Disjunction and "Which"-sluicing*

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Abstract

In this paper, I present an account of disjunction on the basis of disjunctive "which"-sluices.

1 Introduction: Disjunctive Sluices

Sluices are constructions in which a *wh*-phrase occurs in isolation in a question-embedding environment (such as an attitude verb):

(1) Mary adopted a cat at the shelter, but I don't know which cat.

Sluices like (1) is clearly related to the full interrogative in (1'):

(1') Mary adopted a cat at the shelter, but I don't know [[which cat]$_{DP}$ [Mary adopted t]$_{TP}$]

This relationship is usually analyzed as ellipsis on an embedded question (Merchant, 2001).

In this paper, I will be focused on sluices that are unusual in that, rather having an indefinite NP ("a cat") as a correlate, they have a disjunction:

(2) Mary saw John or Bill; I don't know which.

(3) Carlton killed Mr. Boddy or Mr. Boddy committed suicide; I don't know which.

Are (2)-(3) sluices? It seems clear that they are; the *wh*-word "which" is not interpretable as the object of the attitude verb "knows" unless we posit that there is elided material (Ross, 1969). It seems equally clear that the elided material is provided by the disjunction in the same sense in which it is provided by an indefinite NP in standard cases of sluicing; take the disjunction away, and the resulting sentences are not interpretable:

(1") #Mary adopted her cat at the shelter; I don't know which cat.

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(2') #Mary saw John and Bill; I don't know which.

(3') #Carlton killed Mr. Boddy; I don't know which.

The question, then, is what the syntax and semantics of (2)-(3) is. If we look at (2) first, the distance between disjunctive sluicing and indefinite NP sluicing may appear small: there seems to be an identifiable correlate "John or Bill" in (2) that forms a subpart of the antecedent clause. Moreover, semantically, "John or Bill" in (2) seems to function quite a bit like "a cat" in (1). But if we follow the same correlate-identification procedure for (3), the antecedent is a disjunction of whole clauses. This, for my purposes, is what makes sluicing on disjunction interesting. Disjunctions can coordinate clause-level constituents which cannot be reduced, syntactically or semantically, to coordinations of NPs; whereas the difference between (1) and (2) may be small, the difference between (1) and (3) is bigger.[1] Sluices like (3), where the antecedent is an irreducibly clausal disjunction, I will call *propositional sluices*. In this paper, I will make a proposal about the syntax and semantics of propositional sluices. For the syntactic part, I will rely on Adger & Quer (2001)'s functional analysis of the Basque complementizer *(e)nik* and the English complementizers *whether* and *if* (the "if" in e.g. "Mary can't decide *if* she wants to adopt a cat.")

The project proceeds as follows. In §2, I frame the gap I am aiming to fill in terms of the standard syntax for NP-sluicing and address some preliminary objections to this framing. I lay out Adger and Quer's syntactic proposal in detail in §3. In §4, I make some modifications to Adger and Quer's accompanying semantic commitments. In §5-§7, I apply their syntax, with my modified semantics, to the "which"-sluice in (3). The ultimate goal is to propose a syntax for (3) which meshes with intuitively correct and compositional truth-conditions for its constituent parts, especially the clausal "or" in the sluice's antecedent.

2 Syntactic Preliminaries

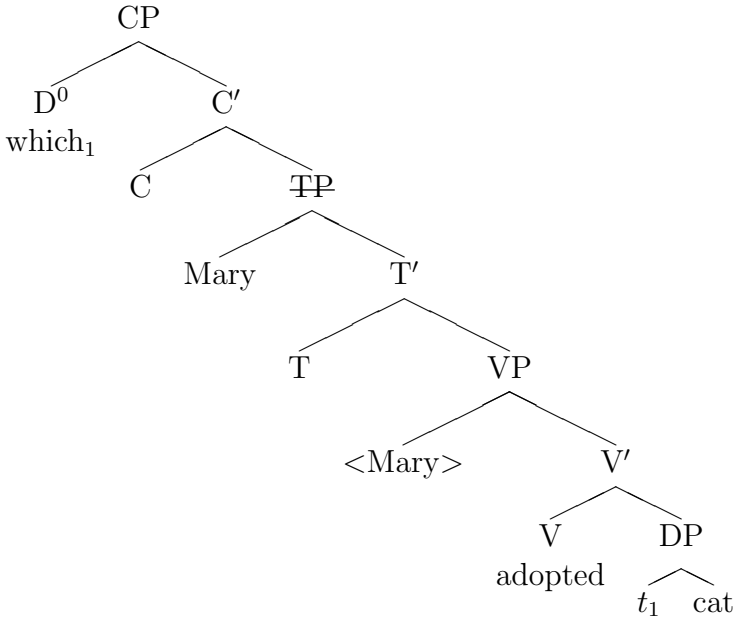
Here again are two "which" sluices on a garden-variety indefinite NP:

(4) Mary adopted a cat at the shelter...
   a. I don't know which.
   b. I don't know which cat.

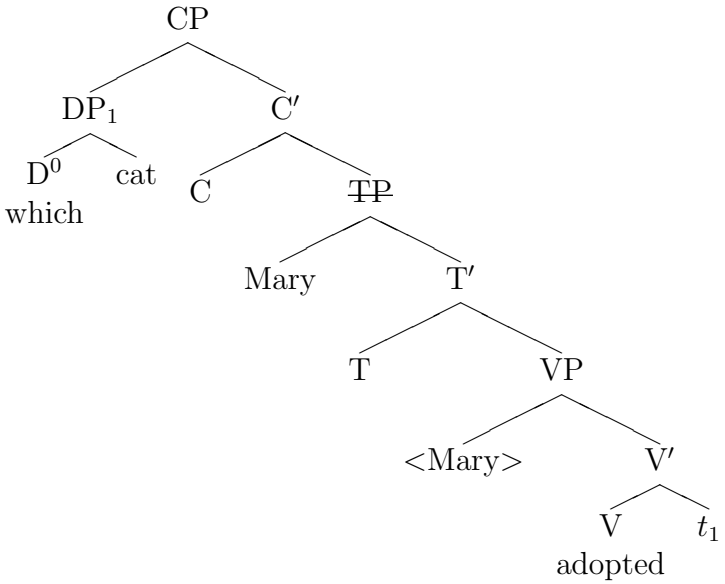
[1] In fact, when we consider the semantics, it seems that we are forced to a clausal analysis even for (2). Disjunctions can coordinate a variety of constituents at surface from, but first-order logic, the standard medium of translation for LFs, can only interpret disjunction as a sentence connective. The standard treatment of the transformation, from Rooth & Partee (1982), is simply to expand a surface coordination of XPs by copying, so that the logical '$\vee$' intervenes between whole clauses at LF. Hence "Mary sees [John or Bill]" is expanded to "[Mary sees John $\vee$ Mary sees Bill]." Whether this standard treatment is correct for (2) is an issue I shall leave aside, since unambiguous cases like (3) are available.

If we were to take as simpleminded an approach as possible to these sluices, one might propose (5) below for (4-a) and (6) for (4-b):

(5)



(6)



Each of these trees shows the hallmark of *wh*-movement: a *wh*-element which originates as the the complement of the verb in the sluice's antecedent—viz., the verb "adopted"—is raised to spec-CP, leaving behind a coindexed trace.

Tree (5) is suspect, however, because it is an instance of long-distance head-movement. The overt (unsluiced) form of (5) is certainly ungrammatical:

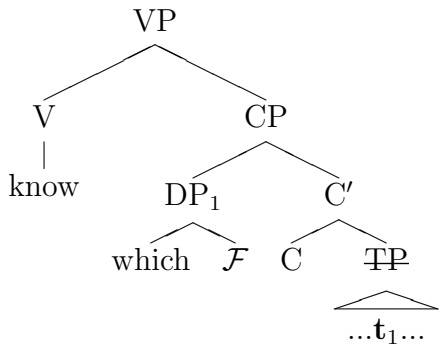
(4') *Mary bought a cat, but I don't know which$_1$ Mary bought t_1 cat.

The standard analysis of NP sluices like (4-a) and (4-b), then, assigns to *both* of them the tree (6). In (4-a), though, the complement of "which" in the fronted DP is capable of undergoing NP ellipsis when its content is recoverable from the context.[2] Hence going forward I will take the following as my first assumption:

> ('WHICH'-COMPLEMENTATION.) The *wh*-element "which," always has a sister node α ("cat" in (4)), which is a predicate. α may be, but also may not be, overt.

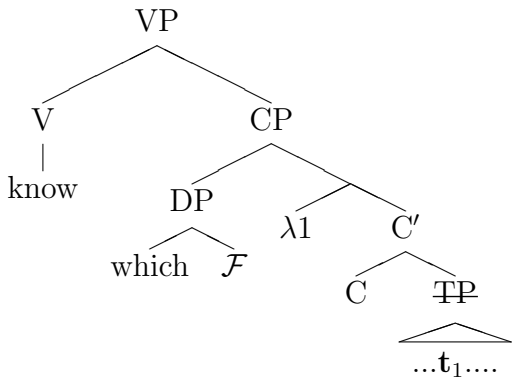
What happens when we try to apply this template to the propositional sluice in (3)? Because (3) is a *clausal* disjunction, it doesn't seem possible to make the complement of "which" explicit. Yet by ('WHICH'-COMPLEMENTATION), there *is* such a complement. Adding in the commitment of Merchant (2001) and Ross (1969) that there is true "syntax in the silence" of sluices—viz., true clausal syntax below TP as well—our preliminary model of (3) should be:

(7) a. Carlton killed Mr. Boddy or Mr. Boddy committed suicide;
b. I don't...



Finally, if we apply the standard assumptions about *wh*-movement to this tree, we should assume the *wh*-element "which $\mathcal{F}$" is coindexed with a trace it leaves behind. In particular, I will follow Adger & Quer (2001) in interpreting the index on the moved constituent as a λ-abstractor that binds the open position. That means that at LF, the structure should look like this (compare Heim & Kratzer (1998, pg. 185-186)):

[2] In other words, when it is elided, it is elided by NP ellipsis, a process that is distinct from the ellipsis operation of sluicing. Thanks to Line Mikkelsen and Jason Merchant for clarity on this point.



So I take it that a full analysis will do the following:

- explain the semantics of the unexpressed predicate $\mathcal{F}$, and what, if any, syntactic and semantic substructure it has.
- articulate the connection between the semantic analysis of $\mathcal{F}$ and the semantics for the clausal disjunction that licenses its presence. Concretely, I will take it that doing full justice to this requirement involves positing a syntax and semantics for the *correlate* of the sluice, (7-a), as well as the sluice itself.

2.1 A Quick Way Home?

In (7-a) and (7-b), I presented an antecedent and a (partial) tree I will be working with for the rest of this paper. In particular, we will be consumed, in what follows, with the nature of the element $\mathcal{F}$ as it appears in (7-b). So here I just want to consider some preliminary "quick answers" to the puzzle of the identity of $\mathcal{F}$.

The first answer is simply that the proper analysis of (3) is:

(8) Carlton killed Mr. Boddy or Mr. Boddy committed suicide; I don't know which **one**.

I don't deny that (8) is equivalent to (3). I don't think this is an answer to the question, though, since the question can be re-framed: what is the semantic value of the common noun "one" as it appears in (8)? In closely parallel cases, "one" is *anaphoric*:[3]

(9) Mary adopted a cat and Billy knows which one.

Sentence (9) cannot mean

(10) Mary adopted a cat and Bill knows which *dog* Mary adopted.

[3]See, for example, the extensive recent discussion of the semantics of such constructions in Payne et al. (2013).

even though "one" can *sometimes* mean "dog," viz., if the antecedent is "Mary adopted a dog," rather than "Mary adopted a cat." The upshot: if "one" is anaphoric, then—as with all such cases—we give a semantic analysis of the anaphor by giving a semantic analysis of the antecedent. And that is precisely what we are doing in analyzing $\mathcal{F}$.

A last hypothesis goes back to the intuitive acceptability of paraphrasing (3) as (8)—using "one" as the missing element—but rejects the anaphor hypothesis. One might, for example, propose that "one" is synonymous with Elbourne (2005)'s silent dummy predicate ONE:

$[\![\text{ONE}]\!] = \lambda x \,.\, x = x$
The property of being self-identical (Elbourne, 2005, pg. 124 ff.)

The Elbourne-inspired hypothesis that $\ulcorner\mathcal{F}\urcorner = \ulcorner\text{ONE}\urcorner$ is attractive because it gives us a concrete semantics for our element $\mathcal{F}$, rather than passing the buck as the original proposal "one" proposal did.

Semantically, though, this hypothesis is a nonstarter in just the same way. All dogs are self-identical, so if Bill knows which dog Mary adopted, Bill knows which ONE Mary adopted:

(11) Mary adopted a cat and Bill knows which dog Mary adopted.

entails the sluiced

(12) Mary adopted a cat and Bill knows [which ONE]$_1$ <Mary adopted t_1 >

But this is clearly not the "one" in (9). This refutes the hypothesis that the overt "one" has the semantics of "ONE" (a hypothesis, I should stress, that Elbourne is in no way committed to.) ONE is too semantically weak to give us the truth-conditions we want—either for the regular sluice (9) or for our propositional sluice (3).

2.2 A Strategy: from "which" to "whether"

Sluices are typically used to deny knowledge, express ignorance, and inquire; in that respect, our object of study,

(13) p or q, but I don't know which.

is entirely unexceptional. I propose to begin by analyzing simpler cases where knowledge is *affirmed* instead of *denied*:

(14) p or q, and Otto knows which.

where p and q are simple sentences. To start, consider an even simpler case:

(15) p or $\neg p$, and Otto knows which.

I claim that (15) is synonymous with

(16) Otto knows whether p.

and (14) is synonymous with

(17) Otto knows whether p or q.

We will pursue the line of thought that there is a connection between the *wh*-words "whether" and "which," a commitment I leave loose for now:

> (WHETHER-WHICH.) 'whether' complements (16) and (17) are semantically and syntactically like 'which'-sluices (15) and (14).

This strategy is bolstered by the observation that both "whether" complements and "which" complements can be licensed by disjunction, albeit in different ways: the disjunction "p or q" can be directly and overtly embedded under "whether," while the same disjunction, when paired with "which," can license the covert, deleted structure we get in a sluice.

3 CP Determiners: Adger and Quer's Model

"whether p" complements have been extensively analyzed by Groenendijk & Stokhof (1982) (hereafter "G&S"), and it is from their work that the semantic analysis of Adger and Quer really takes its inspiration. Adger and Quer take from G&S the suggestion that *wh*-elements like "whether p" can form propositional concepts—phrases that quantify over propositions without naming those propositions outright; again, typically, because the speaker is not in an epistemic position that allows her to do so. With (16), the speaker is able to attribute to Otto knowledge of *how things stand with respect to* p, even though she does not herself know whether p is true or false. Hence, the speaker can use (16) even when she cannot use either of

(18) Otto knows **that** p.

(19) Otto knows **that** $\neg p$.

G&S propose that "whether p" complements accomplish this feat because they are propositional concepts which pick out different propositions in different possible worlds. In (16), "whether p" picks out the proposition that p, *if* p *is true*, and the proposition that not-p, *if* p *is false*. The G&S semantic entry is:

(20) $[\![\text{whether } p]\!]^w = \lambda w' \,.\, p(w') = [\![p]\!]^w$

At a world w, the value of $[\![p]\!]^w$—the expression on the right of the "="—is either 1 (if p is true) or 0 (if p is false). In worlds of the former kind, "whether p" denotes the proposition $\lambda w' \,.\, p(w') = 1$—i.e., the proposition that p. In worlds of the latter kind, "whether

p" denotes the proposition $\lambda w' \ . \ p(w') = 0$—i.e., the proposition that $\neg p$. This built-in dependence on how things are at the world of evaluation allows the speaker to be confident that "whether p" denotes a true proposition—hence a suitable object of *knowledge* for Otto. At a world w, "whether p" always picks out the unique proposition in $\{p, \neg p\}$ that is *true* at w.

With this in mind, let me sketch the parallel between this analysis of "whether p" and the definite determiner "the." (For simplicity I will use a broadly Fregean conception of the latter.) The propositional concept "whether p" allows us to pick out a true proposition in the set $\{p, \neg p\}$ even when we don't know which of them is true. Likewise, a definite description "the F" allows us to secure reference to an individual who is F, even if we don't know which individual that is. For example, consider the definite description "the King of France." I may not know which individual is picked out by "the King of France" (hereafter, "the KoF"). But I *do* know that, *if* it's Louis who is king, then "the KoF" picks out Louis, and *if* it's Alain who's king, then "the KoF" picks out Alain, etc. So I may be confident that

(21) The King of France is French.

is true even if I cannot assent to any of

(22) Alain is French.

(23) Louis is French.

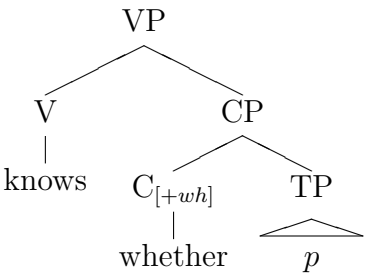
(24) Billy is French.

...etc.

This is, I think, a strong semantic and epistemic parallel between "whether" and "the." Speaking very roughly, it means that we can make, amongst propositions, the same distinction between *knowledge de dicto* and *knowledge de re* that we can make for NPs. I will be abbreviating G&S's semantic entry for "whether p" in a way that makes this parallel explicit:

(25) $[\![\text{whether } p]\!]^w = the_w\{p, \neg p\}$

As the reader can verify, entries (20) and (25) are equivalent on the Fregean understanding of "the": both explicitly mark sensitivity to the world of evaluation w, and both entires are fully compositional: $[\![\text{whether } p]\!]^w$ depends on the semantic values $[\![\text{whether}]\!]^w$ and the intension of its complement, p (viz., $\lambda w' \ . \ [\![p]\!]^{w'}$). When Otto knows whether p, we can write the tree like this:



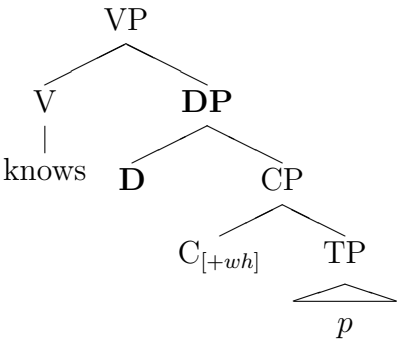
$$[\![\text{CP}]\!]^w = the_w\{p, \neg p\}$$

As it stands, (25) is merely an instructive semantic heuristic; even if a logician may usefully think of "whether p" as a definite description, there little is reason to think, for all I've said so far, that in the *object language*, CP complements of verbs like "know" behave like determiners.

3.1 Finding the Syntax

I can now explain why Adger and Quer's data is exciting to a semanticist: Adger and Quer survey languages in which CPs show determinerlike inflection—in particular, the *polarity-sensitive* inflection we find in English determiners like "any." They argue on the basis of this inflection that CPs are headed by determiners, giving the full structure of a "knows"-type complement a structure like this:

(26)



Better still, Adger and Quer put the English "whether" in the new determiner slot (ibid., pg. 120). As a semanticist, I see the hypothesis like this: it's not simply that, from the point of view of logic, "whether" acts like a definite determiner on a propositional complement; from the point of view of the structure of the object language, "whether" simply *is* a propositional determiner. Adger and Quer call this parallel between propositional and objectual

determiners—between e.g. "whether p" and "the F"—the "major theoretical point" of their article (ibid., 107).

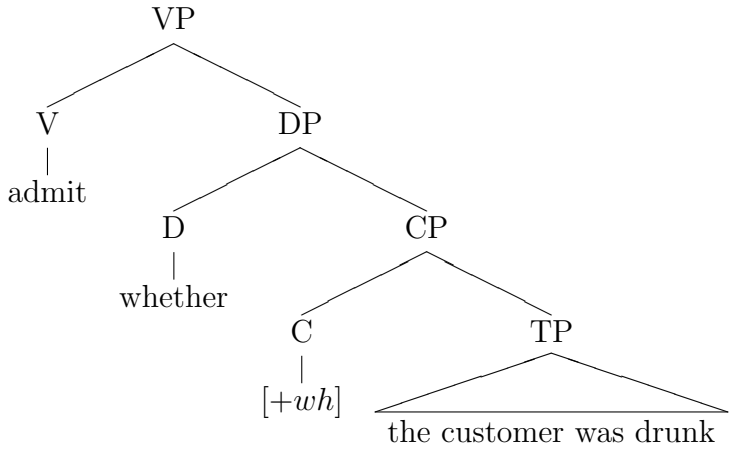
The highly determinate structure of the tree (26) gives us a framework to get into the compositional details of complex embedded-question complements. In order for the item occuping D to act as a true determiner, like "any" or "the," the CP must contribute a predicate as its complement (as in "the F" or "any F"). But this predicate must be a *property of propositions*, because the whole DP must be capable of being the object of a question-embedding verb: viz., capable of being known, said, denied, and so on. Adger and Quer shoulder this requirement as follows:

> [the [$+wh$] morpheme in C] combines with a proposition [p] to give a **predicate of propositions** that will be true of either p itself or its negation. (Adger & Quer, 2001, pg. 123, emphasis added)

The predicate of propositions, which is the semantic value of the CP, then composes with the propositional determiner $[\![\text{whether}]\!]^w$ to form a quantifier over propositions

(27) The bartender didn't admit whether [[$+wh$] the customer was drunk.]

(28)



(29) $[\![\text{CP}]\!]^w$ = a predicate of propositions, satisfied by $\lambda w'$. *the customer was drunk* (w') and $\lambda w'$. $\neg$ *the customer was drunk* (w').

The simplest property that will do the job is

(30) $[\![[+wh]\ p]\!]^w = \lambda x \in D_{st}.\ (x = p) \vee (x = \neg p)$

Call this property "The Adger-Quer Predicate." I want leverage this predicate for our propositional "which"-sluices, such as (3). I will pursue the following hypothesis:

> (HYPOTHESIS). The $\mathcal{F}$ in (7-b) is identical, semantically, to the complement of D in (26).

3.2 Data

First, though, what is the data that supports the extra D-layer in (26)? The best example of polarity-sensitivity in English is negative polarity item "any"; "any" is an indefinite determiner, but is only licensed if it has narrow-scope with respect to negation. This means sentences with "any" display less ambiguity at LF than sentences with non-polarity-sensitive "a", for example

(31) I don't have a Woody Allen movie.

a. $\exists x$: Woody-Allen-movie(x) $\wedge$ $\neg$(I have x).
Some W.A. movie is such that I fail to own it: e.g. I own 'Bananas' but I don't own 'Annie Hall.'

b. $\neg\exists x$: Woody-Allen-movie(x) $\wedge$ I have x
There isn't a single Woody Allen movie that I own.

Sentence (31) is ambiguous between the two readings (a) and (b). But when we replace "a" with "any", as in (32):

(32) I don't have any Woody Allen movie(s).

the ambiguity disappears: unlike (31), (32) only has the interpretation (31-b). Other polarity-sensitive items—including another incarnation of the English "any"—must take narrow scope with respect to question operators, modal operators, and conditional antecedents.

Adger and Quer present data showing that a wide variety of languages have CPs which also bear characteristic inflection only when they take narrow scope with regard to precisely the same set of operators as polarity-sensitive items like "any." The first example is the English "if":

(33) a. The bartender admitted whether/#if the customer was drunk.
(DECLARATIVE)

b. The bartender didn't admit whether/if the customer was drunk.
(MATRIX NEGATION)

c. Did the bartender admit whether/if the customer was drunk?
(QUESTION)

They argue that the behavior of "if" in this respect is matched by the Icelandic *hvort* (citing Thráinsson (1979)), and the Spanish *si* (citing Marín (1985)):

(34) a. ?*Ég veit hvort Jón er farinn.
I know if John has left.

b. Ég veit ekki hvort Jón er farinn.
I know not if John has left.
c. Veist thú hvort Jón er farinn?
know you if John has left

(35) a. #Reconocieron si tenían las llaves.
admitPST.3PL if haveIND.IMPF.3PL the keys
'They admitted if they had they keys.'

b. Reconocieron si tenían las llaves?
admitPST.3PL if haveIND.IMPF.3PL the keys
'Did they admit if the have the keys?'
(Adger & Quer, 2001, pg. 110)

In the (a) sentences, the CP (*hvort* or *si*) appears in a declarative environment, and the sentence is judged defective. In the (b) and (c) sentences, the CP appears in a polarity-sensitive environment (question or matrix negation), and the result is grammatical. So it seems that the acceptability of the relevant CP is determined by the embedding environment in the same way as "if."[4]

Furthermore, in the case of Basque, Adger and Quer argue (citing Laka (1990, 1994) and Uribe-Extebarria (1994)) that CP morphology characteristic of these environments, the partitive case marker *-ik*, is the same in both object determiner (DP) and these hypothesized polarity-sensitive determiner-of-complementizer environments. (36), below, illustrates the polarity-sensitive determiner use—translated with "any"—appearing under negation, in a question, and in a conditional antecedent, respectively.

(36) a. zazpi gizoni ex diet lan-**ik** eman.
seven man.DAT not AUX.1SGE.3SGA.3PLD work.PART given.
'I have not given any work to seven men.'

b. etxeko txakarrari hezurri-**ik** eman diozu?
house.GEN dog.D bone.PART given AUX.2SGE.3SGA.3SGD
'Have you given any bones to the dog of the house?'

c. Mirenen anaiei pari-**rik** ekarri badiezu...
Miren.GEN brothers.D present.PART brought if.AUX.2SGE.3SGA.3PLD
'If you have brought any presents for Miren's brothers..."

By contrast, (37), below, illustrates the CP use:

[4]It would stand to reason, then, that Icelandic and Spanish have non-polarity-sensitive alternates to *hvort* and *si*, which stand to them as the English "whether" stands to the English "if." These are not provided by Adger and Quer; nor do they provide embedding for the Spanish *si* under negation. I can note for Romance, however, that the Italian *si* (which, like the English "if", also does double-duty to mark conditional constructions) is *not* polarity sensitive, nor does Italian seem to have a polarity-sensitive complementizer.

(37) a. Mamaiak [inork gorrotoa dio-**nik**] ukatu du.
Amaia.E anyone.E hatred.A AUX.3SGE.3SGA-COMP denied AUX.3SGE.3SGA
'Amaia denied if anybody hated her.'

b. Jonek ez du esan [inor etorri d-**enik**].
Jon.E NEG AUX.3SGE.3SGA said anyone.A come AUX.3SGA.COMP
'Jon didn't say if anyone came.'

(Adger & Quer, 2001, pg. 116)

We observe the same marker these environments, licensed by appearance under negation.

4 Semantics for Propositional Determiners

What semantics should be given to these propositional determiners? Adger and Quer argue that we want to give a "whether" sentence like (27), repeated below:[5]

(38) The bartender didn't admit whether the customer was drunk.

an analysis on which the determiner "whether" is combined with the Adger-Quer predicate in (30):

(39) The bartender didn't admit [DET + $[\lambda x \in D_{st} \,.\, (x = p) \vee (x = \neg p)]$]

they argue that this is equivalent to

(**) ¬ (the bartender admitted that the customer was drunk ∨ the bartender admitted the customer wasn't drunk)

viz., the bartender neither admitted the customer was drunk nor admitted that he wasn't (Adger & Quer, 2001, pg. 124, (99)).

The assignment of these truth conditions to (38) follows from analyzing "whether" complements under attitude verbs v as wide-scope disjunctions: S v's whether p is analyzed as [S v's that p or S v's that $\neg p$].[6]

(40) [DET] in (39) is the quantificational determiner $\exists$.

[5]In what follows, I will talk mostly about "whether" as opposed to "if," simply because this will allow us to draw more direct connections between the embedded and unembedded cases.

[6]For example, in standard epistemic logic, "S knows whether p" is true at a world w if [S knows $p \vee S$ knows $\neg p$] is true at w.

As the reader may have noticed, (**) is not compatible with the gloss on "whether" I provided in §3.1 above. That is because the wide-scope disjunction analysis, although it is something of an industry standard, is not compatible with the data from Groenedijk and Stokhof's analysis, nor with intuition. As a result, I think Adger and Quer's semantic analysis should be modified before attempting to attack (28) compositionally: Adger and Quer are correct in analyzing "whether" as a determiner, but the combination of an existential determiner and the AQ Predicate is not truth-conditionally adequate: something needs to be added. Once that something is added, Groenendijk and Stokhof's definite propositional determiner and Adger and Quer's *in*-definite propositional determiner will be shown to be semantically equivalent.

4.1 The factivity of "whether" entails the factivity of "if"

As Groenendijk and Stokjof argue (176), "whether p" is factive: it always picks out, and any w, a proposition in $\{p, \neg p\}$ that is *true* at w. Here is a quick argument.

> (Story.) Sandy, who is a customer at Bob's bar, leaves sober on Friday night, but gets in a car crash on the way home. The next day, the police interview Bob, the bartender. Bob, who is secretly Sandy's romantic rival, decides to lie to the police. He says: "you know what: it's true! Sandy left the bar drunk."

Has Bob told the police *whether* Sandy left the bar drunk? Intuitively, no. But he *did* tell the police a proposition in the set $\{\lambda w'$. Sandy left the bar drunk in w', $\lambda w'$. $\neg$ Sandy left the bar drunk in $w'\}$: the wide-scope disjunction in (40) above. So the truth-conditions in (40) are wrong: to tell someone whether p is not *just* to tell them *some* proposition in $\{p, \neg p\}$. It is to tell them the one that's true.[7]

The same argument can be made from the first person. If I ask you to tell me whether my haircut is ugly, I'm not asking you to tell me *some* proposition in the set $\{\lambda w'$. Melissa's haircut is ugly in w', $\lambda w'$. $\neg$ Melissa's haircut is ugly in $w'.\}$ I'm asking you to tell me the true one. There's a difference, then, between (i) asking you to tell me whether my haircut is ugly and (ii) asking you to *either* tell me that my haircut is ugly, or to tell me that my haircut isn't ugly. You can fulfill the latter, but not the former, by lying to me.

I conclude, contra Adger and Quer's official semantics, then, that the truth-conditions of

(41) S v's [whether p]

is not

[7] Adger and Quer write (Adger & Quer, 2001, pg. 109) that they "follow Groenedijk and Stokhof in assuming that *tell* takes a true proposition as its complement." But this is not right, either as a matter of intuition ("he told me a lie" is a perfectly felicitious sentence) nor as a manner of G&S exegesis: see Groenendijk & Stokhof (1982, pg. 177). The point goes back at least to Karttunen (Karttunen, 1977, pg. 11).

(42) *S v*'s [$\exists$ [$\lambda x \in D_{st}$. $(x = p) \vee (x = \neg p)$]]
There is some $x \in \{p, \neg p\}$ *s.t. S v's x.*

but rather

(43) *S v*'s [$\exists$ [$\lambda x \in D_{st}$. $True_w(x)$ $\wedge$ $[(x = p) \vee (x = \neg p)]$]]
There is some **true** $x \in \{p, \neg p\}$ *s.t. S v's x.*

Call this latter, factive predicate,

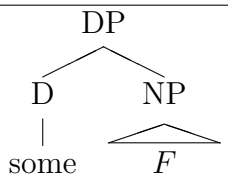
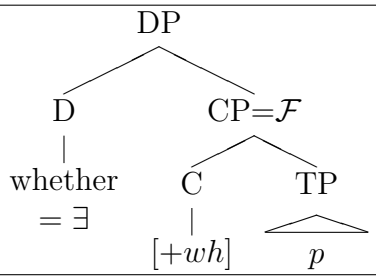
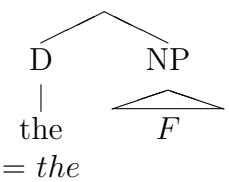
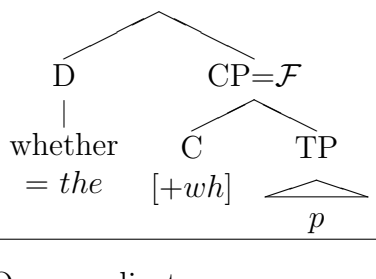
$$\lambda x \in D_{st} \text{ . } True_w(x) \ \wedge \ [(x = p) \vee (x = \neg p)]$$

the "Factive Adger-Quer Predicate." This is just the old Adger-Quer predicate with "$True_w(x)$" added.

Notice that, because p and $\neg p$ are mutually exclusive and jointly exhaustive, only one of them is true at any world w. That is why we can paraphrase "the bartender tells the police a true proposition in $\{p, \neg p\}$" as "the bartender tells the police *the* true proposition in $\{p, \neg p\}$"—i.e., as "the bartender tells the police $the_w\{p, \neg p\}$." So the difference in quantificational force between G&S's definite and A&Q's indefinite evaporates, when the predicate in question is the Factive Adger-Quer predicate: (43) is equivalent to

(44) *S v*'s [*the* [$\lambda x \in D_{st}$. $True_w(x)$ $\wedge$ $[(x = p) \vee (x = \neg p)]$]]
S v's **the** *true* $x \in \{p, \neg p\}$.

Since, for "whether p" constructions—that is, when the propositional predicate in question is The Factive Adger-Quer predicate—the distinction between the two quantificational flavors (43) and (44) is a distinction without a difference, I will leave both hypotheses open for now.

	Object Determiner	Propositional Determiner
Hypothesis 1 (A&Q)		
Hypothesis 2 (G&S)		

where $[\![\mathcal{F}]\!]^w$ is the Factive Adger-Quer predicate:

$$\lambda x \in D_{st} \ . \ True_w(x) \ \wedge \ [(x = p) \vee (x = \neg p)].$$

4.2 Adding Predicates Contributed by Disjunction

As I argued in §2, we are investigating the connection between "whether" complements and propositional sluicing. However, in order to do this, we need to analyze not just

(i) whether p

complements, but

(ii) whether p or q

complements, in a way which respects the insight that "whether p" is equivalent to "whether p or not-p".[8] We now have a fledgling analysis of the former, on which it is equivalent to

(i') [DET + $\{p, \neg p\}$]

where DET is either a definite or indefinite determiner, and $\{p, \neg p\}$ is our shorthand for the factive Adger-Quer predicate.

Let's extend AQ's treatment of "whether" complements to (ii). We began with the Factive Adger-Quer predicate:

(45) $[\![[+wh]\ p]\!]^w \ = \lambda x \in D_{st} \ . \ [True_w(x) \ \wedge \ [(x = p) \ \vee \ (x = \neg p)]]$

this extension to the generalized disjunction "p or q" seems obvious: the property in question is not $\{p, \neg p\}$—being identical to p or to $\neg p$—but $\{p, q\}$–being identical to p or to q.

(46) $[\![[+wh]\ [p \text{ or } q]]\!]^w \ = \lambda x \in D_{st} \ . \ [True_w(x) \ \wedge \ [(x = p) \ \vee \ (x = q)]]$

given that "whether" can take n-ary disjunctions, we can extend this to:

(47) $[\![[+wh]\ [\bigvee p_i]]\!]^w \ = \lambda x \in D_{st} \ . \ [True_w(x) \ \wedge \ [(x = p_1) \ \vee \ ... \vee (x = p_n)]]$

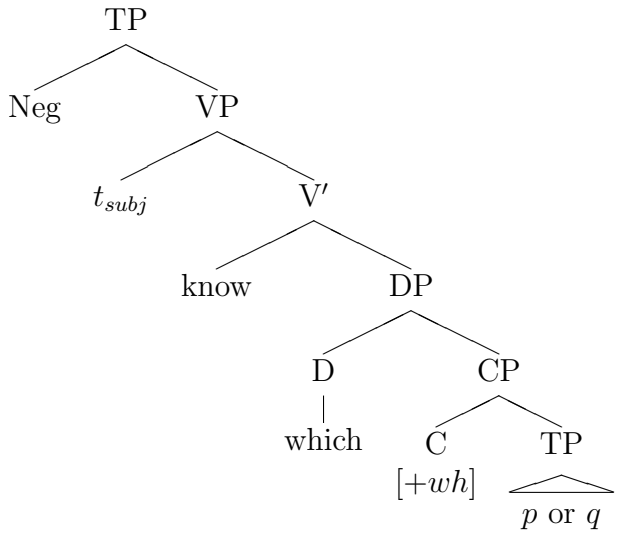
So the property of propositions picked out by "whether p_1 or p_2 or...or p_n" at w is the property a proposition has just in case it is (i) true and (ii) identical to one of the p_i's. We can think of (47) as "the generalized Adger-Quer predicate."

5 Returning to "Which"-sluices

We now have a predicate, the Generalized Adger-Quer predicate, which we can slot into our "which" sluices:

[8] On one reading—see below.

(48) [$_p$ Carlton killed Mr. Boddy] or [$_q$ Mr. Boddy committed suicide]; I



The semantic value of the CP here is the property of propositions picked out above: the property a proposition has just in case it is (i) true and (ii) identical to p or identical to q.

If we assume that sluicing now deletes the TP, we have our target SS.

(49) I don't know [$_{DP}$ which [$_{CP}$ [$_C$ [+wh]] [$_{TP}$ ~~p or q~~]]]

This sluice is both like and unlike the standard objectual sluice in (6). It is alike in that it is a TP deleted under a *wh*-element. It is unlike (6) in that no *wh*-movement has taken place prior to deletion: the *wh*-word is base-generated in the determiner slot under the question-embedding verb. It is *wh*-movement that lifts the predicate "cat" in (6) above the TP that ultimately gets deleted: *wh*-movement explains why "cat" remains overt in the sluice (4-b). Here, there is a predicate to lift—the Adger-Quer predicate—but no lifting takes place. So "which" never has an overt disjunction in the sluice.[9]

6 Filling out the Semantics

(49) is where I will rest on the issue of the *syntax* of disjunctive sluices. But there is a lot of semantics left to do. We have not yet settled the question of the quantificational force—definite or indefinite—of the determiner that sits above the Adger-Quer predicate, since the data from "whether p" in §4 did not distinguish between the two. And we have not yet settled the question of whether structures like (49) are subject to LF movement; this is an

[9]This leaves open why there can't be an overt *un*-sluiced version of the sentence. I return to this question below.

important question for Adger and Quer, and hence for us.

The guiding idea of Adger and Quer's semantics is that CP's can project determiners, which show the kinds of inflection that ordinary indefinites like "a/any" do. I argued in §4 on the basis of G&S's semantic observations that we must either replace the analogy with "a" with an analogy to "the," or enrich the Adger-Quer predicate so it is factive. But this indecision leaves open two possibilities for the semantic *type* of the propositional determiner, because "a" and "the" have different available analyses. The standard view of an indefinite quantifier like "a" is that it takes a *pair* of (object-level) predicates:

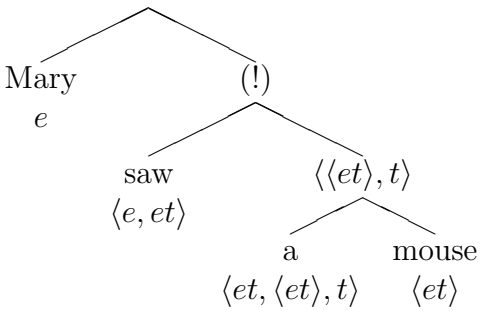
(50) $[\![\text{a(n)}]\!]^w = \lambda F \in D_{et} \,.\, \lambda G \in D_{et} \,.\, [\exists x \in D_e\colon F_w(x) \wedge G_w(x)]$

The Fregean view of "the," however, is that it is a term-forming operator that takes just *one* object-level predicate. Heim & Kratzer (1998, pg. 75), for example, offer this simple Fregean entry:

(51) $[\![\text{the}]\!]^w$ = $\lambda F \in D_{et}$ and there is exactly one such x s.t. $F_w(x) = 1$. the unique y s.t. $F_w(y) = 1$.

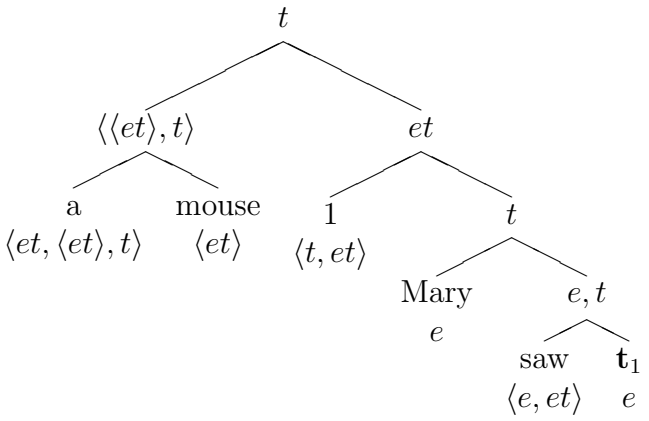
As a result of this difference in type between the indefinite quantifier and the Fregean term-forming operator, in predicative constructions the former, but not the latter, is subject to Quantifier Raising driven by type-mismatch: in e.g.

(52) Mary saw [$_{DP}$ a mouse]



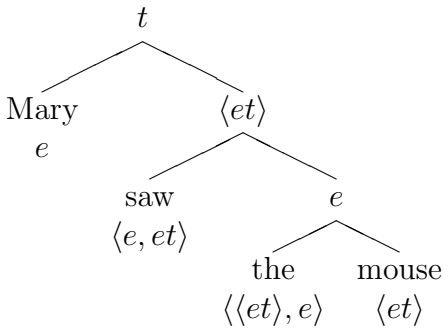
the DP must quit its base position and rise to TP:

(53) [A mouse] 1 Mary saw t_1

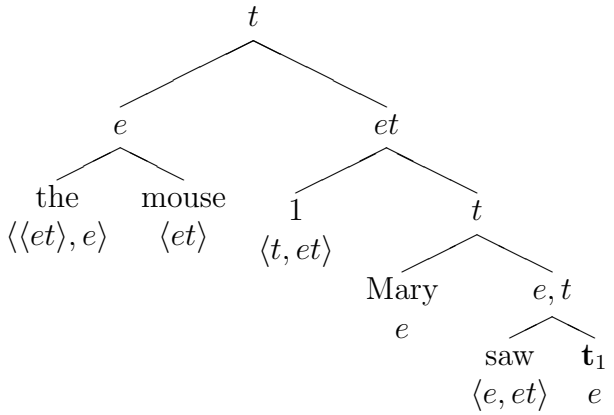


But if we replace "a" with "the," the DP can remain in situ *or* it can rise:

(54) Mary saw [$_{DP}$ the mouse]



(55) [$_{DP}$ the mouse] $_1$ Mary saw t_1



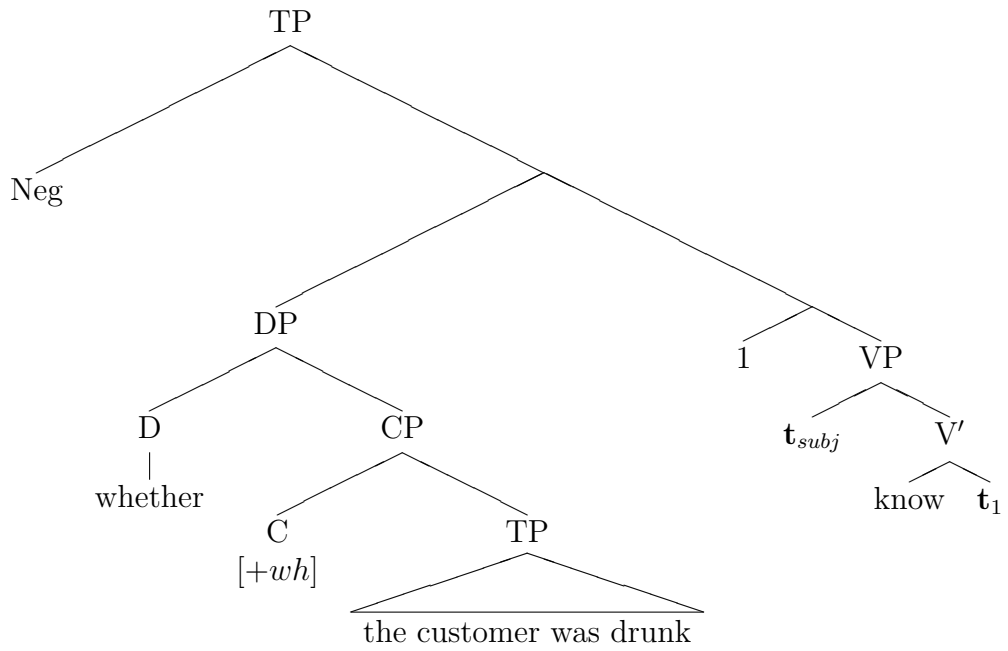
Because Adger and Quer analyze "whether" as an *indefinite*, the relevant type-theoretic analogy is with (52): they assume that "whether" must take *two* predicates of propositions as arguments and hence that there is LF movement of these propositional DPs driven by type-mismatch (ibid. 121). Their example is

(56) The bartender did not know [$_{DP}$ whether [$_{CP}$ [+*wh*] the customer was drunk]]

In this construction, the DP must rise:

(57) The bartender did not [$_{DP}$ whether [$_{CP}$ [+*wh*] the customer was drunk]] [1 t_{subj} know t_1]

(58)



If we gave "whether the customer was drunk" the more G&S-inspired *definite* analysis, however, the analogy with the Fregean definite determiner would suggest that the complement stays in situ, just as the DP in (54). What to choose?

I'd like to give a complicated answer: I think we should assign a *indefinite* quantifier to *disjunctive* "whether"-complements, and a definite analysis to nondisjunctive "whether"-complements, like the one in (57). Let me explain.

There are, intuitively, two reasons we should assign indefinite quantifiers to "whether p or q" complements. The first is that, unlike $\{p, \neg p\}$, there is no guarantee that p and q are mutually exclusive and jointly exhaustive. So if we tried to give a *definite* analysis to "whether p or q"—to analyze it as *the true proposition in the set* $\{p, q\}$—there is a risk that this definite description would be improper.

The second reason is that "whether p or q" complements are scopally ambiguous, in a way that clearly seems to mirror the de dicto-de re distinction. I illustrate with the case of $q = \neg p$. One of the readings is vacuous, and one is not.

(59) I know whether p or not-p.

a. *Vacuous*: I know [whether (p or not-p)]
I know: $\exists x \in D_{st}$: $[[(x = p) \vee (x = \neg p)] \wedge \text{True}_w(x)]$.

b. *Non-Vacuous*: [whether (p or not-p)]$_1$ I know t_1
$\exists x \in D_{st}$: $[[(x = p) \vee (x = \neg p)] \wedge \text{True}_w(x)]$ and I know (x).

(59-a) is trivial, underwritten by nothing more than the Law of the Excluded Middle. It corresponds to reasoning like this:

> I don't know what the weather is like outside. But I know by logic that it's either raining or it's not raining. Therefore, I know *whether* it is raining or it's not raining.

This kind of reasoning is validated by G&S's semantics for "whether p": in general—for any ϕ—if you know *that* ϕ, you know *whether* ϕ. In this case, ϕ = (it's raining)$\vee \neg$ (it's raining).

(59-b) is not trivial: it corresponds not to the colloquial

(60) I know whether it's raining or not raining.

but to the colloquial

(61) I know whether it's raining or not.

Hence there are two good reasons for analyzing the strength of the determiner in "whether p or q" as indefinite. While I think that Adger and Quer must be right about the indefinite quantificational force in this case, notice that they are far from home free when it comes to implementing the second observation (the de dicto-de re ambiguity) compositionally. In (58), when the DP rises to fix the type mismatch, it lifts the quantifier "whether" above the intensional verb "knows." Hence the attitude ascribed is *obligatorily* de re. This is not right, but there are several ways to fix it; in the interest of filling out the typology here, I postpone the resolution of this issue until §6.2.

The reason I favor the *definite* determiner analysis for non-disjunctive "whether p" complements is that "whether p" complements are *not* ambiguous in the way "whether p or not-p" complements are: "whether p" complements only have the *non*-trivial, "de re" reading identical with (59-b) above.

(62) I know whether p.

a. *Non-Vacuous*: I know [whether (p)]
I know: $the_w\{p, \neg p\}$

We can capture this by saying that "whether p" determiners are definites: as (54)-(55) above show, definites are not forced to QR by type-mismatch, and even if they do QR (as in (55)), the movement produces no truth-conditional difference.[10]

We are now in a position to discuss the semantics of "which" sluices. To say

(63) It's raining or not raining; I don't know $[_{DP}$ which $[_{CP}$ $[_{C}[+wh]]$ $[_{TP}$ ~~it's raining or it's not raining~~$]]]$.

...is clearly to deny the kind of substantive knowledge in (59-b). Thus, even though "which"-sluices take surface scope below the attitude verb "know," semantically, they seem to take obligatory wide scope. In sum, it seems that Adger and Quer's entry for "whether" is *exactly* right for the "which" in a propositional sluice: it takes an Adger-Quer "disjunction predicate" as its complement, and it has existential quantificational force which scopes above the attitude verb, but below negation. So I classify "which ~~$[_{TP}$ p or $q]$~~" as as a lexical alternate of "whether p or q," only when the latter takes its wide-scope reading.

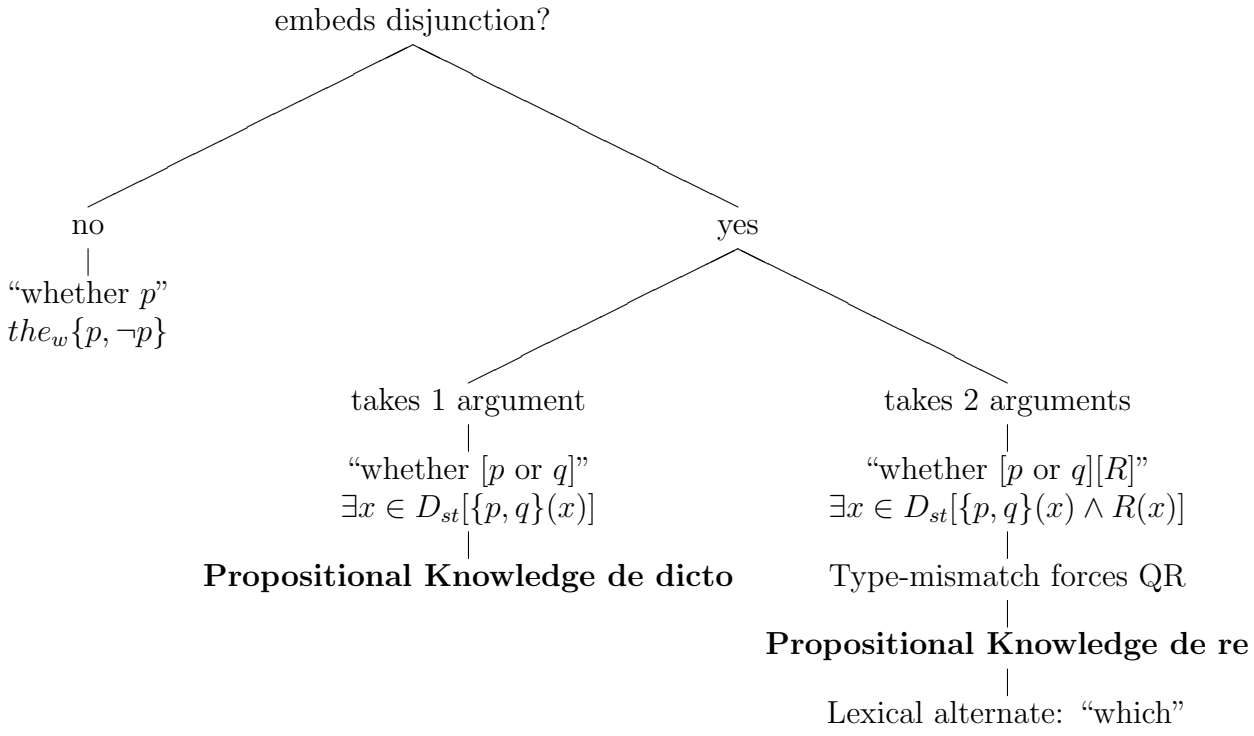


Figure 1: Our system so far.

Classifying $[\![\text{which } [p \text{ or } q]]\!]^w$ as a lexical alternate of wide-scope $[\![\text{whether } [p \text{ or } q]]\!]^w$ has the nice feature that it is quite close to the spirit of Adger and Quer's original parallel with polarity sensitivity. The original phenomenon of polarity sensitivity was that the natural language quantificational determiner "a" had a lexical alternate, "any", which is licensed

[10] Qualify?

only when the determiner has narrow scope with respect to some operator. In our system, the "whether"-"which" alternation is just like this, except that the lexical alternate "which" must take *wide* scope with respect to some operator (here, the knowledge operator.) This gives us insight onto an unresolved empirical question, which is why, even though "whether" is a *wh*-word, it does not license sluicing:

(64) a. *It's raining or it's snowing; I wonder **whether**.
b. *p or q; I wonder **whether** ~~$[_{TP}\ p$ or $q]$~~.

Our typology makes available the following simple answer. At LF, a sluice like (64) *is* available; it is just

(65) a. It's raining or it's snowing; I wonder **which**.
b. p or q; I wonder **which** ~~$[_{TP}\ p$ or $q]$~~.

The contrast between (64) and (65) patterns with the non-equivalent deletion properties of "any" and "a":

(66) Bill has a brother, but I don't have (* a) / any.

From the point of view of pragmatics, the lexical alternate theory is also beautifully right. If (64) were grammatical, it would be ambiguous between a wide-scope "whether" and a narrow-scope "whether" reading. But the narrow-scope reading—the one which is *not* equivalent to (65)—would be an instance of Moore's paradox.[11] It is of the form

(67) # ϕ, but I wonder whether ϕ.

which is clearly pragmatically equivalent to

(68) # ϕ, but I don't know that ϕ.

which is obviously not a felicitous thing to say. So we have a two-part answer to the puzzle of the non-attested "whether" sluices: first, "whether" sluices would, if they existed, correspond to ambiguous LFs. One of these LFs, which has no available SS, is Moorean-paradoxical junk. The second of these LFs is a reasonable thing to say. But then there *is* an available way to sluice on it: it is to use a "which"-sluice, as in (65).

6.1 Interim Summary

In the next section I will propose a fix to the semantic bug mentioned in §6.0: that AQ's QR-by-type-mismatch analysis of *disjunctive* "whether p or q" complements makes them obligatorily de re, in defiance of intuition. First, though, I'd like to summarize where we are with regard to explaining our propositional sluices.

[11] Moore (1993).

We've given an analysis of knowledge-*wh* that runs with the idea that *wh*-elements act like determiners. Propositional determiners take predicates of propositions rather than predicates of objects. Other than that, the two types of determiners are a lot alike. To analyze propositional determiners this way gives us a natural account of disjunctive "which"-sluicing. This kind of sluicing deletes a TP under a *wh*-element, and the resulting intepretation rests on a predicate of propositions, associated with disjunction.

The syntactic analysis we inherit from Adger and Quer explains why sluicing on disjunctions can never make a predicate of disjunctions overt: since the predicate in question, as a TP, *is* the host of the E feature, disjunctive sluices don't have the option of taking the form where the predicate remains overt.

We should note, though, that this explains only why there are not *two kinds* of "which"-sluicing, like (4-a) and (4-b), repeated below:

(69) Mary adopted a cat at the shelter...
   a. I don't know which.
   b. I don't know which cat.

it does *not* explain why *some kind of sluicing must happen in the first place.* So the theory as it stands does not explain why we cannot say

(70) * I don't know which [[Carlton killed Mr. Boddy] or [Mr. Boddy committed suicide]].

in the same way we can utter the *un-sluiced* sentence

(71) Mary adopted a cat, but I don't know which cat Mary adopted.

Here, I can only make a conjecture. Sluicing is famous for remedying islands, illustrated below:

(72) I believe the claim that he bit someone, but I don't know who (* I believe the claim that he bit t).

(73) Irv and someone were dancing together, but I don't know who (* Irv and t were dancing together).

(74) That he'll hire someone is possible, but I won't divulge who (* that he'll hire is possible t).[12]
(Ross, 1969)

A large part of the interest taken in sluicing over the decades since Ross (1969) is due to this fact. What the "rescue-ability" of structures by sluicing suggests is that sometimes, an interpretable LF can be kitted out with proper syntax only by deletion. That is to say:

[12]NB In addition to being a scope-island violation, the wide-scope reading mandated by the sluice violates the Epistemic Containment Principle of von Fintel & Iatridou (2003).

sometimes, when speakers are trying to balance the desire to communicate a certain LF with the need to keep their sentences well-formed at SS, deletion is, oddly enough, the only mono-clausal solution. Perhaps something like this applies to (70): to make this syntactic structure well-formed, deletion *must* apply. I have some very speculative ideas on what kind of "island constraint" an unsluiced disjunctive sentence like (70) might violate, but I confess I do not find any of them to be worth suggesting seriously at this point, so I leave the issue for further research.

6.2 The De Dicto-De Re Bug

In the tree in Figure 1, I proposed an analysis of wide-scope

"(knows) whether p or q"

on which, following Adger and Quer, "whether" is an indefinite propositional determiner that takes two properties of propositions as arguments. As a result, type-mismatch forces the quantifier above the question-embedding verb "knows" at LF. I complained, though, that this is counterintuitive, because

(75) I know whether it's raining or not raining.

is ambiguous, and on one reading—the vacuous one—the existential quantification stays low. It would be nice *not* to have the determiner forced above "knows" by type-mismatch, for this makes the de dicto-de re ambiguity for disjunctions—the difference between

(i) it's being the case that you know: some $\{p, \neg p\}$ is true.

(ii) it's being the case, *of* some $\{p, \neg p\}$, that you know: *it* is true.

...a *lexical* rather than a *structural* ambiguity, in defiance of common sense and well-established semantic tradition.

I can see two solutions to this problem. The first, which is the simplest to state in Adger and Quer's framework, is to say that the indefinite "whether (p or q)" *always* takes two arguments, for both the de dicto and the de re interpretations, but to argue that the second argument can be produced by *short movement*, the kind of movement postulated to capture the ambiguity of e.g.

(76) a. John hates his father, but Markus doesn't (⟨hate John's father⟩ / ⟨hate Markus's father⟩).
b. John [hates his$_j$ father].
c. John$_1$ [t_1 hates t_1 father].
(Heim & Kratzer, 1998, pg. 246).

To produce the so-called "sloppy" reading, we postulate that we can QR "John" a very short distance within the antecedent: just enough to produce an extra predicate in (76-c), which is interpreted as

(77) $\lambda x \in D_e$. x hates x's father

This suggests we can QR "whether it's raining or not raining" in (75), but keep it *below* the verb "knows".

(78) a. I know [whether it's raining or not raining].
b. Long movement: [whether it's raining or not raining] [1 I know t_1]
De Re Reading
c. Short movement: I know [whether it's raining or not raining] [1 t_1]
De Dicto Reading

What is the interpretation of the LF predicate created by short movement, annotated [1 t_1]? Following the recipe for LF movement that generated (77), we assume that the trace is an assignment-function sensitive variable that is eventually λ-bound by the moved generalized quantifier. Starting from the bottom-up, we have[13]:

$[\![t_1]\!]^{gw} = 1$ iff $g(t_1)$	by Disquotation, Traces Rule
$[\![1\ t_1]\!]^{gw} = \lambda x \in D_{st}$. 1 iff x	by Predicate Abstraction
$[\![1\ t_1]\!]^{gw} = \lambda x \in D_{st}$. x	Simplification
$[\![1\ t_1]\!]^{gw} = \lambda x \in D_{st}$. $\text{True}_w(x)$	by (Metalanguage) Truth

As the reader can see by inspecting (78-c), this is exactly what we want. In the Appendix, I give full compositional derivations for the De Re (78-b) and the De Dicto (78-c), using the same, two-place existential determiner for each.

Postulating movement for both readings of (78) restores full ismorophism with the embedded interrogative in our NP sluice (6) (repeated):

(6') I know [which cat]$_1$ [$\sout{\text{TP}}$ Mary adopted t_1]

...since the *wh*-element now binds a trace in both the NP sluicing and the clausal sluicing structures. This binding has no semantic effect in the case of short movement, though, since it simply adds a second Truth-predicate

(79) $\lambda x \in D_{s,t}$. $\text{True}_w(x)$

to the already factive Adger-Quer predicate

(80) $\lambda x \in D_{s,t}$. $\text{True}_w(x) \wedge ((x = p) \vee (x = q))$

[13]For Predicate Abstraction, see Heim & Kratzer (1998, pg. 107)

6.3 Going Dynamic?

There is a second available path to solving the de dicto-de re problem, which I want to mention here because it exploits the resources made available by a move into a more dynamic semantic framework. On this solution, the reason type-mismatch cannot force the existential "whether p or q" above the attitude verb "knows" is because existentials are special in that they can take any number of open sentences as arguments. Consider the way that a DRT theorist—Kamp or Heim—would treat cross-sentential anaphora:

(81) a. Bill adopted [a cat]$_2$. [It]$_2$ meowed.
`[[cat` x_2`] [bill adopted` x_2`]]. [`x_2 `meowed]`
b. Bill adopted [a cat]$_2$ and [it]$_2$ meowed.
`[[cat` x_2`] [[bill adopted` x_2`]` $\wedge$ `[`x_2 `meowed]]]`

In (81-b), when the discourse is existentially closed at text-scope, the existential takes two arguments: `[cat` x_2`]` and `[bill adopted` x_2 $\wedge$ x_2 `meowed]`. In (81-a), the two arguments are `[cat` x_2`]` and `[bill adopted` x_2`]`. But then the next sentence adds another argument, `[`x_2 `meowed]`, to what is intuitively *the same* existential quantifier. So, in (81-a), the existential takes two arguments, while in (81-b), the existential takes three arguments, and the resulting truth-conditions are essentially the same. Thus existential quantifiers hae a special "open-endedness": they can take any number of arguments. This suggests we should, as Heim does, re-design the system around this special feature. That means that the distinction between taking one, two, or three predicative arguments cannot be a difference of type, and *this*, in turn, means that type-mismatch cannot force movement. Hence we could say that the existential introduced by "whether p or q" *need* not take more than one argument—so QR is not forced—but that it *can*, so that the moved, de re reading is also an option.

Since there are many ways of exploring this option which are unconstrained by our data, I will not explore this possibility too much further. But it is easy to see how movement *without* lambda-binding could solve our de dicto-de re problem, if a free variable introduced by "whether" was (i) existentially closed and (ii) could take any number of open sentences as arguments.

(82) a. I know [whether it's raining or not raining].
b. `I know: [`x_1`{it's raining, it's not raining}]`
Existential takes one argument: **De Dicto Reading**
c. `[`x_1`{it's raining, it's not raining}] [I know: [`x_1`]]`
Existential takes two arguments: **De Re Reading**

7 The Form of the Antecedent

In the foregoing I've talked quite a bit about the syntax and semantics of sluices on disjunctions. In conclusion, I'd like to talk about the form of the correlate.

Based on the theory we have in its current form, we have a full analysis of sluices on *embedded* disjunctions, of the form

(83) Mary wants p or q, but I don't know which ~~[[{p, q}$_1$] Mary wants t_1.]~~

But of course the disjunction needs no surface embedding to license sluicing:

(84) p or q, but I don't know which.

What ramifications, if any, does our story about sluicing put on the analysis of the simple disjunctive sentence, "p or q"?

I think the answer is substantive. If we set propositional sluices aside and look at the rest of the phenomena in the sluicing world, it is a striking fact that sluicing is prohibited unless there is a syntactically indefinite antecedent. This is true even when a pragmatic interpretation is readily available, as two examples from Reinhart illustrate:

(85) a. *Lucie knew already that they appointed **Max**. Still, she didn't tell me who.
b. Lucie knew already that they appointed **Max**. Still, she didn't tell me who they appointed.

(86) a. *If you know already that **everyone** objected to your proposal, there is no point in asking who.
b. If you know already that **everyone** objected to your proposal, there is no point in asking who did.
(Reinhart, 1997, pg. 20)

As Reinhart notes, this is something of an outstanding puzzle. It seems that, in order for sluicing to be licensed, the *wh*-word must be adjoined to syntax that is distinctive to indefinites. But once QR applies to the "everyone" in (86), there is no remaining difference between the "everyone" and "someone" versions of the antecedent:

(87) a. Some employee objected to your proposal.
b. `[some employee]`$_1$ `[`e_1 `objected to your proposal].`

(88) a. Every employee objected to your proposal.
b. `[every employee]`$_1$ `[`e_1 `objected to your proposal].`

how, then, can we explain why is sluicing licensed by (87) but not with (88)?

The only proposal I know of in the literature to the question of what distinguishes (87) from (88) syntactically is CLM's. It sits squarely within a certain development of Heim's dynamic system, on which the special semantics of indefinites corresponds to a special syntax. On such a view, "some F" is not a quantificational determiner, because indefinites are free variables. The LF of (87) is just

(89) a. Some employee objected to your proposal.

b. [x_1 `employee`] [e_1 `objected to your proposal.`]

and the LF of the full sentence (89-b) is an *open* formula in which the variable can be bound by a further operator—viz., the *wh* element in a sluice. As Reinhart notes, we will still need some kind of movement, which looks geometrically just like QR, to explain scope ambiguities. But this "raising" is not *quantifier* raising, because the variable being raised is *free*.

Now add back to this story the observation that disjunctions license sluicing. The presence of sluicing on disjunctive correlates suggests that, however we distinguish (87) from (88) syntactically, clausal disjunctions must fall on the former side. More generally, the availability of such sluices encourages the verdict that the parallelism between disjunctions and indefinites must be very tight: disjunctions must be like indefinites not merely (i) the point of view of logic (roughly, from the point of view of our mathematical metalanguage), nor (ii) merely from the point of view of pragmatics (as AnderBois (2010)'s discussion suggests.[14]) Disjunctions must be very similar to existentials *from the point of view of syntax.*

To propose an analysis of unembedded disjunctive antecedents which will work as well as CLM's does, we should pursue an analysis on which a free propositional variable $\mathcal{X}$ occupies D (Heim-style; left tree), or a free choice function variable $\mathfrak{F}$ occupies D (Reinhart-style; right tree):

Figure 3: Speculative syntax for "p or q"

[14]Anderbois suggests that the licensing conditions for sluicing cannot be understood purely in terms of the traditional semantic conception of truth-conditional content. Instead, he argues that the licensing conditions can only be adequately described by using an expanded, essentially pragmatic notion of content: *issues*, or *inquisitive content*, in the sense of Groenendijk & Roelofsen (2009). A compositional calculation of issues works in tandem with a compositional calculation of semantic values:

> Sluicing, we claim, requires ismorphy over both kinds of semantic content, not just truth-conditions. For an interrogative E clause to be elided it must have identical truth conditions *and inquisitive content* as an A clause in previous discourse. (AnderBois, 2010, pg. 457, emphasis added).

This overall position on sluices could be framed, I think, as a deflationary response to the project in this paper. Because AnderBois avails himself of two essentially independent resources—regular, truth-conditional content and richer "inquisitive" content—there is no reason for him to hold that the questions I am asking can be answered given the relatively more limited resources I have tried to use. To this, I think, the best response is simply to see if it can be done. On empirical grounds, AnderBois's analysis has the shortcoming that it cannot account for what CLM call "sprouting"; see AnderBois (2010, pg. 468).

Here, as before, the property contributed by the disjunction is the Disjunctive Adger-Quer predicate, and once again, if we existentially close free variables at text-scope, in Heimain fashion, we recover the classical truth-conditions of disjunction.

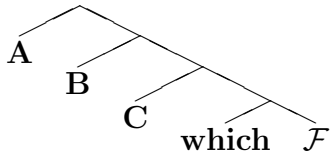
I have proposed such an analysis to philosophers before, but it has met with sharp resistance, on the following grounds. On this analysis—suggested by Figure 3—disjunctions are syntactically like indefinite NPs. But we cannot assert bare NPs:

(90) a. *[$_{NP}$ The proposition that snow is white.]
b. *[$_{NP}$ A proposition expressed by "snow is white."]

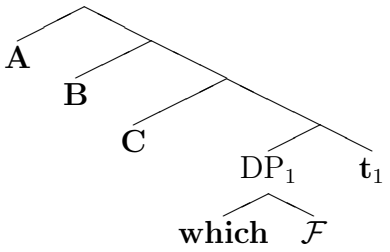
These NPs denote propositions—true ones at that—but they are still not fit objects of assertion. Hence we seem to have a bit of a paradox: can we reconcile the evidence that disjunctions quite literally *are* indefinites with the manifest fact that they are assertables, and therefore *not* NPs? Perhaps the only thing to say here is that disjunctions are special, in that they have both the properties of propositions and the properties of NPs in this regard. I close simply by noting that this is no logical contradiction.

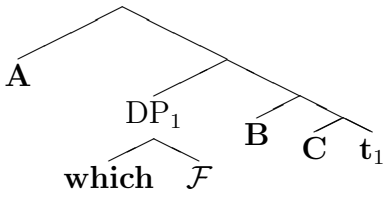
Appendix A: Short and Long Movement

Our schematic for long vs. short movement begins with an SS like this:



where the determiner "which," which requires two arguments, is type-mismatched in situ. Short movement is on the left, long movement is on the right.





Appendix B: Derivations for (78-c) and (78-b)

Repeated:

(79-b) I know [whether it's raining or not raining]$_1$ [1 t_1].

(79-c) [whether it's raining or not raining]$_1$ I know t_1.

Since we're in a highly compressed framework, I make use of the following conventions and assumptions:

1. I assume without delving further that $[\![$**which C**$_{[+Q]}$ $[p$ **or** $q]]\!]$ denotes the Adger-Quer predicate: $\lambda\varphi \in D_{st}$. True$_w(\varphi) \wedge [(\varphi = p) \vee (\varphi = q)]$.
   (Adger and Quer use Hamblin semantics (Hamblin, 1973) to derive this result; see ibid., pg. 119.)

2. Clauses like "I know p" express propositions in D_γ, rather than truth-values in D_t. I implement this compositionally by assuming:

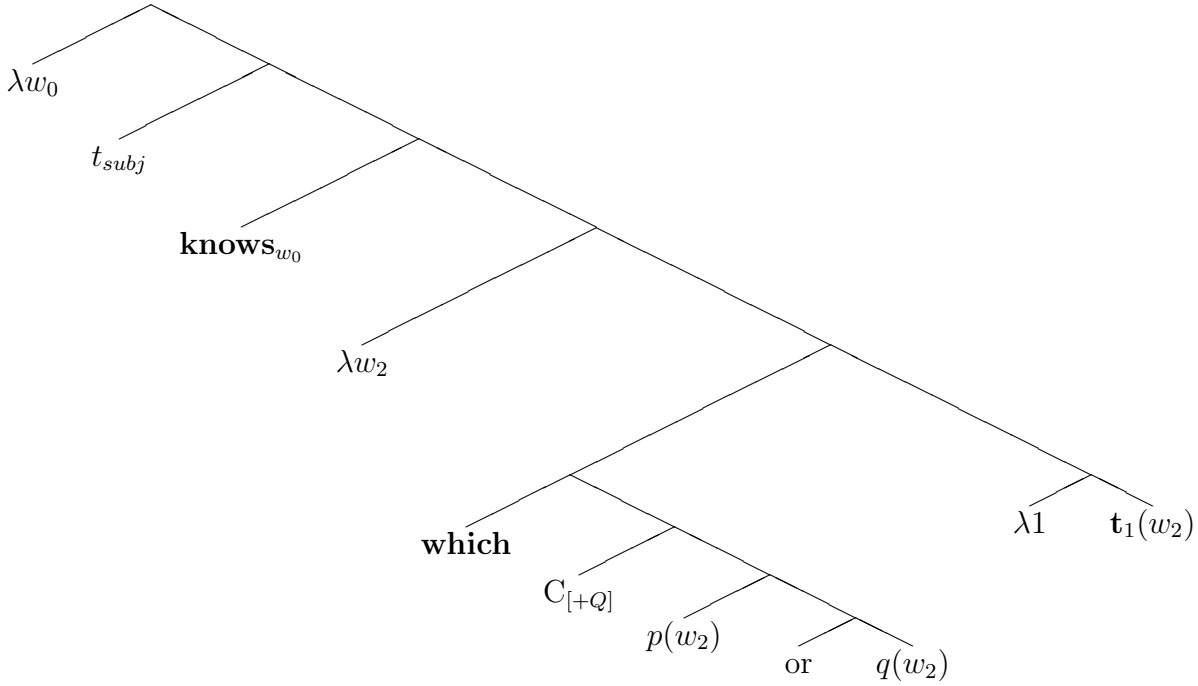
   - there are world-variables in the syntax, implicit in predicates like "knows," which I therefore write "knows$_{w_0}$" (Percus, 2000).
   - clauses are topped by λw_o binders which induce λ-abstraction over worlds of evaluation.

3. γ is an abbreviation for the semantic type $\langle s, t\rangle$: viz., the semantic type of propositions.

4. $\mathbf{t}_1$, $\mathbf{t}_2$, $\mathbf{t}_3$ are object language variables over propositions.

5. $p, q, r...$ will be syncategorematic variables over propositions.

(79-b)



1. $[\![\mathbf{t}_1(w_2))]\!]^g$ = by FA, Traces Rule
   $(g(t_1))(w_2) = 1$

2. $[\![[\lambda 1\ \mathbf{t}_1(w_2))]]\!]^g$ = by PA
   $\lambda\varphi \in D_{st}\ .\ \varphi(w_2)$
   viz., $\lambda\varphi \in D_{st}\ .\ \mathrm{True}_{w_2}(\varphi)$

3. $[\![[\mathrm{C}_{[+Q]}\ p \text{ or } q]]\!]^g$ = by Lexicon
   $\lambda\varphi \in D_{s,t}\ .\ \mathrm{True}_{w_2}(\varphi) \wedge [(\varphi = p) \vee (\varphi = q)]$

4. $[\![\mathbf{which}]\!]^g$ = by Lexicon
   $\lambda\mathcal{F} \in D_{\gamma,t}\ .\ \lambda\mathcal{G} \in D_{\gamma,t}\ .\ \exists\varphi \in D_{s,t}\colon \mathcal{F}(\varphi) \wedge \mathcal{G}(\varphi)$

5. $[\![\mathbf{which}\ [\mathrm{C}_{[+Q]}\ p \text{ or } q]]\!]^g$ = by FA
   $\lambda\mathcal{G} \in D_{\gamma,t}\ .\ \exists\varphi \in D_{s,t}\colon [\mathrm{True}_{w_2}(\varphi) \wedge ((\varphi = p) \vee (\varphi = q))] \wedge \mathcal{G}(\varphi)$

6. $[\![\mathbf{which}\ [\mathrm{C}_{[+Q]}\ p \text{ or } q]\ [\lambda 1\ \mathbf{t}_1(w_2))]]\!]^g$ = by FA
   $\exists\varphi \in D_{s,t}\colon [\mathrm{True}_{w_2}(\varphi) \wedge ((\varphi = p) \vee (\varphi = q))] \wedge \mathrm{True}_{w_2}(\varphi)$ = (simplifying)
   $\exists\varphi \in D_{s,t}\colon [\mathrm{True}_{w_2}(\varphi) \wedge ((\varphi = p) \vee (\varphi = q))]$

7. $[\![\lambda w_2$ **which** $[\mathrm{C}_{[+Q]}\ p$ or $q]\ [\lambda 1\ \mathbf{t}_1(w_2))]]\!]^g$ = by PA
   $\lambda s\ .\ \exists \varphi \in D_{s,t}$: $[\mathrm{True}_s(\varphi) \wedge ((\varphi = p) \vee (\varphi = q))]$

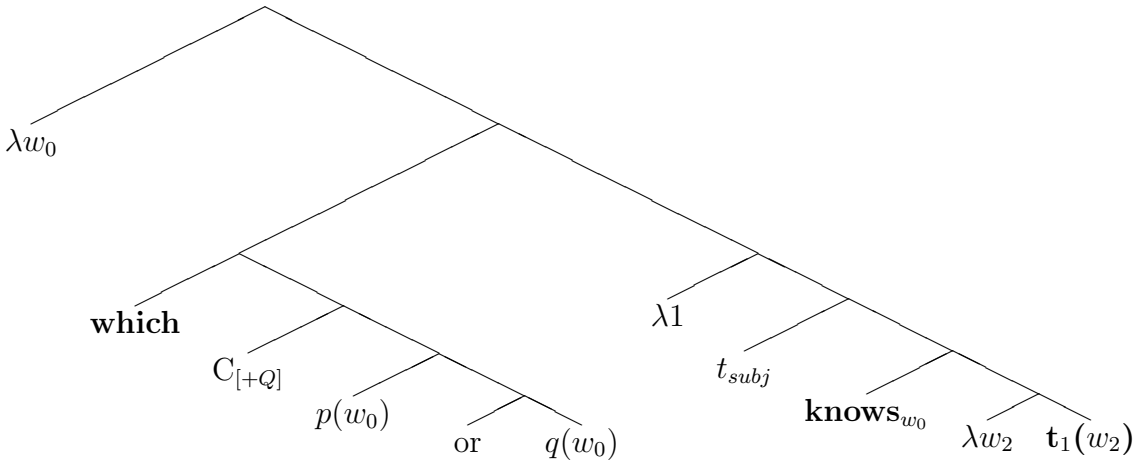
8. $[\![\mathbf{knows}_{w_0}]\!]^g$ = by Lexicon
   $\lambda \varphi \in D_{s,t}\ .\ \lambda x\ .\ \forall s' \in K^x_{w_0}$: $\varphi(s')$

9. $[\![\mathbf{knows}_{w_0}\ \lambda w_2$ **which** $[\mathrm{C}_{[+Q]}\ p$ or $q]\ [\lambda 1\ \mathbf{t}_1(w_2))]]\!]^g$ = by FA, Simplification
   $\lambda x\ .\ \forall s' \in K^x_{w_0}$: $\exists \varphi \in D_{s,t}$: $[\mathrm{True}_{s'}(\varphi) \wedge ((\varphi = p) \vee (\varphi = q))]$

10. $[\![t_{subj}\ \mathbf{knows}_{w_0}\ \lambda w_2$ **which** $[\mathrm{C}_{[+Q]}\ p$ or $q]\ [\lambda 1\ \mathbf{t}_1(w_2))]]\!]^g$ = by FA
    $\forall s' \in K^{subj}_{w_0}$: $\exists \varphi \in D_{s,t}$: $[\mathrm{True}_{s'}(\varphi) \wedge ((\varphi = p) \vee (\varphi = q))]$

11. $[\![\lambda w_0\ (t_{subj}\ \mathbf{knows}_{w_0}\ \lambda w_2$ **which** $[\mathrm{C}_{[+Q]}\ p$ or $q]\ [\lambda 1\ \mathbf{t}_1(w_2)])]\!]^g$ = by FA
    $\lambda s\ .\ \forall s' \in K^{subj}_s$: $\exists \varphi \in D_{s,t}$: $[\mathrm{True}_{s'}(\varphi) \wedge ((\varphi = p) \vee (\varphi = q))]$

(79-b)



1. $[\![\mathbf{t}_1(w_2)]\!]^g$ = by FA, Traces Rule
   $(g(t_1))(w_2)$

2. $[\![\lambda w_2\ \mathbf{t}_1(w_2)]\!]^g$ = by PA
   $\lambda s\ .\ (g(t_1))(s)$

3. $[\![\mathrm{knows}_{w_0}]\!]^g$ = by Lexicon
   $\lambda \varphi \in D_{s,t}\ .\ \lambda x\ .\ \forall s' \in K^x_{w_0}$: $\varphi(s')$

4. $[\![\mathrm{knows}_{w_0}\ \lambda w_2\ \mathbf{t}_1(w_2)]\!]^g$ = by FA
   $\lambda x\ .\ \forall s' \in K^x_{w_0}$: $(g(t_1))(s')$

5. $[\![t_{subj}\ \mathrm{knows}_{w_0}\ \lambda w_2\ \mathbf{t}_1(w_2)]\!]^g$ = by FA
   $\forall s' \in K^{subj}_{w_0}$: $(g(t_1))(s')$

6. $[\![\lambda 1\ t_{subj}\ \text{knows}_{w_0}\ \lambda w_2\ \mathbf{t}_1(w_2)]\!]^g$ = by PA, Simplification
   $\lambda\varphi \in D_{s,t}\ .\ \forall s' \in K_{w_0}^{subj}\colon \varphi(s')$

7. $[\![\textbf{which}]\!]^g$ = by Lexicon
   $\lambda\mathcal{F} \in D_{\gamma,t}\ .\ \lambda\mathcal{G} \in D_{\gamma,t}\ .\ \exists\varphi \in D_{s,t}\colon \mathcal{F}(\varphi) \wedge \mathcal{G}(\varphi)$

8. $[\![[\text{C}_{[+Q]}\ p \text{ or } q]]\!]^g$ = by Lexicon
   $\lambda\varphi \in D_{s,t}\ .\ \text{True}_{w_0}(\varphi) \wedge [(\varphi = p) \vee (\varphi = q)]$

9. $[\![\textbf{which}\ [\text{C}_{[+Q]}\ p \text{ or } q]]\!]^g$ = by FA
   $\lambda\mathcal{G} \in D_{\gamma,t}\ .\ \exists\varphi \in D_{s,t}\colon [\text{True}_{w_0}(\varphi) \wedge ((\varphi = p) \vee (\varphi = q))] \wedge \mathcal{G}(\varphi)$

10. $[\![\textbf{which}\ [\text{C}_{[+Q]}\ p \text{ or } q]\ [\lambda 1\ t_{subj}\ \text{knows}_{w_0}\ \lambda w_2\ \mathbf{t}_1(w_2)]]\!]^g$ = by FA
    $\exists\varphi \in D_{s,t}\colon [\text{True}_{w_0}(\varphi) \wedge ((\varphi = p) \vee (\varphi = q))] \wedge \forall s' \in K_{w_0}^{subj}\colon \varphi(s')$

11. $[\![\lambda w_0\ \textbf{which}\ [\text{C}_{[+Q]}\ p \text{ or } q]\ [\lambda 1\ t_{subj}\ \text{knows}_{w_0}\ \lambda w_2\ \mathbf{t}_1(w_2)]]\!]^g$ = by PA, Simplification
    $\lambda s\ .\ \exists\varphi \in D_{s,t}\colon [\text{True}_s(\varphi) \wedge ((\varphi = p) \vee (\varphi = q))] \wedge \forall s' \in K_s^{subj}\colon \varphi(s')$

References

Adger, David, and Josep Quer (2001). "The Syntax and Semantics of Unselected Embedded Questions." *Language*, 77(1): pp. 107–133.

AnderBois, Scott (2010). "Sluicing as anaphora to issues." In *Proceedings of SALT 20*.

Elbourne, Paul (2005). *Situations and Individuals*. MIT Press.

von Fintel, Kai, and Sabine Iatridou (2003). "Epistemic Containment." *Linguistic Inquiry*, 34(2): pp. 173–198.

Groenendijk, Jeroen, and Floris Roelofsen (2009). "Inquisitive Semantics and Pragmatics." In *Proceedings of SPR 09*.

Groenendijk, Jeroen, and Martin Stokhof (1982). "Semantic Analysis of *Wh*-Complements." *Linguistics and Philosophy*, 5: pp. 172–233.

Hamblin, C. L. (1973). "Questions in Montague English." *Foundations of Language*.

Heim, Irene, and Angelika Kratzer (1998). *Semantics in Generative Grammar*. Wiley-Blackwell.

Karttunen, Lauri (1977). "Syntax and semantics of questions." *Linguistics and Philosophy*, 1: pp. 3–44.

Laka, Itziar (1990). *Negation in Syntax: On the nature of functional categories and projections*. Ph.D. thesis, MIT.

Laka, Itziar (1994). *On the Syntax of Negation*. Garland.

Marín, Juan Martínez (1985). "Semántica y sintaxis en las 'oraciones interrogativas indirectas' en español." *Linguística*, 2.

Merchant, Jason (2001). *The Syntax of Silence*. Oxford University Press.

Moore, G. E. (1993). *G. E. Moore: Selected Writings*. Routledge.

Payne, John, Geoffrey Pullum, Barbara Scholz, and Eva Berlage (2013). "Anaphoric *One* and Its Implications." *Lanugage*, 89(4): pp. 794–829.

Percus, Orin (2000). "Constraints on Some Other Variables in Syntax." *Natural Language Semantics*, 8: pp. 173–229.

Reinhart, Tanya (1997). "Quantifier Scope: How labor is divided between QR and choice functions." *Linguistics and Philosophy*, 20: pp. 335–397.

Rooth, Mats, and Barbara Partee (1982). "Conjunction, Type Ambiguity, and Wide Scope "Or"." In *Proceedings of the First West Coast Conference on Formal Linguistics*, Stanford Linguistics Association.

Ross, John Robert (1969). "Guess Who?" In R. Binnick, and et al (eds.) *Proceedings of the Sixth Annual Meeting of the Northeastern Linguistics Society*.

Thráinsson, Hoskuldur (1979). *On complementation in Icelandic*. Garland.

Uribe-Extebarria, Myriam (1994). *Interface licensing conditions on PSIs: A theory of polairty and tense interactions*. Ph.D. thesis, University of Connecticut, Storrs.