the domain of times:

(10)   Between 1990 and 1995, John always took a woman his same weight to the world series.

   a.   **Non-specific, Opaque**: John took a different woman to each world series and each time she weighed the same as him at that time.

   b.   **Specific, Transparent**: There is a particular woman who is now his weight that John took to each world series.

   c.   **Non-specific, Transparent**: John took a different woman to each world series and each one weighed the same (at that time) as he does now.

If you take *always* to be a universal quantifier over times, (10) sets up a similar three-way split to (9). The specific reading is one where the quantificational force of *a woman his same weight* scopes above *always*, and the non-specific readings are those where this DP scopes below *always*. The transparent readings are those where the weight is the same at the speech time, and the opaque reading is one where it is the same at the time being quantified over (in this case each world series).[5]

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[4]Fodor claimed a fourth reading, non-specific opaque, but researchers after Fodor have cast doubt on whether the fourth reading in (9) actually exists. Under such a reading, as Fodor puts it, there is a particular coat that Mary wants to buy and that she wants to buy under the description *an inexpensive coat* (see Fodor (1970), p. 227). In this case, it is not necessarily true that the coat in question is actually inexpensive. This seems like a reasonable idea to express, and in fact this is what (i) means. However, this is simply not a reading for (9), as shown in (ii). The use of the word *it* in the second sentence of (ii) forces a specific reading of *an inexpensive coat* (see Ioup 1975). However, once this reading is forced, it is impossible to deny that the coat is inexpensive.

(i)   There's a coat that Mary wants to buy. She thinks it is inexpensive. But really, it is quite expensive.

(ii)   Mary wants to buy an inexpensive coat. #But really, it is quite expensive.

[5]Please note that for the rest of this work, I will refer to items as *de re* when their intensional status scopes above an intensional operator (i.e., they are transparent in Fodor's terminology), whether their quantificational force scopes above this operator (i.e., they are specific) or below this operator (i.e., non-specific). Similarly, I will refer to items as *de dicto* when their intensional status scopes below an intensional operator.

1.4 Bäuerle's Paradox

Bäuerle (1983) argues against the STI using sentences like the following (translated loosely from German), which create a paradox for the STI:

(11)   George thinks every Red Sox player is staying in some five-star hotel downtown.

The context Bäuerle assumes for (11) is as follows. Imagine that George believes a group of men to all be staying at the same five-star hotel - perhaps he overhears the men comparing notes on their luxurious accommodations. This group of men happens to be the Boston Red Sox, but George does not know this. Furthermore, George does not know which hotel they are staying at. He is only of the opinion that they are all staying together in a five-star establishment. In fact, there may not even be any five-star hotels downtown; the sentence can be true even if the players' hotel actually has only four stars.

   In this context, the quantificational force of the existential quantifier *some five-star hotel* outscopes that of the universal quantifier *every Red Sox player*, since there is only one hotel in which all of the players are staying. Therefore, under standard assumptions about quantifiers, the existential quantifier should outscope the universal quantifier. However, the universal quantifier is *de re* and the existential quantifier is *de dicto*. Therefore, under the STI, the universal quantifier should scope above the intensional verb think and the existential quantifier should scope below think. The universal quantifier should therefore outscope the existential quantifier. So the predictions of the STI contradict the standard theory of quantifiers.

   A similar scenario can also be constructed for times:

(12)   In 2001, a 14-year-old boy interviewed every most-wanted fugitive in America.
   a.   [a 14-year-old boy] > [every most-wanted fugitive]
   b.   [every most-wanted fugitive] > PAST > [a 14-year-old boy]

Imagine that in 2001, a boy who was fourteen years old at the time interviewed ten prisoners at a maximum-security penitentiary for his school newspaper. Recently, all ten broke out of prison and are now America's ten most-wanted fugitives. Again, in this situation, the sentence in (12) sounds acceptable. However, this poses a paradox. The scopes of the quantificational force for the two DPs must be as in (12-a), since there is one boy who interviewed all the prisoners. But the intensional status indicates the scoping in (12-b), since the fugitives only escaped recently, and the boy is no longer fourteen years old.

2   Data

Since the mechanism for generating a *de re* reading under the STI involves syntactic movement, the theory predicts that *de re* readings should be blocked

where such movement is blocked. The previous section presented counterexamples to this prediction, cases where a *de re* reading is available that seem to require an illegal syntactic movement. In contrast, this section presents evidence supporting the predictions of the STI. Data is presented in which DPs lose their *de re* reading in positions where syntactic movement is blocked and in one case a DP loses its *de dicto* reading when it is required to move above the relevant intensional operator. Under a scope theory, these data would be explained: the DPs cannot move above the relevant intensional operator and hence cannot receive a *de re* reading. However, the puzzle remains: what is the difference between the counterexamples analyzed in section 1 and the positive evidence presented here below?

2.1 Islands

A syntactic island is a node α in a syntactic tree such that no phrase dominated by α may move to a position not dominated by α. Although various reasons have been proposed for why various nodes are syntactic islands, that will not be the focus of this section. Instead, the effect of various well-established islands on intensionality will be examined.

Consider a structure where an intensional operator ω c-commands an island for movement which contains a DP, as schematized in (13). Any scope theory where the DP must move above ω in order to be *de re* would predict that the DP in this structure cannot be *de re*.

(13)　　a.

b.
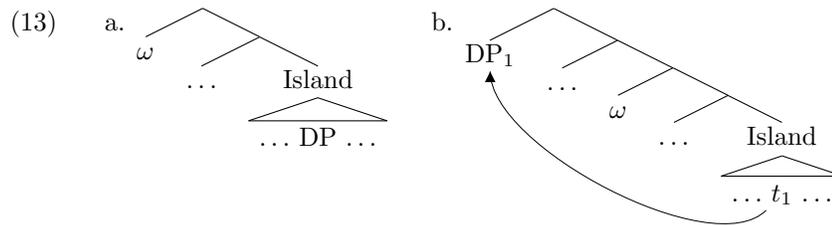
One way to construct a sentence having the structure in (13) involves a conditional statement embedded under a propositional attitude verb. Before we move to the complete sentence, though, let's take a quick look at counterfactual conditionals. A counterfactual statement sounds odd when its antecedent is a tautology:

(14)　　a.　If three students were professors, the classes would be better taught.
　　　　b. #If three professors were professors, the classes would be better taught.

As a counterfactual conditional, (14-a) quantifies over possible worlds different from the real world where the only thing that has changed is that three real-world students are instead professors. (14-b) is anomalous, though, because it quantifies over possible worlds different from the real world where the only thing that has changed is that three real-world professors are instead, professors. This is odd because nothing has changed between the real world and these new

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supposition worlds, even though the counterfactual presupposes that something must be different.

Theoretically, if such a sentence were embedded under a propositional attitude verb, the subject of the *if*-statement could be *de re* relative to this verb. If the example were set up correctly, this could change the antecedent from a tautology to a contingent statement, thus correcting the problem with the counterfactual conditional. However, this does not seem to be possible. For instance, consider the following sentence:

(15)   #Mary thinks that if three professors were professors, the classes would be better taught.

Imagine that Mary sees three professors (call them A, B, and C) giving presentations and mistakes them for graduate students. She thinks that A, B, and C are much better lecturers than any of the professors she knows. Therefore, she thinks that classes would be better if they were professors. In this scenario, the following statement is true:

(16)   Mary thinks that if A, B, and C were professors, the classes would be better taught.

Since Mary does not know that A, B, and C are professors, the antecedent *A, B, and C [are] professors* is not true in her thought-worlds. If the DP *three professors* in (15) were allowed to be *de re*, (16) would be predicted to have a reading identical to (16) because the *de re* interpretation of *three professors* would denote (a quantifier ranging over) A, B, and C in this scenario.

As shown above, *if*-statements are syntactic islands. Under a scope theory, movement out of a position within such an island should be blocked. Therefore, a scope theory in its strongest form would handily explain this data: the *de re* reading is blocked because the DP *three professors* is trapped within a syntactic island and cannot move to a position high enough to be *de re* relative to the intensional verb *think*. Under a theory such as the situation pronoun theory, however, where almost any phrase may become *de re*, (15) should be fine. But in fact, the sentence sounds much worse than the supposedly equivalent (16).

Consider one more example. Imagine that John is a staunch Democrat, and he cannot bring himself to (knowingly) be friends with a Republican. However, some of his friends (call them A, B, and C), unbeknownst to him, are Republican. If John knew they were Republican, he wouldn't be friends with them, and he believes as much, too. In this scenario, (17) is true and sounds fine, but (18) does not sound good.

(17)   John believes that if A, B, or C were Republican, he wouldn't be friends with him.

(18)   #John believes that if any Republican friend of his were Republican, he wouldn't be friends with him.

Once again, if the DP (*any Republican friend of his*, in this case) could be

de re relative to the intensional verb (*believes*, in this case), it should have a reading where the antecedent of the counterfactual is no longer a tautology. However, as shown by the oddness of (18), this does not seem possible. In this case, the syntactic movement is doubly blocked, since the DP in question is a negative polarity item, and therefore must remain in the downward-entailing environment created by the *if*-statement. See section 2.2 below for more such cases.

Other islands for movement show the same pattern. For instance, (19) shows a *de re* reading being blocked for a DP inside a because-clause, (20) for a DP inside an NP complement, and (21) for the DP subject of a finite clause:

(19)   Because-clause:
   a.   The teacher thinks John should be punished because Sally wrote papers A, B, and C.
        (Even if A, B, and C were actually written by John.)
   b.   #The teacher thinks John should be punished because Sally wrote every paper he/John wrote.

(20)   NP complement:
   a.   Mary didn't believe the rumor that Bill married Sarah.
        (Even if Sarah is Bill's wife.)
   b.   #Mary didn't believe the rumor that Bill married his wife.

(21)   Subject of a finite clause:
   a.   Yesterday, Bob knew that A, B, and C were outside.
        (Even if A, B, and C are currently inside.)
   b.   #Yesterday, Bob knew that everyone in this room was outside.

Another, more complex island is a coordinate structure (Ross 1967). Ross's Coordinate Structure Constraint holds that in most cases, one cannot extract from within one clause of a coordinate structure. (22) is an example with a coordinate structure that actually sounds acceptable, even though one conjunct (*a hat that looks awful on her*) is clearly *de re*[6], and therefore, under the scope analysis, must have moved. However, consider the two possible continuations of the sentence in (22). (22-a), which forces the second conjunct (*an inexpensive coat*) to also be *de re*, sounds fine. (22-b), which forces the second conjunct to be *de dicto*, on the other hand, sounds quite odd. An analysis of this case involving the movement of the entire coordinate structure – as schematized in (23)– captures this data without violating any island constraint.

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[6]It must be *de re* at least under the sensible reading, where Mary does not want to look awful.

(22)   Mary wants to buy a hat that looks awful on her and an inex-
         pensive coat.
         a.   ✓But she doesn't know that the coat is inexpensive.
         b.   #But the coat she picked out is actually expensive.

(23)   [a hat that looks awful on her and an inexpensive coat]$_x$
              [Mary wants to buy x]

2.2   Polarity Items

Syntactic islands are not the only phenomena which restrict syntactic movement.
For instance, syntactic movement is blocked if it creates a structure where a
negative polarity item (NPI) is in a positive context or a positive polarity item
(PPI) is in a negative context. This section explores the interactions between
polarity items and intensionality. A scope theory predicts that such items should
have a limited number of intensional readings versus non-polarity items. Again,
the prediction of the scope system is confirmed by the data. For instance, in
(24), where the positive polarity item *some* requires the DP *some inexpensive
coat* to scope above negation, this DP can only receive a *de re* interpretation.
The continuation in (24-a), which forces a *de re* reading, is fine, while the
continuation in (24-b), which forces a *de dicto* reading, sounds odd.

(24)   Mary doesn't want to buy some inexpensive dress at Macy's . . .
         a.   ✓. . . because she thinks it is expensive.
         b.   # . . . but she hasn't decided which.

    Conversely, a negative polarity item like *any* can eliminate a *de re* reading.
Consider the following sentences:

(25)   a.   John told his kids not to say a sentence with any swears in it.
         b.   John told his kids not to say a sentence with swears in it.
         c.   John didn't tell his kids to say a sentence with any swears in it.

These sentences differ in whether the description of the sentence as having swears
in it is part of what John tells his kids. Under a *de re* reading, the description
of the sentence might be a quotation of the sentence John forbade his kids to
say, but under a *de dicto* reading, John must have explicitly told his kids not
to swear. In (25-a), where the DP in question is an NPI and the negation
scopes below the verb *tell*, only the *de dicto* reading – where *swears* is a part
of what John tells his kids – is available. In (25-b), where the DP is not an
NPI, and in (25-c), where the negation scopes above the verb *tell*, both readings
are available. This pattern is easily explained in a scope theory, where the DP
containing an NPI is effectively trapped below negation.
    Consider one more set of examples:

(26) a. #Mary said that she doesn't like anyone she likes.
      b.   Mary said that she doesn't like someone she likes.
      c.   Mary didn't say that she likes anyone she likes.

(26) sounds odd, since it sounds like Mary contradicted herself. If the NPI DP *anyone she likes* could be *de re*, the sentence would no longer be odd, similar to the examples in section 2.1. However, this is not possible here. Notice that in (26-b), where there is no NPI, and in (26-c), where negation scopes above the intensional verb, the *de re* reading once again is allowed.

2.3 Subconstituents

One of the most basic restrictions on syntactic movement is that constituents are moved as a unit. Consider the following example noticed by Romoli and Sudo (to appear):

(27) John wants to meet the wife of the president.
      a. ***Wife de dicto, president de re***: The president, Barack Obama, is such that John wants to meet his wife, whoever she may be.
      b. **Both *de re***: The wife of the president, Michelle Obama, is such that John wants to meet her, though perhaps he does not even know she's the wife of the president.
      c. **Both *de dicto***: John wants to meet whoever the wife of the current president is, though perhaps he does not even know who the president is, or who his wife is.
      d. ***Wife de re, president de dicto***: #The wife of the man John thinks is the president is such that John wants to meet her. E.g., John thinks George W. Bush is still president and wants to meet his wife, Laura Bush. He may or may not know that she is his wife.

Romoli and Sudo note that the sentence in (27) has the readings in (27-a), (27-b), and (27-c), but not the reading in (27-d). The scope theory correctly predicts that this reading is unavailable.[7] The only way to derive the missing reading via a scoping operation would be with one of the following illicit structures:

(28) a. [the wife]$_x$ John wants to meet [x of the president].
      b. [wife]$_x$ John wants to meet [the x of the president].

In (28-a), a non-constituent has moved, which is an illicit movement. In (28-b), a constituent has moved, but it is a single head. So far, every item which has moved to get a *de re* interpretation has been a maximal projection. So, it stands to reason that this type of movement targets maximal projections, not heads. Additionally, even if head movement were allowed, the structure

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[7]Note that a scope theory analysis of the reading in (27-a) would involve the DP *the president* moving – a licit movement.

in (28-b) violates the head movement constraint (Travis 1984), since there are several heads between the starting position for *wife* and its landing position.

3 Split Intensionality

The previous section showed a few ways in which a system of *de re* and *de dicto* intensionality that allows any DP to be *de re* would make false predictions about the availability of *de re* readings in positions where syntactic movement is restricted. For a more complete analysis of where such powerful systems overgenerate, and why a scope system does not, please see Keshet (2008). For the purposes of this paper, though, let us simply stipulate that the only thing preventing adoption of a scope theory is the few cases of undergeneration detailed in section 1. The aim of this section is to propose a less radical change to the scope theory that addresses the problems of the traditional theory without increasing the power of the system to the point at which it could overgenerate.

How should such a balance be achieved? The data presented in the previous section point the way to a solution. The difference between the cases in section 1 (where the STI fails) and those in section 2 (where the STI succeeds) is a structural one. Both sets of data involve a DP inside an island for syntactic movement c-commanded by an intensional operator ω[8]. In the cases in section 1, the island is the sister to ω, as schematized in (29-a). An *if*-statement is the sister to the modal *would*; a finite complement island is the sister to an propositional attitude verb. But the DPs in section 2 are trapped in a position not immediately dominated by the sister to ω, but rather under another node: negation, an embedded propositional attitude or conditional statement, or a *because*-clause. These cases are schematized in (29-b).[9]

(29)   a.   b.
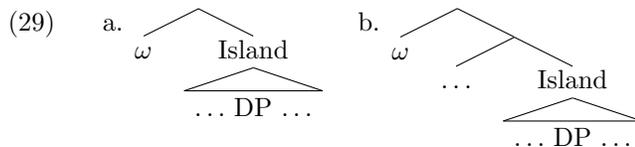
The system proposed in this section maintains the core idea of the STI, that in order to receive a *de re* reading, a DP must scope above a certain item in the structure of a clause. In the scope theory, this is the intensional operator itself. Everything below the operator (e.g., in the box in (30)) is *de dicto* and everything above it is *de re*. However, in the new system, there is an item *lower* than the intensional operator that serves this purpose, the operator $^\wedge$ (after

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[8]In the Fodor examples, the DP is not inside an island for syntactic movement, but under a scope theory its interpretation fixes its position below the intensional operator. Also, technically speaking, the polarity items data does not involve islands, but again the DP's movement is blocked for a different reason.

[9]One simple theory that can be easily dispensed with is akin to subjacency: a *de re* DP can escape one island, but not two. This theory would not explain the fact that a *de re* DP's quantificational force always remains within an island.

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the "up" operator of Montague (1970)), as shown in (31). Since the work of intensionality is now divided between an intensional operator like *think* and the $^\wedge$ operator the new system is called *split intensionality*.

(30)

DP
my brother $e\text{-}\lambda_1$
Mary
thinks
t_1 is my father

(31)

Mary
thinks
DP $\wedge$
my brother
$e\text{-}\lambda_1$
t_1 is
my father
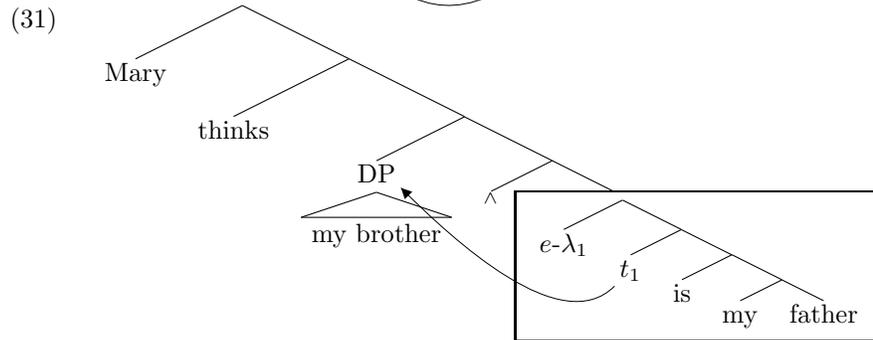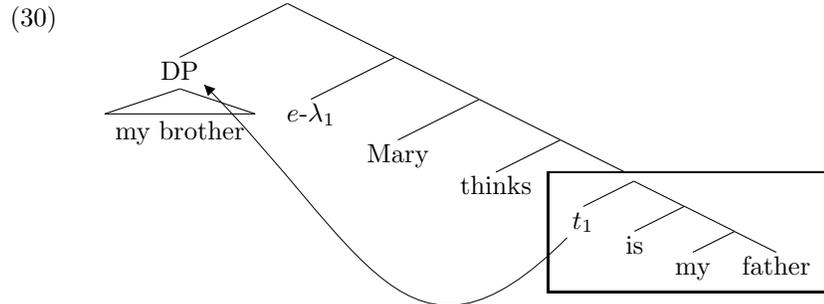
In the new system, the only region of the tree that is *de dicto* is the subtree below the $^\wedge$ (e.g., in the box in (31)). Therefore, instead of having to scope above an intensional operator ω (as *my brother* does in (30)) in order to receive a *de re* reading relative to ω, a DP may now merely scope above the $^\wedge$ below ω (as *my brother* does in (31)). As we will see below, this creates an intensional twilight zone, where DPs may be evaluated *de re* relative to an operator, but still scope beneath this operator in terms of quantificational force. As discussed in sections 3.1 and 3.2, this feature allows the split intensionality theory to keep the benefits of the original scope theory, but avoid many of the scope paradoxes which plagued the traditional account.

The standard Intensional Functional Application (IFA) rule described by Heim and Kratzer (1998) is basically a type repair strategy for intensionality: when a function requires an intensional argument but the syntax only supplies an extensional one, IFA shifts the type of the argument from an extension to an intension and then applies Functional Application as per usual. The main innovation of the system argued for here is that these two steps are divided. The type-shifting step is achieved through the insertion of the $^\wedge$ operator and a new rule:

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(32) **Intensional Abstraction** ($\approx$ Heim and Kratzer (4), p. 186)
If α is a branching node and $\{\beta, \gamma\}$ is the set of its daughters, where β dominates only an $^\wedge$ operator, then, for any situation s and variable assignment g, $[\![\alpha]\!]^{s,g} = \lambda s' \in D_s \ . \ [\![\gamma]\!]^{s',g}$.

$^\wedge$ may be inserted freely – if it yields a type mismatch, the derivation will simply fail. There is no longer a repair strategy when a function requires an intension but is supplied with an intension. Instead, the idea is that a derivation will only succeed if $^\wedge$ has already been inserted by the time the function takes its argument.

Take for instance, the following sentence due to Percus (2000):

(33) Mary thinks my brother is Canadian.

Using this new rule, a *de dicto* reading of *my brother* is derived when *my brother* is below the $^\wedge$ and a *de re* reading is derived when this DP is above the $^\wedge$:

(34) Mary thinks my brother is Canadian.
  a. *De dicto* for *my brother*:
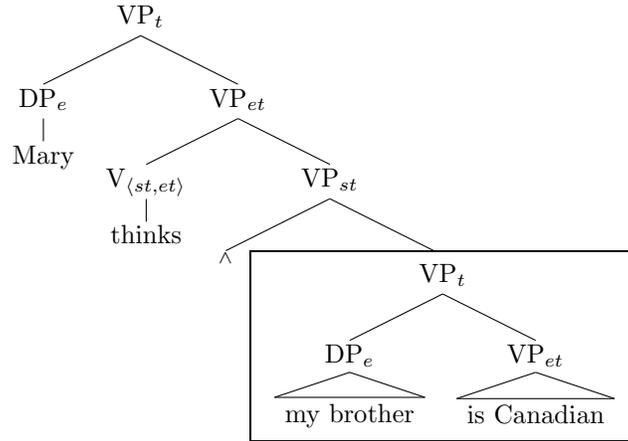
b.   *De re* for *my brother*:
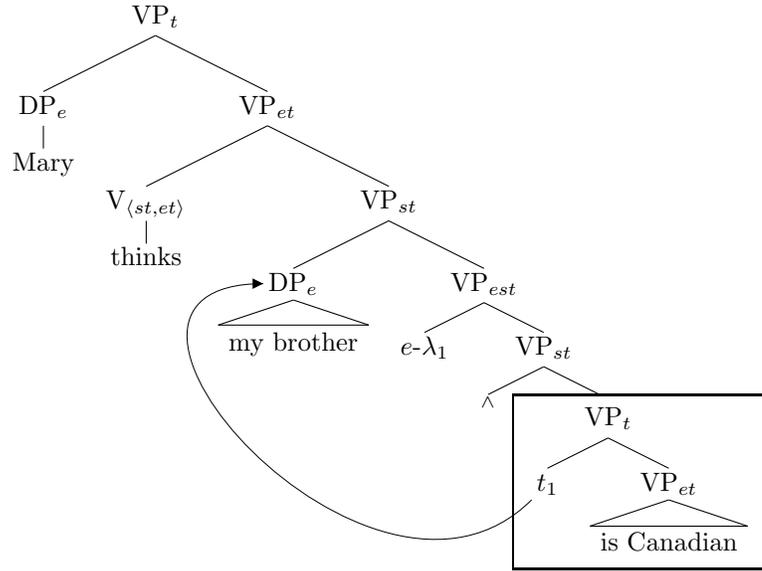
A complete derivation for (34-b) is shown in appendix A, but here is a sketch of how it proceeds: First, the $^\wedge$ applies to the VP, of type t, to form a node of type st. Then, the subject *my brother* moves above this node, first abstracting over a type-e argument to form a node of type est, then filling this argument, creating another node of type st. Last, the verb *thinks* takes this type-st node as its argument, without any need for Intensional Functional Application.

One problem arises for this analysis, though, when the items scoping above $^\wedge$ are quantifiers. Quantifiers are not arguments of the VP; rather, they are functions that take the VP as their argument (see Barwise and Cooper 1981). A quantifier requires its VP complement to be of type $\langle e, t \rangle$. If it is not of this type, the two nodes may not combine. For instance, under the Heim and Kratzer (1998) definition of Functional Application, a quantifier of type $\langle et, t \rangle$ cannot combine with a node of type set or est:

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(35)   Generalized Quantifier:

$\text{VP}_{???}$

DP_e — Mary

$\text{VP}_{???}$

$\text{V}_{\langle st,et\rangle}$ — thinks

$\text{VP}_{???}$

$\text{DP}_{\langle et,t\rangle}$ — every boy

VP_{est}

$e\text{-}\lambda_1$

VP_{st}

$\land$

VP_t

t_1 VP_{et} — is a girl
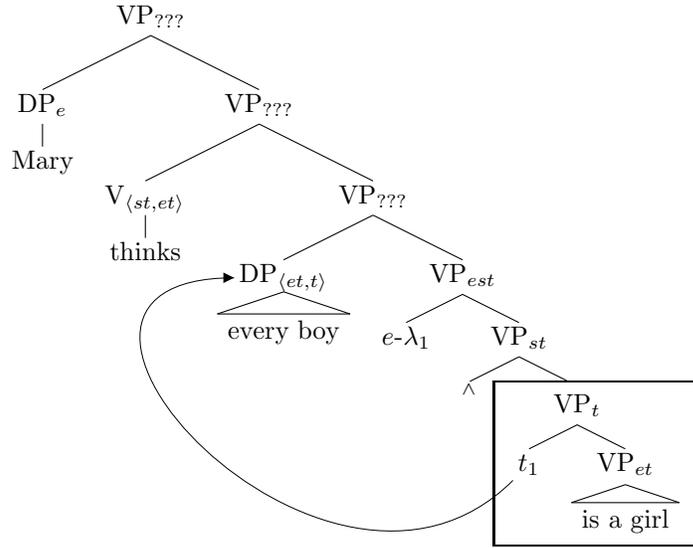
To solve this problem, I turn to a proposal in Keenan (1993), as implemented by Büring (2005). Under Büring's proposal, generalized quantifiers of type $\langle\langle e,t\rangle,t\rangle$ can combine with any predicate whose first argument is an individual (type e) and whose eventual result is a truth value (type t). This way, an object quantifier can combine with a two-place predicate (type $\langle e,\langle e,t\rangle\rangle$) directly, without needing to move for type reasons:

(36)

VP_t

DP_e — John

$\text{VP}_{\langle e,t\rangle}$

$\text{V}_{\langle e,\langle e,t\rangle\rangle}$ — likes

$\text{DP}_{\langle\langle e,t\rangle,t\rangle}$ — every girl
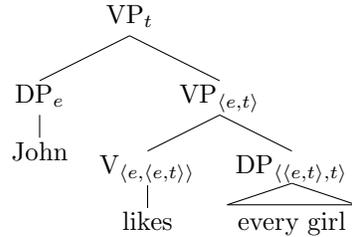
In (36), the DP *every girl* combines directly with the verb *likes*, even though the rule of Functional Application cannot combine these two nodes. This is achieved via a new function, $\mathcal{C}$ for *Combine*, and a new composition rule, *Argument Saturation*:

(37) $\mathcal{C}(\phi,q)$ is defined if q is of type $\langle et,\tau\rangle$ (with τ being any type) and ϕ is a predicate denotation (see below). If defined, $\mathcal{C}(\phi,q) =$

    a. $q(\phi)$ if $\phi \in D_{et}$,

    b. $\lambda\psi.[\mathcal{C}(\lambda y.[\phi(y)(\psi)],q)]$, otherwise.

(38)   a.   Predicate denotation:

        If τ is a conjoinable type, $\langle e,\tau\rangle$ is a predicate type. For any predicate type τ_p, all elements in D_{τ_p} are predicate denotations.

b. Conjoinable type:
   (i) $\langle t \rangle$ is a conjoinable type.
   (ii) if τ_1 is a conjoinable type, then for any type τ_2, $\langle \tau_2, \tau_1 \rangle$ is a conjoinable type.

(39) **Argument Saturation**:
   If α is a branching node and $\{\beta, \gamma\}$ is the set of its daughters, where β is of type $\langle et, \tau \rangle$ (with τ being any type) and γ has a predicate type, then, for any situation s and variable assignment g, $[\![\alpha]\!]^{s,g} = \mathcal{C}([\![\gamma]\!]^{s,g}, [\![\beta]\!]^{s,g})$.

Basically, the rule in (39) allows a quantifier to saturate the first argument of its complement predicate and pass up any remaining arguments to be saturated in later steps of the derivation.

Turning back to the split intensionality system, Büring's rule will solve our problem without any modification. Using the rule above, a quantifier of type $\langle \langle e, t \rangle, t \rangle$ can combine directly with a predicate of type $\langle e, \langle s, t \rangle \rangle$. Thus, with Intensional Abstraction and Argument Saturation, the split intensionality system can reproduce the results of the traditional scope theory. (See the full derivation in appendix B.)

3.1 Solving the Problems with STI

As mentioned, split intensionality solves the problems with the original STI. The main intuition behind the solution is that under the new system there is an extra scopal position below the intensional operator where a DP may be interpreted *de re* and yet where its quantificational force will remain below that of the operator.

3.1.1 Finite Clauses

As seen above (e.g., in (34-b)), under split intensionality a DP no longer needs to scope out of a finite clause to become *de re*. This immediately solves May's objection to the STI, since the syntactic movement involved is no longer illegal. In fact, the new theory makes a stronger prediction, though, which seems to be borne out: no DP should have a specific transparent reading (in Fodor's terms) when it is within a finite complement. For instance, consider the following pairs of sentences:

(40) a. Mary's parents required her to marry a doctor.
     b. Mary's parents required that she marry a doctor.

(41) a. John has doubts about three or more people having come to the party.
     b. John doubts that three or more people came to the party.

In (40-b) but not (40-a), the DP *a doctor* is within a finite complement clause. (40-a) has a reading where there is a specific doctor x such that Mary's parents required her to marry x. This reading is much harder or impossible to get in

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(40-b)[10]. Similarly, (41-a) has a reading where there are at least three people x such that John has doubts x having come to the party, but (41-b) can only mean that John thinks the total number of party guests was less than three.

3.1.2 *If*-statements

The fact that under the split intensionality theory a DP *de re* relative to an intensional operator ω remains below ω explains why its quantificational force scopes below that of ω. Recall our counterexample to the STI from section 1:

(42)   If everyone in this room were outside, it would be empty.

The original STI predicts (41) to mean that for each person x, if x were outside, the room would be empty. Split intensionality, on the other hand, captures this case correctly. As shown in (43), inside the *if*-clause, the DP *everyone in this room* has raised to a position above the $^\wedge$. Only the items below $^\wedge$ (those in the box 8shown in (43)) are interpreted in the supposition worlds of the conditional. Since *everyone in this room* has moved out of this box, it is evaluated in the real world, although it still scopes below the modal in terms of quantificational force.

(43)
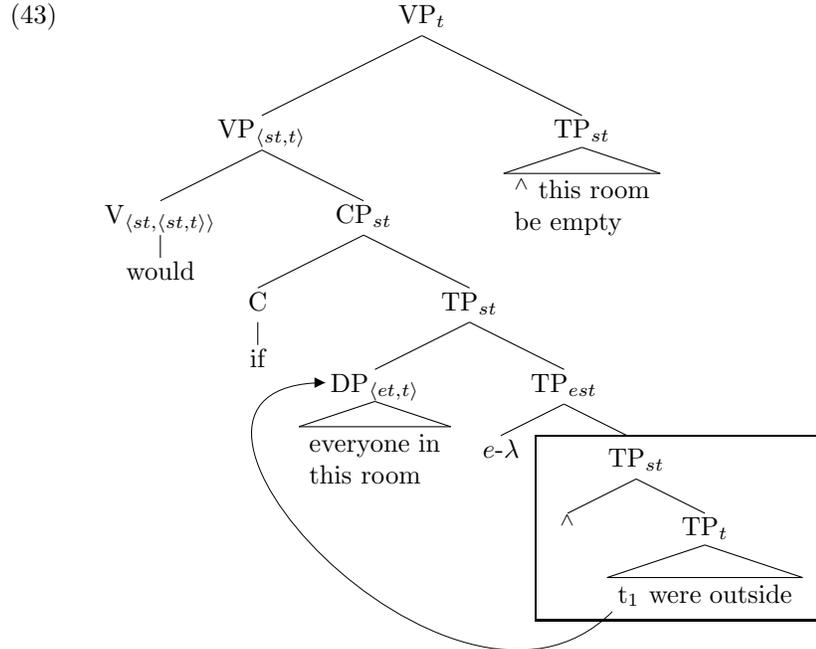
(44) $[\![\mathbf{would}]\!]^{s,g} = \lambda P_{st} \ . \ \lambda Q_{st} \ . \ \forall s' \text{ accessible from } s \ . \ P(s') \rightarrow Q(s')$

---

[10]See section 3.1.4, though, for cases where an indefinite with exceptional scope properties can ostensibly escape from such an island.

(45) $[\![$**if [everyone in this room]** e-λ_1 $^\wedge$ t_1 **were outside**$]\!]^{s,g} = \lambda s'_s$. everyone in this room in s is outside in s'

(46) $[\![$**(43)**$]\!]^{s,g} = 1$ iff $\forall s'$ where everyone in this room in s is outside in s', this room is empty in s'

3.1.3 Fodor

Similarly, the new theory captures the data discovered by Fodor:

(47)   Mary wants to buy an inexpensive coat.

As mentioned before, Fodor (1970) shows that (47) has a reading where the DP *an inexpensive coat* is *de re*, in the sense that Mary does not know that what she wants is an inexpensive coat, but the DP still takes scope below the verb *want* in the sense that there is no one single coat that Mary wants.

This reading is not a problem in the split intensionality system, where a DP may take quantificational force below an intensional verb ω and yet still be interpreted *de re* relative to ω. For instance, consider the structure in (48) and the corresponding truth-condition paraphrase in (49):

(48)
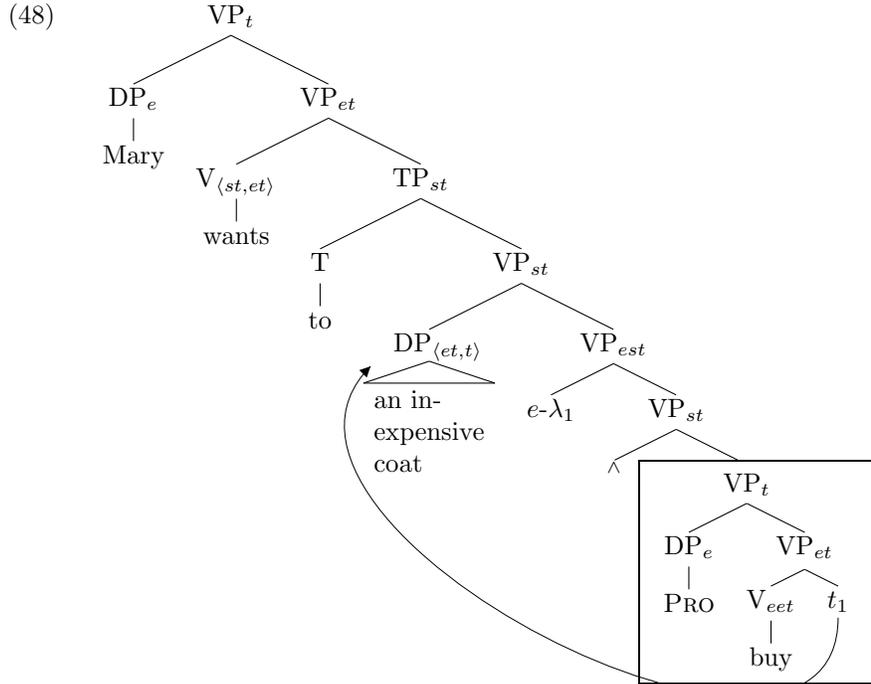
(49)   In all of Mary's desire worlds w, there's an x such that x is an inexpensive coat in the real world and Mary buys x in w.

As described above, everything below the $^\wedge$ operator is evaluated at the shifted intensional index – in this case in Mary's desire worlds. In this structure, for

instance, the verb *buy* is the only item interpreted in Mary's desire worlds. Everything above the $^\wedge$, on the other hand, is interpreted at the same index as the higher clause. Therefore, *an inexpensive coat* is interpreted in the actual world, even though it scopes below the verb *wants*.

So, the split intensionality system predicts that there should be a reading of this sentence where, as Fodor describes, there is no one coat in the real world which Mary wants and yet the description *inexpensive coat* holds (only) in the real world.[11]

3.1.4   Bäuerle's Paradox

The one remaining paradox is that raised by Bäuerle (1983). The sentence in question is repeated here:

(50)   George thinks that every Red Sox player ate at some five-star restaurant downtown.

The scenario is one where *every Red Sox player* is *de re* and *some five-star restaurant downtown* is *de dicto* and yet the quantificational force of the existential outscopes that of the universal. This example is still a problem for the split intensionality system. Even though the DP *every Red Sox player* need only raise above the $^\wedge$ operator to become *de re*, the DP *some five-star restaurant downtown* must remain below $^\wedge$ to be *de dicto*. So, the paradox persists.

The remainder of this section will sketch the solution to this dilemma detailed in Keshet (2008) and Keshet (to appearb). The basic idea is that indefinites – especially specific indefinites like *some five-star restaurant downtown* – often have exceptional scope properties. Fodor and Sag (1982), who first noticed this phenomenon, analyzed such indefinites as simply referential instead of quantificational. Subsequent researchers have invoked everything from contextual restrictions to choice functions to explain the phenomenon, but they all agree that sometimes indefinites seem to change their scope without moving syntactically. Since the exact method used to solve the problem is orthogonal to the issue at hand, I will present the solution using existentially closed choice functions .

Under this theory, (50) could receive the desired interpretation in a structure like (51):

---

[11]Incidentally, the new system does not predict Fodor's fourth reading, where the quantificational force of the DP is above the intensional operator but the intensional status is *de dicto*. See footnote 4, though, for an argument that this reading does not, in fact, exist.

(51)

```
                    VP
          ┌─────────┴─────────┐
       George              VP
                   ┌─────────┴─────────┐
                   V                VP
                   │          ┌───────┴───────┐
                 thinks      f-∃          VP
                                   ┌───────┴───────┐
                                 f-λ₃         VP
                                        ┌───────┴───────┐
                                      DP            VP
                                    ╱  ╲       ┌─────┴─────┐
                                  every      e-λ₁      VP
                                 Red Sox           ∧
                                  player        ┌──────┴──────┐
                                              VP
                                        ┌──────┴──────┐
                                       t₂         VP
                                             ┌─────┴─────┐
                                            V          DP
                                            │        ╱  ╲
                                           ate    at f₃(some
                                                  five-star
                                                  restaurant
                                                  downtown)
```
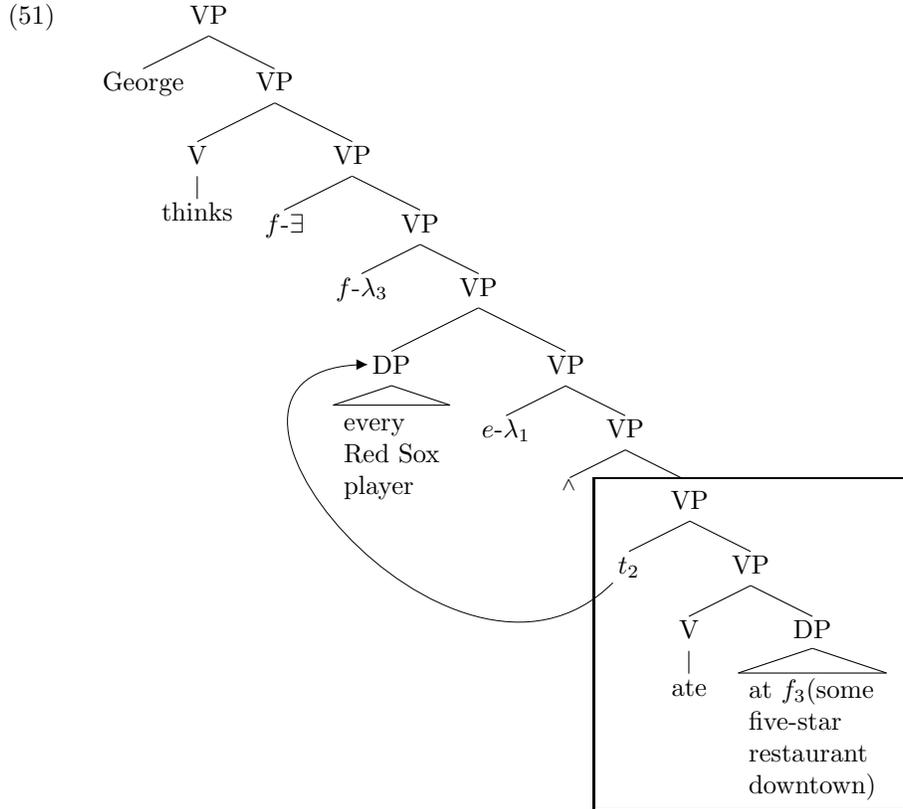
The DP *some five-star restaurant* receives a *de dicto* interpretation by dint of being under the $^\wedge$ beneath the verb *thinks*, while still appearing to outscope the *de re* DP *every Red Sox player*, due to fact that the choice function f_3 is existentially closed by the f-∃ above the universal DP.[12]

Not all indefinites have exceptional scope properties, and therefore one prediction of this analysis is that if you remove any DP in such a sentence that has exceptional scope properties, the ostensible paradox should disappear. For instance, consider the following sentence, which contains no DPs with exceptional scope properties:

(52)   George thinks that at least two Red Sox players ate at every five-star restaurant downtown.

Imagine that George sees a group of men discussing which restaurants they had patronized. George has a set of restaurants in mind that he considers the five-star restaurants downtown, and he is listening for the names of these restaurants.

---

[12]An important part of this analysis is that when the choice function combines with the indefinite (or before this step), the indefinite is evaluated with respect to the local time/world. This falls out of the existentially closed choice function analysis as long as the type of the choice function is $\langle et, e \rangle$ and not something like $\langle set, e \rangle$.

For each such restaurant, he hears at least two of the men say they ate there. What George does not know is that these men are the Red Sox, and that no restaurant downtown has five stars. This scenario is not describable using (52); the closest scenario where (52) is true is one where George thinks the men are Red Sox players – i.e., one where *every Red Sox player* is *de dicto*. Similarly the following sentence does not have a reading where *at least two restaurants downtown* outscopes *every Red Sox player* and yet *every Red Sox player* is *de re* and *at least two restaurants downtown* is *de dicto*:

(53)   George thinks that every Red Sox player ate at at least two restaurants downtown.

These data strongly suggest that the reason why Bäuerle's sentences pose a paradox is due to the fact that they contain indefinites with exceptional scope properties, not due to some restriction on the theory of intensionality.

3.2   Explaining the New Data

The split intensionality system also maintains the advantages of the original STI vis-à-vis the data presented in section 2. These data supported a scope theory, but not necessarily one where a *de re* DP must scope above the intensional operator itself. For instance, if a subconstituent has to move at all, it will be an illegal movement, as shown in (54):

(54)   a.   John wants [the wife]$_x$ $^\wedge$ to meet [x of the president].
         b.   John wants [wife]$_x$ $^\wedge$ to meet [the x of the president].

Here, *wife* or *the wife* has moved, not above *wants* but above $^\wedge$, but the same arguments apply for why this movement is illicit. Similarly, if a polarity item must scope above negation, which is in turn above $^\wedge$ (as in (55-a)), this item must be *de re*; and if such an item must scope below negation, which is in turn below $^\wedge$ (as in (55-b)), this item must be *de dicto*[13]:

(55)   a.   Mary doesn't want $^\wedge$ to buy some inexpensive dress.
         b.   Mary said that $^\wedge$ she doesn't like anyone she likes.

The question of islands is a little trickier under the split intensionality system. For instance, if the $^\wedge$ operator were to scope below an island for movement, a DP would simply have to scope above this operator in order to be *de re*. Therefore, the split intensionality system predicts that such DPs inside islands should be able to be *de re*, as shown in (56):

---

[13]Assuming the simplest type for negation, $\langle t, t \rangle$, negation must apply to an extension, and hence must apply before $^\wedge$.

(56)

```
        ω
            ╱‾‾‾╲
         …      Island
              ╱‾‾‾‾‾‾╲
           … DP … ^ …
```
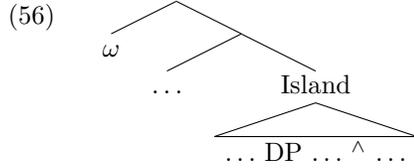
And in fact, this is the very mechanism by which the split intensionality system solves many of the problems with the traditional scope theory, as shown in section 3.1. However, the cases discussed in section 2 are mostly ones where one intensional operator is embedded under another – for instance, a conditional under a propositional attitude verb. This is schematized in (57), where ω and ω' are both intensional operators. In these cases, the island boundary is marked by the embedded intensional operator ω' (such as the conditional modal), and therefore any DP scoping above an $^\wedge$ operator inside the island will merely be *de re* relative to the embedded intensional operator ω', not the matrix-level intensional operator ω.

(57)

```
        ω
          ╱‾‾‾╲
       …
          ω'      Island
              ╱‾‾‾‾‾‾╲
           … DP … ^ …
```
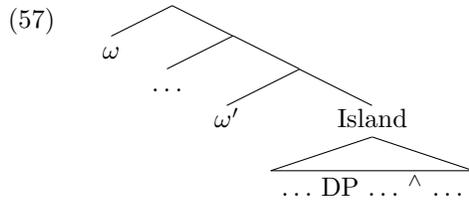
This schema holds for *if*-clauses, because-clauses, NP complements, and finite clauses. The one other island discussed above is the coordinate structure constraint. In this case, if the $^\wedge$ operator is above the coordinate structure, as shown in (58), the same argument holds: one of the coordinated phrases must move out of the structure in order to become *de re* independently of the other and such movement is blocked by the CSC. If the $^\wedge$ is in one coordinated phrase but not the other, the structure would not be interpretable, since the two conjuncts will have different types. So, the data presented in section 2 is indeed still captured by the split intensionality system.

(58)

```
        ω
          ╱‾‾‾╲
       …
          ^
           …        DP
                 ╱‾‾‾‾‾╲
              DP and DP
```
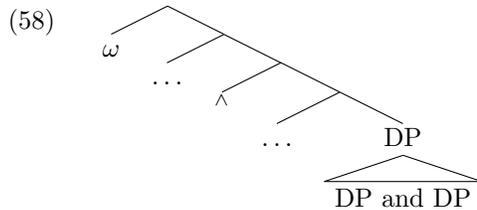
4 Remaining Issues

4.1 Definite Descriptions

The underlined sentence in (59) presents another problem for the scope theory:

(59)   When I last visited my friend, he had two children: a six-year-old and
        a ten-year-old. The six-year-old graduated from med school two years
        ago.
        a.   Predicted reading: The salient person who is now six years old
              graduated from med school at some time t two years ago.
        b.   Actual reading: The salient person who at some contextual time
              was six years old graduated from med school at some time t two
              years ago.

Here what is needed is a time that is not related to anything else in the sentence.
So far, we have been assuming that *de re* readings are evaluated with respect
to the real world and the utterance time. However, *the six-year-old* is evaluated
with respect to a time well before the utterance time.

(60)   Elwood thinks he can see a six-foot-tall rabbit. ?Elwood's wife wants
        him to stop talking to the six-foot-tall rabbit.

Arguably, a similar situation arises in (60). The DP *the six-foot rabbit* in the
last sentence is not a proper description of anything in the real world or in
Elwood's wife's desire-worlds; presumably it is only in Elwood's imagination
(pace *Harvey*). Yet (60), although a little odd, is not unacceptable. This time,
the world at which the DP is evaluated is set by context, rather than being
either the real world or a world being quantified over.

    The split intensionality theory has no way of explaining this reading. Simi-
larly, adding context can greatly improve the acceptability of a sentence involv-
ing a definite description that sounds odd out of the blue:

(61)   #The teacher thinks that John should be punished because he didn't
        write the papers he wrote.

(62)   John wrote some amazing papers over the course of last semester. They
        made me laugh and they made me cry. They were so good, in fact, that
        his teacher didn't believe he wrote them. She thinks that John should
        be punished because he didn't write those papers he wrote.

    Since Donnellan (1966), philosophers and linguists have noted that definite
descriptions have strange intensional properties. Although I do not have a
complete argument, I believe that the answer to this issue is that certain definite
descriptions are purely anaphoric, or meta-linguistic, so that *the six-year-old* can
actually mean *the person recently described as a six-year-old*. In this way, the
descriptive content in the definite description need only hold in the original
context where the description was used, not in the current context.

    There is independent evidence that some (but not all) definite descriptions
are purely anaphoric. For instance, in Bavarian German, there are two forms
of the definite description (Schwager 2007):

(63)   a.   des biachl/s biachl (the book)
        b.   dea ma/da ma (the man)

This corresponds to a difference in preposition contraction in standard German (Heim 1991). Preliminary investigations indicate that all the problematic definite descriptions would use the anaphoric form of the definite article. This would fit with the view that the descriptions in such DPs are only used for identifying the antecedent and are not evaluated in the local context.

4.2   Tense on Verbs

Although this paper argues that intensionality in DPs is strictly scopal, scholars since Kamp (1971) and Partee (1973) have argued that fully tensed verbs require another mechanism, such as an anaphor or operator. Kusumoto (2005) explicitly argues for such a distinction between VPs and DPs. The distinction becomes quite apparent in relative clauses.

Full relative clauses allow a little more disparity between the time at which they are evaluated and the time at which the nouns they modify are evaluated. Consider the following sentences:

(64)   a.   A year ago, I met a bachelor who is now married.
       b.   Five years ago, Jill married a 30-year-old who made partner two years later.

(64-a) poses a problem because someone cannot be a bachelor and married at the same time, and under split intensionality, this DP would have to be entirely evaluated at the same time. (64-b) is a problem because the noun describing Jill's husband is *30-year-old* and yet the action inside the relative clause takes place when he is probably 32 years old.

Let us first consider (64-a). I will follow Ogihara (1996) (who is following Kamp (1971), among others) in assuming that the present tense operator PRES is indexical to the time of utterance.[14]   What this means is that the noun *bachelor* and the relative clause *who* PRES *is now married* can both be evaluated at some time in the past, even when *married* itself is evaluated at the speech time. In this way, (64-a) is no longer a problem because the relative clause as a whole is evaluated at the same time as the noun it modifies.

(64-b) is a little trickier. For this case, I will modify a proposal due to Kusumoto (2005) and assume that the relative clause has an indexical present tense operator above the past tense. Therefore, the noun *30-year-old* can be evaluated at the same time as the relative clause *who* PRES PAST *made partner two years later*; but PAST *made partner* is evaluated at the speech time, and hence *made partner* is evaluated at a time prior to the speech time – namely two years after the matrix past tense time (the time of the marriage). In this

---

[14]I assume that the *now* itself is not creating this reading due to the oddness of the following sentence:

(i)   #There was a now/current professor in kindergarten in the '80's.

Under this analysis, since there is no tense on the phrase *now professor*, it cannot be shifted in time, and therefore the professor must be a kindergartner at the same time. And indeed the sentence sounds odd for this reason.

way, any modifier with its own tense can receive an independent time reading with a form of indexicality.

4.3 Conceptual Issues

The version of split intensionality here views the $^\wedge$ operator as freely insertable, but could it be that $^\wedge$ is actually a more familiar node in syntax, such as T or C?

Also, $^\wedge$ divides each clause into two regions: one where every DP is *de dicto* and one where every DP is *de dicto*. Similar divides have been proposed for presuppositional vs. non-presuppositional DPs and given vs. new DPs (Kucerova 2008, Diesing 1992). Is this a coincidence, or is there a connection?

The addition of the Argument Saturation rule seems like a complication to the system in Heim and Kratzer (1998), but one way of looking at the new rule is as a generalization of Functional Application itself. In fact, if all DPs were generalized quantifiers and hence no node was of type e, the Functional Application rule would be unnecessary in the new system. Also, compare the new Argument Saturation rule to the generalized Predicate Modification rule proposed, e.g., by Winter (1996), Gazdar (1980), Keenan and Faltz (1985), and Partee (1987).

Is there an empirical justification for having both QR and Argument Saturation (which allows in-situ object quantifiers)? Yes, Fox (1999)'s Scope Economy requires some – but not all – object quantifiers to remain in situ.

5 Conclusion

The paradoxes that the traditional scope theory suffers from make it clear that this theory cannot be correct as it stands. Clearly, an alternative theory is needed. However, adding situation pronouns to the syntax of natural language increases the power of the system, as evidenced by the many new readings that are predicted under the situation pronoun account. Furthermore, a good number of these readings are not actually available. The split intensionality theory, on the other hand, is a more modest change to the traditional scope theory. This new approach solves the problems raised for the traditional theory without increasing the power of the system as much as the situation pronoun account does.

Much remains to be worked out in the new system. For instance, more research is needed to explore the predictions that the new theory makes concerning the connection between intensionality and other scopal phenomena, such as binding theory, scope economy, and e-type anaphora. However, since this new account is inherently more constrained, it seems prudent to research the split intensionality system as a replacement for the traditional scope theory before proposing the more powerful situation pronoun account, which already requires several further constraints to rein in its overgenerating predictions.

Appendices

A Sample Derivation

(65) a. $[\![\mathbf{thinks}]\!]^{\langle w,i\rangle,g} = \lambda P_{\langle s,t\rangle}$. λx_e . $\forall w' \in W$ such that x entertains w' as a candidate for w at i . $P(\langle w',i\rangle)$

    b. $[\![\mathbf{is\ Canadian}]\!]^{s,g} = \lambda x_e$. x is Canadian in s

    c. $[\![\mathbf{my\ brother}]\!]^{s,g} =$ my brother in s

(66)

a. $\left[\!\!\left[\begin{array}{c} \text{VP}_t \\ t_1 \quad \text{VP}_{et} \\ \text{is Canadian} \end{array} \right]\!\!\right]^{s,g} = 1$ iff $g(1)$ is Canadian in s

b. $\left[\!\!\left[\begin{array}{c} \text{VP}_{st} \\ \wedge \quad \text{VP}_t \\ t_1 \text{ is Canadian} \end{array} \right]\!\!\right]^{s,g} = \begin{array}{l}\lambda s' \in D_s \ . \\ g(1) \text{ is Canadian in } s'\end{array}$

c. $\left[\!\!\left[\begin{array}{c} \text{VP}_{est} \\ e\text{-}\lambda_1 \quad \text{VP}_{st} \\ \wedge \ t_1 \text{ is Canadian} \end{array} \right]\!\!\right]^{s,g} = \begin{array}{l}\lambda x \in D_e \ . \ \lambda s' \in D_s \ . \ x \text{ is} \\ \text{Canadian in } s'\end{array}$

d. $\left[\!\!\left[\begin{array}{c} \text{DP}_e \\ \text{my brother} \end{array} \right]\!\!\right]^{s,g} =$ my brother in s

e. $\left[\!\!\left[\begin{array}{c} \text{VP}_{st} \\ \text{DP}_e \quad\quad \text{VP}_{est} \\ \text{my brother} \quad e\text{-}\lambda_1 \ \wedge \\ t_1 \text{ is Canadian} \end{array} \right]\!\!\right]^{s,g} = \begin{array}{l}\lambda s' \in D_s \ . \text{ my brother in} \\ s \text{ is Canadian in } s'\end{array}$

f. $\left[\!\!\left[\begin{array}{c} \text{VP}_{et} \\ \text{V}_{\langle st,et\rangle} \quad\quad \text{VP}_{st} \\ \text{thinks} \quad \text{my brother } e\text{-}\lambda_1 \\ \wedge \ t_1 \text{ is Canadian} \end{array} \right]\!\!\right]^{\langle w,i\rangle,g} = \begin{array}{l}\lambda x \in D_e \ . \ \forall w' \in W \text{ such} \\ \text{that } x \text{ entertains } w' \text{ as a} \\ \text{candidate for } w \text{ at } i \ . \text{ my} \\ \text{brother in } \langle w,i\rangle \text{ is Cana-} \\ \text{dian in } \langle w',i\rangle\end{array}$

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g. $\left[\!\!\left[\begin{array}{c} \text{VP}_t \\ \text{DP}_e \quad \text{VP}_{et} \\ | \\ \text{Mary} \quad \text{thinks my brother} \\ e\text{-}\lambda_1 \ {}^\wedge t_1 \\ \text{is Canadian} \end{array}\right]\!\!\right]^{\langle @,\nu \rangle, g}$ $= 1$ iff $\forall w' \in W$ such that Mary entertains w' as a candidate for @ at ν . my brother in $\langle @, \nu \rangle$ is Canadian in $\langle w', \nu \rangle$

B   Sample Derivation with a Quantifier

(67) $[\![\textbf{every bachelor}]\!]^{s,g} = \lambda P_{st}$. $\forall x$ such that x is a bachelor in s . $P(s)$

(68)

a. $\left[\!\!\left[\begin{array}{c} \text{VP}_t \\ t_1 \quad \text{VP}_{et} \\ \text{is Canadian} \end{array}\right]\!\!\right]^{s,g}$ $= 1$ iff $g(1)$ is Canadian in s

b. $\left[\!\!\left[\begin{array}{c} \text{VP}_{st} \\ {}^\wedge \quad \text{VP}_t \\ t_1 \text{ is Canadian} \end{array}\right]\!\!\right]^{s,g}$ $=$ $\lambda s' \in D_s$. $g(1)$ is Canadian in s'

c. $\left[\!\!\left[\begin{array}{c} \text{VP}_{et} \\ e\text{-}\lambda_1 \quad \text{VP}_t \\ {}^\wedge t_1 \text{ is Canadian} \end{array}\right]\!\!\right]^{s,g}$ $=$ $\lambda x \in D_e$. $\lambda s' \in D_s$. x is Canadian in s'

d. $\left[\!\!\left[\begin{array}{c} \text{DP}_{\langle et,t \rangle} \\ \text{every boy} \end{array}\right]\!\!\right]^{s,g}$ $=$ $\lambda P \in D_e^{D_t}$. $\forall x$ such that x is a boy in s . $P(x)$

e. $\left[\!\!\left[\begin{array}{c} \text{VP}_{st} \\ \text{DP}_{\langle et,t \rangle} \quad \text{VP}_{set} \\ \text{every boy} \quad e\text{-}\lambda_1 \ {}^\wedge \\ t_1 \text{ is Canadian} \end{array}\right]\!\!\right]^{s,g}$ $=$ $\lambda s' \in D_s$. $\forall x$ such that x is a boy in s . x is Canadian in s'

f. $\left[\!\!\left[\begin{array}{c} \text{VP}_{et} \\ \text{V}_{\langle st,et \rangle} \quad \text{VP}_{st} \\ | \\ \text{thinks} \quad \text{every boy } e\text{-}\lambda_1 \\ {}^\wedge t_1 \text{ is Canadian} \end{array}\right]\!\!\right]^{\langle w,i \rangle, g}$ $=$ $\lambda x \in D_e$. $\forall w' \in W$ such that x entertains w' as a candidate for w at i . $\forall x$ such that x is a boy in $\langle w, i \rangle$. x is Canadian in $\langle w', i \rangle$

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g. $\left[\!\left[\ \begin{array}{c} \text{VP}_t \\ \diagup \diagdown \\ \text{DP}_e \qquad \text{VP}_{et} \\ | \qquad \diagup \diagdown \\ \text{Mary} \quad \text{thinks every boy} \\ {}^{\wedge} e\text{-}\lambda_1\ t_1 \\ \text{is Canadian} \end{array}\ \right]\!\right]^{\langle @,\nu\rangle,g} = 1$ iff $\forall w' \in W$ such that Mary entertains w' as a candidate for @ at ν . $\forall x$ such that x is a boy in $\langle @,\nu\rangle$. x is Canadian in $\langle w',\nu\rangle$

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