Chapter Five

Specificity and Transparency

We discuss two important aspects of the interpretation of DPs in intensional contexts: the scope of their quantificational force, if any, and the world with respect to which their predicate is evaluated.

5.1 Predictions of our framework

When a DP occurs in the scope of an intensional operator, our framework makes clear predictions. Consider, for example:

(1) Emma wanted Taylor to buy a book about soccer.

Imagine that we give the following meaning to *want*:

(2) $[\![\text{want}]\!]^{w,g} = \lambda p_{\langle s,t\rangle}.\lambda x_e.\ \forall w'$ such that x's wants in w are satisfied in w': $p(w') = 1$.

In other words, x *wants* p is true iff p is true in all worlds where x's wants are satisfied. Further, assume that the DP *a book about soccer* is interpreted within the embedded clause. Then, we claim, (1) will be true iff in all of the worlds that satisfy all of Emma's wants, there is a book about soccer that Taylor buys. (You prove this claim in the following exercise.)

Exercise 5.1: Draw the obvious, if simplified, LF for (1) and calculate its truth-conditions. □

Now, consider what happens if the object of the lower verb QRs and adjoins to the matrix clause:

(3) [a book about soccer] (1 [Emma wanted Taylor to buy t_1])

When you calculate the truth-conditions of (3) [please do so], you will get a result that is very different from the previous exercise. Now what is claimed is that there is a book about soccer, call it x, such that in all of the worlds satisfying all of Emma's wants Taylor buys x.

There are two important differences between the truth-conditions that our framework assigns to these two LFs.

Quantifier scope: Since *want* is a universal quantifier over worlds and *a book about soccer* is an existential quantifier over individuals, there's a question about the relative scope of the two quantifiers. In the first truth-conditions we sketched, the existential quantifier scopes under the universal quantifier: for every world there is an individual such that bla-bla. In the second LF, the existential quantifier scopes over the universal one: there is an individual such that in every world yadda-yadda. The most common terminology for this difference involves the pair *specific/non-specific*: the sentence (or the object DP) is interpreted specifically if the DP takes scope over the intensional operator, and it is interpreted non-specifically if the DP takes scope under the intensional operator.

Predicate evaluation: When the existential quantifier scopes over the intensional operator, this also has the effect that the predicate contained in it, *book about soccer*, is evaluated in the matrix evaluation world. And when the quantifier takes lower scope, its predicate is evaluated in the worlds that the intensional operator shifts to. One evocative terminology for whether the predicate is evaluated with respect to the matrix evaluation world or the worlds shifted to by the intensional operator is *transparent/opaque*. A predicate evaluated relative to the matrix world is called *transparent*. A predicate evaluated in the worlds shifted to by an intensional operator is receiving an *opaque* interpretation.

There's another terminological pair that is very common: *de re*/*de dicto*. One way to conceive of that distinction in our framework is that it stands for a particular combination of the two distinctions we just introduced: *de re* means specific and transparent, and *de dicto* means non-specific and opaque.

Caution about terminology: terminological confusion and exuberance is rampant in this area (and many others). In a way, terminology is just a shorthand way to pick out salient properties of LFs (or their denotation). It's the latter that truly matters. One particular problematic aspect of the terminology is its binary nature, while the relevant distinctions are actually more complex, especially as soon as we are dealing with nested intensionality.

Exercise 5.2: Consider the sentence *Emma must want Taylor to buy a book about soccer*. One can imagine using this to describe a scenario where we are seeing Taylor enter a bookstore known to cater to soccer aficionados. For some reason we won't go into, we come to the conclusion that there is a specific book about soccer that Emma must have asked Taylor to buy. But at the same time, we have no idea what that book might be, so there's not a specific book about which we made our deduction. This suggest that we may want to give the object DP intermediate scope. So, draw an LF that corresponds to this idea and calculate its truth-conditions. □

The notion of *specificity* is particularly laden with complexity. We use it here to indicate the scope of a DP with respect to an intensional operator. There are quite a few other conceptions, usefully surveyed by von Heusinger 2011. One that is very common is the notion that specific DPs indicate that the speaker has a referent or referents "in mind", something that may even be relevant in the absence of intensional operators. Consider:

(4) A man is knocking on the door.

The speaker might base such a claim on circumstantial evidence (hearing a particularly masculine knock on the door?) or on clear visual evidence (seeing the man through the window). In the second case, we're tempted to say that the speaker has a specific referent "in mind" while in the first case there is non-specific existential quantification. Whether this is merely a pragmatic distinction about what is grounding the speaker's claim or whether the LF reflects this difference in "specificity" is a debatable issue. If one adopted the idea that all matrix sentences contain an epistemic operator, such as Marie-Christine Meyer's "Matrix K" operator (Meyer 2013), then we would have a genuine LF ambiguity if DPs such as *a man* could take scope over or under that operator.

For discussion, see for example Ludlow & Neale 1991.

Our recommendation is to use the terms *specific/non-specific*, *transparent/opaque*, *de re/de dicto* only with extreme caution. They are sometimes useful shorthands, but unless it is crystal-clear what properties of LFs/denotations you are using them to pick out, they are more likely to be a source of obfuscation and confusion.

Let's look at some more examples of the ambiguity predicted by our framework as soon as we allow for the possibility of an embedded DP to take scope either under or over a relevant intensional operator. A classic kind of example is (5), which is of the same form as our initial example and contains the DP *a plumber* inside the infinitival complement of *want*.

(5) Mesut wants to marry a plumber.

According to the non-specific reading, every possible world in which Mesut gets what he wants is a world in which there is a plumber whom he marries. According to the specific reading, there is a plumber in the actual world whom Mesut marries in every world in which he gets what he wants. We can imagine situations in which one of the readings is true and the other one false.

For example, suppose Mesut thinks that plumbers make ideal spouses, because they can fix things around the house. He has never met one so far, but he definitely wants to marry one. In this scenario, the non-specific reading is true, but the specific reading is false. What all of Mesut's desire-worlds have in common is that they have a plumber getting married to Mesut in them. But it's not the same plumber in all those worlds. In fact, there is no particular individual (actual plumber or other) whom he marries in every one of those worlds.

For a different scenario, suppose that Mesut has fallen in love with Robin and wants to marry Robin. Robin happens to be a plumber, but Mesut doesn't know this; in fact, he wouldn't like it and might even call off the engagement if he found out. Here the specific reading is true, because there is an actual plumber, viz. Robin, who gets married to Mesut in every world in which he gets what he wants. The non-specific reading is false, however, because the worlds which conform to Mesut's wishes actually do not have him marrying a plumber in them. In his favorite worlds, he marries Robin, who is not a plumber in those worlds.

When confronted with this second scenario, you might, with equal justification, say 'Mesut wants to marry a plumber', or 'Mesut *doesn't* want to marry a plumber'. Each can be taken in a way that makes it a true description of the facts — although, of course, you cannot assert both in the same breath. This intuition fits well with the idea that we are dealing with a genuine ambiguity.

Actually, *why* wouldn't one be able to assert both sentences in the same breath, if both have a true reading?

Let's look at another example:

(6) John believes that your abstract will be accepted.

Here the relevant DP in the complement clause of the verb *believe* is *your abstract*. Again, we detect an ambiguity, which is brought to light by constructing different scenarios.

(i) John's belief may be about an abstract that he reviewed, but since the abstract is anonymous, he doesn't know who wrote it. He told me that there was a wonderful abstract about subjacency in Hindi that is sure to be accepted. I know that it was your abstract and inform you of John's opinion by saying (6). This is the specific reading. In the same situation, the non-specific reading is false: Among John's belief worlds, there are many worlds in which *your abstract will be accepted* is not true or even false. For all he knows, you might have written, for instance, that terrible abstract about Antecedent-Contained Deletion, which he also reviewed and is positive will be rejected.

(ii) For the other scenario, imagine that you are a famous linguist, and John doesn't have a very high opinion about the fairness of the abstract selection process. He thinks that famous people never get rejected, however the anonymous reviewers judge their submissions. He believes (correctly or incorrectly — this doesn't matter here) that you submitted a (unique) abstract. He has no specific information or opinion about the abstract's content and quality, but given his general beliefs and his knowledge that you are famous, he nevertheless believes that your abstract will be accepted. This is the non-specific reading. Here it is true in all of John's belief worlds that you submitted a (unique) abstract and it will be accepted. The specific reading of (6), though, may well be false in this scenario. Suppose — to flesh it out further — the abstract you actually submitted is that terrible one about ACD. That one surely doesn't get accepted in every one of John's belief worlds. There may be some where it gets in (unless John is certain it can't be by anyone famous, he has to allow at least the possibility that it will get in despite its low quality). But there are definitely also belief-worlds of his in which it doesn't get accepted.

We have taken care here to construct scenarios that make one of the readings true and the other false. This establishes the existence of two distinct readings. We should note, however, that there are also many possible and natural scenarios that simultaneously support the truth of *both* readings. Consider, for instance, the following third scenario for sentence (6).

(iii) John is your adviser and is fully convinced that your abstract will be accepted, since he knows it and in fact helped you when you were writing it. This is the sort of situation in which both the non-specific and the specific reading are true. It is true, on the one hand, that the sentence *your abstract will be accepted* is true in every one of John's belief worlds (non-specific reading). And on the other hand, if we ask whether the abstract which you actually wrote will get accepted in each of John's belief worlds, that is likewise true (specific reading).

In fact, this kind of "doubly verifying" scenario is very common when we look at actual uses of attitude sentences in ordinary conversation. There may even be many cases where communication proceeds smoothly without either the speaker or the hearer making up their minds as to which of the two readings they intend or understand. It doesn't matter, since the possible circumstances in which their truth-values would differ are unlikely and ignorable anyway. Still, we *can* conjure up scenarios in which the two readings come apart, and our intuitions about those scenarios do support the existence of a semantic ambiguity.

EXERCISE 5.3: For the two examples just discussed, we can explain their non-specific (and opaque) interpretation via LFs where the relevant DP remains inside the scope of the intensional operator at LF:

(7) John wants [[a plumber]$_1$ [PRO$_2$ to marry t$_1$]]

(8) John believes [the abstract-by-you will-be-accepted]

To obtain the specific (and transparent) readings, we apparently have to QR the DP to a position above the intensional predicate, minimally the VP headed by *want* or *believe*.

(9) [a plumber]$_1$ [John wants [PRO$_2$ to marry t$_1$]]

(10) [the abstract-by-you]$_1$ [John believes t$_1$ will-be-accepted]

Calculate the interpretations of the four structures in (7) — (10), and determine their predicted truth-values in each of the (types of) possible worlds that we described above in our introduction to the ambiguity.

Some assumptions to make the job easier: (i) Assume that (7) and (9) are evaluated with respect to a variable assignment that assigns John to the number 2. This assumption takes the place of a worked out theory of how controlled PRO is interpreted. (ii) Assume that *abstract-by-you* is an unanalyzed one-place predicate. This takes the place of a worked out theory of how genitives with a non-possessive meaning are to be analyzed. □

5.2 Raised subjects

In the examples of ambiguities that we have looked at so far, the surface position of the DP in question was inside the modal predicate's clausal or VP-complement. We saw that if it stays there at LF, a non-specific opaque reading results, and if it covertly moves up above the modal operator, we get a specific transparent reading. In the present section, we will look at cases in which a DP that is superficially *higher* than a modal operator can still be read non-specifically. In these cases, it is the specific reading which we obtain if the LF looks essentially like the surface structure, and it is the non-specific reading for which we apparently have to posit a non-trivial covert derivation.

5.2.1 Non-specific readings for raised subjects

Suppose I come to my office one morning and find the papers and books on my desk in different locations than I remember leaving them the night before. I say:

(11) Somebody must have been here (since last night).

On the assumptions we have been making, *somebody* is base-generated as the subject of the VP *be here* and then moved to its surface position above the modal. So (11) has the following S-structure, which is also an interpretable LF.

(12) somebody [2 [[must R] [t_2 have-been-here]]]

What does (12) mean? The appropriate reading for *must* here is epistemic, so suppose the variable R is mapped to the relation $[\lambda w.\lambda w'.\ w'$ is compatible with what I believe in $w]$. Let w_0 be the utterance world. Then the truth-condtion calculated by our rules is as follows.

(13) $\exists x[x$ is a person in w_0 &
$\forall w'[w'$ is compatible with what I believe in $w_0 \rightarrow\ x$ was here in $w']]$

But this is not the intended meaning. For (13) to be true, there has to be a person who in every world compatible with what I believe was in my office. In other words, all my belief-worlds have to have one and the same person coming to my office. But this is not what you intuitively understood me to be saying about my belief-state when I said (11). The context we described suggests that I do not know (nor have any opinion about) which person it was that was in my office. For all I know, it might have been John, or it might have been Mary, or it have been this stranger here, or that stranger there. In each of my belief-worlds, somebody or other was in my office, but no one person was there in all of them. I do not believe of anyone in particular that he or she was there, and you did not understand me to be saying so when I uttered (11). What you did understand me to be claiming, apparently, was not (13) but (14).

(14) $\forall w'[w'$ is compatible with what I believe in w_0
$\rightarrow \exists x$ [x is a person in w' & x was here in w']]

In other words — to use the terminology we introduced in the last section — the DP *somebody* in (11) appears to have a non-specific reading.

How can sentence (11) have the meaning in (14)? The LF in (12), as we saw, means something else; it expresses a specific reading, which typically is false when (11) is uttered sincerely. So there must be another LF. What does it look like and how is it derived? One way to capture the intended reading, it seems, would be to generate an LF that's essentially the same as the underlying structure we posited for (11), i.e., the structure *before* the subject has raised:

(15) $[_{IP}$ e $[_{I'}$ [must R] [somebody have-been-here]]]

(15) means precisely (14) (assuming that the unfilled Spec-of-IP position is semantically vacuous), as you can verify by calculating its interpretation by our rules. So is (15) (one of) the LF(s) for (11), and what assumption about syntax allow it to be generated? Or are there other — perhaps less obvious, but easier to generate — candidates for the non-specific LF-structure of (11)?

Before we get into these question, let's look at a few more examples. Each of the following sentences, we claim, has a non-specific reading for the subject, as given in the accompanying formula. The modal operators in the examples are of a variety of syntactic types, including modal auxiliaries, main verbs, adjectives, and adverbs.

(16) Everyone in the class may have received an A.
$\exists w'[w'$ conforms to what I believe in w &
$\forall x$[x is in this class in $w' \rightarrow$ x received an A in w']].

(17) At least two semanticists have to be invited.
$\forall w'[w'$ conforms to what is desirable in w
$\rightarrow \exists_2 x$ [x is a semanticist in w' & x is invited in w']].

(18) Somebody from New York is expected to win the lottery.
$\forall w'[w'$ conforms to what is expected in w
$\rightarrow \exists x[x$ is a person from NY in w' & x wins the lottery in $w']]$

(19) Somebody from New York is likely to win the lottery.
$\forall w'[w'$ is as likely as any other world, given what I know in w
$\rightarrow \exists x[x$ is a person from NY in w' & x wins the lottery in $w']]$[1]

(20) One of these two people is probably infected.
$\forall w'[w'$ is as likely as any other world, given what I know in w
$\rightarrow \exists x[x$ is one of these two people & x is in infected in $w']]$

To bring out the intended non-specific reading of the last example (to pick just one) imagine this scenario: We are tracking a dangerous virus infection and have sampled blood from two particular patients. Unfortunately, we were sloppy and the blood samples ended up all mixed up in one container. The virus count is high enough to make it quite probable that one of the patients is infected but because of the mix-up we have no evidence about which one of them it may be.

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1 Hopefully the exact analysis of the modal operators *likely* and *probably* is not too crucial for the present discussion, but you may still be wondering about it. As you see in our formula, we are thinking of *likely* (*probably*) as a kind of epistemic necessity operator, i.e., a universal quantifier over a set of worlds that is somehow determined by the speaker's knowledge. (We are focussing on the "subjective probability" sense of these words. Perhaps there is also an "objective probability" reading that is circumstantial rather than epistemic.) What is the difference then between *likely* and e.g. epistemic *must* (or *necessary* or *I believe that*)? Intuitively, 'it is likely that p' makes a weaker claim than 'it must be the case that p'. If both are universal quantifiers, then, it appears that *likely* is quantifying over a smaller set than *must*, i.e., over only a proper subset of the worlds that are compatible with what I believe. The difference concerns those worlds that I cannot strictly rule out but regard as remote possibilities. These worlds are included in the domain for *must*, but not in the one for *likely*. For example, if there was a race between John and Mary, and I am willing to bet that Mary won but am not completely sure she did, then those worlds where John won are remote possibilities for me. They are included in the domain of *must*, and so I will not say that Mary *must* have won, but they are not in the domain quantified over by *likely*, so I do say that Mary is *likely* to have won.

This is only a very crude approximation, of course. For one thing, probability is a gradable notion. Some things are more probable than others, and where we draw the line between what's probable and what isn't is a vague or context-dependent matter. Even *must*, *necessary* etc. arguably don't really express complete certainty (because in practice there is hardly anything we are completely certain of), but rather just a very high degree of probability. For more discussion of *likely*, *necessary*, and other graded modal concepts in a possible worlds semantics, see e.g. Kratzer 1981, 1991.

A different approach may be that *likely* quantifies over the same set of worlds as *must*, but with a weaker, less than universal, quantificational force. I.e., 'it is likely that p' means something like p is true in *most* of the worlds conforming to what I know. A *prima facie* problem with this idea is that presumably every proposition is true in infinitely many possible worlds, so how can we make sense of cardinal notions like 'more' and 'most' here? But perhaps this can be worked out somehow.

In this scenario, (20) appears to be true. It would not be true under a specific reading, because neither one of the two people is infected in every one of the likely worlds.

A word of clarification about our empirical claim: We have been concentrating on the observation that non-specific readings are *available*, but have not addressed the question whether they are the *only* available readings or coexist with equally possible specific readings. Indeed, some of the sentences in our list appear to be ambiguous: For example, it seems that (18) could also be understood to claim that there is a particular New Yorker who is likely to win (e.g., because he has bribed everybody). Others arguably are not ambiguous and can only be read non-specific. This is what von Fintel & Iatridou (2003) claim about sentences like (16). They note that if (16) also allowed a specific reading, it should be possible to make coherent sense of (21).

(21) Everyone in the class may have received an A. But not everybody did.

In fact, (21) sounds contradictory, which they show is explained if only the non-specific reading is permitted by the grammar. They conjecture that this is a systematic property of epistemic modal operators (as opposed to deontic and other types of modalities). Epistemic operators always have widest scope in their sentence.

So there are really two challenges here for our current theory. We need to account for the existence of non-specific readings, and also for the absence, in at least some of our examples, of specific readings. We will be concerned here exclusively with the first challenge and will set the second aside. We will aim, in effect, to set up the system so that all sentences of this type are in principle ambiguous, hoping that additional constraints that we are not investigating here will kick in to exclude the specific readings where they are missing.

To complicate the empirical picture further, there are also examples where raised subjects are unambiguously specific. Such cases have been around in the syntactic literature for a while, and they have received renewed attention in the work of Lasnik and others. To illustrate just one of the systematic restrictions, negative quantifiers like *nobody* seem to permit only surface scope (i.e., wide scope) with respect to a modal verb or adjective they have raised over.

For a thorough investigation of low scope readings of negative DPs, see Iatridou & Sichel 2011.

(22) Nobody from New York is likely to win the lottery.

(22) does not have a non-specific reading parallel to the one for (19) above, i.e., it cannot mean that it is likely that nobody from NY will win. It can only mean that there is nobody from NY who is likely to win. This too is an issue that we set aside.

In the next couple of sections, all that we are trying to do is find and justify a mechanism by which the grammar is able to generate both specific and non-specific readings for subjects that have raised over modal operators. It is quite conceivable, of course, that the nature of the additional constraints which often exclude one reading or the other is ultimately relevant to this discussion and that a better understanding of them may undermine our conclusions. But this is something we must leave for further research.

5.2.2 Syntactic "Reconstruction"

Given that the non-specific reading of (11) we are aiming to generate is equivalent to the formula in (14), an obvious idea is that there is an LF which is essentially the pre-movement structure of this sentence, i.e., the structure prior to the raising of the subject above the operator. There are a number of ways to make such an LF available.

One option, most defended in Sauerland & Elbourne (2002), is to assume that the raising of the subject can happen in a part of the derivation which only feeds PF, not LF. In that case, the subject simply stays in its underlying VP-internal position throughout the derivation from DS to LF. (Recall that quantifiers are interpretable there, as they generally are in subject positions.)

Another option is a version of the so-called Copy Theory of movement introduced in Chomsky (1993). This assumes that movement generally proceeds in two separate steps, rather than as a single complex operation as we have assumed so far. Recall that in H&K, it was stipulated that every movement effects the following four changes:

(i) a phrase α is deleted,
(ii) an index i is attached to the resulting empty node (making it a so-called trace, which the semantic rule for "Pronouns and Traces" recognizes as a variable),
(iii) a new copy of α is created somewhere else in the tree (at the "landing site"), and
(iv) the sister-constituent of this new copy gets another instance of the index i adjoined to it (which the semantic rule of Predicate Abstraction recognizes as a binder index).

If we adopt the Copy Theory, we assume instead that there are three distinct operations:

"Copy": Create a new copy of α somewhere in the tree, attach an index i to the original α, and adjoin another instance of i to the sister of the new copy of α. (= steps (ii), (iii), and (iv) above)
"Delete Lower Copy": Delete the original α. (= step (i) above)
"Delete Upper Copy": Delete the new copy of α and both instances of i.

The Copy operation is part of every movement operation, and can happen anywhere in the syntactic derivation. The Delete operations happen at the end of the LF derivation and at the end of the PF deletion. We have a choice of applying either Delete Lower Copy or Delete Upper Copy to each pair of copies, and we can make this choice independently at LF and at PF. (E.g., we can do Copy in the common part of the derivation and than Delete Lower Copy at LF and Delete Upper Copy at PF.) If we always choose Delete Lower Copy at LF, this system generates exactly the same structures and interpretations as the one from H&K. But if we exercise the Delete Upper Copy option at LF, we are effectively undoing previous movements, and this gives us LFs with potentially new interpretations. In the application we are interested in here, we would apply the Copy step of subject raising before the derivation branches, and then choose Delete Lower Copy at PF but Delete Upper Copy at LF. The LF will thus look as if the raising never happened, and it will straightforwardly get the desired non-specific reading.

If the choice between the two Delete operations is generally optional, we in principle predict ambiguity wherever there has been movement. Notice, however, first, that the two structures will often be truth-conditionally equivalent (e.g. when the moved phrase is a name), and second, that they will not always be both interpretable. (E.g., if we chose Delete Upper Copy after QRing a quantifier from object position, we'd get an uninterpretable structure, and so this option is automatically ruled out.) Even so, we predict lots of ambiguity. Specifically, since raised subjects are always interpretable in both their underlying and raised locations, we predict all raising structures where a quantificational DP has raised over a modal operator (or over negation or a temporal operator) to be ambiguous. As we have already mentioned, this is not factually correct, and so there must be various further constraints that somehow restrict the choices. (Similar comments apply, of course, to the option we mentioned first, of applying raising only on the PF-branch.)

Yet another solution was first proposed by May (1977): May assumed that QR could in principle apply in a "downward" fashion, i.e., it could adjoin the moved phrase to a node that doesn't contain its trace. Exercising this option with a raised subject would let us produce the following structure, where the subject has first raised over the modal and then QRed below it.

(23) t_j λ_i [must-R [someone λ_j [t_i have been here]]]

As it stands, this structure contains at least one free variable (the trace t_j) and can therefore not possibly represent any actual reading of this sentence. May further assumes that traces can in principle be deleted, when their presence is not required for interpretability. This is not yet quite enough, though to make (23) interpretable, at least not within our framework of assumptions, for (24) is still not a candidate for an actual reading of (11).

(24) λ_i [must-R [someone λ_j [t_i have been here]]]

We would need to assume further that the topmost binder index could be deleted along with the unbound trace, and also that the indices *i* and *j* can be the same, so that the raising trace t_j is bound by the binding-index created by QR. If these things can be properly worked out somehow, then this is another way to generate the non-specific reading. Notice that the LF is not exactly the same as on the previous two approaches, since the subject ends up in an adjoined position rather than in its original argument position, but this difference is obviously without semantic import.

What all of these approaches have in common is that they place the burden of generating the non-specific reading for raised subjects on the syntactic derivation. Somehow or other, they all wind up with structures in which the subject is lower than it is on the surface and thereby falls within the scope of the modal operator. They also have in common that they take the modal operator (here the auxiliary, in other cases a main predicate or an adverb) to be staying put. I.e., they assume that the non-specific readings are not due to the modal operator being covertly higher than it seems to be, but to the subject being lower. Approaches with these features will be said to appeal to "syntactic reconstruction" of the subject.[2]

5.2.3 Some Alternatives to Syntactic Reconstruction

Besides (some version of) syntactic reconstruction, there are many other ways in which one try to generate non-specific readings for raised subjects. Here are some other possibilities that have been suggested and/or readily come to mind. We will see that some of them yield exactly the non-specific reading as we have been describing it so far, whereas others yield a reading that is very similar but not quite the same. We will confine ourselves to analyses which involve no or only minor changes to our system of syntactic and semantic assumptions. Obviously, if one departed from these further, there would be even more different options, but even so, there seem to be quite a few.

1. Raising the modal operator, variant 1: no trace Conceivably, an LF for the non-specific reading of (11) might be derived from the S-structure (=(12)) by covertly moving *must* (and its covert *R*-argument) up above the subject. This would have to be a movement which leaves no (semantically non-vacuous) trace. Given our inventory of composition rules, the only type that the trace could have to make the structure containing it interpretable would be the type of the moved operator itself (i.e. $\langle st, t\rangle$). If it had that type, however, the movement would be semantically inconsequential, i.e., the structure would mean exactly the same as (12). So this would not be a way to provide an LF for the non-specific reading. If there was no trace left however (and also no binder index introduced), we indeed would obtain the non-specific reading.

2 This is a very broad notion of "reconstruction", where basically any mechanism which puts a phrase at LF in a location nearer to its underlying site than its surface site is called "reconstruction". In some of the literature, the term is used more narrowly. For example, May's downward QR is sometimes explicitly contrasted with genuine reconstruction, since it places the quantifier somewhere else than exactly where it has moved from.

EXERCISE 5.4: Prove the claims we just made in the previous paragraph. Why is no type for the trace other than $\langle st, t\rangle$ possible? Why is the movement semantically inert when this type is chosen? How does the correct intended meaning arise if there is no trace and binder index? □

2. RAISING THE MODAL OPERATOR, VARIANT 2: TRACE OF TYPE S [Requires slightly modified inventory of composition rules. Derives an interpretation that is not quite the same as the non-specific opaque reading we have assumed so far. Rather, it is the non-specific transparent "third" reading discussed in the next chapter.]

3. HIGHER TYPE FOR TRACE OF RAISING, VARIANT 1: TYPE $\langle et, t\rangle$ [Before reading this section, read and do the exercise on p.212/3 in H&K]

So far in our discussion, we have taken for granted that the LF which corresponds to the surface structure, viz. (12), gives us the specific reading. This, however, is correct only on the tacit assumption that the trace of raising is a variable of type e. If it is part of our general theory that all variables, or at least all interpretable binder indices (hence all bound variables), in our LFs are of type e, then there is nothing more here to say. But it is not *prima facie* obvious that we must or should make this general assumption, and if we don't, then the tree in (12) is not really one single LF, but the common structure for many different ones, which differ in the type chosen for the trace. Most of the infinitely many semantic types we might assign to this trace will lead to uninterpretable structures, but there turns out to be one other choice besides e that works, namely $\langle et, t\rangle$:

(25) somebody $\lambda_{2,\langle et,t\rangle}$ [[must R] [$t_{2,\langle et,t\rangle}$ have-been-here]]

(25) is interpretable in our system, but again, as in the previous approach, the predicted interpretation is not exactly the non-specific reading as we have been describing it so far, but the non-specific transparent third reading.

That a trace of type $\langle et, t\rangle$ does not in fact yield the targeted non-specific opaque reading had not been noticed until we bothered to calculate the meaning of (25). For example, Fox 2000, which derives from a dissertation supervised by us, is unaware of the fact that a high-type but extensional trace gives a scope-reconstructed but transparent reading.

EXERCISE 5.5: Using higher-type traces to "reverse" syntactic scope-relations is a trick which can be used quite generally. It is useful to look at a non-intensional example as a first illustration. (26) contains a universal quantifier and a negation, and it is scopally ambiguous between the readings in (a) and (b).

(26) Everything that glitters is not gold.

a. $\forall x[x \text{ glitters} \rightarrow \neg x \text{ is gold}]$ "surface scope"

b. $\neg\forall x[x \text{ glitters} \rightarrow x \text{ is gold}]$ "inverse scope"

We could derive the inverse scope reading for (26) by generating an LF (e.g. by some version of syntactic reconstruction") in which the *every*-DP is below *not*. Interestingly, however, we can also derive this reading if the *every*-DP is in its raised position above *not* but its trace has the type $\langle\langle e, t\rangle, t\rangle$.

Spell out this analysis. (I.e., draw the LF and show how the inverse-scope interpretation is calculated by our semantic rules.) □

EXERCISE 5.6: Convince yourself that there are no other types for the raising trace besides e and $\langle et, t\rangle$ that would make the structure in (12) interpretable. (At least not if we stick exactly to our current composition rules.) □

4. HIGHER TYPE FOR TRACE OF RAISING, VARIANT 2: TYPE $\langle s, \langle et, t\rangle\rangle$ If we want to get *exactly* the non-specific reading that results from syntactic reconstruction out of a surface-like LF of the form (12), we must use an even higher type for the raising trace, namely $\langle s, \langle\langle e, t\rangle, t\rangle\rangle$, the type of the intension of a quantifier. As you just proved in the exercise, this is not possible if we stick to exactly the composition rules that we have currently available. The problem is in the VP: the trace in subject position is of type $\langle s, \langle\langle e, t\rangle, t\rangle\rangle$ and its sister is of type $\langle e, t\rangle$. These two connot combine by either FA or IFA, but it works if we employ another variant of functional application.[3]

(27) *Extensionalizing Functional Application* (EFA)
If α is a branching node and $\{\beta, \gamma\}$ the set of its daughters, then, for any world w and assignment g:
if $[\![\beta]\!]^{w,g}(w)$ is a function whose domain contains $[\![\gamma]\!]^{w,g}$,
then $[\![\alpha]\!]^{w,g} = [\![\beta]\!]^{w,g}(w)([\![\gamma]\!]^{w,g})$.

EXERCISE 5.7: Calculate the truth-conditions of (12) under the assumption that the trace of the subject quantifier is of type $\langle s, \langle\langle e, t\rangle, t\rangle\rangle$. □

CAN WE CHOOSE BETWEEN ALL THESE OPTIONS? Two of the methods we tried derived readings in which the raised subject's *quantificational determiner* took scope below the world-quantifier in the modal operator, but the raised subject's *restricting NP* still was evaluated in the utterance world (or the evaluation world for the larger sentence, whichever that may be), in other words: a non-specific but transparent interpretation. It is difficult to assess whether such readings are actually available for the particular sentences under consideration, and we will postpone this question to the next chapter. We would like to argue here, however, that even if these readings are available, they cannot be the *only* readings that are available for raised subjects besides their wide-scope readings. In other words,

3 Notice that the problem here is kind of the mirror image of the problem that led to the introduction of "Intensional Functional Application" in H&K, ch. 12. There, we had a function looking for an argument of type $\langle s, t\rangle$, but the sister node had an extension of type t. IFA allowed us to, in effect, construct an argument with an added "s" in its type. This time around, we have to get rid of an "s" rather than adding one; and this is what EFA accomplishes.

So we now have three different "functional application"-type rules altogether in our system: ordinary FA simply applies $[\![\beta]\!]^w$ to $[\![\gamma]\!]^w$; IFA applies $[\![\beta]\!]^w$ to $\lambda w'.[\![\gamma]\!]^{w'}$; and EFA applies $[\![\beta]\!]^w(w)$ to $[\![\gamma]\!]^w$. At most one of them will be applicable to each given branching node, depending on the type of $[\![\gamma]\!]^w$.

Think about the situation. Might there be other variant functional application rules?

even if we allowed one of the mechanisms that generated these sort of hybrid readings, we would still need another mechanism that gives us, for at least some examples, the "real" non-specific opaque readings that we obtain e.g. by syntactic reconstruction. The relevant examples that show this most clearly involve DPs with more descriptive content than *somebody* and whose NPs express clearly contingent properties.

(28) A neat-freak must have been here.

If I say this instead of our original (11) when I come to my office in the morning and interpret the clues on my desk, I am saying that every world compatible with my beliefs is such that someone who is a neat-freak *in that world* was here in that world. Suppose there is a guy, Bill, whom I know slightly but not well enough to have an opinion on whether or not he is neat. He may or not be, for all I know. So there are worlds among my belief worlds where he is a neat-freak and worlds where he is not. I also don't have an opinion on whether he was or wasn't the one who came into my office last night. He did in some of my belief worlds and he didn't in others. I am implying with (28), however, that if Bill isn't a neat-freak, then it wasn't him in my office. I.e., (28) *is* telling you that, even if I have belief-worlds in which Bill is a slob and I have belief-worlds in which (only) he was in my office, I do not have any belief-worlds in which Bill is a slob *and* the only person who was in my office. This is correctly predicted if (28) expresses the "genuine" non-specific reading in (29), but not if it expresses the "hybrid" reading in (30).

(29) $\forall w'[w'$ is compatible with what I believe in $w_0 \rightarrow$
$\exists x[x$ is a neatfreak *in* w' and x was here in $w']]$

(30) $\forall w'[w'$ is compatible with what I believe in $w_0 \rightarrow$
$\exists x[x$ is a neatfreak *in* w_0 and x was here in $w']]$

We therefore conclude the mechanisms 2 and 3 considered above (whatever their merits otherwise) cannot supplant syntactic reconstruction or some other mechanism that yields readings like (29).

This leaves only the first and fourth options that we looked at as potential competitors to syntactic reconstruction, and we will focus the rest of the discussion on how we might be able to tease apart the predictions that these mechanisms imply from the ones of a syntactic reconstruction approach.

As for moving the modal operator, there are no direct bad predictions that we are aware of with this. But it leads us to expect that we might find not only scope ambiguities involving a modal operator and a DP, but also scope ambiguities between two modal operators, since one of them might covertly move over the other. It seems that this never happens. Sentences with stacked modal verbs seem to be unambiguous and show only those readings where the scopes of the operators reflect their surface hierarchy.

(31) a. I have to be allowed to graduate.
b. #I am allowed to have to graduate.

See Lechner 2007 for an early discussion of semantic effects of head movement. See McCloskey 2016 for a recent re-assessment.

Of course, this might be explained by appropriate constraints on the movement of modal operators, and such constraints may even come for free in a the right syntactic theory. Also, we should have a much more comprehensive investigation of the empirical facts before we reach any verdict. If it is true, however, that modal operators only engage in scope interaction with DPs and never with each other, then a theory which does not allow any movement of modals at all could claim the advantage of having a simple and principled explanation for this fact.

What about the "semantic reconstruction" option, where raised subjects can leave traces of type $\langle s, \langle et, t\rangle\rangle$ and thus get narrow scope semantically without ending up low syntactically? This type of approach has been explored quite thoroughly and defended with great sophistication. The main consideration against semantic reconstruction and in favor of syntactic reconstruction comes from binding theoretic concerns. We give some crucial examples from Fox 2000 here.

SCOPE RECONSTRUCTION AND CONDITION C. Consider:

(32) a. [A first year student] seems to David t to be at the party.
b. [Someone from NY] is very likely t to win the lottery.

These examples are a reminder that we can get non-specific readings of raised subjects. Fox argues that Binding Theory Condition C can be used to distinguish syntactic and semantic reconstruction. Assuming that Condition C applies at LF, syntactic reconstruction (where the full DP is interpreted in a lower position) predicts that an R-expression in that DP should not be allowed if there's a higher coreferential pronoun. The semantic reconstruction account has no simple way of making the same prediction.

Here are the crucial tests:

(33) a. [A student of his$_1$] seems to David$_1$ to be at the party. ^{OK}specific, ^{OK}non-specific
b. [A student of David's$_1$] seems to him$_1$ to be at the party. ^{OK}specific, *non-specific

(34) a. [Someone from his$_1$ city] seems to David$_1$ t to be likely to win the lottery. ^{OK}specific, ^{OK}non-specific
b. [Someone from David$_1$'s city] seems to him$_1$ t to be likely to win the lottery. ^{OK}specific, *non-specific

Fox claims that the (b) cases do not have a non-specific reading. If syntactic reconstruction is the mechanism that gives us non-specific readings of A-moved subjects, the explanation is straightforward.

EXERCISE 5.8: Use the following observations to bolster Fox's argument.

(35) a. The cat seems to be out of the bag.
b. Advantage might have been taken of them.

(36) a. For these issues to be clarified, many new papers about his_1 philosophy seem to Quine t to be needed.
b. #For these issues to be clarified, many new papers about Quine's_1 philosophy seem to him t to be needed. □

If Fox's argument is correct, then (some form of) syntactic reconstruction is the mechanism by which we get non-specific readings of A-movement subjects. This means that syntactic reconstruction is possible, but it also means that semantic reconstruction must not be available. Otherwise, there would be a way of getting non-specific readings that would not be sensitive to Condition C. So, the question arises *why* semantic reconstruction is unavailable. Fox (2000: p. 171, fn. 41) discusses two ways of ruling out the high type traces that would give rise to semantic reconstruction:

(i) "traces, like pronouns, are always interpreted as variables that range over individuals (type e)",
(ii) "the semantic type of a trace is determined to be the lowest type compatible with the syntactic environment (as suggested in Beck 1996)".

We will return to this issue in a later chapter when we can raise it again in a slightly different framework.

5.3 Supplemental readings

In addition to the references about reconstruction in the text, you might want to look at:

Cedric Boeckx. 2001. Scope reconstruction and A-movement. *Natural Language and Linguistic Theory* 19(3). 503–548. https://doi.org/10.1023/a:1010646425448.

Mark Baltin. 2010. The copy theory of movement and the binding-theoretic status of A-traces: You can't get there from here. http://linguistics.as.nyu.edu/docs/IO/2637/baltin_copytheoryofmovement.pdf.

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Chapter Six

The Third Reading

In this chapter, we will see that quantificational noun phrases in the scope of a modal operator can receive a reading where their restrictive predicate is not interpreted in the worlds introduced by the modal operator (which is what happens in specific readings as well) while at the same time *their quantificational force takes scope below the modal operator (which is what happens in non-specific readings as well). This seemingly paradoxical situation might force whole-sale revisions to our architecture. We discuss the standard solution (which involves supplying predicates with world-arguments).*

6.1 A Problem

Janet Dean Fodor discussed examples like (1) in her dissertation (1970).

(1) Mary wanted to buy a hat just like mine.

Fodor observes that (1) has three readings, which she labels "specific transparent," "non-specific transparent," and "non-specific opaque."

(i) On the "specific transparent" reading, the sentence says that there is a particular hat which is just like mine such that Mary has a desire to buy it. Say, I am walking along Newbury Street with Mary. Mary sees a hat in a display window and wants to buy *it*. She tells me so. I don't reveal that I have one just like it. But later I tell *you* by uttering (1).

(ii) On the "non-specific opaque" reading, the sentence says that Mary's desire was to buy some hat or other which fulfills the description that it is just like mine. She is a copycat.

(iii) On the "non-specific transparent" reading, finally, the sentence will be true, e.g., in the following situation: Mary's desire is to buy some hat or other, and the only important thing is that it be a Red Sox cap. Unbeknownst to her, my hat is one of those as well.

The existence of three different readings appears to be problematic for the scopal account of specific/non-specific ambiguities that we have been assuming. It seems that our analysis allows just two semantically distinct types of LFs: Either the DP *a hat just like mine* takes scope below *want*, as in (2), or it takes scope above *want*, as in (3).

(2) Mary wanted [[a hat-just-like-mine]$_1$ [PRO to buy t_1]]

(3) [a hat-just-like-mine]$_1$ [Mary wanted [PRO to buy t_1]]

In the system we have developed so far, (2) says that in every world w' in which Mary gets what she wants, there is something that she buys in w' that's a hat in w' and like my hat in w'. This is Fodor's "non-specific opaque" reading. (3), on the other hand, says that there is some thing x which is a hat in the actual world and like my hat in the actual world, and Mary buys x in every one of her desire worlds. That is Fodor's "specific transparent." But what about the "non-specific transparent" reading? To obtain this reading, it seems that we would have to evaluate the predicate *hat just like mine* in the actual world, so as to obtain its actual extension (in the scenario we have sketched, the set of all Red Sox caps). But the existential quantifier expressed by the indefinite article in the *hat*-DP should not take scope over the modal operator *want*, but below it, so that we can account for the fact that in different desire-worlds of Mary's, she buys possibly different hats.

There is a tension here: one aspect of the truth-conditions of this reading suggests that the DP *a hat just like mine* should be *outside* of the scope of *want*, but another aspect of these truth-conditions compels us to place it *inside* the scope of *want*. We can't have it both ways, it would seem, which is why this has been called a "scope paradox"

Another example of this sort, due to Bäuerle (1983), is (4):

(4) Georg believes that a woman from Stuttgart loves every member of the VfB team.

Bäuerle describes the following scenario: Georg has seen a group of men on the bus. This group happens to be the VfB team (Stuttgart's soccer team), but Georg does not know this. Georg also believes (Bäuerle doesn't spell out on what grounds) that there is some woman from Stuttgart who loves every one of these men. There is no particular woman of whom he believes that, so there are different such women in his different belief-worlds. Bäuerle notes that (4) can be understood as true in this scenario. But there is a problem in finding an appropriate LF that will predict its truth here. First, since there are different women in different belief-worlds of Georg's, the existential quantifier *a woman from Stuttgart* must be inside the scope of *believe*. Second, since (in each belief world) there aren't different women that love each of the men, but one that loves them all, the *a*-DP should take scope over the *every*-DP. If the *every*-DP is in the scope of the *a*-DP, and the *a*-DP is in the scope of *believe*, then it follows that the *every*-DP is in the scope of *believe*. But on the other hand, if we want to capture the fact that the men in question need not be VfB-members in Georg's belief-worlds, the predicate *member of the VfB team* needs to be outside of the scope of *believe*. Again, we have a "scope paradox".

Before we turn to possible solutions for this problem, let's have one more example:

(5) Mary hopes that a friend of mine will win the race.

This again seems to have three readings. In Fodor's terminology, the DP *a friend of mine* can be "non-specific opaque," in which case (5) is true iff in every world where Mary's hopes come true, there is somebody who is my friend and wins. It can also have a "specific transparent" reading: Mary wants John to win, she doesn't know John is my friend, but I can still report her hope as in (5). But there is a third option, the "non-specific transparent" reading. To bring out this rather exotic reading, imagine this: Mary looks at the ten contestants and says *I hope one of the three on the right wins - they are so shaggy - I like shaggy people*. She doesn't know that those are my friends. But I could still report her hope as in (5).

6.2 The Standard Solution: Overt World Variables

The scope paradoxes we have encountered can be traced back to a basic design feature of our system of intensional semantics: the relevant "evaluation world" for each predicate in a sentence is strictly determined by its LF-position. All predicates that occur in the (immediate) scope of the same modal operator must be evaluated in the same possible worlds. E.g. if the scope of *want* consists of the clause *a friend of mine (to) win*, then every desire-world w' will be required to contain an individual that wins in w' and is also my friend *in* w'. If we want to quantify over individuals that are my friends in the actual world (and not necessarily in all the subject's desire worlds), we have no choice but to place *friend of mine* outside of the scope of *want*. And if we want to accomplish this by means of QR, we must move the entire DP *a friend of mine*.

Not every kind of intensional semantics constrains our options in this way. One way to visualize what we might want is to write down an LF that looks promising:

(6) Mary wanted$_{w_0}$[$\lambda w'$[a hat-just-like-mine $_{w_0}$]λx_1[PRO to buy$_{w'}$$x_1$]]

We have annotated each predicate with the world in which we wish to evaluate it. w_0 is the evaluation world for the entire sentence and it is the world in which we evaluate the predicates *want* and *hat-just-like-mine*. The embedded sentence contributes a function from worlds to truth-values and we insert an explicit λ-operator binding the world where the predicate *buy* is evaluated. The crucial aspect of (6) is that the world in which *hat-just-like-mine* is evaluated is the matrix evaluation world and not the same world in which its clause-mate predicate *buy* is evaluated. This LF thus looks like it might faithfully capture Fodor's third reading.

Logical forms with overt world variables such as (6) are in fact the standard solution to the problem presented by the third reading. Let us spell out some of the technicalities. Later, we will consider a couple of alternatives.

We return to the basic system used in Heim & Kratzer up to chapter 11. The interpretation function is relativized only to an assignment function, not to any other evaluation parameters such as a world, a time, or an index. The semantic rules are Functional Application, Predicate Abstraction, and Predicate Modification, in their formulations from the earlier part of H&K. There is no rule of Intensional Functional Application. The only ingredient of intensional semantics that we do retain is the expanded type system and ontology. We have a third basic type besides e and t, the type s. D_s is the set of all indices, for now possible worlds (later: world-time pairs).

There are a number of innovations in the lexicon and in the syntax. As for the lexicon, the main change concerns the treatment of predicates (verbs, nouns, adjectives). They now all get an additional argument, of type s.

The decision to make the world-argument the predicate's first (lowest) argument is arbitrary, and nothing hinges on it. For all we know, it could be the highest argument, or somewhere in between.

(7) a. $[\![\text{smart}]\!] = \lambda w \in D_s.\ \lambda x \in D_e.\ x \text{ is smart in } w$
b. $[\![\text{likes}]\!] = \lambda w \in D_s.\ \lambda x \in D_e.\ \lambda y \in D_e.\ y \text{ likes } x \text{ in } w$
c. $[\![\text{teacher}]\!] = \lambda w \in D_s.\ \lambda x \in D_e.\ x \text{ is a teacher in } w$
d. $[\![\text{friend}]\!] = \lambda w \in D_s.\ \lambda x \in D_e.\ \lambda y \in D_e.\ y \text{ is } x\text{'s friend in } w$

This also applies to attitude predicates, modals, and tenses. We illustrate with *believe* and *must*:

(8) a. $[\![\text{believe}]\!] = \lambda w \in D_s.\ \lambda p \in D_{\langle s,t \rangle}.\ \lambda x \in D.$
$\forall w'\ [w' \text{ conforms to what } x \text{ believes in } w \rightarrow p(w') = 1]$
b. $[\![\text{must}]\!] = \lambda w \in D_s.\ \lambda R \in D_{\langle s,st \rangle}.\ \lambda p \in D_{\langle s,t \rangle}.$
$\forall w'\ [R(w)(w') = 1 \rightarrow p(w') = 1]$

Note that predicates (ordinary ones and modal ones), like the ones in (7) and (8) now have as their semantic values what used to be their *intensions*.

There is no change to the entries of proper names, determiners, or truth-functional connectives; these keep their purely extensional ("s-free") types and meanings:

(9) a. $[\![\text{Ann}]\!] = \text{Ann}$
b. $[\![\text{and}]\!] = \lambda u \in D_t.\ [\lambda v \in D_t.\ u = v = 1]$
c. $[\![\text{the}]\!] = \lambda f \in D_{\langle e,t \rangle} : \exists! x.\ f(x) = 1.\ \text{the } y \text{ such that } f(y) = 1.$
d. $[\![\text{every}]\!] = \lambda f \in D_{\langle e,t \rangle}.\ \lambda g \in D_{\langle e,t \rangle}.\ \forall x[f(x) = 1 \rightarrow g(x) = 1]$

So, let's start analyzing a simple sentence.

(10) $[_{VP}$ John leaves$]$

The verb's type is $\langle s, et\rangle$, so it's looking for a sister node which denotes a *world*. *John*, which denotes an individual, is not a suitable argument.

We get out of this problem by adding a couple of items to our lexicon, which are abstract (unpronounced) morphemes. One is a series of pronouns of type s ("index pronouns" or, for now, "world pronouns"). In this chapter, we will write them as w_n, with a numerical subscript n, or even as w, w', w''. (Later, we sometimes might write them as pro_n and rely on context to make clear we are not referring to an individual.) Their semantics is what you expect: they get values from the assignment function.

We will stipulate that a complete (matrix) sentence must not contain any free variables of type s and must receive a denotation of type $\langle s, t\rangle$.[1] This means that we need binders of world pronouns. Many proposals in this line of thought help themselves to freely inserted covert binders. We will follow H&K in not doing that. Instead we posit one more lexical item, analogous to the covert vacuous operator *PRO* of type e in H&K (pp.227-228): a semantically vacuous operator, *OP*, which moves and leaves a trace of type s. Its syntactic properties are such that it must end up in C or right below a functional head in the "clausal spine" between C and V, and it must get there by a very short movement, a kind of "head movement". We are leaving this rather vague.

So, our sentence *John leaves* contains *OP*, generated as the first sister of the verb and then moved to the "top" of the sentence:

(11) *OP* 1 [John [leaves t_1]]

Our system generates the following denotation for (11): "λw_s. John leaves in w", a proposition. We rewrite the definition of truth/falsity of an utterance as follows:

(12) An utterance of a sentence (=LF) ϕ in world w is true iff $[\![\phi]\!](w) = 1$.

So, if we utter our sentence in this world (call it $w_@$), then the utterance was true iff John leaves in $w_@$.

Now, we have to look at more complex sentences. First, a simple case of embedding. The sentence is *John wants to leave*, which now has an LF like this:

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1 In the 2016 edition of this class, Suzana Fong noted that this stipulation is prima facie less appealing than the alternative assumption that type-s pronouns are exactly like type-e pronoun in every respect, including the ability to remain free and get values from a contextually supplied assignment. Irene tried to sketch some principled reason why it might not be possible to refer to a specific world other than the world one is in. But as Mitya Privoznov pointed out, a similar idea is not plausible for times, given the existence of temporal deictics like *then*. So at best there might be a principled reason why the world-coordinate of a free index-pronoun would always have to be w_u. Irene had to concede therefore that the ban against free index-pronouns was just a stipulation. We want to think more about (a) whether we really need it, and (b) if we do, what might explain it.

(13) [*OP* 1 [John [wants t_1 [*OP* 2 [PRO(= John) [leave t_2]]]]]]

Exercise 6.1: Calculate the semantic value of (13). □

Next, look at an example involving a complex subject, such as *the teacher left*. The verb will need a world argument as before. The noun *teacher* will likewise need one, so that *the* can get the required argument of type $\langle e, t \rangle$ (not $\langle s, et \rangle$!). Now, our system makes an interesting prediction: one of the world arguments has to be *OP* and one of them has to be a pronoun. (Why?) We have free choice, it appears, as to which predicate gets which kind of world argument. Let's assume, for now, that we insert *OP* as the sister of the verb and a world pronoun $w_?$ as the sister of the noun. Since we have stipulated that a complete sentence cannot contain any free world pronouns, the operator and the pronoun have to be co-indexed. So, after *OP*-movement, we will have this LF:

(14) *OP* 1 [[The [teacher w_1]] [left t_1]]

This will denote the correct proposition (true of a world w iff the unique individual who is a teacher in w left in w).

Now comes the payoff. Consider what happens when the sentence contains both a modal operator and a complex DP in its complement.

(15) Mary wants a friend of mine to win.

There are now three predicates that need world arguments. Furthermore, since *want* needs a proposition as its second argument (after its world argument), there needs to be an *OP* on top of the embedded clause. There also needs to be an *OP* on top of the matrix clause. As before, *a friend of mine* can stay in the embedded clause or QR into the matrix clause. When it moves into the matrix clause, the only way to not leave its world argument free is to co-index it with the matrix *OP*. But when it stays below, we can choose to co-index it with either *OP*, which is how we generate two non-specific readings, one opaque and one transparent. Here are the three LFs (to make the structures more readable, we leave off most of the bracketing and start writing the world arguments as subscripts to the predicates):

So, instead of writing t_1 for a trace of type s that serves as the first argument of *leaves*, say, we write "leaves$_{w_1}$"

(16) a. non-specific opaque:
OP 1 Mary wants$_{w_1}$ [*OP* 2 a friend-of-mine$_{w_2}$ leave$_{w_2}$]

b. specific transparent:
OP 1 a friend-of-mine$_{w_1}$ 3 Mary wants$_{w_1}$ [*OP* 2 t_3 leave$_{w_2}$]

c. non-specific transparent:
OP 1 Mary wants$_{w_1}$ [*OP* 2 a friend-of-mine$_{w_1}$ leave$_{w_2}$]

Notice that the third reading is minimally different from the first reading: all that happened is the choice to co-index the world argument of *friend of mine* with the matrix *OP*.

In this new framework, then, we have a way of resolving the apparent "scope paradoxes" and of acknowledging Fodor's point that there are two separate distinctions to be made when DPs interact with modal operators. First, there is the scopal relation between the DP and the operator; the DP may take wider scope (Fodor's "specific" reading) or narrower scope ("non-specific" reading) than the operator. Second, there is the choice of binder for the world-argument of the DP's restricting predicate; this may be cobound with the world-argument of the embedded predicate (Fodor "opaque") or with the modal operator's own world-argument ("transparent"). So the transparent/opaque distinction in the sense of Fodor is not *per se* a distinction of scope; but it has a principled connection with scope in one direction: Unless the DP is within the modal operator's scope, the opaque option (= co-binding the world-pronoun with the embedded predicate's world-argument) is in principle unavailable. (Hence "specific" implies "transparent", and "opaque" implies "non-specific".) But there is no implication in the other direction: if the DP has narrow scope w.r.t. to the modal operator, either the local or the long-distance binding option for its world-pronoun is in principle available. Hence "non-specific" readings may be either "transparent" or "opaque".

EXERCISE 6.2: For DPs with extensions of type e (specifically, DPs headed by the definite article), there is a truth-conditionally manifest transparent/opaque distinction, but no truth-conditionally detectable specific/non-specific distinction. In other words, if we construct LFs analogous to (16)[a-c] above for an example with a definite DP, we can always prove that the first option (wide scope DP) and the third option (narrow scope DP with distantly bound world-pronoun) denote identical propositions. In this exercise, you are asked to show this for the example in (17).

(17) John believes that your abstract will be accepted. □

6.3 The third reading with conditionals and modals

So, far our examples of the third reading have all been with attitude predicates but the phenomenon can also be observed in conditionals and with modals. A famous example is due to Abusch 1994:

(18) Things would be different if every senator had grown up to be a rancher instead.

What makes conditionals different is that the *if*-clause is a scope island for quantifiers so that *every senator* cannot QR scope out of the *if*-clause in (18).

But the question of whether its predicate, *senator*, is interpreted in the matrix evaluation world ("transparent") or in the worlds that *if* takes us to ("opaque") remains open. Abusch's example is constructed to heavily favor the transparent reading.

Percus 2000 provides a clever minimal pair that shows the expected ambiguity:

(19) a. If every semanticist owned a villa in Tuscany, there would be no field at all.

b. If I were a syntactician and if every semanticist owned a villa in Tuscany, I would be quite envious.

We can also see the ambiguities at work in modal sentences:

(20) a. It could have been that everyone inside was outside.

b. Everyone inside is permitted to be outside.

These latter examples are from Yalcin 2015, who proceeds to discuss the very puzzling fact that transparent readings do not seem to be available in certain "epistemic" contexts, neither with indicative conditionals nor modals.

6.4 Binding Theory for World Variables

One could in principle imagine some indexings of our LFs that we have not considered so far. In a system (unlike ours) where one freely inserts "λw" operators on top of every clause, one could generate the following LF, which indexes the predicate of the complement clause to the matrix λ-operator rather than to the one on top of its own clause.

(21) λw_0 John wants_{w_0} [λw_1 PRO leave_{w_0}]

Of course, the resulting semantics would be pathological: what John would be claimed to stand in the wanting relation to is a set of worlds that is either the entire set W of possible worlds (if the evaluation world is one in which John leaves) or the empty set (if the evaluation world is one in which John doesn't leave). Clearly, the sentence has no such meaning. Would we need to restrict our system to not generate such an LF? Perhaps not, if the meaning is so absurd that the LF would be filtered out by some overarching rules distinguishing sense from nonsense. Nevertheless, it is gratifying to note that this kind of LF is unavailable in our system: the only place where the lower world-binder *OP* could originate is as a sister to *leave* and moving it to the lower CP (where we need a proposition to feed to *want*) would by necessity make it bind the world argument of *leave*.

But there are real problems when we look at more complex examples. Here is one discussed by Percus in important work (Percus 2000):

(22) Mary thinks that my brother is Canadian.

Since the subject of the lower clause is a type e expression, we expect at least two readings: opaque and transparent, cf. Exercise 6.2. The two LFs are as follows:

(23) a. opaque
OP 0 Mary thinks$_{w_0}$ [(that) OP 1 my brother$_{w_1}$ (is) Canadian$_{w_1}$]

b. transparent
OP 0 Mary thinks$_{w_0}$ [(that) OP 1 my brother$_{w_0}$ (is) Canadian$_{w_1}$]

But as Percus points out, there is another indexing that might be generated:

(24) OP 0 Mary thinks$_{w_0}$ [(that) OP 1 my brother$_{w_1}$ (is) Canadian$_{w_0}$]

In (24), we have co-indexed the main predicate of the lower clause with the matrix λ-operator and co-indexed the nominal predicate *brother* with the embedded λ-operator. That is, in comparison with the transparent reading in (23b), we have just switched around the indices on the two predicates in the lower clause.

Note that this LF will not lead to a pathological reading. So, is the predicted reading one that the sentence actually has? No. For the transparent reading, we can easily convince ourselves that the sentence does have that reading. Here is Percus' scenario: "My brother's name is Allon. Suppose Mary thinks Allon is not my brother but she also thinks that Allon is Canadian." In such a scenario, our sentence can be judged as true, as predicted if it can have the LF in (23b). But when we try to find evidence that (24) is a possible LF for our sentence, we fail. Here is Percus:

> If the sentence permitted a structure with this indexing, we would take the sentence to be true whenever there is some *actual* Canadian who *Mary thinks* is my brother — even when this person is not my brother in actuality, and *even when Mary mistakenly thinks that he is not Canadian*. For instance, we would take the sentence to be true when Mary thinks that Pierre (the Canadian) is my brother and naturally concludes — since she knows that *I* am American — that Pierre too is American. But in fact we judge the sentence to be *false* on this scenario, and so there must be something that makes the indexing in (24) impossible.

Percus then proposes the following descriptive generalization:

(25) Generalization X: The situation pronoun that a verb selects for must be coindexed with the nearest λ above it.

Percus works with situation pronouns rather than world pronouns, an immaterial difference for our purposes here.

We expect that there will need to be a lot of work done to understand the deeper sources of this generalization. But note that we could implement the constraint in our system by brute force: the OP operator can only be generated as the sister of a main predicate, not as the sister of a predicate inside an argument nominal.

6.5 Excursus: Semantic reconstruction revisited

Let us look back at the account of non-specific readings of raised subjects that we sketched earlier in Section 5.2.3. We showed that you can derive such readings by positing a high type trace for the subject raising, a trace of type $\langle s, \langle et, t\rangle\rangle$. Before the lower predicate can combine with the trace, the semantic value of the trace has to be extensionalized by being applied to the lower evaluation world (done via the EFA composition principle). Upstairs the raised subject has to be combined with the λ-abstract (which will be of type $\langle\langle s, \langle et, t\rangle\rangle, t\rangle$) via its intension.

We then saw data suggesting that syntactic reconstruction is actually what is going on. This, of course, raises the question of why semantic reconstruction is unavailable (otherwise we wouldn't expect the data that we observed).

In this excursus, we will briefly consider whether our new framework has something to say about this issue. Let's figure out what we would have to do in the new framework to replicate the account in the section on semantics reconstruction.

Downstairs, we would have a trace of type $\langle s, \langle et, t\rangle\rangle$. To calculate its extension, we do not need recourse to a special composition principle, but can simply give it a world-argument (co-indexed with the abstractor resulting from the movement of the *w-OP* in the argument position of the lower verb).

Now, what has to happen upstairs? Well, there we need the subject to be of type $\langle s, \langle et, t\rangle\rangle$, the same type as the trace, to make sure that its semantics will enter the truth-conditions downstairs. But how can we do this?

We need the DP *somebody from New York* to have as its semantic value an intension, the function from any world to the existential quantifier over individuals who are people from New York in that world. This is actually hard to do in our system. It *would* be possible if (i) the predicate(s) inside the DP received *w*-PRO as their argument, and if (ii) that *w*-PRO were allowed to moved to adjoin to the DP. If we manage to rule out at least one of the two preconditions on principled grounds, we would have derived the impossibility of semantic reconstruction as a way of getting non-specific readings of raised subjects.

(i) may be ruled out by the Binding Theory for world pronominals, when it gets developed.

(ii) may be ruled out by principled considerations as well. Perhaps, world-abstractors are only allowed at sentential boundaries.

See Larson (2002) for some discussion of recalcitrant cases, one of which is the object position of so-called intensional transitive verbs, a topic for another occasion.

6.6 Further reading

There is an interesting literature spawned by Percus 2000:

Magdalena Schwager. 2009. Speaking of qualities. *Semantics and Linguistic Theory (SALT)* 19. 395–412. https://doi.org/10.3765/salt.v19i0.2534.

Jacopo Romoli & Yasutada Sudo. 2009. *De re/de dicto* ambiguity and presupposition projection. *Proceedings of Sinn und Bedeutung* 13. 426–438. http://semanticsarchive.net/Archive/DhhOTI2Z/sub13proc.pdf#page=447.

Ezra Keshet. 2010. Situation economy. *Natural Language Semantics* 18(4). 385–434. https://doi.org/10.1007/s11050-010-9059-1.

Ezra Keshet. 2011. Split intensionality: A new scope theory of *de re* and *de dicto*. *Linguistics and Philosophy* 33(4). 251–283. https://doi.org/10.1007/s10988-011-9081-x. http://www.ezrakeshet.com/Home/papers/split.pdf.

Florian Schwarz. 2012. Situation pronouns in determiner phrases. *Natural Language Semantics* 20(4). 431–475. https://doi.org/10.1007/s11050-012-9086-1.

Ezra Keshet & Florian Schwarz. 2014. De re / de dicto. http://florianschwarz.net/wp-content/uploads/papers/De_Re___De_Dicto.pdf.

Fodor also discussed a fourth reading, specific opaque, which is hard to fit into our framework. Whether it really exists is a question discussed in some recent work:

Zoltán Gendler Szabó. 2010. Specific, yet opaque. In Maria Aloni et al. (eds.), *Logic, language and meaning: 17th Amsterdam Colloquium, Amsterdam, The Netherlands, December 16-18, 2009, revised selected papers* (Lecture Notes in Computer Science 6042), 32–41. Springer. https://doi.org/10.1007/978-3-642-14287-1_4. http://pantheon.yale.edu/~zs47/documents/Specific.pdf.

Itamar Francez. 2017. Summative existentials. To appear in *Linguistic Inquiry*. https://lucian.uchicago.edu/blogs/ifrancez/files/2017/05/Summex-preprint.pdf.

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