Focus and Contrastive Topics in Question Acts

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1. Introduction

A well-known phenomenon: Question/Answer congruence mediated by focus

(1) A: *Who won the first prize?* B: *ED_F won the first prize.*
A: *Which price did Ed win?* B: *Ed won the $FIRST_F$ prize.*

Evidence that wh-constituent is related to focus:

- Realized in focus position (Hungarian),
- focused in wh-in-situ or when part of phrase that underwent wh-movement (Haida 2008).

(2) a. *Ed won WHICH price?* b. *The author of WHICH book won a prize?*

Topic of this talk: Focus in **questions**.

- ➢ In polarity questions; corresponds to cleft focus, realized as *H

(3) A: *Did ED win the first price?* B: *Yes.*
Is it ED who won the first price? B: *No, ANN won the first prize.*
B: #*No.* (incomplete answer)

- ➢ In polarity questions and constituent questions; contrastive topics, L+*H

(4) A: *I want to know which of your students won a prize.*
Did ED win a prize? B: *Yes.*
As for ED, did HE win a prize? B: *No.* (complete answer of this question)

(5) A: *I want to know which prizes our students won.*
Which prize did ED win? B: *ED won the SECond prize.*
As for ED, which prize did he win?

(6) A: *I want to know which of your students won the first prize.*
(#) *Did ED win the first prize?*
As for ED, did HE win the first prize?

For different realizations cf. Tomioka 2010 on Japanese, Kamali & Büring 2011 on Turkish; cf. Constant 2012, 2014

Overview of talk:

- Representation framework for illocutionary acts
- Constituent questions and question/answer congruence
- Embedded polarity questions
- Polarity questions acts, Type A focus and Type B focus in questions
- Appendix: Alternative syntax/semantics mapping

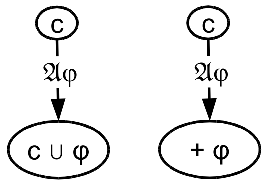
2. A Framework for Illocutionary Acts

Proposal for illocutionary acts (cf. Szabolcsi 1982, Krifka 2014):

- ➢ Illocutionary acts change the world by introducing new commitments;
  hence an act type is a function from worlds to worlds, allowing for speech act embedding.
- ➢ Implementation in terms of change of commitment states and commitment spaces, (Cohen & Krifka 2014), to model the projective character of illoc. acts in conversation.

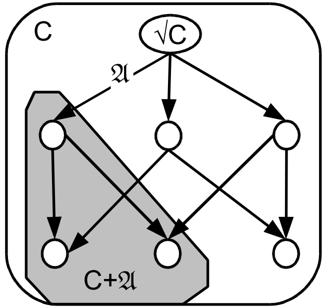
Commitment states are sets of commitments publicly shared by participants, as accrued so far in conversation. This corresponds to the notion of common ground, but contains information about the commitments of speakers, e.g. being responsible for the truth of a proposition.

(7) Update of commitment state c with speech act $\mathfrak{A}_\varphi$: $c + \mathfrak{A}_\varphi = c \cup \varphi$,
where φ: the set of commitments introduced by speech act $\mathfrak{A}_\varphi$;
commitment states should be logical consistent.



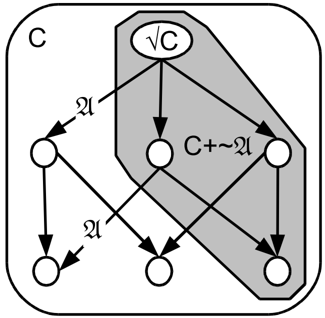
Commitment spaces encompass the preferred or "legal" continuations of a commitment state

(8) C is a Commitment Space (CS) iff
a. C is a set of commitment states (consistent, no contradictions);
b. There is a smallest commitment state in C:
$\exists c \in C\ \forall c' \in C\ [c \neq \emptyset \wedge c \subseteq c']$
This unique c ($= \cap C$) is the **root** of C, written $\surd C$



(9) Update of a commitment space with an illocutionary act $\mathfrak{A}$,
where $\mathfrak{A}$ is defined for commitment states:
$C + \mathfrak{A} = \{c \in C \mid \surd C + \mathfrak{A} \subseteq c\}$

One application for commitment spaces:
Denegation of illocutionary acts (cf. Searle 1969, Hare 1970) expressed as changes of commitment spaces.



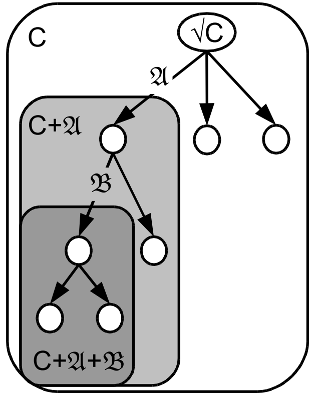
(10) *I don't promise to come* ($\neq$ *I promise not to come*).

(11) Update of a commitment space with the denegation of $\mathfrak{A}$,
a meta speech acts (cf. Cohen & Krifka 2014):
$C + {\sim}\mathfrak{A} = C - [C + \mathfrak{A}]$
Denegation does not change the root of the
input commitment space, but prunes the legal developments, a **meta speech act**.

+ notation shorthand for functional application:

(12) a. $c + \mathfrak{A}_\varphi = \mathfrak{A}_\varphi(c)$, where $\mathfrak{A}_\varphi = \lambda c[c \cup \varphi]$

b. $C + \mathfrak{A} = \mathfrak{A}(C)$, where $\mathfrak{A} = \lambda C\{c \in C \mid \sqrt{C} + \mathfrak{A} \subseteq c\}$



Commitment Space Developments: Record of the history of subsequent commitment states in conversation. Modeled as a stack, a sequence of commitment spaces, called Commitment Space Development (CSD).

(13) Update of a commitment space development with a speech act:

$\langle ..., C\rangle + \mathfrak{A} = \langle ..., C, C+\mathfrak{A}\rangle$

– update the last commitment space of the stack: $C+\mathfrak{A}$

– add this commitment space to the stack.

3. Assertions and Reactions to Assertions

Assertion of a proposition φ by S_1 to S_2

- S_1 expresses public commitment for the truth of proposition φ
- S_1 attempts to make φ part of the common ground.

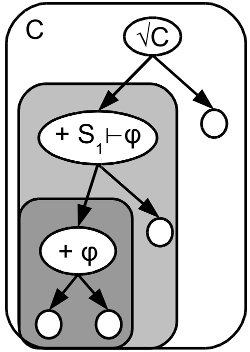
Alternative views:

(14) *Believe it or not, Ed met Beth*.
Problem for assertion as intention of S_1 to make S_2 believe φ, cf. Bach & Harnish 1982

(15) Assertion *I believe that Bill stole the cookie* ≠ Assertion *Bill stole the cookie*.
Problem assertions as expression that S_1 believes φ

(16) # *Ed met Beth, but I don't believe it.*
Moore's paradox appears paradoxical because the joint public commitment to a proposition and to the proposition that one does not believe φ is self-defeating.

Public commitment and social standing: "But if a lie would not endanger the esteem in which the utterer was held, nor otherwise be apt to entail such real effects as he would avoid, the interpreter would have no reason to believe the assertion." – Peirce 1908



Implementation of assertive commitments:

(17) a. Assertive commitments: $S_1 \vdash \varphi$
S_1 is committed to the truth of proposition φ

b. Interpretation of assertion as a sequence of two updates
$\langle ..., C\rangle + S_1 \vdash \varphi + \varphi$
$= \langle ..., C + S_1 \vdash \varphi,$ adding assertive commitment,
$C + S_1 \vdash \varphi + \varphi\rangle$ adding the proposition φ itself

- The move $+ \varphi$ corresponds to the "projected set", $+ S_1 \vdash \varphi$ to the commitments of S_1 in Farkas & Bruce 2011.
- A permanent record is kept for which speaker committed to which proposition.
- φ in a commitment state means that both speakers take φ for mutually granted in conversation, but not that both need to be committed to it in general.

Syntactic realization of assertion, with ForceP with head $\vdash$ (Frege 1879, "Urtheilsstrich")

(18) $[_{\text{ForceP}}\ \textit{Ed}\ [[_{\text{Force}^\circ}\ \vdash\text{-}\textit{met}]\ \ [_{\text{TP}}\ t_{\text{Ed}}\ [_{\text{T}^\circ}\ \underbrace{\text{PAST-}t_{\text{meet}}}_{t_{\text{met}}}\ [_{\text{vP}}\ t_{\text{Ed}}\ t_{\text{meet}}\ \textit{Beth}]]]]]$

(19) Boundary tone L%: part of assertive commitment, cf. Bartels (1997).
Nuclear stress H*: indicates that TP proposition is new in c,
(cf. Pierrehumbert & Hirschberg 1990, Truckenbrodt 2012)

(20) Interpretation of TP as proposition:
$[\![[_{\text{TP}}\ \textit{Ed met Beth}]]\!]^{S1,S2} = \lambda i[\text{Ed met Beth in i}]$,
where first parameter (S_1): speaker, second parameter (S_2): addressee

(21) Interpretation of assertion operator $\vdash$ and prosodic features:
$\langle ..., C\rangle + [\![[_{\text{ForceP}}\ [[_{\text{Force}^\circ}\ \vdash]\ [_{\text{TP}}\ ...]]]]\!]^{S1,S2}$
$= \langle ..., C\rangle + S_1\vdash [\![[_{\text{TP}}\ ...]]\!]^{S1,S2} + [\![[_{\text{TP}}\ \dots\ ]]\!]^{S1,S2}$

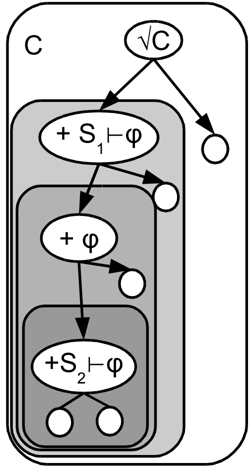
Reactions to assertion:

(22) The part $\langle ..., C\rangle + S_1\vdash \varphi$ is normally accepted, no grammatical means to reject:
A: *Ed stole my cookie.*
B: *Don't say that!* / *Take that back! You will regret it.*

(23) The part $\langle ..., C + S_1\vdash \varphi\rangle + \varphi$ is often explicitly accepted, grammatical means to reject:
A: *Ed stole my cookie.*
B: *Uh-huh.* / *Okay.* / *Yes.* / *No.*

Mechanism of response particles (cf. Krifka 2013, cf. also Farkas & Roelofsen 2012, t.app.):

- TP of antecedent clause introduces a propositional discourse referent,
- Response particles are anaphoric to propositional discourse referents and assert them (or their negation) as speech acts.

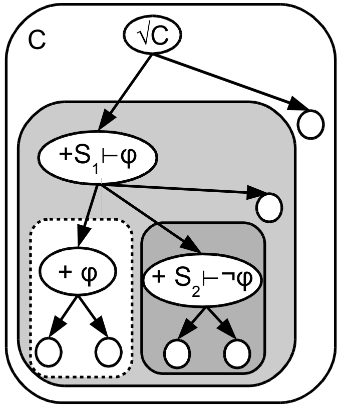


(24) Answer *okay*, *uh-huh*, or no reaction at all:
S_2 accepts the proposed commitment space.
$\langle ..., C + S_1 \vdash \varphi, C + S_1 \vdash \varphi + \varphi \rangle + \text{ACCEPT}^{S2}$
$= \langle ..., C + S_1 \vdash \varphi, C + S_1 \vdash \varphi + \varphi \rangle$

(25) Answer *yes*: S_2 picks up and asserts the same proposition:
$\langle ..., C + S_1 \vdash \varphi, C + S_1 \vdash \varphi + \varphi \rangle + S_2 \vdash \varphi$
$= \langle ..., C + S_1 \vdash \varphi, C + S_1 \vdash \varphi + \varphi, C + S_1 \vdash \varphi + \varphi + S_2 \vdash \varphi \rangle$

(26) Answer *no*: S_2 picks up and negates the same proposition;
for consistency, this requires a previous REJECT operation,
as a common ground c cannot contain both φ and $S_2 \vdash \neg\varphi$:
$\langle ..., C + S_1 \vdash \varphi, C + S_1 \vdash \varphi + \varphi \rangle + \text{REJECT}^{S2} + S_2 \vdash \neg\varphi$
$= \langle ..., C + S_1 \vdash \varphi, C + S_1 \vdash \varphi + \varphi, C + S_1 \vdash \varphi, C + S_1 \vdash \varphi + S_2 \vdash \neg\varphi \rangle$

Note:
$\{S_1 \vdash \varphi, S_2 \vdash \neg\varphi\}$ is consistent, $\{\neg\varphi, S_2 \vdash \varphi\}$ is not consistent.

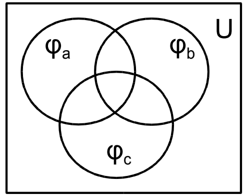


(27) Note that *no* does not itself reject, but enforces a prior rejection;
no rejection in confirming responses to assertion that is negated:
S_1: *Ed didn't meet Beth.*
S_2: *No, he didn't.*

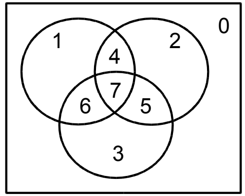
4. Constituent Questions and their Answers

Question radicals: Sets of propositions (Hamblin 1973), used in embedded questions.

(28) $[\![[_{\text{CP}}\, \textit{who}\ [_{\text{TP}}\ \textit{Ed met}\ \text{t}_{\text{who}}]]]\!]^{\text{S1,S2}}$
$= \{\lambda i[\text{Ed stole x in i}] \mid x \in \text{PERSON}\}$
$= \{\lambda i[\text{Ed met Ann in i}], \lambda i[\text{Ed met Beth in i}], \lambda i[\text{Ed med Carla in i}]\}$
$= \{\varphi_a, \varphi_b, \varphi_c\}$



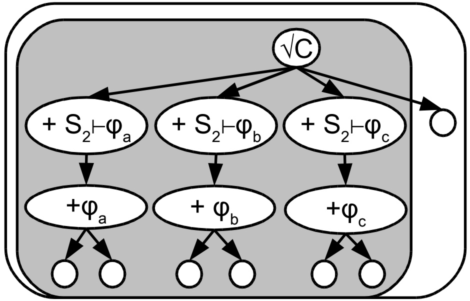
(29) Possible pragmatic exhaustification on this set
by generalized complementary intersection, resulting in a partition
(similar to partition semantics, Groenendijk & Stokhof 1984):
Let M be a set of sets drawn from a universe U,
then $\overline{\cap}\text{M} = \{\text{X} \mid \exists \text{M}' \subseteq \overline{\text{M}}[\text{X} = \cap \text{M}' \wedge \neg \exists \text{M}'' \subseteq \overline{\text{M}}[\cap \text{M}'' \subset \cap \text{M}']]\}$,
where $\overline{\text{M}} = \{\text{X} \mid \text{X} \in \text{M} \vee \overline{\text{X}} \in \text{M}\}$, and $\overline{\text{X}} = \text{U} - \text{X}$
(Without minimization, we get all Boolean combinations.)



$\overline{\cap}\{\varphi_a, \varphi_b, \varphi_c\}$

Example for embedded question radical (without exhaustification, for simplicity)

(30) $[\![[_{TP}\ \textit{Dan knows}\ [_{CP}\ \textit{who}\ [_{TP}\ \textit{Ed met}\ t_{wh}]]]]\!]^{S1,S2}$
$= \lambda i \forall p \in [\![[_{CP}\ \textit{who}\ [_{TP}\ \textit{Ed met}\ t_{wh}]]\!]^{S1,S2}\,[p(i) \rightarrow [\![\textit{know}]\!](i)(p)([\![\text{Dan}]\!])]$
$= \lambda i \forall p \in \{\varphi_a, \varphi_b, \varphi_c\}[p(i) \rightarrow \text{Dan knows that p in i}]$



Question speech acts, ForceP with head operator ?

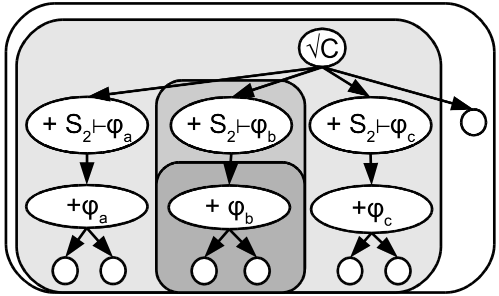
(31) $[_{ForceP}\ \textit{who}\ [_{Force^o}\ ?\text{-}\textit{did}\ [_{CP}\ t_{whot=}\ [_{TP}\ \textit{Ed}\ t_{did}\ \textit{meet}\ t_{who}]]]]]$

Questions as projected assertions for the other speaker, resulting in a meta speech act, with pruned continuations.

(32) $\langle ..., C\rangle + [\![[_{ForceP}\ [[_{Force^o}\ ?]\ [_{CP}\ ...]]]]\!]^{S1,S2}$
$= \langle ..., C, \{\surd C\} \cup \{C{+}S_2{\vdash}p{+}p \mid p \in [\![[_{CP}\ ...]]\!]^{S1,S2}\}\rangle$
$= \langle ..., C, \{\surd C\} \cup \{C{+}S_2{\vdash}p{+}p \mid p \in \{\varphi_a, \varphi_b, \varphi_c\}\}\rangle$

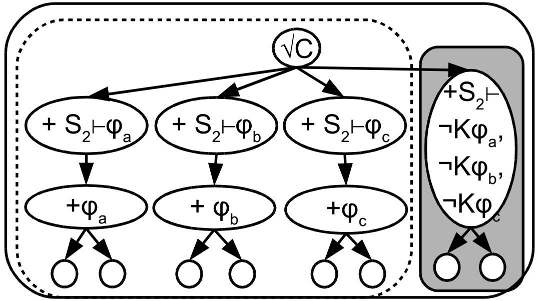
Reactions to questions:

(33) **Fully congruent answer:**
e.g. (32) + $[\![[_{\text{ForceP}}\ [\vdash\ [_{\text{TP}}\ \textit{Ed met Beth}]]]]\!]^{S2,S1}$
$= \langle ..., C,\ \{\surd C\} \cup \{C+S_2\vdash p+p \mid p \in \{\varphi_a,\varphi_b,\varphi_c\}\},$
$\{\surd C\} \cup \{C+S_2\vdash p+p \mid p \in \{\varphi_a,\varphi_b,\varphi_c\}\}+S_2\vdash\varphi_c+\varphi_c\}\rangle$



(34) **Refusal to answer**, e.g.: *I don't know.*
REJECT by S_2,
then assertion of *I don't know who Ed met.*

$(33) + \text{REJECT}^{S2} + S_2\vdash\neg K\varphi_a\wedge\neg K\varphi_b\wedge\neg K\varphi_c$
$= \langle ..., C,\ \{\surd C\} \cup \{C+S_2\vdash p+p \mid p \in \{\varphi_a,\varphi_b,\varphi_c\}\},$
$\{\surd C\} \cup \{C+S_2\vdash p+p \mid p \in \{\varphi_a,\varphi_b,\varphi_c\}\}+S_2\vdash\varphi_c+\varphi_c,$
$C,\ C + S_2\vdash\neg K\varphi_a\wedge\neg K\varphi_b\wedge\neg K\varphi_c\rangle$



REJECT operation necessary, as $S_2\vdash\varphi$ and $S_2\vdash\neg K\varphi$ would lead to an inconsistent commitment state.

(35) **Excluding answers**: *Not Beth.*

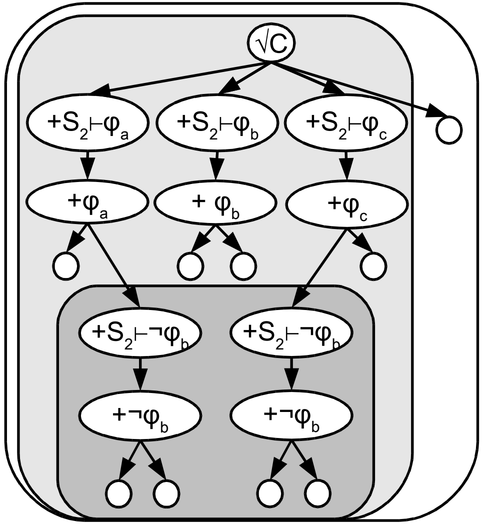
a. Congruent answer after exhaustification;
it follows that Ed met every other person.

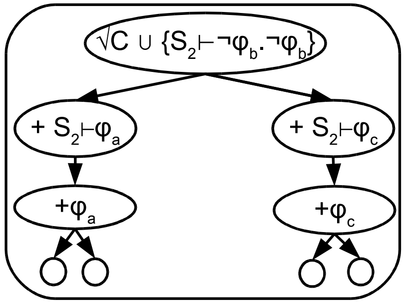
b. Alternatively, a rule to extend the legal moves.

(36) Update with *Ed didn't meet Beth* is possible:
$C' = \{c \in C \mid \surd C + S_2 \vdash \neg\varphi_b + \neg\varphi_b \subseteq c\}$
eliminating one branch ($\neg\varphi_b$) due to inconsistency,
leads to a non-rooted set of commitment states,
which is not a commitment space.

(37) We can assume a "rooting" operation
to create a rooted set of commitment states
by adding intersection of the commitment states:
$\circ C = \{\cap C\} \cup C$

(38) Note that this results in a question meaning:
Who did Ed meet?,
where 'Ed met Beth' has been eliminated,
the remaining questions.





5. Focus and question/answer congruence.

(39) S_1: *Who did Ed meet?* S_2: *Ed met BETH*$_F$

Focus indicates propositional alternatives (Rooth 1992) on TP level

(40) a. $[\![[_{TP}\ \textit{Ed met BETH}_F]]\!]^{S1,S2} = \lambda i[\text{Ed met Beth in i}]$
b. $[\![[_{TP}\ \textit{Ed met BETH}_F]]\!]_f^{S1,S2} = \{\lambda i[\text{Ed met x in i}] \mid x \in \text{THING}\} = \{\varphi_a, \varphi_b, \varphi_c, \varphi_d\}$

Focus indicates illocutionary alternatives on the ForceP level:

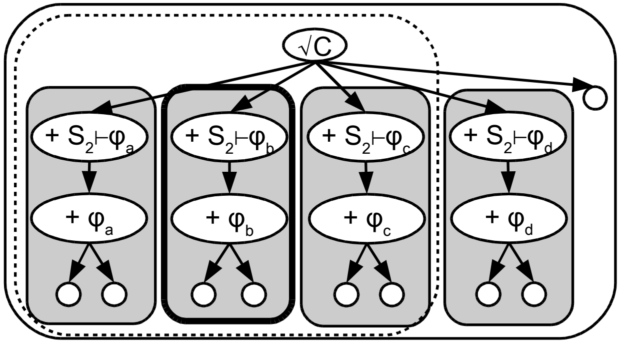
(41) a. $[\![[_{ForceP}\ [\vdash [_{TP}\ \textit{Ed met BETH}_F]]]]\!]^{S1,S2} = +S_1{\vdash}\varphi_b{+}\varphi_b$
b. $[\![[_{ForceP}\ [\vdash [_{TP}\ \textit{Ed met BETH}_F]]]]\!]_f^{S1,S2} = \{+S_1{\vdash}\varphi_a{+}\varphi_a, +S_1{\vdash}\varphi_b{+}\varphi_b, +S_1{\vdash}\varphi_c{+}\varphi_c, +S_1{\vdash}\varphi_d{+}\varphi_d\}$

Pragmatic rule for act $\mathfrak{A}$ with alternatives $\mathfrak{A}_f$:

(42) $C + \mathfrak{A}$ is defined if for every immediate illocutionary act A in C it holds that $A \in \mathfrak{A}_f$.

Simplified: $C - \{\surd C\} \in \cup\{C+A \mid A \in \mathfrak{A}_f\}$

(43) $(32) + [\![[_{ForceP}\ [\vdash [_{TP}\ \textit{Ed met BETH}_F]]]]\!]^{S2,S1}$
defined, as for every immediate act A in (32):
$A \in [\![[_{ForceP}\ [\vdash [_{TP}\ \textit{Ed met BETH}_F]]]]\!]_f^{S2,S1}$



Generation of scalar implicature: **Denegate** every alternative assertion,
notice that this is weaker than the assertion of the negation of the alternative assertions.

Focus-induced alternatives on illocutionary acts may also **accommodate**
an appropriately restricted input commitment space ("implicit questions").

6. Polarity Questions: Question Radicals

Standard account of *whether* questions:

(44) *Dan knows* [*whether Ed came*]
$[\![[_{CP}$ *whether Ed came*$]]\!]$ = {$[\![$*Ed came*$]\!]$, ¬$[\![$*Ed came*$]\!]$},
= {λi[Ed came in i], λi¬[Ed came in i]}

Problem: Standard accounts of questions assign the same denotation:

(45) a. *Dan knows whether Ed came.*
b. *Dan knows whether Ed didn't come.*
b. *Dan knows whether Ed came or not.*

Biezma & Rawlins (2012) propose a different analysis for the embedded questions:

(46) a. $[\![$*whether Ed came*$]\!]$ = λi[Ed came in i],
provided there are salient alternatives, here: λi¬[Ed came in i]
b. $[\![$*whether Ed came or not*$]\!]$: {λi[Ed came in i], λi¬[Ed came in i]}
c. in a., coercion to {λi[Ed came in i], λi¬[Ed came in i]}

(a) proposes a **monopolar** analysis of the embedded question, but (c) transfers this to a standard **bipolar** analysis, by an "anti-singleton coercion" to satisfy the type requirement of the question-embedding verbs. For singleton set accounts cf. also Constant 2012, 2014.

Alternative proposal without coercion:

- *whether* as a set-forming operator, possibly leading to **singleton** sets, **monopolar** reading:

(47) $[\![[_{CP}$ *whether* $[_{TP}$ *Ed came*$]]]\!] = \{[\![$*Ed came*$]\!]\} = \{\lambda i[\text{Ed came in i}]\}$,

- Possible pragmatic strengthening by exhaustification, cf. (29), leading to **bipolar** reading:

(48) $\overline{\cap}\{\lambda i[\text{Ed came in i}]\} = \{\lambda i[\text{Ed came in i}], \lambda i\neg[\text{Ed came in i}]\}$

- Disjunction as set union, as usual; cf. Alternative questions:

(49) $[\![[_{CP} [_{CP}$ *whether Ed came*$]$ *or* $[_{CP}$ *whether Ann came*$]]]\!]$
$= [\![$*whether Ed came*$]\!] \cup [\![$*whether Ann came*$]\!]$
$= \{\lambda i[\text{Ed came in i}], \lambda i[\text{Ann came in i}]\}$

- Pragmatic non-overlap constraint on the elements, possibly due to contrastive focus:

(50) … provided $\lambda i[\text{Ed came in i}] \cap \lambda i[\text{Ann came in i}] = \varnothing$, for indices i in common ground

- Across-the-board wh-movement of *whether*

(51) $[_{CP}$ *whether* $[_{CP}$ t $[$*Ed came*$]$ *or* $[_{CP}$ t $[$*Ann came*$]]$, same interpretation as (49)

- Disjunction with negated clause under TP-deletion, cf. Kramer & Rawlins 2009.

(52) $[\![[_{CP}$ *whether* $[[_{CP}$ t $[_{TP}$ *Ed came*$]]$ *or* $[_{CP}$ t $[_{TP}$ *not* $[_{TP}$ ~~*Ed came*~~$]]]]]]\!]$
$= \{\lambda i[\text{Ed came in i}], \lambda i\neg[\text{Ed came in i}]\}$

➢ *wh*-movement possible from constituents, to form constituent alternative questions:

(53) a. $[\![$[$_{CP}$ *whether* [$_{TP}$ *Ed met* [$_{DP}$ [t [*Ann*] *or* [t *Beth*]]]]]$]\!]$

b. $[\![$[[*whether Ann*] *or* [*whether Beth*]]$]\!]$
= $[\![$*whether Ann*$]\!]$ ∪ $[\![$*whether Beth*$]\!]$ = {$[\![$*Ann*$]\!]$} ∪ {$[\![$*Beth*$]\!]$} = {$[\![$*Ann*$]\!]$, $[\![$*Beth*$]\!]$}

c. same denotation as [*who of Ann and Beth*] or [*who, Ann or Beth*]

d. Further semantic composition, following rules of Hamblin 1973:
{$[\![$*Ed met Ann*$]\!]$, $[\![$*Ed met Beth*$]\!]$}

Interpretation of question-embedding *know*, as before:

(54) $[\![$*Dan knows* Φ$]\!]$ = $\lambda i \forall p \in [\![\Phi]\!][p(i) \rightarrow$ Dan believes p in i],

(55) $[\![$*Dan knows* [*whether Ed came*]$]\!]$ =
$\lambda i \forall p \in \{\lambda i$[Ed came in i]$\}[p(i) \rightarrow$ Dan believes p in i],
i.e. if Ed came, then Dan believes that Ed came.

(56) With exhaustification:
$\lambda i \forall p \in \{\lambda i$[Ed came in i], $\lambda i \neg$[Ed came in i]$\}[p(i) \rightarrow$ Dan believes p in i]},
i.e. we also have: if Ed did not come, then Dan believes that Ed did not come.

(57) Another pragmatic derivation of that meaning:

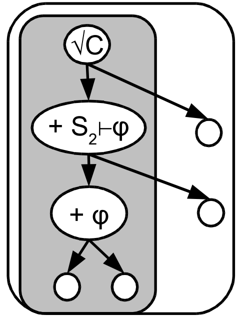
Pragmatic strengthening of → to ↔:	$\forall p \in \{\varphi\}[\varphi(i) \leftrightarrow B(i)(\varphi)]$
Falsity of embedded clause:	$\neg\varphi(i)$
Inference:	$\neg B(i)(\varphi)$
Pragmatic strengthening:	$B(i)(\neg\varphi)$

(58) ⟦*Dan knows* [*whether* [*Ed met* [[t *Ann*] *or* [t *Beth*]]]]⟧ =
λi∀p∈ {⟦*Ed met Ann*⟧, ⟦*Ed met Beth*⟧}[p(i) → Dan knows that p in i],
one of the propositions should be true due to pragmatic non-empty domain constraint,
not both of the propositions should be true due to pragmatic non-overlap constraint.

(59) ⟦*Dan knows* [*whether* [t [*Ed came*]] *or* [t [*not* [~~*Ed came*~~]]]]]]⟧ =
λi∀p∈ {⟦*Ed came*⟧,⟦*Ed did not come*⟧} [p(i) → Dan knows that p in i],
it follows without pragmatic principles and logical inference
that, in case Ed didn't come, Dan knows that Ed didn't come.

7. Polarity Question Acts

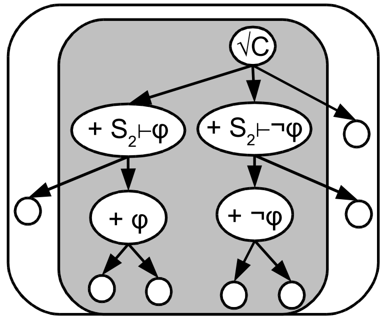
From question radicals to illocutionary question acts:
like with constituent questions, cf. (32)



Derivation from a structure that assumes an underlying *whether* CP, with *whether* moved to SpecForceP like all wh-elements, then deleted (see appendix for a different derivation).

Monopolar question:

(60) $\langle \ldots, C\rangle + [\![[_{\text{ForceP}}\ \cancel{\textit{whether}}\ [[_{\text{Force}^{\circ}}\ ?\text{-}\textit{did}]\ [_{\text{CP}}\ t_{wh}\ [_{\text{TP}}\ \textit{Ed}\ t_{did}\ \textit{come}]]]]]\!]^{S1,S2}$
$= \langle \ldots, C,\ \{\surd C\} \cup \{C + S_2 \vdash p + p \mid p \in [\![[_{\text{CP}}\ \cancel{\textit{whether}}\ [_{\text{TP}} \ldots]]]\!]^{S1,S2}\rangle$
$= \langle \ldots, C,\ \{\surd C\} \cup \{C + S_2 \vdash p + p \mid p \in \{\lambda i[\text{Ed came in i}]\}\}\rangle$
$= \langle \ldots, C,\ \{\surd C\} \cup \{C + S_2 \vdash \lambda i[\text{Ed came in i}] + \lambda i[\text{Ed came in i}]\rangle$



Bipolar question after exhaustification of the CP meaning:

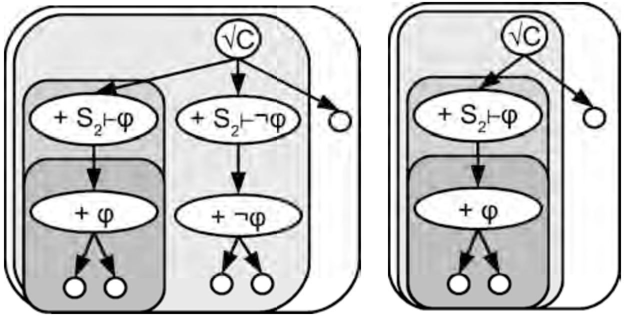
(61) $\langle \ldots, C,\ \{\surd C\} \cup \{C + S_2 \vdash p + p \mid p \in \overline{\cap}\{\lambda i[\text{Ed came in i}]\}\}\rangle$
$= \langle \ldots, C,\ \{\surd C\} \cup \{C + S_2 \vdash p + p \mid$
$p \in \{\lambda i[\text{Ed came in i}], \lambda i\neg[\text{Ed came in i}]\}\}\rangle$
$= \langle \ldots, C,\ \{\surd C\} \cup C + S_2 \vdash p + p \mid p \in \{\lambda i[\text{Ed came in i}]\}\}\rangle$

Answers to polarity questions by *yes* and *no*,
illocutionary anaphora picking up the propositional discourse referent corresponding to the TP of the antecedent clause, $\varphi = \lambda i[\text{Ed came in i}]$.

(62) Congruent answers *yes*:

a. To bipolar question:
(61) + ⟦yes_{φ}⟧^{S2,S1}
= (61) + $S_2 \vdash \varphi + \varphi$, a legal move.

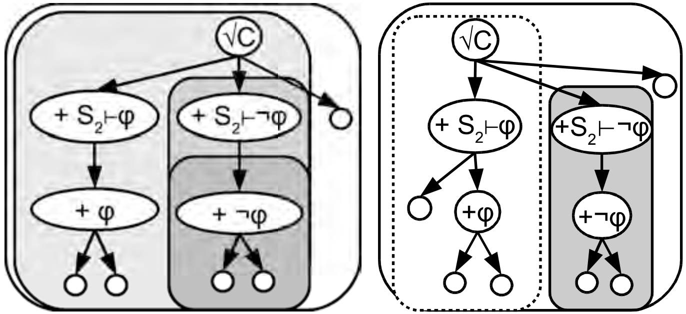
b. To monopolar question:
(60) + ⟦yes_{φ}⟧^{S2,S1}
= (60) + $S_2 \vdash \varphi + \varphi$, a legal move.



(63) Congruent answer *no*:

a. To bipolar question:
(61) + ⟦no_{φ}⟧^{S2,S1}
= (61) + $S_2 \vdash \neg\varphi + \neg\varphi$, a legal move.

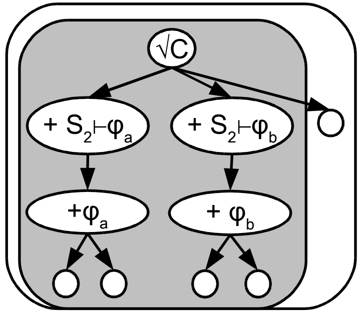
b. To monopolar question:
(60) + REJECT^{S2,S1} + ⟦no_{φ}⟧^{S2,S1}
= (60) + REJECT + $S_2 \vdash \neg\varphi + \neg\varphi$.



Monopolar question is **biased** towards answer *yes*
the answer *no* requires a REJECT operation.

Alternative questions lead to meaning similar to wh-questions:

(64) $\langle ..., \mathrm{C}\rangle + [\![[_{\mathrm{ForceP}}\ [[_{\mathrm{Force0}}\ ?\text{-}\mathit{did}]$
$[_{\mathrm{CP}}\ \cancel{\mathit{whether}}\ [_{\mathrm{TP}}\ \mathit{Ed\ met}\ [[\mathrm{t}_{\mathrm{wh}}\ [\mathit{Ann}]]\ \mathit{or}\ [\mathrm{t}_{\mathrm{wh}}\ [\mathit{Beth}]]]]]]]]]\!]^{\mathrm{S1,S2}}$
$= \langle ..., \mathrm{C}, \{\surd\mathrm{C}\} \cup \{\mathrm{C} + \mathrm{S}_2{\vdash}\mathrm{p} + \mathrm{p} \mid \mathrm{p}{\in}\ [\![[_{\mathrm{CP}} \ldots\ ]]\!]^{\mathrm{S1,S2}}\}\rangle$
$= \langle ..., \mathrm{C}, \{\surd\mathrm{C}\} \cup \{\mathrm{C} + \mathrm{S}_2{\vdash}\mathrm{p} + \mathrm{p} \mid \mathrm{p}{\in}\ \{\lambda \mathrm{i}[\mathrm{Ed\ met\ Ann\ in\ i}],$
$\lambda \mathrm{i}[\mathrm{Ed\ met\ Beth\ in\ i}]\}\rangle$



With *or not*, interpretation as bipolar question:

(65) $\langle ..., \mathrm{C}\rangle + [\![[_{\mathrm{ForceP}}\ \cancel{\mathit{whether}}\ [[_{\mathrm{Force^o}}\ ?\text{-}\mathit{did}]\ \ [_{\mathrm{CP}}\ \ [_{\mathrm{CP}}\ \mathrm{t}_{\mathrm{wh}}\ [_{\mathrm{TP}}\ \mathit{Ed}\ \mathrm{t}_{\mathrm{did}}\ \mathit{meet\ Beth}]]\ \mathit{or}$
$[_{\mathrm{CP}}\ \mathrm{t}_{\mathrm{wh}}\ [_{\mathrm{TP}}\ \mathit{not}\ [_{\mathrm{TP}}\ \cancel{\mathit{Ed}\ \mathrm{t}_{\mathrm{did}}\ \mathit{meet\ Beth}}]]]]]]\!]^{\mathrm{S1,S2}}$
$= \langle ..., \mathrm{C}, \{\surd\mathrm{C}\} \cup \{\mathrm{C} + \mathrm{S}_2{\vdash}\varphi_b + \varphi_b,\ \mathrm{C} + \mathrm{S}_2{\vdash}\neg\varphi_b + \varphi_b\}\rangle$

Other ways of expressing monopolar question:
Declarative questions (Gunlogson 2002), assertive syntax, question interpretation by prosody:

(66) S1, to S_2: *Ed met Beth?*
Request by S_1 to S_2 to perform the illocutionary act *Ed met Beth* (an assertion).

8. Focus in Polarity Questions

(67) *Did Ed meet ANN*$_{\mathrm{F}}$?
Was it ANN that Ed met?

Focus on the CP level for monopolar question:

(68) a. $[\![[_{\mathrm{CP}}\ \textit{whether}\ [_{\mathrm{TP}}\ \textit{Ed met BETH}_{\mathrm{F}}]]]\!]$
$= \lambda i[\text{Ed met Ann in i}], = \{\varphi_b\}$
b. $[\![[_{\mathrm{CP}}\ \textit{whether}\ [_{\mathrm{TP}}\ \textit{Ed met BETH}_{\mathrm{F}}]]]\!]_f$
$= \{\lambda i[\text{Ed met x in i}] \mid x\in \text{THING}\}, = \{\{\varphi_a\}\ \{\varphi_b\}, \{\varphi_c\}, \{\varphi_d\}\}$

The illocutionary operator, here ?, has a focus-sensitive interpretation (Jacobs 1984):

(69) $\langle ..., C\rangle + [\![[_{\mathrm{ForceP}}\ [?\ [_{\mathrm{CP}}\ ...]]]]\!]^{S1,S2}$
$= \langle ..., C, \{\surd C\} \cup \{C + S_2 \vdash p + p \mid p\in [\![[_{\mathrm{CP}}\ \ldots]]\!]^{S1,S2}\}\rangle$,
provided that for every legal meta-speech act A in C
$\exists P\in [\![[_{\mathrm{CP}}\ ...]]\!]_f^{S1,S2}\ [C{+}A = \{\surd C\} \cup \{C + S_2\vdash p + p \mid p\in P\}]$

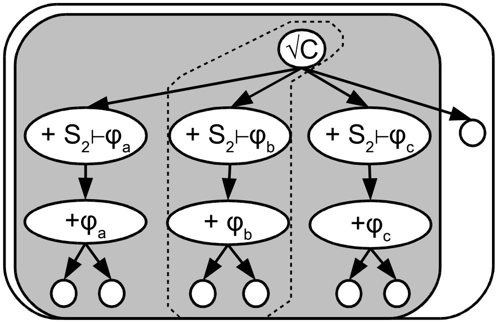
Alternative monopolar questions express restriction on the input commitment space

(70) $\langle ..., C\rangle + [\![[_{\mathrm{ForceP}}\ \cancel{\textit{whether}}\ [[?\text{-}\textit{did}]\ [_{\mathrm{CP}}\ t_{wh}\ [_{\mathrm{TP}}\ \textit{Ed}\ t_{did}\ \textit{meet BETH}_{\mathrm{F}}]]]]]\!]^{S1,S2}$
$= \langle ..., C, \{\surd C\}\cup\{C + S_2\vdash\varphi_b + \varphi_b\}\rangle$,
provided that for every legal meta-speech act A in C
$\exists P\in \{\{\varphi_a\}\ \{\varphi_b\}, \{\varphi_c\}, \{\varphi_d\}\}[C{+}A = \{\surd C\} \cup \{C + S_2\vdash p + p \mid p\in P\}]$,
i.e. $\exists p\in \{\varphi_a, \varphi_b, \varphi_c, \varphi_d\}[C + A = \{\surd C\} \cup \{C + S_2\vdash p + p\}]$

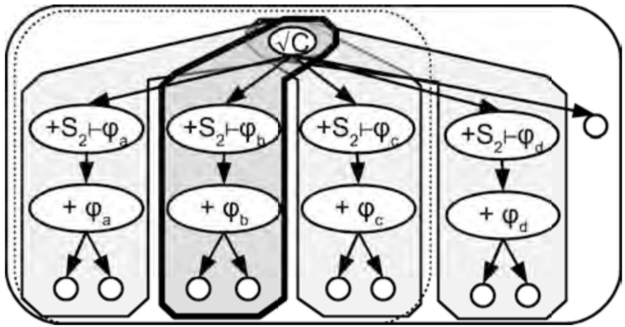
Appropriate restriction by the question *Who did Ed meet?* (can also be accommodated):

(71) $\langle ..., C'\rangle + [\![[_{\text{ForceP}}\ \textit{who did Ed meet}]]\!]^{S1,S2}$
$= \langle ..., C', \{\surd C'\} \cup \{C' + S_2 \vdash p \mid p \in \{\varphi_a, \varphi_b, \varphi_c\}\}\rangle$
$= \langle ..., C', C\rangle$, the input for (70).

Note: $C - \{\surd C\} = \cup\{C{+}A \mid A \in A_f\}$, just as in (42).



CS after *Who did Ed meet?*



CS after *Did Ed meet BETH*$_F$*?*

(72) Answer *Yes* is congruent with respect to the monopolar question that was asked.

(73) Answer *No* (asserting $\lambda i\neg$[Ed met Beth in i], $= \neg\varphi_b$):
   a. requires REJECT operation, leading back to commitment space (71)
   b. asserting $\neg\varphi_b$ is not an immediate legal move,
   c. Just as with exluding answers to wh-questions, cf. (35):
      – $S_2\vdash\neg\varphi_b$ and $\neg\varphi_b$ are added,
      – Next legal moves are answers of the question *Who did Ed meet?*
      – This explains why a simple answer *no* is felt incomplete,
        and that a completion like *He met Ann* is expected.

Overall effect of polarity questions with focus: Biased constituent question.

No coherent interpretation in bipolar questions or constituent questions after rule (69).

9. Contrastive Topics in Questions

(74) a. *I want to know who Ed and Dan met. Let's start. Who did ED*$_{\text{L+H*}}$ *meet* $_{\text{H\%}}$*?*
b. *I want to know who met Beth. Let's start. Did ED*$_{\text{L+H*}}$ *meet Beth* $_{\text{H\%}}$*?*

Cf. Contrastive Topic (CT) in assertions (Büring 2003):

(75) S_1: *Who met who yesterday?* S_2: *ED*$_{\text{L+H*}}$ *met BETH*$_{\text{H*}}$ *yesterday* $_{\text{L\%}}$.

QUD means: Certain alternative illocutionary acts have been put on the "backburner" (cf. Krifka 2001, Tomioka 2010 for contrastive topics interpreted on the speech act level).

For well-behaved commitment spaces, all backburner questions are answered eventually.

- The question *Who did ED*$_{\text{CT}}$ *meet?* presupposes a commitment space C in which every question of the type *Who did X meet?* is answered "down the line" i.e. it might be answered already, or might be answered later.
- If not satisfied, this can be accommodated by restricting C to a C′ where it is satisfied.

Maximal history in a commitment space, maxhist(H,C), iff:

(76) H is a maximal history in C iff:
a. $H \subseteq C$
b. $\forall c,c' \in H[c' \subseteq c \vee c \subseteq c']$ (H is a linear order)
c. $\forall H' \subseteq C[H' \subseteq C \wedge \forall c,c \in H'[c' \subseteq c \vee c \subseteq c'] \rightarrow H' \subseteq H]]$ (H is maximal)

Interpretation of question with contrastive topic:

(77) $\langle ..., C\rangle + [\![[_{CTP}\, \mathit{Ed}\; [_{ForceP}\; \mathit{who}\; [\; ?\text{-}\mathit{did}\; [_{CP}\; t_{wh}\; [_{TP}\; t_{Ed}\; t_{did}\; \mathit{meet}\; t_{wh}]]]]]]\!]^{S1,S2}$ CTP: Contr. Topic
$= \langle ..., C\rangle + [\![[_{ForceP}\; \mathit{who}\; [?\text{-}\mathit{did}\; [_{CP}\; t_{wh}\; [_{TP}\; t_x\; t_{did}\; \mathit{meet}\; t_{wh}]]]]]\!]^{x:Ed,\, S1,S2}$

provided that for every maximal history H in C there is a c, $c \in H$
such that for every a, $a \in ALT(Ed)$,
the question $[\![[_{ForceP}\; \mathit{who}\; [?\text{-}\mathit{did}\; [_{CP}\; t_{wh}\; [_{TP}\; t_x\; t_{did}\; \mathit{meet}\; t_{wh}]]]]]\!]^{x:a,S1,S2}$ is answered in c,
i.e. for every $a \in ALT(Ed)$ there is a φ, $\varphi \in [\![[_{CP}\; t_{wh}\; [_{TP}\; t_x\; t_{did}\; \mathit{meet}\; t_{wh}]]]\!]^{x:a,S1,S2}$ with $\varphi \in c$

If C does not satisfy this requirement: Construct the maximal $C' \subseteq C$ that does, and take C′.

This procedure could be used to deal with other “potential questions” (Onea 2013) as well, e.g. raising the topic of a vacation trip raises questions about the place, the weather, etc.

An assertion with CT presupposes the same effect as the corresponding question.

Implementation: Keep track of backburner speech acts in a set.

- In (74)(a) the question *Who did Dan meet?* is put on the backburner.
- In (74)(b) the question *Did Dan meet Beth?* is but on the backburner.
- In (75) an answer like *Dan met Ann* is put on the backburner.

Dealing with question alternatives in discourse

(78) Representation of acts and set of alternatives of illocutionary acts by a pair $\langle \mathfrak{Q}, \underline{\mathfrak{Q}} \rangle$.

(79) Performing a question with backburner questions:
$\langle ..., C\rangle + \langle \mathfrak{Q}, \underline{\mathfrak{Q}}\rangle = \langle ..., C, \langle C+\mathfrak{Q}, \underline{\mathfrak{Q}}\rangle\rangle$, where $C + \mathfrak{Q} = \mathfrak{Q}(C)$;
$\underline{\mathfrak{Q}}$ are the backburner questions that still have to be answered.

(80) Answering a question with alternatives
where $\underline{\mathfrak{Q}}-\mathfrak{Q} = \underline{\mathfrak{Q}} — \{\mathfrak{Q}\}$, provided that $\mathfrak{Q}\in\underline{\mathfrak{Q}}$, else undefined:
$\langle ..., \langle C+\mathfrak{Q}, \underline{\mathfrak{Q}}\rangle\rangle + \mathfrak{A} = \langle ..., \langle C+\mathfrak{Q}, \underline{\mathfrak{Q}}\rangle, \langle C+\mathfrak{Q}+\mathfrak{A}, \underline{\mathfrak{Q}}-\mathfrak{Q}\rangle\rangle$, **removal** of $\mathfrak{Q}$ from $\underline{\mathfrak{Q}}$

(81) Answering remaining questions: $\langle ..., \langle C, \underline{\mathfrak{Q}}\rangle\rangle + \mathfrak{A}$:

a. first attempt to find a $\mathfrak{Q}^*\in\underline{\mathfrak{Q}}$, then interpret as $\langle ..., \langle C+\mathfrak{Q}^*, \underline{\mathfrak{Q}}\rangle\rangle + \mathfrak{A}$
b. if not possible because $\mathfrak{A}$ is not a suitable answer, interpret as $\langle ..., \langle C+\mathfrak{A}, \underline{\mathfrak{Q}}\rangle\rangle$

(82) Generalization for backburner questions from different sources:

a. take $\langle ..., C\rangle$ as abbreviation of $\langle ..., \langle C, \varnothing\rangle\rangle$: no remaining backburner questions
b. have $\langle ..., \langle C, \underline{\mathfrak{Q}}'\rangle\rangle + \langle \mathfrak{Q}, \underline{\mathfrak{Q}}\rangle\rangle = \langle ..., \langle C, \underline{\mathfrak{Q}}'\rangle, \langle C+\mathfrak{Q}, \underline{\mathfrak{Q}}' \cup \underline{\mathfrak{Q}}\rangle\rangle$: bb-questions added.

Backburner questions collected in unordered set. Do we need trees (Roberts 1996)?

10. Appendix: A simpler syntax/semantics mapping?

Before: TenseP → CP → ForceP   Alternatively: TT → CP, TP → ForceP

Advantage: No need for *whether* deletion; new view on constituent questions.

(83) a. $[_{\text{CP}}$ *whether* $[_{\text{TP}}$ *Ed met Beth*]] (as before)
b. $[_{\text{ForceP}}$ $[[_{\text{Force°}}$?-*did*] $[_{\text{TP}}$ *Ed* t_{did} *meet Beth*]]] (not derived from CP)

(84) a. $[\![[_{\text{Force°}}\ ?\ ]]\!]^{S1,S2} = \lambda p\ \lambda C[\{\surd C\} + S_2 \vdash p + p]$ (a monopolar question)
b. $[\![?]\!]^{S1,S2}([\![[_{\text{TP}}\ \textit{Ed met Beth}]]\!]^{S1,S2}) = \lambda C[\{\surd C\} + S_2 \vdash \varphi_b + \varphi_b]$ (as above)

Speech act conjunction and disjunction
(cf. Krifka 2001, Cohen & Krifka 2014):

(85) $C + [\mathfrak{A}\ \&\ \mathfrak{B}] = [C + \mathfrak{A}] \cap [C + \mathfrak{B}]$
Results in a rooted commitment space for regular speech acts and for meta-speech acts.

(86) $C + [\mathfrak{A} \text{ or } \mathfrak{B}] = [C + \mathfrak{A}] \cup [C + \mathfrak{B}]$
Results in a rooted commitment space for meta-speech acts, not for regular speech acts.

Alternative questions by question disjunction:

(87) $[\![[[_{\mathrm{ForceP}}\ ?\text{-}\textit{did Ed meet Ann}]\ \textit{or}\ [_{\mathrm{ForceP}}\ ?\text{-}\textit{did Ed meet Beth}]]]\!]^{S1,S2}$
$= [\![[_{\mathrm{ForceP}}\ ?\text{-}\textit{did Ed meet Ann}]]\!]^{S1,S2} \cup [\![[_{\mathrm{ForceP}}\ ?\text{-}\textit{did Ed meet Beth}]]\!]^{S1,S2}$
$= \lambda C[\{\surd C\} + S_2 \vdash \varphi_a + \varphi_a] \cup \lambda C[\{\surd C\} + S_2 \vdash \varphi_b + \varphi_b]$
$= \lambda C[[\{\surd C\} + S_2 \vdash \varphi_a + \varphi_a] \cup [\{\surd C\} + S_2 \vdash \varphi_b + \varphi_b]]$

Bipolar questions as alternative questions:

(88) $[\![[[_{\mathrm{ForceP}}\ ?\text{-}\textit{did}\ [_{\mathrm{TP}}\ \textit{Ed meet Beth}]]\ \textit{or}\ [_{\mathrm{ForceP}}\ ?\ [_{\mathrm{TP}}\ \textit{not}\ [_{\mathrm{TP}}\ \cancel{\textit{Ed met Beth}}]]]]\!]^{S1,S2}$

Constituent questions by generalized disjunction, wh-constituent determines set of questions.

(89) $[\![[_{\mathrm{ForceP}}\ \textit{who}\ [?\text{-}\textit{did}\ [_{\mathrm{TP}}\ \textit{Ed meet}\ t_{wh}]]]]\!]^{S1,S2} = \bigcup_{x \in \mathrm{PERSON}} [\![[[_{\mathrm{Force}^{\circ}}\ ?]\ [_{\mathrm{TP}}\ \textit{Ed meet}\ t_x]]]\!]^{S1,S2}$

$= \lambda C[\{\surd C\} + S_2 \vdash \varphi_a + \varphi_a] \cup [\{\surd C\} + S_2 \vdash \varphi_b + \varphi_b] \cup [\{\surd C\} + S_2 \vdash \varphi_c + \varphi_c]]$