The Semantics of Questions – Introductory remarks

1. Goals for this class

(1) a. Which boy (among John, Bill and Fred) read the book?
Uniqueness presupposition (UP): exactly one boy came to the party.
b. Which boy (among John, Bill and Fred) read which book?
No UP (at least under one reading).

1. To account for the distribution of UPs (taking Dayal's (1996) account of UP in (a) as a starting point, rejecting her account of (b), and instead providing a way to generalize from (a) to (b) based on the assumption (common in the literature and elsewhere in Dayal) that multiple questions can denote second order questions.
2. To discuss potential ramifications for quantificational variability in questions.
3. To discuss similarities between the properties of (1)b and pair-list readings that arise through universal quantification (of, e.g., *which book did every boy read?*)
4. To discuss constraints on pair list readings: the fact that they arise only with universal quantifiers, though other quantifiers seem to be able to outscope questions when they are embedded (Szabolsci 1997).
5. To draw consequences for superiority, and in particular exceptions to superiority (given the perspective of Golan 1993)
6. To discuss consequences for the distribution of covert *wh* movement.

2. Goals for today

1. To introduce Groenendijk & Stokhof's (G&S's) assumption about the meaning of questions.
2. To develop a modification of Karttunen's system that yields G&S's semantics (by embedding K's CPs under an *Ans* operator).
3. To introduce Dayal's notion of *Ans* and explain why it makes the right prediction for (1)a, but the wrong prediction for (1)b.
4. To discuss a possible account for constraints on pair-list reading (goal 4 above) within G&S's approach to the semantics of questions (an account which I will later have to reject).

3. Two very basic desiderata for the semantics of questions

a. To distinguish between appropriate and inappropriate answers to a question.
b. To account for the truth conditions of sentences that embed questions, e.g. *John knows who came*.

4. Questions denote their complete true answer (G&S)

(2) Possible Hypothesis:
a. The meaning of an indicative sentence is a recipe for determining *a truth value based on facts* (a function from worlds to truth values, a.k.a. a proposition)
b. The meaning of a question is a recipe for demining *an answer based on facts* (a function from worlds to propositions, if an answer is a proposition).

(3) **Question Intension**
$[\![\text{who came}]\!] =$
λw.
the proposition that serves as the (complete) true answer to the question *who came* in w.

(4) **Question Extension**
$[\![\text{who came}]\!]^{w} = [\![\text{who came}]\!]\,(w)$ = the proposition that serves as the …

What is the proposition that serves as the (complete) true answer to the question *who came*? There are a few approaches here, but first let's see how the general perspective might provide a framework for meeting the two basic desiderata:

(5) a. S is an appropriate response to a question Q by a speaker x if S is the strongest sentence such that for all w compatible with x's beliefs, $[\![Q]\!]^{w} \subseteq \{w: [\![S]\!]^{w} = 1\}$

a'. S is an appropriate response to a question if S is not a tautology and $\exists w\,([\![Q]\!]^{w} \subseteq \{w: [\![S]\!]^{w} = 1\}$.
Equiv. if S is not a tautology and it's logically possible for there to be an individual x such that S is an appropriate response to Q by x

b. $[\![\text{John knows who came}]\!]^{w} = 1$ iff $[\![\text{knows}]\!]^{w}([\![\text{who came}]\!]^{w})([\![\text{John}]\!]^{w}) = 1$

Issue to return to: non-veridical predicates such as *John is certain who came*, *John and Mary agree on who came*. Here we might adopt Egré and Spector's position. Here's a simplificaiton

(6) Let V be a verb of type <st,et>:
$[\![\text{x V who came}]\!]^{w} = 1$ iff $\exists w' [\![V]\!]^{w}([\![\text{who came}]\!]^{w'})([\![\text{John}]\!]^{w}) = 1$

5. Two options for complete answer[1]

(7) Ans-Weak:
$[\![\text{who came}]\!]^{w0} = \lambda w$
$\forall p \in \{\text{that x came: x is a person in } w^0 \text{ and x came in } w^0\}[p(w)=1]$
$=\lambda w$
$\forall p \in \{\text{that x came: x is a person in } w^0 \text{ and x came in } w^0\}[p(w)=p(w^0)]$

Ans-strong:[2]
$[\![\text{who came}]\!]^{w0} =$
$\lambda w \forall p \in \{\text{that x came: x is a person in } w^0\}[p(w) = p(w^0)]$

[1] Based on Heim (1994)
[2] I am ignoring the reading that would result from the *de-dicto* interpretation of the *wh*-phrase. See Rullmann and Beck (1999), Sharvit (2002) and references therein.

6. Karttunen's assumptions about the syntax semantics interface[3]

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

In order to avoid any appeal to a special composition rule (or a special meaning for a *wh*-feature), we will assume that one argument of q is saturated by a variable bound by a lamda abstractor:

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

(10) who read what?
LF:
λp [who λx what λy [[C_{int} p] λw. x $read_w$ y]]
Denotation (in a world w^0):
$\lambda p.\ [\![\text{someone}]\!]^{w0}(\lambda x.\ [\![\text{something}]\!]^{w0}\ \lambda y\ p = \lambda w.\ x \text{ read } y \text{ in } w)$
In set notation $\{\lambda w.\ x \text{ read } y \text{ in } w: x \text{ a person in } w^0 \text{ and } y \text{ is a thing in } w^0\}$

(11) Question: How do we get the variable p and abstraction over p?
Possible answers:
a. Movement of a semantically vacuous element (as in the formation of relative clauses), which leaves a trace of type st.
b. Movement of an operator which takes question denotations as its argument.

So questions denote a set of propositions, not the complete true answer (which we've assumed is a proposition)

7. Karttunen meets G&S

Let's enrich the logical form by introducing the operator *Ans*. And for the sake of explicitness, let's assume that *Ans* is the operator that is base generated in the argument position of C_{int} and moves to yield lambda abstraction

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

(13) a. $[\![\text{Ans-Weak}]\!] = \lambda Q.\lambda w.\lambda w'.\forall p \in Q[p(w)=1 \rightarrow p(w')=1]$
b. $[\![\text{Ans-Strong}]\!] = \lambda Q.\lambda w.\lambda w'.\forall p \in Q[p(w)=p(w')]$

[3] Based on various class notes of Irene Heim's.

(14) Resulting Meanings

a. **Ans-Weak:**

$\lambda w.\lambda w'.\forall p\in(\{\lambda w.\ x \text{ came in } w: x \text{ a person in } w^0\})$
$[p(w)=1\rightarrow p(w')=1]$

a. **Ans-Strong:**

$\lambda w.\lambda w'.\forall p\in(\{\lambda w.\ x \text{ came in } w: x \text{ a person in } w^0\})$
$[p(w)=p(w')]$

Advantages of Ans-Strong:

1. Provides the right meaning for sentences such as *John knows who came*.
2. We can provide so called negative responses to questions (e.g., *John didn't come* in response to *who came?*). Under *Ans-Weak* (in conjunction with (4)a) they should not be appropriate.

   More generally, G&S show that the notion of a partition (of logical space, or the common ground) is a useful tool in describing what is relevant given a question. The meaning in (14)b (in contrast to (14)a) provides a partition of logical space [into equivalence classes], which we might think of as a more suitable question meaning.

   Homework: Show that (14)b is an equivalence relation, whereas (14)a is not.

3. Makes it possible for us to adopt Egré and Spector's account of non-veridical predicates.

   Homework:
   -Show that (6) is way too weak under *Ans-Weak*.

Advantages of Ans-Weak (Heim 1994):

Might provide the right meaning for sentences such as *John was surprised by who came*.

For alternatives to Heim's perspectives on *surprise*, see Egré and Spector 2007, and George 2011.

8. Dayal's notion of *Ans*

8.1. An Account of the uniqueness presupposition of (1)a (bad result for (1)b)

(1)a. Which boy (among John, Bill and Fred) came to the party?
Uniqueness presupposition (UP): exactly one boy came to the party.

This presupposition is triggered by *Ans*.

(15) a. $[\![\text{Ans-Weak}_{\text{Dayal}}]\!] = \text{Max}_{inf} =$
$\lambda Q.\lambda w: \exists p\in Q\ (p = [\![\text{Ans-Weak}]\!]\ (Q)(w)).\ [\![\text{Ans-Weak}]\!]\ (Q)(w)$

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

We thus predict a UP for all *wh*-questions with singular restrictors:

(16) a. $[\![\text{which girl came}]\!]^{w0} = \{\lambda w.\ x \text{ came in } w: x\in[\![\text{girl}]\!]^{w0}\}$
b. $[\![\text{which girl read which book}]\!]^{w0} =$
$\{\lambda w.\ x \text{ read } y \text{ in } w: x\in[\![\text{girl}]\!]^{w0}\ \&\ y\in[\![\text{book}]\!]^{w0}\}$

Conclusion: Good result for simple *wh*-questions. Bad result for multiple *wh*-questions.

8.2. An Account of neagive islands and their obviation

Abrusán (2007), Abrusán and Spector (2012), Fox and Hackl (2006), Schwarz and Shimoyama (2010).

(17) *How much money did you not bring to the US
Q = {λw. you did not bring d much money to the US: d a degree}
$\forall w(\text{Max}_{\text{inf}}(Q)(w)$ is not defined)

(18) How much money are you not allowed to bring to the US
Q = {λw. you are not allowed bring d much money to the US: d a degree}
$\exists w(\text{Max}_{\text{inf}}(Q)(w)$ is defined)

(19) *How much money are you not required to bring to the US
Q = {λw. you are not required to bring d much money to the US: d a degree}
$\forall w(\text{Max}_{\text{inf}}(Q)(w)$ is not defined)

Relevant logical facts (see Fox 2007):

even if $\forall w(\text{Max}_{\text{inf}}(Q)(w)$ is not defined), $\text{Max}_{\text{inf}}(\text{BOX}(Q))(w)$ will still be defined in some world (as long as Q contains a consistent proposition).

If $\forall w(\text{Max}_{\text{inf}}(Q)(w)$ is not defined), then $\forall w(\text{Max}_{\text{inf}}(\text{DIAMOND}(Q))(w)$ is not defined),

Where
BOX(Q) is the result of point-wise composition of Q with a universal modal
$= \{\lambda w.\forall w'(R(w,w') \rightarrow p(w') =1): p\in Q\}$ for some accessibility relation R
DIAMOND(Q) is the result of point-wise composition of Q with an existential modal
$= \{\lambda w.\exists w'(R(w,w')\ \&\ p(w') =1): p\in Q\}$ for some accessibility relation R

General Question to Ask: Is there a language with *Ans* overt? Possibility: Japanese Q-particle (Miyagawa 2001, 2005, Yoshida 2012).

9. Karttunen refuses to meet G&S

For what we've done up to now, it is not necessary to introduce *Ans* into the logical form. We can view *Ans* as part of the pragmatics of answering questions as well as part of the meaning of question embedding predicates. This is the position taken in Heim (1994).

10. Quantifying into questions (G&S)

A possible reason to introduce *Ans* into the LF is that it can provide a landing-site for QR (the one used by G&S to account for pair-list readings)

(20) what did every boy read?
LF:
$\lambda w \lambda w'$ Every boy λx. $Ans_{w,w'}$ λp [what λy [[C_{int} p] $\lambda w''$. x $read_{w''}$ y]]

where (for convenience) *Ans* here is a different currying of Ans-$Strong_{Dayal}$

(21) $[\![Ans]\!] = \lambda w.\lambda w'.\lambda Q.\ [Max_{inf}(Q)(w) = Max_{inf}(Q)(w')]$

11. Szabolsci's Problem and a possible way of dealing with part of it

11.1. Quantifying into matrix questions is restricted

(23)

Who	did *every dog* bite?	OK Fido bit X, Spot bit Y, …
Which boys		OK Fido bit X, Spot bit Y, …
Which boy		% Fido bit X, Spot bit Y, …
What boy		% Fido bit X, Spot bit Y, …

(24)

Who	did *more than two dogs* bite?	* Fido bit X, Spot bit Y, …
Which boys		* Fido bit X, Spot bit Y, …
Which boy		* Fido bit X, Spot bit Y, …
What boy		* Fido bit X, Spot bit Y, …

11.2. Quantifying into embedded questions is not restricted in the same way

(25) a. John found out who/which boys every dog bit. cf. (23)
OK 'John found out about every dog who/which boys it bit'

b. John found out which boy every dog bit.
OK 'John found out about every dog which boy it bit'

(26) John found out which boy more than two dogs bit. cf. (24)
OK 'John found out about more than two dogs which boy each bit'

11.3. A possible explanation

(22) **Constraint on Question**: A question Q is acceptable only if it denotes an equivalence relation.

Intuition: an answer to a matrix question Q is an indication of the cell in the partition induced by Q that the actual world belongs to.

PARTITION = $\lambda Q_{<s,st>}$: Q is an equivalence relation. $\{\lambda w.Q(w)(w'): w'\in W\}$
The function that yields the set of equivalence relations under Q.

(23) Back to (6):
Let V be a verb of type <st,et>:
$[\![x\ V\ Q]\!]^w = 1$ iff $\exists p\in$PARTITION(Q)$[\![V]\!]^w$ (p)($[\![x]\!]^w$) = 1

Homework:

a. Show that
$\lambda w\lambda w'$ Every boy λx. $Ans_{w,w'}$ λp [what λy [[C_{int} p] $\lambda w''$. x $read_{w''}$ y]]
denotes an equivalence relation
b. Show that
$\lambda w\lambda w'$ more than 3 boys λx. $Ans_{w,w'}$ λp [what λy [[C_{int} p] $\lambda w''$. x $read_{w''}$ y]]
does not denote an equivalence relation
assume *more than 3 boys* has a distributive meaning: $[\![$more than 3 boys$]\!]$ = λP_{et}. There is a set B of cardinality 4 such that $\forall b\in B$ P(b)=1.
c. Show that
$\lambda w\lambda w'$ no boy λx. $Ans_{w,w'}$ λp [what λy [[C_{int} p] $\lambda w''$. x $read_{w''}$ y]]
does not denote an equivalence relation
d. Assume that the boys are J B and F and that in w^0 John read W&P, Bill read BK, and Fred read AK (and no body else read anything). What would be the answer in w^0 to the question derived by QR of *no boy* above *Ans*:
$\lambda w\lambda w'$ no boy λx. $Ans_{w,w'}$ λp [what λy [[C_{int} p] $\lambda w''$. x $read_{w''}$ y]]

12. Summary

-There are reasons to believe that at some level we need a function from a set of propositions to its most informative true member – Dayal's *Ans.*
1. *Ans* accounts for negative islands
2. *Ans* accounts for the uniqueness presupposition of *which boy came?*

-If *Ans* is represented at LF, we have a location for QR and thus a possible account for the pair list reading of *which book did every boy read*? We also have a way of thinking about the fact that pair-list arises only with universal quantifiers.

Remaining Questions:
1. What accounts for the disappearance of uniqueness in *which boy read which book*?
2. What is the relationship between the pair-list reading of *which boy read which book* and the pair-list reading of *which book did every boy read*?