Mention Some Readings

1. Introduction

Goal

To learn something about "mention some" readings and to see if what we learn has implications for the syntax and semantics of questions.

(1) Where can we get gas in Cambridge?
mention some (MS)
Specify one location where we can get gas.
mention all (MA)
Specify all locations where we can get gas.

Plan

1. To explain the two approaches to MS that George (2011) entertains.
2. To present arguments that only one of these approaches is viable.
3. To argue for an alternative.

George, like G&S, treats *wh*-phrases as predicate abstractors. But for him, just like Hamblin and Karttunen, questions end up denoting sets of propositions. I, like Karttunen, will treat *wh*-phrases as indefinites and have question start out life as sets of propositions. But I think this difference is not going to be crucial for understanding much of what George says. (There will, however, be a few places where the difference will matter, and I will try to single those out.)

2. George's Theory 1 (Ambiguity everywhere, Chapter 2)

Basic idea: Questions denote sets of propositions and an answer to a question is any member of the set. The difference between MS and MA pertains to the presence or absence of an operator that takes an ordinary Hamblin denotation and turns it into a partition of logical space.

(2) **Answerhood condition**: p is a (complete) answer to Q in w if $p \in [\![Q]\!]$ and $w \in p$

(3) $[\![C_{int}]\!] = \lambda p_{\alpha}.\lambda q_{\alpha}.p=q$ (*i.e., the relation of identity*)

(4) MS Reading
who came?
LF:
λp [who λx [[C_{int} p] λw. x $came_w$]]
Denotation (in a world w^0):
$\lambda p.\ [\![someone]\!]^{w0} (\lambda x.\ p = \lambda w.\ x$ came in w) (*$[\![someone]\!] = [\![who]\!]$*)
In set notation $\{\lambda w.\ x$ came in w: $x \in [\![person]\!]^{w0}\}$

To get the MA reading we introduce a new morpheme that takes a set of propositions and returns a new set which is a partition of logical space (or of the common ground).

(5) $[\![X]\!] = \lambda Q \lambda p\ \exists w[p=$
$\lambda w' \forall q \in Q[w' \in q \leftrightarrow w \in q]]$

Homework:

a. Show that (5) is point-wise Functional Application of *Ans-strong*(Q) to the set W (the set of all possible worlds).
b. What is the difference between (5) and (5)' below
(5)' $[\![X]\!] = \lambda Q \lambda p\ \exists q \in Q[p=Exh(Q)(q)]$
(*Where $Exh(Q)(q) = \lambda w[w \in q\ \&\ \forall q' \in Q[w \in q \rightarrow q \subseteq q']]$*

(6) MA Reading
who came?
LF:
$[X\ \lambda p\ [who\ \lambda x\ [[C_{int}\ p]\ \lambda w.\ x\ came_w]]]$
Denotation (in a world w^0):
$[\![X]\!](\ \{\lambda w.\ x \text{ came in } w: x \in [\![person]\!]^{w0}\ \}) =$
$\{p: \exists w[p=$
$\lambda w'\ \forall x \in [\![person]\!]^{w0}\ [x \text{ came in } w' \leftrightarrow x \text{ came in } w]]$

2.1. Advantages of Theory 1

a. A very simple theory of the ambiguity
b. Provides a simple theory of question embedding (inspired by Egré and Spector)
c. Gives us a way to think about the difference in question embedding between *know* and *surprise*.

A verb of type <st, α> cannot embed a question. However, there are verbs that appear to take as sisters both question and proposition denoting constituents (e.g., *know*, *remember*, *tell*, *agree (on)*, *certain (about)*, *surprised at*, so called responsive verbs). According to George's approach, combining a responsive verb with a question requires existential closure.

2.1.1. *know*-type verbs select for an MA reading

(7) John knows who came.
LF:
$\exists\ [X\ \lambda p.\ who_x\ C\ p\ [x\ came]]$
$\lambda p.$ John knows p

paraphrase:
there is a specification of who came and who didn't, s.t. John knows this specification

Given the veridicality of *know*, this ends up equivalent to the claim that John knows the correct specification of who came and who didn't (E&S)

In order to capture the fact that *know*-type verbs select for an MA reading, we can say that they C-select either for a *that* or an X headed maximal projection.

2.1.2. *surprise*-type verbs select for an MS reading

(8) John is surprised by who came.
LF:
$\exists$ [λp. who$_x$ C p [x came]]
λp. John is surprised by p

paraphrase:
there is a proposition p of the form x came, s.t. John is surprised that p.

George claims that this is a correct paraphrase. In particular, he points out that it captures Heim's (1994) observation that the sentence would be false if the only past expectation of John's that came out false is that some person, say Mary, wouldn't come.

In order to capture the fact that *surprise*-type verbs select for an MS reading, we can say that they C-select either for a *that* or a Q headed XP.

2.2. Disadvantages of Theory 1

a. Doesn't capture the limited distribution of MS readings (pointed out by George).
b. Not clear (to me, at least) that it provides a viable way of thinking of the *surprise*/*know* contrast.

2.2.1. MS is rather limited in distribution

(9) a. Who are some of your friends? (MS, (*)MA)
b. Who are your friends? (*MS, MA)

This is an example that George presents [as an argument against the claim of van Rooij's (2004) that the MS/MA ambiguity is entirely pragmatic (resolved entirely by the goals and interests of speaker and hearer)]. See also Groenendijk and Stokhof (1984).

Here are a few other examples:

(10) a. Who did some of your friends vote for? (MS, (*)MA)
b. Who did your friends vote for? (*MS, MA)

(11) a. Where can we get gas? (MS, MA)
b. What gas stations are open now? (*MS, MA)

(12) Imagine that there was no gas in the Boston area for a couple of days (say…the aftermath of a storm). Imagine, further, that Josh got a huge tank truck and delivered gas to various gas stations.
a. Where can we get gas? (MS, MA)
b. Where did Josh deliver gas? (*MS, MA)

2.2.2. Doesn't seem like the right theory of *know*

(13) a. John knows where we can get gas. (MS, MA)
b. John knows what gas stations are open now. (*MS, MA)

2.2.3. Doesn't seem like the right theory of *surprise*

(14) John is surprised that p.
Conveys:
Via presupposition: John currently believes p.
Via assertion: In the past John expected the negation of p.

(15) John is surprised by who came.
George's paraphrase:
there is a proposition p of the form x came, s.t. John is surprised that p.

Collapsing assertion and presupposition should convey:
There is a person such that John currently believes that this person came and in the past expected this person not to come.

Too permissive (on the presuppositional component): John needs to have learned the MA answer to the question who came.

This is E&S's judgment, which I share.

(16) a. John is surprised by where we can get gas. (MS, MA)
b. John is surprised by what gas stations are open now. (*MS, MA)

According to my judgments, (16)a does not necessarily convey that John, at the present moment, has an MA opinion on where we can get gas. (16)b, by contrast, does. (George reports the opposite judments on (16)b; he doesn't consider a comparison with a sentence such as (16)a that has an MS reading in isolation).

3. George's Theory 2 (Chapter 6)

X is always present, but existential quantifiers can outscope X. To have a scope position for the existential quantifier, we need to provide X with both its arguments (Q and p). For the sake of notational familiarity, I will provide the two arguments of X in the apposite order.

(17) $[\![X]\!] = \lambda p \lambda Q\ \exists w[p= \lambda w' \forall q \in Q[w' \in q \leftrightarrow w \in q]]$

(18) Who did some of your friends vote for?
LF_1
$\lambda p.\ [[X\ p][\lambda p'.\ who_x\ [C_{int}\ p']\ [\lambda w.$ some of your friends voted for x in w]]]
LF_2
$\lambda p.$ some of your $friends_y$ $[[X\ p][\lambda p'.\ who_x\ [C_{int}\ p']\ [\lambda w.$ y voted for x in w]]]

(19) $[\![LF_1]\!]$ =
$\{p: \exists w[p=$
$\lambda w'\ \forall x \in [\![person]\!]^{w0}$ [some of your friends voted for x w' $\leftrightarrow$
some of your friends voted for x in w]]

(20) $[\![LF_2]\!]$ =
$\{p: \exists y \in [\![your\ friends]\!]^{w0}\ \exists w[p=$
$\lambda w'\ \forall x \in [\![person]\!]^{w0}$ [y voted for x w' $\leftrightarrow$
y voted for x in w]]

Homework (somewhat open ended):
Provide syntactic assumptions that would explain the fact that *which of your friends voted for whom*, receives a different interpretation from that of *who did some of your friends vote for.*

3.1. Advantage of Theory 2

a. Accounts for the dependence of MS on existential quantification.
b. Continues to provide a simple theory of question embedding.

3.2. Disadvantages of Theory 2

a. Doesn't provide an account of the *surprise*/*know* contrast (not necessarily a disadvantage)
b. Doesn't extend to existential modals

(21) Tell me where we can get gas.

-Extential modals are not known to QR and take inverse scope.
-Under my implementation of George's theory (in contrast to his own), even if we treated existential modals as quantifiers that move, we would not be getting a coherent representation.

c. Under my implementation of George's theory (in contrast to his own), the MS reading, even when it works, seems too strong: an MS answer to (18) is predicted by (20) to specify the identity of the voter, not only of the people voted for.

d. There seems to be differences between existential modals and existential quantifiers, which might suggest that a different account is called for.

(22) a. How fast did one of your friends drive?
MS possible: For one of your friends, how fast did he drive.
b. How fast can you drive on this highway?
MA: what is the maximal allowed speed?
*MS: For some allowed world what is your sped in that world?

(23) a. At which station did one of your friends get gas?
MS possible: For one of your friends, x, at which gas station did x get gas
b. At which station can you get gas?
MA: what is the unique gas station where you can get gas?
*MS: For some allowed world, w, what is the unique gas station where you get gas station at w?

3.3. New Prediction of Theory 2 (additional rather significant advantage)

Theory 2, in contrast to Theory 1, predicts an effect of exhaustivity/MA even in MS readings. Specifically, it predicts that given a choice of an individual (which the existential quantifier quantifiers over) the answer would have to be complete.

(24) Imagine an election where each voter must specify a list of 4 people (say for four different positions).
Tell me who one of your friends voted for.
(must specify 4 people)

Likewise for existential modals

(25) Imagine that we need to form a committee with 3 members one of which would be chair.
a. I know who can chair this committee, John.
b. I know who can serve on this committee, John, Bill and Fred

Goal: to preserve the advantages of theory 2 without the disadvantages.[1]

4. First stab -- Distributivity in trace positions (reconstruction of plural *wh*-phrases)

4.1. Reminder of Dayal's *Ans*

Recall the system we had with *Ans* instead of *X*.

(26) who came?
LF:
Ans λp [who λx [[C_{int} p] λw. x $came_w$]]
meaning (with *someone* interpreted de re):
$[\![$Ans$]\!]$ ({λw. x came in w: x a person or people in w^0})

[1] There is a potential advantage that theory 1 has over theory 2 which I will not discuss: George discusses the problem of "non reducibility" in MS readings (chapter 4) in the terms of theory 1. I haven't studied the question of whether an equally satisfying proposal can be restated in the terms of theory 2 or the alternative I'm proposing.

(27) a. $[\![\text{Ans-Weak}_{\text{Dayal}}]\!] = \text{Max}_{\text{inf}} =$
$\lambda Q.\lambda w: \exists p\,(w \in p \in Q \;\&\; \forall p' \in Q\,[w \in p' \to p \subseteq p'].$
$(\iota p)(w \in p \in Q \;\&\; \forall p' \in Q\,[w \in p' \to p \subseteq p'].$

b. $[\![\text{Ans-Strong}_{\text{Dayal}}]\!] = \lambda Q.\lambda w.\lambda w'\,[\text{Max}_{\text{inf}}(Q)(w) = \text{Max}_{\text{inf}}(Q)(w')]$

This would not capture MS readings.

4.2. Modification of Dayal's *Ans*

In order for this to be possible, we will take *Ans* to denote a function from Q and w not to a proposition but to a set of propositions, the set of maximality informative true answers to Q in w (those proposition in p that are true and are not asymmetrically entailed by other propositions in Q).

(28) a. $[\![\text{Ans}_s\text{-Weak}]\!] = \text{Max}_s =$
$\lambda Q.\lambda w: \exists p\,(w \in p \in Q \;\&\; \neg\exists p' \in Q\,[w \in p' \to p' \subset p].$
$\{p: w \in p \in Q \;\&\; \neg\exists p' \in Q\,[w \in p' \to p' \subset p]\}.$

b. $[\![\text{Ans}_s\text{-Strong}]\!] = \lambda Q.\lambda w\{\lambda w'\,[p \in \text{Max}_s(Q)(w')]: p \in \text{Max}_s(Q)(w)\}$
$= \lambda Q.\lambda w\{\lambda w'\; w' \in p \;\&\; \forall p' \in Q[p' \subset p \to w' \notin p]:$
$p \in \text{Max}_s(Q)(w)\text{Max}_s(Q)(w)\}$
$= \lambda Q.\lambda w\{\text{Exh}(Q)(p): p \in \text{Max}_s(Q)(w)\}$
(*under one definition of Exh, weaker than the one given in (5)'*)

The choice between MS and MA will be determined by whether or not Ans_s delivers a singleton proposition.

Homework: provide the definition of *exh* which would yield the last identity statement in (28)a

4.3. Reconstruction of plural *wh*-phrases

4.3.1. *Who can chair this committee?*

(29) Who can chair this committee?
LF_1: $\text{Ans}_s\ \lambda p$ [who λX [[C_{int} p] λw. can_w [X $\cancel{\text{each}}$] chair this committee]]
LF_2: $\text{Ans}_s\ \lambda p$ [who λX [[C_{int} p] λw. [X $\cancel{\text{each}}$] λy can_w y chair this committee]

(30) Meaning of silent *each* (simplified)
$[\![\text{each}]\!](X_e) = \lambda P_{et}.\forall y \in \text{ATOM}(X)(P(y)=1)$
$\text{ATOM}(X) = \{y: y \leq x \text{ and } y \text{ is atomic}\}$

(31) Denotations for (29) in w^0:
$[\![LF_1]\!]^{w0} = [\![\text{Ans}_s]\!](\{\Diamond(\forall y \in \text{ATOM}(X)[\text{chair}(y, \text{comm.})]: X \in [\![\text{Pl(person)}]\!]^{w0}\}(w^0)$
$[\![LF_2]\!]^{w0} = [\![\text{Ans}_s]\!](\{\forall y \in \text{ATOM}(X)\Diamond[\text{chair}(y, \text{comm.})]: X \in [\![\text{Pl(person)}]\!]^{w0}\}(w^0)$

Assume that in w^0 there are three people each of which can chair this committee: p_1, p_2, p_3.

(32) Denotations for (29) in w^0:

$[\![LF_1]\!]^{w0} = [\![Ans_s]\!](\{\Diamond(\forall y\in ATOM(X)[chair(y, comm.)]:X \in [\![Pl(person)]\!]^{w0}\}(w^0)$
$= \{\Diamond(\forall y\in ATOM(p_1)[chair(y, comm.)], \Diamond(\forall y\in ATOM(p_2)[chair(y, comm.)]$
$[\Diamond(\forall y\in ATOM(p_3)[chair(y, comm.)]\}$
$= \{\Diamond([chair(p_1, comm.)], \Diamond([chair(p_2, comm.)], \Diamond([chair(p_3, comm.)]\}$

$[\![LF_2]\!]^{w0} = \{\forall y\in ATOM(p_1+p_2+p_3)\Diamond[chair(y, comm.)]\}$

(*to save ink computed based on Ans_s-Weak*)

(33) **Answerhood condition**: Let Q be a denotation of a question in w. p is a (complete) answer to Q in w, if $p\in Q$

4.3.2. *Who can serve on this committee?*

(34) Who can serve on this committee?

LF_1

Ans_s λp [who λX [[C_{int} p] λw. can_w [X ~~each~~] serve on this committee]

LF_2

Ans_s λp [who λX [[C_{int} p] λw. [X ~~each~~] λy can_w y serve on this committee]

(35) Denotations for (34) in w^0:

$[\![LF_1]\!]^{w0} = [\![Ans_s]\!](\{\Diamond(\forall y\in ATOM(X)[serve\text{-}on(y, comm.)]:X \in [\![Pl(person)]\!]^{w0}\}(w^0)$

$[\![LF_2]\!]^{w0} = [\![Ans_s]\!](\{\forall y\in ATOM(X)\Diamond[serve\text{-}on(y, comm.)]:X \in [\![Pl(person)]\!]^{w0}\}(w^0)$

Assume that in w^0 there are two possible committees one consisting of p_1, p_2, p_3, and the other of p'_1, p'_2 , p'_3:

(36) Denotations for (34) in w^0:

$[\![LF_1]\!]^{w0} = [\![Ans_s]\!](\{\Diamond(\forall y\in ATOM(X)[serve\text{-}on(y, comm.)]:X \in [\![Pl(person)]\!]^{w0}\}(w^0)$
$=\{\Diamond(\forall y\in ATOM(p_1+p_2+p_3)[serve\text{-}on(y, comm.)]),$
$\Diamond(\forall y\in ATOM(p'_1+p'_2+p'_3)[serve\text{-}on (y, comm.)])\}$

$[\![LF_2]\!]^{w0} = \{\forall y\in ATOM(p_1+p_2+p_3+ p'_1+p'_2+p'_3)\Diamond[serve\text{-}on (y, comm.)]\}$

Homework: Explain why:

a. $\Diamond(\forall y\in ATOM(p'_1+p'_2)[serve\text{-}on (y, comm.)])$ is not a member of $[\![LF_1]\!]^{w0}$.

b. $\Diamond(\forall y\in ATOM(p_1+p_2+p_3+ p'_1+p'_2+p'_3)[serve\text{-}on (y, comm.)])$
is not a member of $[\![LF_1]\!]^{w0}$.

4.3.3. *Who did some of your friends vote for?*

(37) Who some of your friends voted for?

LF_1

Ans_s λp [who λX [[C_{int} p]
λw. some of your friends λY [X ~~each~~] λx [Y ~~each~~] $voted_w$ x]

LF_2

Ans_s λp [who λX [[C_{int} p]
λw. [X ~~each~~] λx some of your friends λY [Y ~~each~~] $voted_w$ x]

(38) Denotations for (37) in w^0:

$[\![LF_1]\!]^{w0} = [\![Ans_s]\!](\{\exists Y\in (friends)\forall y\in ATOM(Y)\ \mathbf{\forall x\in ATOM(X)}[voted\text{-}for(y, x)]:$
$X \in [\![Pl(person)]\!]^{w0}\}(w^0)$

$[\![LF_2]\!]^{w0} = [\![Ans_s]\!](\{\mathbf{\forall x\in ATOM(X)}\ \exists Y\in (friends)\forall y\in ATOM(Y)[voted\text{-}for(y, x)]:$
$X \in [\![Pl(person)]\!]^{w0}\}(w^0)$

Assume that there is an election for three different positions, and that in w^0 your friends John and Mary each voted for p_1, p_2, and p_3, your friends Fred and Sue each voted for p'_1, p'_2, and p'_3:

(39) Denotations for (37) in w^0:

$[\![LF_1]\!]^{w0} = [\![Ans_s]\!](\{\exists Y\in (friends)\forall y\in ATOM(Y)\ \mathbf{\forall x\in ATOM(X)}[voted\text{-}for(y, x)]:$
$X \in [\![Pl(person)]\!]^{w0}\}(w^0)$
$= \{\exists Y\in (friends)\forall y\in ATOM(Y)\ \forall x\in ATOM(p_1+p_2+p_3)[voted\text{-}for(y, x)],$
$\exists Y\in (friends)\forall y\in ATOM(Y)\ \forall x\in ATOM(p'_1+p'_2+p'_3)[voted\text{-}for(y, x)]\}$

$[\![LF_2]\!]^{w0} = [\![Ans_s]\!](\{\mathbf{\forall x\in ATOM(X)}\ \exists Y\in (friends)\forall y\in ATOM(Y)[voted\text{-}for(y, x)]:$
$X \in [\![Pl(person)]\!]^{w0}\}(w^0)$
$= \{\forall x\in ATOM(p_1+p_2+p_3+p'_1+p'_2+p'_3)\ \exists Y\in (friends)\forall y\in ATOM(Y)$
$[voted\ for(y, x)]\}$

5. Two Differences between QR (George's account) and reconstruction

5.1. Degree Questions

5.1.1. Reconstruction makes the right prediction for existential modals

(40) How fast can this car drive?
MS impossible

Hamblin denotation
$\{\Diamond(Speed(this\ car) \geq d: d\ a\ degree\}$
This is a set of proposition closed under conjunction (in fact a scale, totally ordered by entailement). Hence, it always contains a unique maximally informative true proposition. Hence, no MS reading.

George's account, as we presented it, cannot derive MS for existential modals. His system is different: it allows him to deal with MS for existential modals (if he treats existential modals as quantifiers that can move). I will not go over his system, and will just point out that it makes the wrong predictions here, for essentially the same reasons that it makes the right predictions for indefinites.

5.1.2. QR makes the right prediction for indefinites

(41) How fast did one of your friends drive?
MS possible: For one of your friends, how fast did he drive.

Hamblin denotation with reconstruction

$\{\lambda w \exists f(\mathrm{Speed}_w(f) \geq d$: d a degree$\}$
This is a set of proposition closed under conjunction. Hence (if it at all contains a maximally informative true proposition), it will contain a unique maximally informative true proposition. Prediction of reconstruction: no MS reading.

(42) How fast did one of your friends drive?
LF with QR
λp. some of your friends$_y$ [[X p][$\lambda p'$. How$_d$ [C_{int} p'] [λw. y drove d fast in w]]]
Denotation in w^0
$\{\lambda w.\mathrm{Speed}_w(f) = d$: d a degree $f \in [\![$one of your friends$]\!]^{w0}\}$

5.2. Different parts of the same plural individual

When X and X'<X both can serve as an exhaustive answer (for different choices of individuals/worlds), reconstruction and QR make different predictions.

5.2.1. Reconstruction makes the right prediction for existential modals

(43) What can I buy in your store for 5 dollars or less?

Imagine that there are all sorts of groups of things that can together be purchased for 5 dollars or less:
Group 1: C_1, C_2, and C_3;
Group 2: C'_1, C'_2, and C'_3.
…

Prediction of Reconstruction: if *C_1, C_2, and C_3* is an answer on the MS reading, then *C_1 and C_2* is not.
Reason: $\Diamond[\exists d(5 \geq d)$ (buy(you, $C_1 + C_2 + C_3$, d dollars)$] \Rightarrow$
$\Diamond[\exists d(5 \geq d)$ (buy(you, $C_1 + C_2$, d dollars)$]$

I think this is a good prediction.[2]

Again, George's account makes the wrong predictions here for essentially the same reasons that it makes the right predictions for indefinites.

5.2.2. George makes the right prediction for indefinites

(44) What did someone buy in your store for 5 dollars or less?

Imagine that there is a client in your store that bought C_1 C_2 and C_3 together for 5 dollars, and that another client bought C1 and C2 together for 3 dollars. It seems that there are two MS answers here. This is predicted by George, but not by the reconstruction account.

[2] I think that I have different judgments for *who can serve on this committee*. I have no explanation for this fact. One could derive the different judgments by embedding an exhaust operator below the modal, but why should there be a difference between the examples?

Homework: explain why

Obvious Conclusion: We need to allow indefinites to QR outside of the question nucleus and this must be one way of getting an MS reading. However, we also need another way of deriving MS reading: (plural) *wh*-phrases should be able to reconstruct below an existential quantifier and this could be the other way of getting an MS reading.

-Where reconstruction is unavailable or fails to get an MS reading (degree questions, entailment across individuals), MS will only be possible for indefinites.
Missing piece: assumptions about syntax and semantics that would allow both the reconstructed and the QRed meaning to be derived.

6. Reconstruction + QR

(45) $[\![X_s]\!] = \lambda p \lambda Q\ \exists w[p \in [\![\text{Ans}_s\text{-Strong}]\!](Q)(w)]$

We can now have both our reconstruction structures and structures with the indefinite QRing above X_s, as in (47).

Homework:
a. Derive truth conditions for the two LFs in (46):

(46) Who can chair this committee?
LF_1
λp' [X_s p'] λp [who λY [[C_{int} p] λw. can_w [Y ~~each~~] chair this committee]
LF_2
λp' [X_s p'] λp [who λY [[C_{int} p] λw. [Y ~~each~~] λz can_w z chair this committee]

b. Derive truth conditions for the three LFs in (47):

(47) Who some of your friends voted for?
LF_1
λp' [X_s p'] λp [who λY [[C_{int} p]
λw. some of your friends λZ [Y ~~each~~] λx [Z ~~each~~] $voted_w$ x]
LF_2
λp' [X_s p'] λp [who λY [[C_{int} p]
λw. [Y ~~each~~] λx some of your friends λZ [Z ~~each~~] $voted_w$ x]
LF_3
λp' some of your friends λY [X_s p'] λp [who λZ [[C_{int} p]
λw. [Z ~~each~~] λx [Y ~~each~~] $voted_w$ x]

c. Explain why we can't use Ans_s-weak in (45). Hint: essentially the reason why E&S (and George following them) had to base their semantics on Ans-Strong.

Further Prediction:
(48) **The QR anti-Reconstruction correlation**
Evidence for QR should be attested iff reconstruction is blocked

6.1. Scope relative to operators in the Question nucleus.

(49) **Reconstruction; two MS readings**
What must a/one player in this math team know?
MA: List all of the things that must be known by a player
$MS_{\exists>must}$: For one player, List all of the things that the player must know.
$MS_{must>\exists}$: Provide one complete list such that there is a requirement that there be a player who knows everything on that list.

(50) **No Reconstruction; one MS reading**
How tall must a/one player in this team be?
MA: What must be the height of even the shortest player (easier with *a*)
$MS_{\exists>must}$: For one player, what must be his/her hight
($MS_{\exists>must}$: Mention a height such that there is a requirement that there be a player who is that tall)

6.2. Scope relative to X_s

Test: will the answer to the question have to specify the identity of an individual in the domain that the indefinite quantifies over?

(51) **Reconstruction not blocked; two MS readings**
I know where some people bought gas?
MA: I know the list all of the places in which people bought gas
$MS_{\exists>X}$: There are some people, such that I know where they bought gas.
$MS_{X>\exists}$: I know of a particular place that it is a place where people bought gas.

Suppose there are 10 people around who have bought gas at various places. I believe John and Bill bought gas at Shell on Mem. Drive and Fred and Sue bought gas at Mobile. In fact, it was the other way around: John and Bill bought gas at Mobile while Fred and Sue bought gas at Shell. Can (51) be true?

(52) **No Reconstructions; one MS readings**
I know how fast some people drove?
MA: I know the speed at which even the slowest people drove.
$MS_{\exists>X}$: There are some people, such that I know the speed at which they drove.
($MS_{X>\exists}$: I know of some speed that there are people who drove at that speed.)

Suppose there are 10 people around who have driven at various speeds. I believe John and Bill drove at 60 Mph and Fred and Sue drove at 50 Mph. In fact, it was the other way around: John and Bill drove at 50 Mph while Fred and Sue drove at 60 Mph. Can (52) be true?

In search of other tests for reconstruction/QR
For example, in West Ulster English, a floating quantifier *all* can be stranded by *wh*-movement (McCloskey 2000). Would stranding below an existential force reconstruction? Would stranding above force anti-reconstruction? If so, standing above should block MS for existential modals, and yield the QR signature for indefinites. (Predictions will change if the proposal in section 8 is adopted.): *(Fred knows) who could all serve on this committee*; **Who could all chair this committee*.

Homework:
Spell out predictions in detail.
Spell out the way the predictions change with the proposal in section 8.

7. But…Uniqueness

(53) Which boy came?
Denotation in w^0:
$[\![\text{Ans}]\!]$ ({λw. x came in w: x a person in w^0})(w^0)

This is defined in w^0 only if there is a unique boy who came. If no boy comes, there will be no true member in the Hamblin denotation. If two boys come, there will not be a true member in the Hamblin denotation which entails all other true members.

But if we move to Ans_s (or X_s), there is no longer a requirement to have a single member that entails all true members. All that's needed is that every true member be entailed by a maximally informative true member (one that is not entailed by any other true member). We thus loose our account of the uniqueness presupposition.

Homework: Do we loose the account of negative islands provided in Fox and Hackl (2006)? Can you distinguish cases of Maximality Failure (in the sense of my SALT 2007 paper) that would be eliminated by the move to Ans_S from cases that would not?

8. Modification of Ans_s

8.1. Conjecture

(54) **MS via reconstruction and higher types:**
MS readings (when QR is not available) involves a *wh*-phrase of a higher type, one that quantifies over generalized quantifiers (argued for in Spector 2008)

(55) What are you required to read for this class?
a. War and Peace or Brothers Karamazov. (required>or; or >required)
b. Three Russian books. (required>3; 3 >required)
c. Madame Bovary
and W&P or BK (required> or; or>required)

(56) John knows what we are required to read for this class?
War and Peace or Brothers Karamazov. (required>or; or >required)

(57) John knows what we are required to read for this class?
War and Peace or Brothers Karamazov. (required>or; or >required)

8.2. Spector's Proposal

(58) LF for *required > or* (before application of *X*/*Ans*)
λp. What^R λQ C p λw. required$_w$ Q λx. [you to read x for this class]?

Where Q is a variable ranging over GQs and *what*^{R} is an existential quantifier over UM quantifiers over the domain of *what*.

(59) $[\![\text{what}^R]\!]^{w0}$
$= \lambda\varphi_{ett,t}\ \exists Q_{et,t}$. Q is upward monotone & Q lives on $[\![\text{PL(thing)}]\!]^{w0}$ & $\varphi(Q)=1$

(60) $Q_{et,t}$ lives on A_{et} iff $\forall B_{et}\ (B\in Q \rightarrow (A\cap B)\in Q)$

(61) Alternatively
$[\![\text{what}^R]\!]^{w0}$
$= \lambda\varphi_{ett,t}\ \exists Q_{et,t}$. Q is the conjunction of universal and existential quantification over a subdomain of $[\![\text{PL(thing)}]\!]^{w0}$ & $\varphi(Q)=1$

(62) possible syntactic derivation of what^R:
$[\![TS]\!](P_{et}) = \lambda Q_{et,t}.\exists x \in P.\ Q = \lambda P P(x)$ (pointwise application of a familiar type-shift)
$Closure_{\vee\wedge}(P_{\alpha,t})$ = the closure of P under $\vee,\wedge$

what = wh PL(thing)
what^R = wh $Closure_{\vee\wedge}$ TS PL(thing)

(63) An alternative view of the logical form (what moves is something smaller than the *wh*-phrase):
Wh λP_{et} required $\exists$(PL(thing) $\cap$ P) λx. [you to read x for this class]?

(64) **Possible way to distinguish different views of the logical form**
a. What books from his library did John plan on reading?
War and Peace or Brothers Karamazov. ?(required>or; or>required)
b. What books from John's library did he plan on reading?
War and Peace or Brothers Karamazov. ?(required>or; or>required)

If the conjecture in (54) is correct, we can understand the non-availability of MS for singular *which* questions by observing that quantification over higher types is not available for *which* questions.

(65) Which book are you required to read for this class?
War and Peace or Brothers Karamazov. (*required>or; or >required)

8.3. A modification of Dayal's *Ans*

(66) $[\![\text{Ans-Weak}_D]\!]\ (Q)(w) = (\iota p)(p \in Q\ \&\ w \in Exh(Q)(p))$
(67) $Exh(Q)(p)(w) = 1$ iff $w \in p$ and $\forall p' \in Q(w \in p' \rightarrow p \subseteq p')$

This is, of course, just another way of writing Dayal's operator (what we have written in (27)a). But this equivalence will not hold, in the general case, if we modify *Exh* to allow for free choice (see Fox 2007).

(68) Free Choice:
You are allowed to have cake or ice cream.
$Exh(Q)(\Diamond(C \vee IC)) = \Diamond(C)\ \&\ \Diamond(IC)\ \&\ \neg\Diamond(C\ \&\ IC)$

$[Q = \{\Diamond(C \vee IC), \Diamond(C), \Diamond(IC), \Diamond(C\ \&\ IC)\}]$[3]

[3] To account for the optionality of the inference $\neg\Diamond(C\ \&\ IC)$ we can appeal to the pruning of alternatives. The inference disappears if the alternative $\Diamond(C\ \&\ IC)$ is considered to be irrelevant. Such pruning is consistent with the constraint argued for by Fox and Katzir (2011), a constraint crucial for understanding the impossibility of a conjunctive inference when the set of formal alternatives is closed under conjunction.

(69) $Exh(Q)(p) = \lambda w.$ p is the strongest proposition in Q which is true in w and does not involve any arbitrary choice among members of Q.[4] I.e.

$= \lambda w.\ p =$ the strongest proposition in
$\{q: w \in q \in Q\ \&\ \forall q' \in Q[(w \in q'\ \&\ \neg q \subseteq q') \rightarrow \exists q'' \neq q(w \in q''\ \&\ \neg q \subseteq q'')]$

$Exh(Q)(p) = \lambda w.\ w \in p\ \&$
p is the strongest proposition in Q entailed by every member of $Max_s(Q)(w)$.[5]

8.4. Modification of *Ans$_S$*

In order for the conjecture in (54) to follow, we will consider a minimal modification of (66)

(70) a. $[\![\text{Ans-weak}_s]\!] = \lambda Q \lambda w: \exists p \in Q\ w \in Exh(Q)(p).$
$\{p \in Q:\ w \in p\ \&\ p \subseteq (\iota p)(p \in Q\ \&\ w \in Exh(Q)(p)]\ \}$
b. $[\![\text{Ans-strong}_s]\!] = \lambda Q.\lambda w\{\lambda w'\ [p \in [\![\text{Ans-weak}_s]\!]\ (Q)(w')]:$
$p \in [\![\text{Ans-weak}_s]\!]\ (Q)(w)\}$

8.5. Illustration (*Who can chair this committee?*)

(71) Who can chair this committee?
LF_1 (before application of Ans_s)
λp [who λX C p $\lambda w.$ can_w [X ~~each~~] chair this committee]
LF_2
λp [who λX C p $\lambda w.$ [X ~~each~~] λy can_w y chair this committee]
LF_3
λp [who^R λQ C p $\lambda w.$ can_w [Q chair this committee]]

(72) Denotations for (71) in w^0 (after application of Ans_S):
$[\![LF_1]\!]^{w0} = [\![Ans_s]\!](\{\Diamond(\forall y \in ATOM(X)[chair(y, comm.)]:X \in [\![Pl(person)]\!]^{w0}\}(w^0)$
$[\![LF_2]\!]^{w0} = [\![Ans_s]\!](\{\forall y \in ATOM(X)\Diamond[chair(y, comm.)]:X \in [\![Pl(person)]\!]^{w0}\}(w^0)$
$[\![LF_3]\!]^{w0} = [\![Ans_s]\!](\{\Diamond[Q(\lambda x.chair(x, comm.))]:Q \text{ UM GQ over } [\![Pl(person)]\!]^{w0}\}(w^0)$

Assume that in w^0 there are three people who can chair this committee p_1, p_2, p_3.

(73) Denotations for (71) in w^0 (with Ans-weak_s)
$[\![LF_1]\!]^{w0} = [\![Ans_s]\!](\{\Diamond(\forall y \in ATOM(X)[chair(y, comm.)]:X \in [\![Pl(person)]\!]^{w0}\}(w^0)\})$
undefined since for no $p \in Q$ is $w^0 \in Exh(Q)(p)$
(*where Q is $\{\Diamond(\forall y \in ATOM(X)[chair(y, comm.)]:X \in [\![Pl(person)]\!]^{w0}\}$*)
$[\![LF_2]\!]^{w0} = \{\forall y \in ATOM(p_1+p_2+p_3)\Diamond[chair(y, comm.)]\}$
$[\![LF_3]\!]^{w0} = \{p \in Q: w^0 \in p\ \&\ p$ entails

[4] Throughout the use of the definite article is meant to save ink. The definition should be understood based on a Russilinan interpretation of the meta language, e.g. the first line of (69) is shorthand for *λw. there is a unique proposition q. s.t q is the strongest proposition such that….and p=q.*
[5] An alternative would be to apply *Exh* recursively up to a fixed point based on the definition in Fox (2007).

$[\Diamond[(\text{chair}(p_1, \text{comm.})) \vee (\text{chair}(p_2, \text{comm.})) \vee \Diamond(\text{chair}(p_3, \text{comm.}))]\}$

Homework:

Explain why $[\![LF_3]\!]^{w0}$ is close to delivering the MS reading, but not quite there. In particular, explain why we need to compute with Ans-strong$_s$

8.6. Advantage

Explains differences between *which* questions and other *wh* questions, based on the observation that only the latter can quantify over higher type traces.

8.6.1. Uniqueness

-explains uniqueness with *which* questions – reduces it to the independent (though unaccounted for) observation that *which* questions, at least in the singular case, do not allow the higher type reading

(74) Which book are we required to read?
W&P or BK (*required>or; or >required)

(75) Which books are we required to read?
The Russian books or the French boos ((*)required>or; or >required)

8.6.2. MS

-Provides an explanation (exactly the same explanation) for the fact that *which* questions don't have MS readings (via reconstruction).

(76) a. At which gas station(s) can we get gas? (*MS; MA)
b. Where can we get gas? (MS; MA)

8.6.3. QR anti-Reconstruction Correlation

-Provides an explanation of the fact that with indefinites the contrast in (76) disappears:

(77) a. At which gas station(s) did someone you know get gas? (MS; MA)
b. Where did someone you know get gas? (MS; MA)

-But then diagnostics of QR should emerge (based on the QR anti-reconstruction correlation)

(78) **Reconstruction; two MS readings**
What must a/one player in this math team know?
MA: List all of the things that must be known by a player
$MS_{\exists>must}$: For one player, List all of the things that the player must know.
$MS_{must>\exists}$: Provide one complete list such that there is a requirement that there be a player who knows everything on that list.

(79) **No Reconstruction; one MS reading**
Which proof must a/one player in this team know?
MA: state the unique proof that must be known by a player
$MS_{\exists>must}$: For one player, state the unique proof that he must know.
($MS_{must>\exists}$: Provide one example of a proof such that there is a requirement that there be a player who knows that proof.)

Homework:
State and test other predictions (along the lines of the discussion in section 6). You might also want to consider the potential test for reconstruction in (64), and whether you think it might be relevant, as well as the relevance of *all* stranding in WUE.

8.6.4. A problem for Dayal resolved

Allows us to explain another apparent counter-example to Dayal's presupposition

(80) a. (#)I know who came. No one did.
b. #I know which boy(s) came. No one did.

In (80)a, the existence presupposition can be circumvented by quantification over higher types. Ans_S does not lead to an existence presupposition, with Spector's LF.

Homework: explain why

9. A note on *surprise* vs. *know*

Since we did not adopt Theory 1, we might want to discuss what alternative perspectives there might be on the *surprise*/*know* contrast.

One perspective is Heim's (1994), according to which there are two notions of Ans: Ans_w and Ans_s and it is the job of an embedding responsive predicate to stipulate the relevant notion: *know* stipulates Ans_s and *surprise* stipulates Ans_w.

I would like to pursue a more general predictive proposal (inspired by Egré and Spector's observation about the presupposition of *surprise*).

In this discussion I will not worry about MS readings. But I think everything I say can be modified by moving to the Ans_S version of Ans-strong and Ans-weak.

(81) **The evaluation of every responsive verb appeals both to Ans_w and to Ans_s:**
Let S_{int} be a question with Hamblin denotation Q:
$J\ V\ S_{int}$ is true in w^0 iff

$$\exists w\ [\ [\![v]\!](\text{Ans-strong}(Q)(w))([\![J]\!]^{w0})(w^0) =1]\ \&$$
$$[\![v]\!](\text{Ans-weak}(Q)(w))([\![J]\!]^{w0})(w^0) =1]$$

9.1. *know*-type verbs.

If a responsive verb is upward entailing in its propositional argument, then

$$\exists w\ [\ [\![v]\!](\text{Ans-strong}(Q)(w))([\![J]\!]^{w0})(w^0) =1]\ \&$$

$[\![v]\!](\text{Ans-weak}(Q)(w))([\![J]\!]^{w0})(w^0) =1]$

is equivalent to

$\exists w\ [\ [\![v]\!](\text{Ans-strong}(Q)(w))([\![J]\!]^{w0})(w^0) =1]$

Hence we think *know* makes use of *Ans-strong*

9.2. *surprise*-type verbs.

If a responsive verb is downward entailing in its propositional argument, then

$\exists w\ [\ [\![v]\!](\text{Ans-strong}(Q)(w))([\![J]\!]^{w0})(w^0) =1]\ \&$
$[\![v]\!](\text{Ans-weak}(Q)(w))([\![J]\!]^{w0})(w^0) =1]$

is equivalent to

$\exists w\ [\ [\![v]\!](\text{Ans-weak}(Q)(w))([\![J]\!]^{w0})(w^0) =1]$

Hence, when we ignore the presuppositional component, we think that *surprise* makes use of Ans-weak. (I know of no question embedding verb which is downward entailing when presuppositions are not ignored).

But, we predict that we will see the effects of Ans-stong on the presuppositional component. As claimed by E&S, *John is surprised at who came* should lead to the inference that John learned who came.

9.2. *Discover*-type verbs.

Discover is the mirror image of *surprise.* It is upward entailing on the assertive component and downward entailing on the presuppositional component.

We, therefore, predict Ans-strong to give us the right results on the assertive component and Ans-weak to give us the right results on the presuppositional component: the mirror image of *discover*.

Evidence that this is the case.

(82) John discovered who came

(82) clearly leads to the inference that John knows who came (in the strong sense). However, Ans-strong does not give us the full picture.

(83) John is the president of a company with four vice presidents Fred, Sue, Jane, and Paul. Yesterday Fred and Sue met in secret to conspire to oust John. John has spies in Fred and Sue's office who informed him in advance that the meeting would take place and that Fred and Sue would be there and that they are trying to get Jane and Paul to come as well. Today John learned that Jane and Paul both refused to attend the meeting.

a. Today John discovered that Jane and Paul did not attend the meeting. TRUE
b. Today John discovered who attended the meeting. NOT TRUE
c. Today John discovered who did not attend the meeting. TRUE

Homework: Restate the proposal made here so that it is consistent with our account of MS.

10. Q-Particle Drop (Miyagawa 2001, Yoshida 2012)

11. Back to multiple *wh* questions and pair-list readings