



Focus in Answers and Questions in Commitment Space Semantics

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Introduction

Aspects of linguistic coding of information

- “Information is the answer to a question of some kind.” (Wikipedia)
- Linguistic coding expresses the **answer** (truth conditions, information proper)
- but also the **question** that it is an answer of (packaging, information structure)

Focus as a critical notion of information structure:

- At the interface of prosody, syntax, semantics, pragmatics, discourse
- At the center of discussion in recent treatments of information structure
 - SFB 623 Information Structure, 2002 – 2015, U Potsdam, FU, HU Berlin
 - *Oxford Handbook of Information Structure* 2016, Féry & Ishihara, used in nearly all of the 40 chapters.
 - *The Expression of Information Structure* 2014, Krifka & Musan 2012
 - *Sense and Sensitivity: How Focus Determines Meaning*, Beaver & Clark 2008
- Similar notions recognized under different terms for a long time:
 - **habar** ‘message’ contrasted with **mubtada** in the Arab grammatical tradition
 - **psychologisches Prädikat** – **psychologisches Subjekt** (v.d. Gabelenz, Hermann Paul)
 - **Rhema** – **Thema** in the Czech functionalist tradition (Vilém Mathesius)
 - **comment** – **topic** in the American tradition (Charles Hockett)
 - **newness** – **givenness** in the American tradition (Wallace Chafe)
 - **focus** – **background** (Ray Jackendoff; Armin von Stechow; Joachim Jacobs e.a.)
 - see Krifka & Musan 2012, introduction, for relations between these notions

Focus in answers to questions

A prototypical use of focus: Relate answers to their constituent questions

- Hermann Paul 1880, *Prinzipien der Sprachgeschichte*:
 - Am schärfsten von den übrigen Gliedern des Satzes sondert sich zunächst das psychologische Präd. ab als das wichtigste, dessen Mitteilung der Endzweck des Satzes ist, auf welches daher der stärkste Ton fällt.
 - *Karl fährt morgen nach BERLIN.*
 - *Karl fährt MORGEN nach Berlin.*
 - *Karl FÄHRT morgen nach Berlin.*
 - *KARL fährt morgen nach Berlin.*
 - Die hier besprochenen vier Variationen eines aus den nämlichen Wörtern gebildeten Satzes entsprechen vier verschiedenen Fragen:
 - *wohin reist Karl morgen?*
 - *wann reist Karl nach Berlin?*
 - *wie reist Karl morgen nach Berlin?*
 - *wer reist morgen nach Berlin?*
 - Cf. also H. Paul, *Deutsche Grammatik* 1919:
 - *Fritz fährt morgen nach Potsdam.*
- Focus projection (Selkirk 1984, Gussenhoven 1984, Jacobs 1991)
 F: focus feature (Jackendoff 1977)
 - *Was macht Karl? – Karl [fährt morgen nach BERLIN]_F*
 - *Was gibt's Neues? – [Karl fährt morgen nach BERLIN]_F*
- Multiple focus
 - *Wann fährt Karl wohin? – Karl fährt [MORGEN]_{F1} nach [BERLIN]_{F1} (und ÜTERMORGEN nach POTSDAM).*



Nature of focus:

- What is the „most important“ syntactic constituent, the „final purpose“ of a sentence?
- The one which is selected out of a set of alternatives (Rooth 1985, v. Stechow 1990)
- Prototypical example: Answer to questions
 - Congruent question-answer pair:
 - *Wann fährt Karl nach Berlin?*
Karl fährt [MORGEN]_F nach Berlin.
 - Alternatives:
 - *Karl fährt heute nach Berlin.*
 - *Karl fährt übermorgen nach Berlin.*
 - *Karl fährt T nach Berlin*, where T: some (present or future) time
- Other examples: Focus-sensitive particles, e.g. *nur* ‘only’ (Jacobs 1983)
 - *Karl fährt nur MORGEN nach Berlin.*
 - For all T such that *Karl fährt T nach Berlin*: T = tomorrow

Rooth, Mats. 1985. Association with focus. University of Massachusetts at Amherst.

von Stechow, Arnim. 1990. Focusing and backgrounding operators. In: Abraham, Werner, (ed), Discourse particles. Amsterdam: John Benjamins, 37-84.

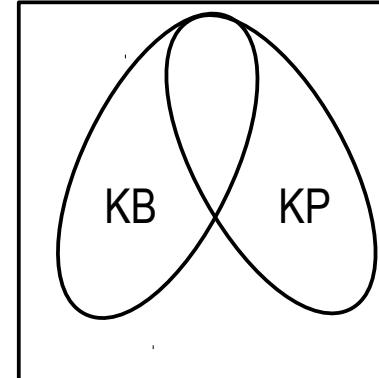
Jacobs, Joachim. 1983. Fokus und Skalen. Zur Syntax und Semantik der Gradpartikel im Deutschen. Tübingen: Niemeye

Focus in answers: Question meanings

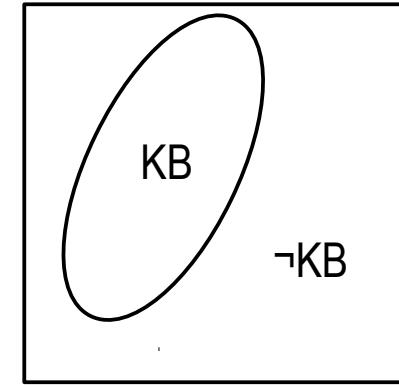
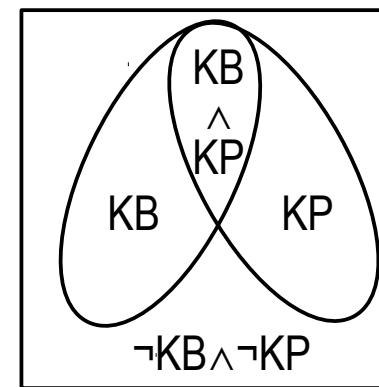
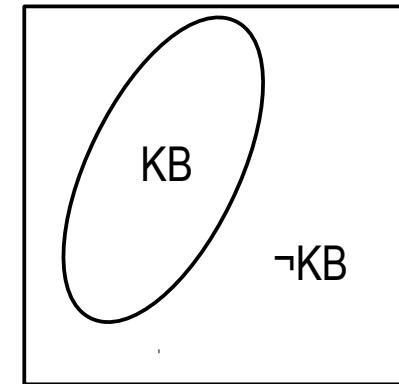
Alternative notions of alternatives:

- Charles Hamblin, 1973
 - sets of propositions
 - where a proposition is a set of indices (world / times)
 - may overlap
 - not exhaustive
- Groenendijk & Stokhof 1984
 - Partitions of all indices
 - no overlap
 - exhaustive
- Inquisitive semantics
(Ciardelli, Groenendijk, Roelofsen 2013)

*Wohin fährt Karl,
nach Berlin oder Potsdam?*



Fährt Karl nach Berlin?

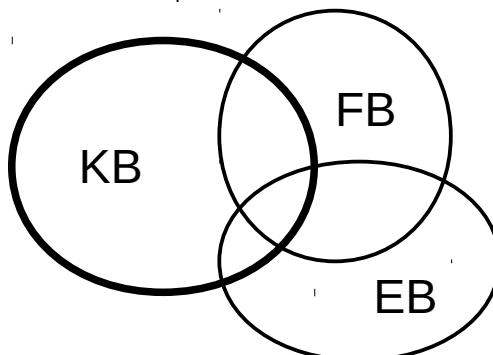
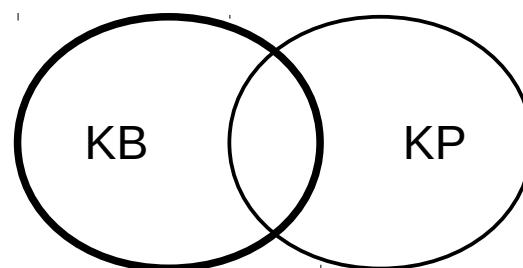
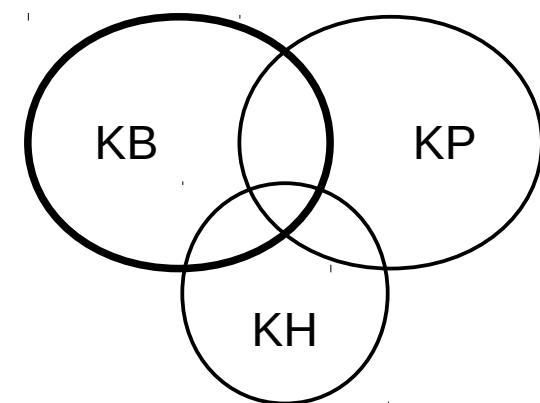


Glossing over details:

- Non-inquisitive meanings are singleton sets of propositions,
 $\llbracket \text{Karl fährt morgen nach Berlin oder Potsdam} \rrbracket = \{\text{KB} \vee \text{KP}\}$
- Inquisitive meanings are non-singleton set of propositions,
 $\llbracket \text{Wohin fährt Karl morgen, nach Berlin oder Potsdam?} \rrbracket = \{\text{KB}, \text{KP}\}$

Established theories for Q/A focus congruence

- Alternative semantics (Rooth 1985, 1992):
 - Distinguish between ordinary meanings and focus meanings:
 - $\llbracket \text{Karl fährt nach [Berlin]}_F \rrbracket = \text{KB}$
 - $\llbracket \text{Karl fährt nach [Berlin]}_F \rrbracket^f = \{\text{Kx} \mid x \in \text{Places}\}$
 - Questions denote sets of propositions:
 - $\llbracket \text{Wohin fährt Karl?} \rrbracket = \{\text{Kx} \mid x \in \text{Places}\}$
 - The focus meanings have to correspond to the question meanings:
 - $\llbracket \text{Wohin fährt Karl morgen?} \rrbracket \subseteq \llbracket \text{Karl fährt morgen nach [BERLIN]}_F \rrbracket^f$
 - Failure of Q/A congruence:
 - $\llbracket \text{Wohn fährt Karl morgen?} \rrbracket \not\subseteq \llbracket [\text{KARL}]_F \text{ fährt morgen nach Berlin} \rrbracket^f$

 $\llbracket [\text{KARL}]_F \text{ fährt nach Berlin} \rrbracket^f$  $\llbracket \text{Wohin fährt Karl, nach Berlin oder Potsdam?} \rrbracket$  $\llbracket \text{Karl fährt nach [BERLIN]} \rrbracket^f$  $\not\subseteq$ \subseteq

- Structured meanings (Jacobs 1983, 1984, von Stechow 1990, Krifka 1992):
 - Focus induces structuring into background part and focus part
 - <‘Karl drives to Berlin at T’, tomorrow>
 - Questions introduce structuring into background part and wh-part:
 - <‘Karl drives to Berlin at T’, Times>
 - In congruent Q-A-relations, background of Q and A must be the same,
Focus of answer must be an element of wh-part of question

Focus in questions

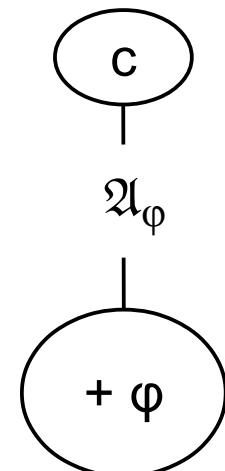
But what about focus in **questions**?

- Focus in polarity questions:
 - *Fährt Karl MORGEN nach Berlin?*
 - *Ja. / #Nein. / Nein, übermorgen. / Nein, er fährt übermorgen nach Berlin.*
- *li*-marked questions in Russian:
 - *Zavtra li pojedet Karl v Berline?*
- Focus in constituent questions:
 - *Wer fährt MORGEN nach Berlin?*
 - *Morgen fährt Karl nach Berlin, und übermorgen Fritz.*
- H* accent vs. L*H Accent (contrastive topics)
 - H* accent: *Fährt Karl MORGEN nach Berlin?*
Ja. / #Nein. / #Nein, übermorgen.
 - L*H accent: *Ich weiß, dass Karl gestern nach Berlin fuhr.*
Aber fährt Karl MORGEN nach Berlin?
Ja. / Nein.
- Goal of this talk:
 - Present a framework for focus across speech acts (assertions and questions)
 - Cast in Commitment Space Semantics (cf. Cohen & Krifka 2014, Krifka 2015).

A Framework for Illocutionary Acts: Commitment States

Basic assumptions:

- Illocutionary acts change commitments of interlocutors
- A commitment is represented by a proposition, e.g. φ
- Commitments accrue during conversation,
modeled by a commitment state, a set of propositions
- Cf. common ground in dynamic semantics:
Stalnaker, Lewis, Karttunen, Heim,
often modeled as context set (a proposition)
- Here: modeled as **commitment state**,
a **set of propositions**



Update of commitment state c with speech act \mathfrak{A}_φ :

- $c + \mathfrak{A}_\varphi = c \cup \{\varphi\}$,
where φ : commitment introduced by speech act \mathfrak{A}_φ

Requirements for update of commitment states:

- φ should not be present by c : $\varphi \notin c$
- φ should be consistent with c : $c \cup \{\varphi\} \models \perp$
- φ may make overt a proposition already entailed by c (analytic update): $c \vDash \varphi$, $c \cup \{\varphi\} \models \varphi$

A Framework for Illocutionary Acts: Commitment Spaces

Basic idea:

- Commitment states represent the propositions the interlocutors have agreed upon at the current state of conversation
- **Commitment spaces (CS)** represent the **preferred future developments**
- Cf. distinction common ground content vs. common ground management (Krifka 2008)

Why commitment spaces?

- **Denegations**: S refrains from speech act (Searle 1969, Hare 1970): *I don't promise to come.*
- **Questions**: S restricting future developments to answers

Modeling of commitment spaces

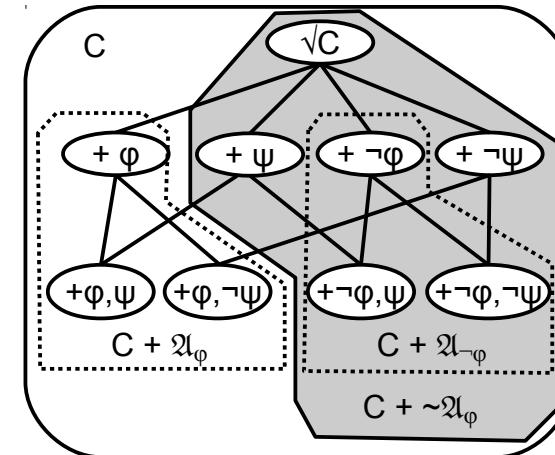
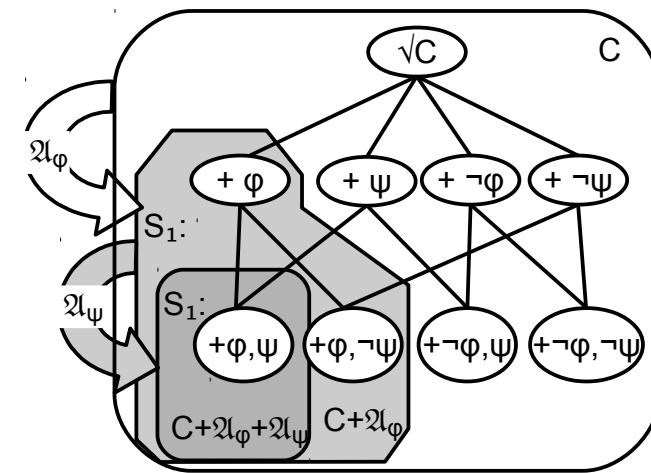
- Sets of commitment states
- Commitment states are ordered by \subseteq
- Smallest commitment state is the root of the CS

Update of commitment space C with speech act \mathfrak{A} :

- $C + \mathfrak{A} = \{c \in C \mid \sqrt{C} + \mathfrak{A} \subseteq c\}$
- Indicating actor / performer S: $C + \mathfrak{A} = \langle C + \mathfrak{A}, S \rangle$

Update with denegation of speech act \mathfrak{A} :

- $C + \sim \mathfrak{A} = C - [C + \mathfrak{A}]$
- This does not change the root
 - a **meta speech act** (Cohen & Krifka 2014)



A framework for illocutionary acts

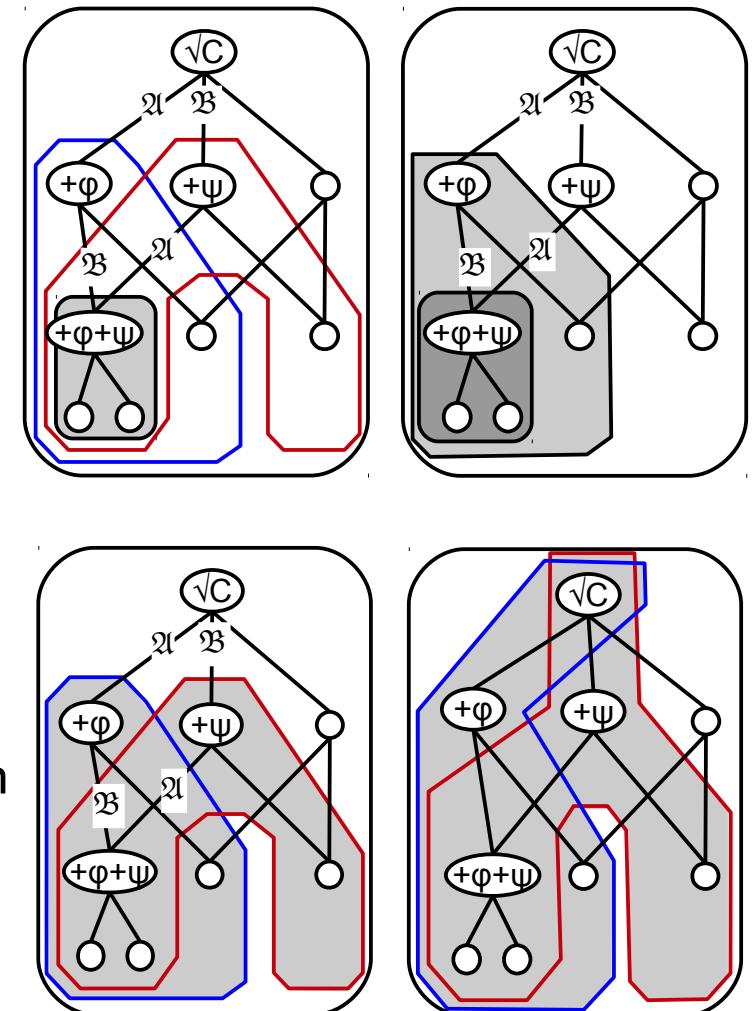
Conjunction and disjunction of CSs

- **Conjunction** of speech acts by intersection

- $C + [\mathfrak{A} \& \mathfrak{B}] = [[C + \mathfrak{A}] \cap [C + \mathfrak{B}]]$
 - If C has a single root, $C + [\mathfrak{A} \& \mathfrak{B}]$ has, too
 - Similar to sequential update (dynamic conjunction), except for anaphoric bindings
- $$C + [\mathfrak{A} ; \mathfrak{B}] = [C + \mathfrak{A}] + \mathfrak{B}$$

- **Disjunction** of speech acts by union

- $C + [\mathfrak{A} V \mathfrak{B}] = [[C + \mathfrak{A}] \cup [C + \mathfrak{B}]]$
- Single root is not guaranteed
- Allowing for multiple-rooted CS, to reflect unclear commitments after disjunction (cf. Gärtner & Michaelis 2010)
- Objectionable status of speech act disjunction (Krifka 2001)
- With meta speech acts, single root guaranteed



A Framework for Illocutionary Acts: Assertion

The essence of assertion

- Speaker commits to the truth of a proposition:
 $S_1 \vdash \varphi$ 'S₁ is committed to the truth of φ '
- Typical reason: S₁ wants to make φ common ground
- But this is only a **conversational implicature**, as it can be cancelled:
 - *Believe it or not, Karl will go to Berlin.*
 - *Ob du es glaubst oder nicht, Karl wird nach Berlin fahren.*
- Reason for addressee to draw this implicature:
Social sanctions for committing to falsehoods
- Cf. Charles S. Peirce, ca. 1908 (cf. Tuzet 2006)
 - For clearly, every assertion involves an effort to make the intended interpreter believe what is asserted, to which end a reason for believing it must be furnished.
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.
- Cf. Brandom 1983, McFarlane 2011, etc.

Assertion

Implementation of assertion:

- $S: C + \text{ASSERT}(\varphi) = C + S \vdash \varphi$,
where S : speaker, $S \vdash \varphi$: S is publicly committed to φ ; \vdash : Frege 1879, “Urtheilsstrich”

Syntactic structure of assertive sentences

- Asserted proposition: TP, Tense Phrase
- Proposition expressing commitment: CmP, Commitment Phrase
- Application to CS_p: ActP, Illocutionary Act Phrase
- Following principles of \bar{X} -syntax:

- $[\text{ActP} [[\text{Act}^o .] [\text{CmP} [[\text{Cm}^o \vdash] [\text{TP} [[\text{VP} \text{ ich gewonnen hab- }] [\text{T}^o -e]]]]]]]$
- $[\text{ActP} \text{ ich}_1 [[\text{Act}^o \text{ hab-e} .] [\text{CmP} [[\text{Cm}^o \vdash] [\text{TP} [[\text{VP} _ \text{ gewonnen} _] [\text{T}^o _]]]]]]]$



- verb movement as related to speech act: Cf. Truckenbrodt 2006

Semantic interpretation:

- $\llbracket [\text{ActP} [[\text{Act}^o .] [\text{CmP} [[\text{Cm}^o \vdash] [\text{TP} \text{ ich gewonnen habe }]]]]] \rrbracket_{S_1 S_2}$ S_1 : speaker
 $= \llbracket [\text{Act}^o .] \rrbracket_{S_1 S_2} (\llbracket [\text{Cm}^o \vdash] [\text{TP} \text{ ich gewonnen habe }] \rrbracket_{S_1 S_2})$ S_2 : addressee
 $= \llbracket [\text{Act}^o .] \rrbracket_{S_1 S_2} (\llbracket [\text{Cm}^o \vdash] \rrbracket_{S_1 S_2} (\llbracket [\text{TP} \text{ ich gewonnen habe }] \rrbracket_{S_1 S_2}))$
- with $\llbracket [\text{TP} \text{ ich gewonnen habe }] \rrbracket_{S_1 S_2} = 'S_1 \text{ won the race}'$ proposition, TP
 $\llbracket [\text{Cm}^o \vdash] \rrbracket_{S_1 S_2} = \lambda p \lambda S [S \vdash p]$ head of CmP
 $\llbracket [\text{Act}^o .] \rrbracket_{S_1 S_2} = \lambda R \lambda C \langle [C + R(S_1)], S_1 \rangle$ head of ActP
- $= \lambda C \langle [C + S_1 \vdash 'S_1 \text{ won the race}'], S_1 \rangle$

Questions as meta speech acts

Questions affect the future development:

- Preferred development: Addressee answers question

Example, disjunctive polarity question:

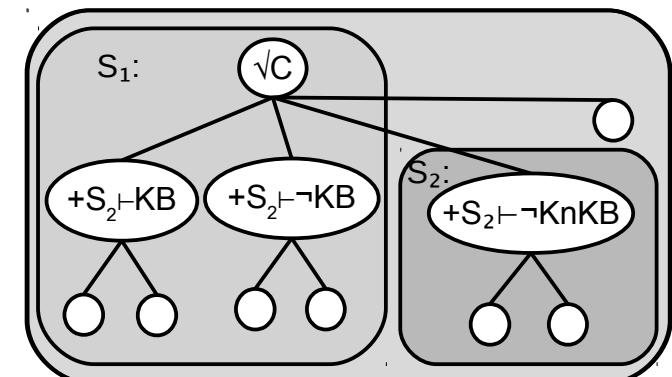
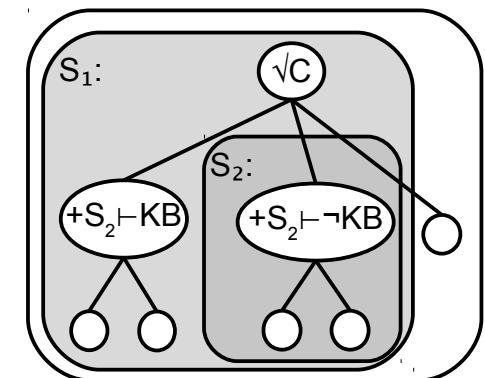
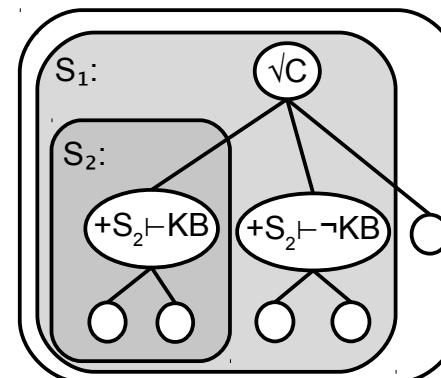
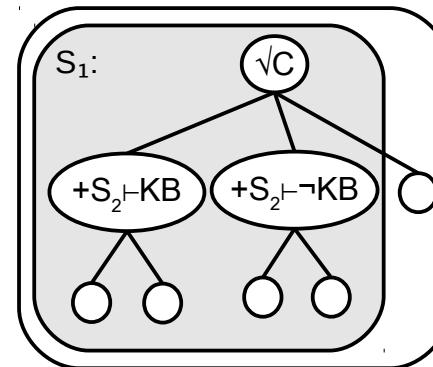
- C + S₁ to S₂: *Fährt Karl nach Berlin oder nicht?*
- = ⟨{√C} ∪ [C + S₂ ⊢ KB] ∪ [C + S₂ ⊢ ¬KB], S₁⟩

Preferred reaction by S₂: Assertion

- *Ja, Karl fährt nach Berlin.*
- *Nein, Karl fährt nicht nach Berlin.*

Non-congruent answers:

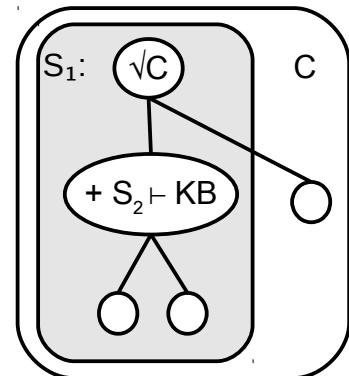
- *Ich weiß nicht.*
Kann ich dir nicht sagen.
- Requires previous rejection of question, as S₂ ⊢ φ / S₂ ⊢ ¬φ and S₂ ⊢ ¬Knφ are pragmatically non-consistent
- Cf. Krifka 2015 for reject operation



Monopolar questions

Varieties of polar (yes/no) questions

- **Bipolar questions**, offer two equally prominent answers (yes / no)
 - The only polar question type considered in previous semantic models (Hamblin, Groenendijk/Stokhof, Inquisitive Semantics)
- **Monopolar questions**, offer only one prominent answer
 - Questions biased to one answer
 - Declarative questions: *Karl fährt nach Berlin?*
 - Negated questions: *Fährt Karl nicht nach Berlin?*
 - One option for regular questions: *Fährt Karl nach Berlin?*
 - Bipolarity by focus on verum operator: *FÄHRT Karl nach Berlin?*



Modeling of monopolar questions in Commitment Space Semantics

- $\llbracket_{\text{Act}^\circ} \llbracket_{\text{Act}^\circ} \text{hab-e ?} \rrbracket_{\text{Cm}^\circ} \text{ ich } \llbracket_{\text{Cm}^\circ \vdash} \llbracket_{\text{TP}} \llbracket_{\text{vP}} _ \text{gewonnen} _ \rrbracket_{\text{TP}} \rrbracket_{\text{vP}} \rrbracket_{\text{Cm}^\circ \vdash} \rrbracket_{\text{Act}^\circ} \rrbracket_{\text{Act}^\circ} \rrbracket_{\text{S}_1 \text{S}_2}$
- $= \llbracket_{\text{Act}^\circ} ? \rrbracket_{\text{S}_1 \text{S}_2} (\llbracket_{\text{Cm}^\circ \vdash} \llbracket_{\text{S}_1 \text{S}_2} (\llbracket_{\text{TP}} \text{ich gewonnen habe} \rrbracket_{\text{S}_1 \text{S}_2}) \rrbracket_{\text{S}_1 \text{S}_2})$
- with $\llbracket_{\text{Act}^\circ} ? \rrbracket_{\text{S}_1 \text{S}_2} = \lambda R \lambda C \langle \{\sqrt{C}\} \cup C + R(S_2), S_1 \rangle$ head of question act phrase
 $\llbracket_{\text{Cm}^\circ \vdash} \rrbracket_{\text{S}_1 \text{S}_2} = \lambda p \lambda S [S \vdash p]$ head of CmP, as before
 $\llbracket_{\text{TP}} \text{ich gewonnen habe} \rrbracket_{\text{S}_1 \text{S}_2} = 'S_1 \text{ has won}'$ TP, as before
- $= \lambda C \langle \{\sqrt{C}\} + S_2 \vdash 'S_1 \text{ won the race}' \rangle, S_1 \rangle$

Egophoricity (conjunct/disjunct systems)

- Example: Kathmandu Newari (Hargreaves 2005):

Assertions

a. *jī* *a:pwa twan-ā.*
 1.SG.ERG much drink-PST.**CJ**
 'I drank a lot.'

b. *chā* *a:pwa twan-ā.*
 2. SG.ERG much drink-PST.**DJ**
 'You drank a lot'

c. *wā:* *a:pwa twan-ā.*
 3. SG.ERG much drink-PST.**DJ**
 'he/she drank a lot'

Questions

d. *jī:* *a:pwa twan-ā-la.*
 '1.SG.ERG much drink-PST.**DJ-Q**
 'Did I drink a lot?'

e. *chā* *a:pwa twan-ā-la.*
 2.SG.ERG much drink-PST.**CJ-Q**
 'Did you drink a lot?'

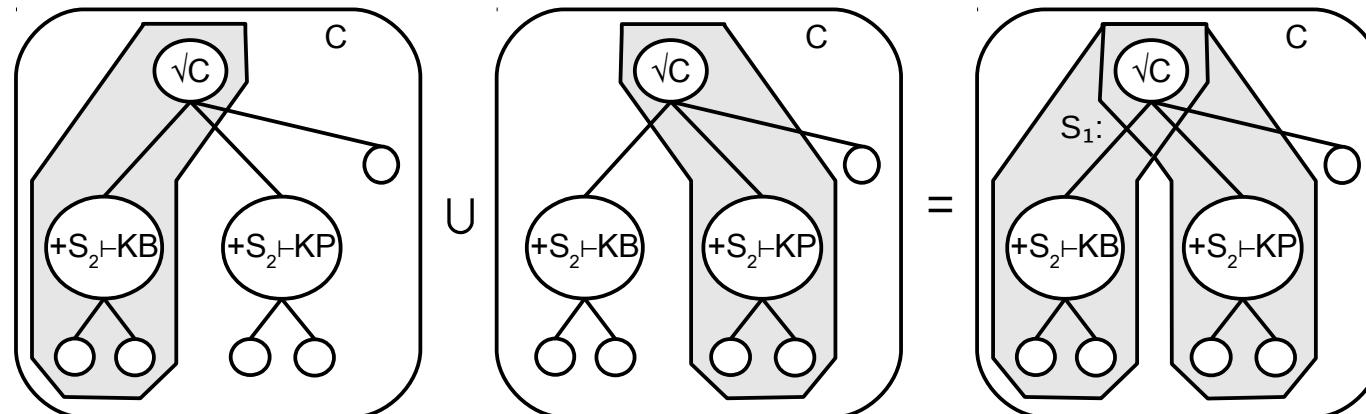
f. *wā:* *a:pwa twan-ā-la.*
 '3. SG.ERG much drink-PST.**DJ-Q**
 'Did he/she drink a lot?'

- Proposal:

- CJ presupposes Committer = Subject:
 $\llbracket \text{CJ} \rrbracket^{S_1 S_2} = \lambda P \lambda x \lambda S. \text{S} = x [S \vdash P(x)]$
- DJ presupposes Committer \neq Subject:
 $\llbracket \text{DJ} \rrbracket^{S_1 S_2} = \lambda P \lambda x \lambda S. \text{S} \neq x [S \vdash P(x)]$

Disjunctive (or: Alternative) Questions

- Example of disjunctive (alternative) question
 - *Fährt Karl nach /BERLIN oder fährt Karl nach \POTSDAM?*
 - *Fährt Karl nach /BERLIN oder \POTSDAM?*
- Derivation as speech act disjunction (cf. Uegaki 2014, Japanese)
 - $\llbracket [_{\text{ActP}} ? \text{Karl fährt nach Berlin}] \rrbracket_{S_1 S_2} = \lambda C \langle \{\sqrt{C}\} \cup C + S_2 \vdash \text{KB}, S_1 \rangle$
 - $\llbracket [_{\text{ActP}} ? \text{Karl fährt nach Potsdam}] \rrbracket_{S_1 S_2} = \lambda C \langle \{\sqrt{C}\} \cup C + S_2 \vdash \text{KP}, S_1 \rangle$
 - $\llbracket [_{\text{ActP}} [_{\text{ActP}} ? \text{Karl fährt nach Berlin}] \text{ oder } [_{\text{ActP}} ? \text{Karl fährt nach Potsdam}]] \rrbracket_{S_1 S_2}$
 $= \llbracket [_{\text{ActP}} ? \text{Karl fährt nach Berlin}] \rrbracket_{S_1 S_2} \vee \llbracket [_{\text{ActP}} ? \text{Karl fährt nach Potsdam}] \rrbracket_{S_1 S_2}$
 $= \lambda C \langle \{\sqrt{C}\} \cup C + S_2 \vdash \text{KB} \text{ } \textcolor{red}{\cup} \text{ } \{\sqrt{C}\} \cup C + S_2 \vdash \text{KP}, S_1 \rangle$
 $= \lambda C \langle \{\sqrt{C}\} \cup C + S_2 \vdash \text{KB} \text{ } \textcolor{red}{\cup} \text{ } C + S_2 \vdash \text{KP}, S_1 \rangle$



Phrasal disjunctions in questions

- Question disjunction may be expressed over constituents:
 - *Fährt Karl [nach /BERLIN oder nach \POTSDAM]?*
 - *Fährt Karl nach [/BERLIN oder \POTSDAM]?*
- Speech act disjunction **V** can be lifted, e.g. to DP level
 - $\llbracket_{\text{ActP}} [\llbracket_{\text{DP}} \text{Berlin oder Potsdam} \rrbracket_x \llbracket_{\text{ActP}} ? \text{Karl fährt nach } t_x \rrbracket] \rrbracket_{S_1 S_2}$
 - $= \llbracket \text{Berlin oder Potsdam} \rrbracket_{S_1 S_2} (\lambda x \llbracket_{\text{ActP}} ? \text{Karl fährt nach } t_x \rrbracket) \rrbracket_{S_1 S_2}$
 - with $\llbracket \text{Berlin oder Potsdam} \rrbracket_{S_1 S_2} = \lambda R \lambda C \langle R(B)(C) \cup R(P)(C), S_1 \rangle$
 $\llbracket_{x \text{ActP}} ? \text{Karl fährt nach } t_x \rrbracket_{S_1 S_2} = \lambda x \lambda C \langle \{\sqrt{C}\} \cup C + S_2 \vdash Kx \rangle$
 - $= \lambda C \langle \{\sqrt{C}\} \cup C + S_2 \vdash KB \cup C + S_2 \vdash KP \rangle S_1$
- To be distinguished from propositional disjunction:
 - *Fährt Karl nach /Berlin oder nach /Potsdam?*
 - $\llbracket_{\text{ActP}} ? \llbracket_{\text{CmP}} \vdash \llbracket_{\text{TP}} [\llbracket_{\text{DP}} \text{Berlin oder Potsdam} \rrbracket_x \llbracket_{\text{TP}} \text{Karl fährt nach } t_x \rrbracket] \rrbracket \rrbracket \rrbracket_{S_1 S_2}$
 $= \lambda C \langle \{\sqrt{C}\} \cup C + S_2 \vdash [KB \vee KP], S_1 \rangle$
- Non-falling final accent may also indicate non-closed list,
 where closed list presupposes that one of the assertions can be made.
 - *Fährt Karl nach /Berlin, oder fährt er nach /Potsdam?*

Disjunctive Questions

Constituent Questions

Constituent questions as disjunctive questions

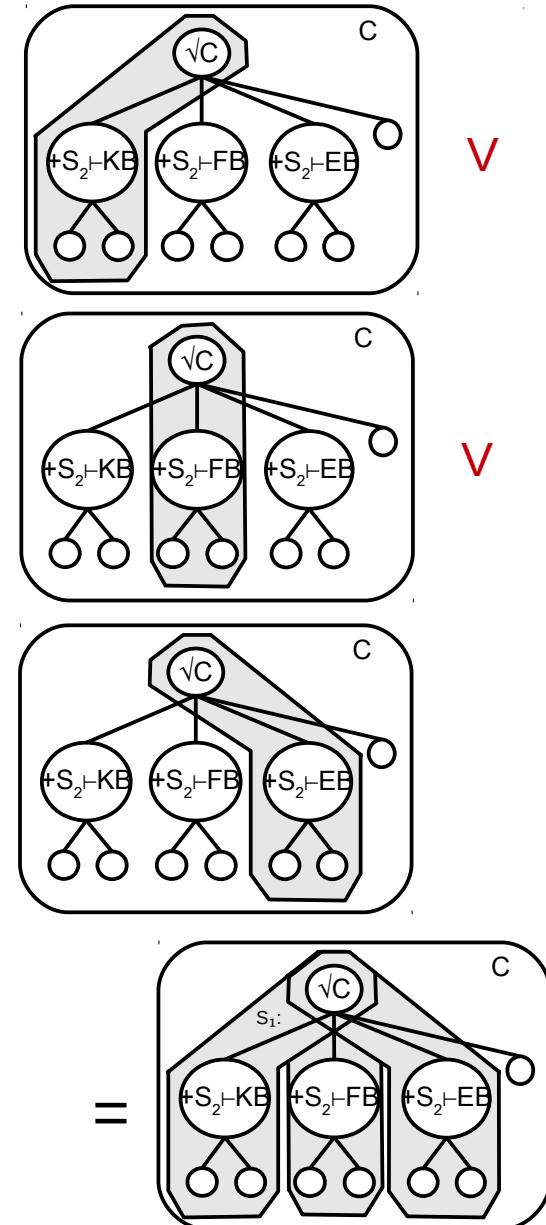
- $[\text{Act}^P \text{ Wer}_x [[\text{Act}^P \text{ fährt?}] [\text{Cm}^P [[\text{Cm}^o \vdash] [\text{TP} t_x \text{ nach Berlin} t]]]]]$

Interpretation of wh constituent
as generalized disjunction:

- $\llbracket \llbracket \text{DP wer} \rrbracket \rrbracket_{S_1 S_2} = \lambda R \lambda C \langle V_{x \in \llbracket \text{person} \rrbracket} R(x)(C), S_1 \rangle$
- $\llbracket \llbracket x [[\text{Act}^o ?] x \text{ fährt nach Berlin}] \rrbracket \rrbracket_{S_1, S_2}$
 $= \lambda x \lambda C [\{\sqrt{C}\} \cup S_2 \vdash x B]$
- $\llbracket \llbracket \text{DP wer} \rrbracket_{S_1 S_2} (\llbracket \llbracket x [[\text{Act}^o ?] x \text{ fährt nach Berlin}] \rrbracket \rrbracket_{S_1, S_2})$
 $= \lambda C \langle V_{x \in \llbracket \text{person} \rrbracket} [\{\sqrt{C}\} \cup S_2 \vdash x B], S_1 \rangle$

wh constituent as indefinite ($\text{wer} \approx \text{jemand}$)

- *Es fährt wer nach Berlin:*
- $\llbracket \text{wer} \rrbracket = \lambda r V_{x \in \llbracket \text{person} \rrbracket} r(x)$
- $\llbracket \llbracket \text{TP} t_x \text{ nach B. fährt} \rrbracket \rrbracket = \lambda x [x B]$
- $\llbracket \llbracket \text{TP} \text{ wer fährt nach B.} \rrbracket \rrbracket = V_{x \in \llbracket \text{person} \rrbracket} x B$



Focus in Answers

- Example exchange:

- $S_1: \text{Wer fährt nach Berlin?}$
- $S_2: KARL_F \text{ fährt nach Berlin.}$

- Focus indicates alternative assertions:

- regular meaning:

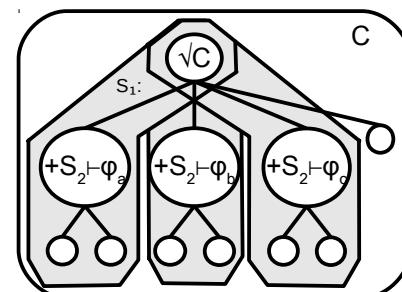
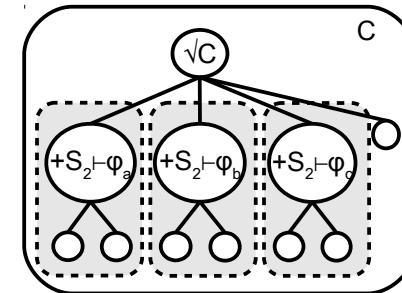
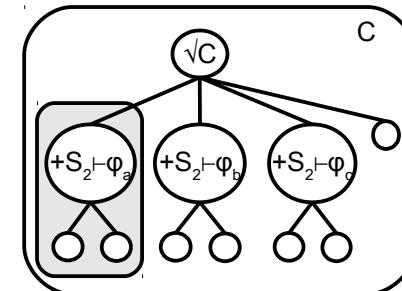
$$\llbracket [_{\text{ActP}} \cdot [_{\text{Cmp}} \vdash [_{\text{TP}} KARL_F \text{ nach Berlin fährt}]]] \rrbracket_{S_2 S_1} \\ = \lambda C \langle [C + S_2 \vdash \text{KB}], S_2 \rangle$$

- focus meaning:

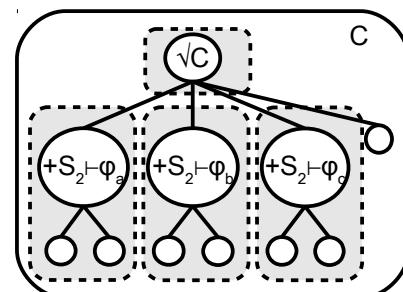
$$\llbracket [_{\text{ActP}} \cdot [_{\text{Cmp}} \vdash [_{\text{TP}} KARL_F \text{ nach Berlin fährt}]]] \rrbracket^f_{S_2 S_1} \\ = \{ \lambda C \langle [C + S_2 \vdash \text{KB}], S_2 \rangle \mid x \in \text{ENTITY} \}$$

- Alternatives must correspond to question (modeled similar to Rooth 1992):

- $\llbracket Q \rrbracket -- \llbracket A \rrbracket$ is well-formed in C iff $\llbracket Q \rrbracket(C) \subseteq \{\sqrt{C}\} \cup \textcolor{red}{U} \llbracket A \rrbracket(C)$
- i.e. $\textcolor{red}{U}_{x \in \llbracket \text{person} \rrbracket} [\{\sqrt{C}\} \cup S_2 \vdash xB] \subseteq [\{\sqrt{C}\} \cup \textcolor{red}{U} \{[C + S_2 \vdash xB], \mid x \in \text{ENTITY}\}]$



\subseteq



Focus in Assertions

A slightly different take on focus in assertion:

- Focus indicates alternatives.
- Focus interpreted at the level of speech acts indicates a Commitment Space that consists of a rooted disjunction of all the alternatives.
- An appropriate question provides such a Commitment Space, otherwise a suitable CS is accommodated.

Implementation:

- $C + \llbracket [_{ActP} [KARL]_F fährt nach Berlin] \rrbracket$
 $= [\{\sqrt{C}\} \cup C + \textcolor{red}{V} \llbracket [_{ActP} [KARL]_F fährt nach Berlin] \rrbracket^{f, s_1 s_2}] \quad \text{presupposed / accommodated}$
 $\quad + \llbracket [_{ActP} [KARL]_F fährt nach Berlin] \rrbracket^{s_1 s_2} \quad \text{asserted}$

Focus in monopolar questions

- Example exchange

- $S_1: Fährt KARL_F nach Berlin?$
- $S_2: Ja.$

$S_2: \#Nein. / Nein, Fritz fährt nach Berlin.$

- Assume: Focus indicates alternative questions.

- Regular meaning:

$$\llbracket [_{\text{ActP}} ? [_{\text{CmP}} \vdash [_{\text{TP}} KARL_F \text{ nach Berlin fährt}]]] \rrbracket_{S_2 S_1} \\ = \lambda C \langle \{\sqrt{C}\} \cup C + S_2 \vdash \text{KB}, S_1 \rangle$$

- focus meaning:

$$\llbracket [_{\text{ActP}} ? [_{\text{CmP}} \vdash [_{\text{TP}} KARL_F \text{ nach Berlin fährt}]]] \rrbracket^f_{S_2 S_1} \\ = \{ \lambda C \langle \{\sqrt{C}\} \cup C + S_2 \vdash xB, S_1 \rangle \mid x \in \text{ENTITY} \}$$

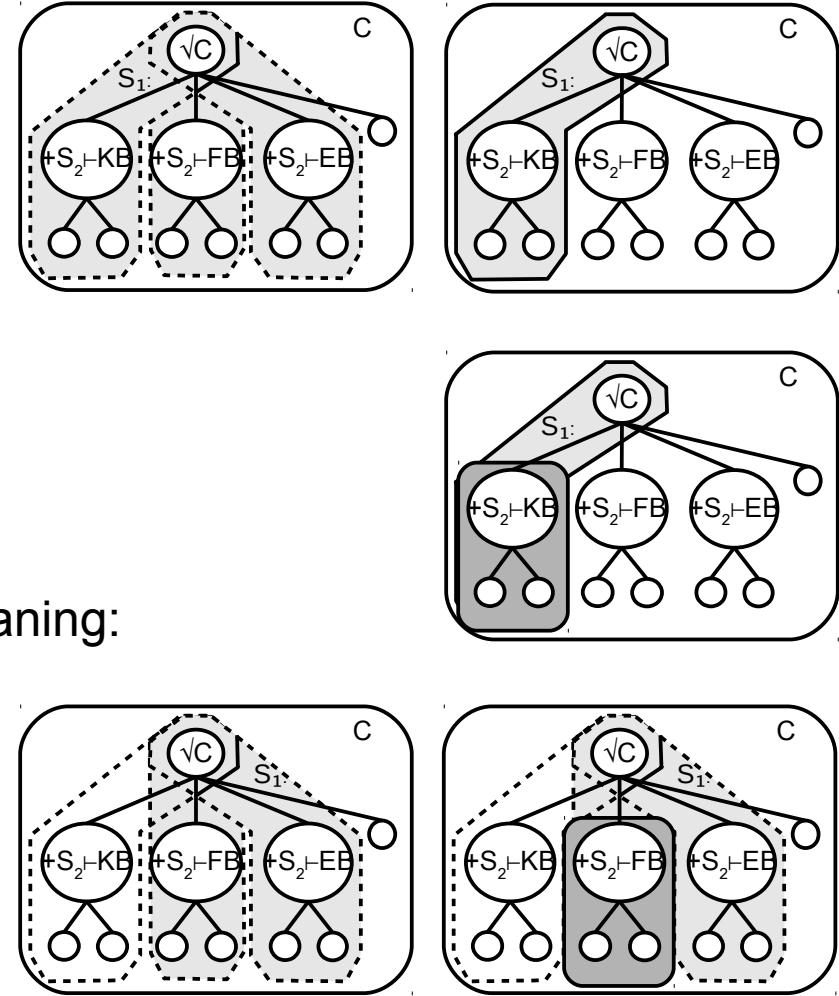
- Focus meaning similar to constituent question meaning:

Wer fährt nach Berlin?

- Role of focus in monopolar questions:

- As with answers, presuppose / accommodate a CS by way of disjunction over focus alternatives
- In case of positive answer: proceed as usual
- In case of negative answer:
fall back to constituent question meaning,
answer the remaining constituent question.

- Crucial for this analysis: non-standard monopolar analysis of questions proposed here



Focus in monopolar questions

- Example exchange

- $S_1: Fährt KARL_F nach Berlin?$
- $S_2: Ja.$

$S_2: \#Nein. / Nein, Fritz fährt nach Berlin.$

- Assume: Focus indicates alternative questions.

- Regular meaning:

$$\llbracket [_{\text{ActP}} ? [_{\text{CmP}} \vdash [_{\text{TP}} KARL_F \text{ nach Berlin fährt}]]] \rrbracket_{S_2 S_1} \\ = \lambda C \langle [\{\sqrt{C}\} \cup C + S_2 \vdash \text{KB}], S_1 \rangle$$

- Focus meaning:

$$\llbracket [_{\text{ActP}} ? [_{\text{CmP}} \vdash [_{\text{TP}} KARL_F \text{ nach Berlin fährt}]]] \rrbracket^f_{S_2 S_1} \\ = \{ \lambda C \langle [\{\sqrt{C}\} \cup [C + S_2 \vdash xB]], S_1 \rangle \mid x \in \text{ENTITY} \}$$

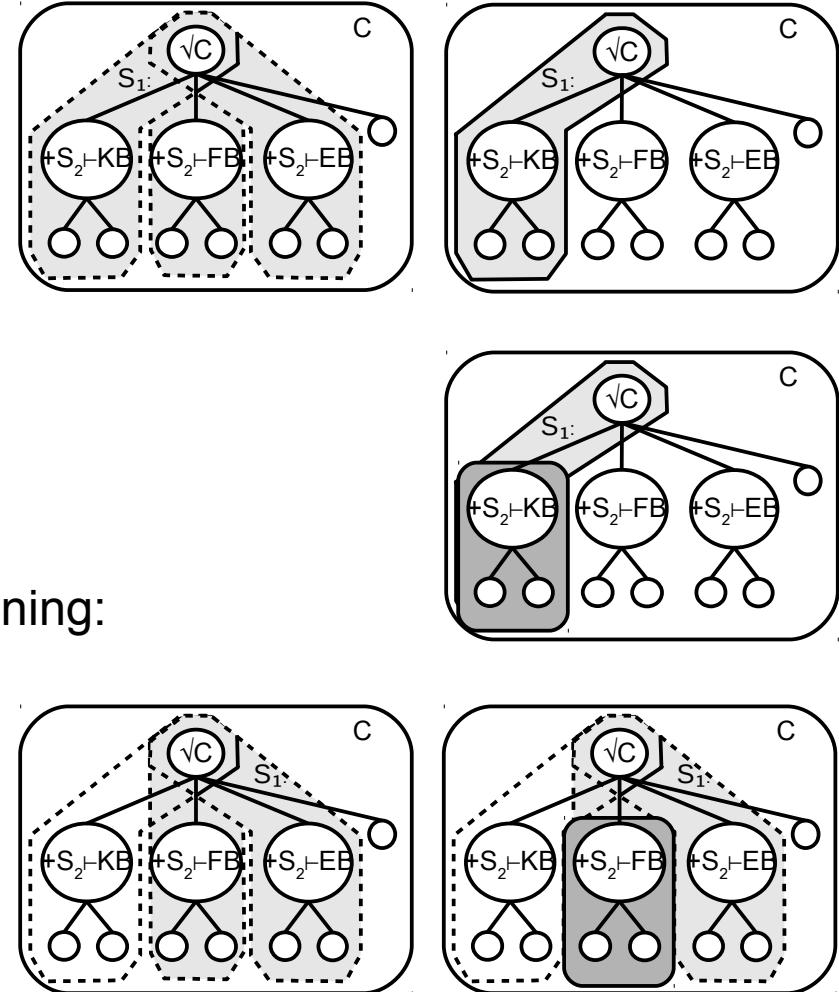
- Focus meaning similar to constituent question meaning:

- Wer fährt nach Berlin?*

- Role of focus in monopolar questions:

- Presuppose / accommodate a CS by way of disjunction over focus alternatives, similar to answers
- In case of positive answer: proceed as usual.
- In case of negative answer: fall back to constituent question meaning, answer the remaining constituent question

- Crucial for this analysis: monopolar analysis of questions proposed here.



Contribution of Focus in Speech Acts

Different uses of focus

- Focus always indicates alternatives, can be mediated by way of Alternative Semantics, Structured Meanings, or a hybrid mechanism (Krifka 2006)
- Alternatives can be used by focus-sensitive particles, e.g. *only*, *also*
- They can also be used at the level of speech acts (CS updates)

Focus interpretation in speech acts, structured meanings

- $\langle \lambda x \mathfrak{A}[x], f, \text{ALT}(f) \rangle$, where $\lambda x A(x)$: background,
 f : focus meaning,
 $\text{ALT}(f)$: focus alternatives
- Alternative speech acts express a disjunctive condition on input CS:
 - $C + \langle \lambda x \mathfrak{A}[x], f, \text{ALT}(f) \rangle = C + \mathfrak{A}[f]$, provided that $C = \{\sqrt{C}\} \cup C + \bigvee_{x \in \text{ALT}(f)} \mathfrak{A}[x]$
 - If condition not satisfied, then C is accommodated accordingly.
- Works for assertions and for monopolar questions
 - Focus in assertions presupposes a background question
 - Focus in monopolar questions presupposes a background constituent question

Contrastive Topics

Contrastiveness in Answers

A second kind of focus:

- Hermann Paul 1919, §54:
“Das psychologische Subj. [...] kommt aber in seiner [Betonungs-] Stärke nur dann dem [psychol.] Prädikat gleich, wenn es im Gegensatz zum psychologischen Subj. eines anderen Satzes steht.”
- Contrastive topic (Büring 1998, Jacobs 2001), contrast (Molnár 2006), frame or delimitation (Krifka 2008)

Example:

- S_1 : *Wohin sind Karl und Fritz gefahren?*
- S_2 : $[KARL]_{CF}$ ist nach $[BERLIN]_F$ gefahren, und $[FRITZ]_{CT}$ nach $[POTSDAM]_F$.
- Realized by L*H accent, in contrast to H* (+L%) for focus

Analysis of focus in contrastive topics as indicating alternative topics / frames:

- $[Meine JÜNGERE]_F$ Schwester] $_{CF}$ ist nach Berlin gefahren, und ...

Contrastive topics as indicating alternative conversational moves

- Discourse trees (Roberts 1996, Büring 2003)
- Indicating alternative speech acts (Tomioka 2010)

Büring, Daniel. 1998. The 59th Street Bridge Accent. London: Routledge.

Jacobs, Joachim. 2001. The dimensions of topic-comment. *Linguistics* 39: 641-681.

Molnár, Valéria & Susanne Winkler (eds). 2006. On different kinds of contrast.

Krifka, Manfred. 2008. Basic notions of information structure. *Acta Linguistica Hungarica* 55: 243-276.

Roberts, Craige. 1996. Information structure in discourse: Towards an integrated formal theory of pragmatics. In: Yoon, J. H. & Andreas Kathol, (eds), OSU Working Papers in Linguistics 49: Papers in Semantics. Columbus: The Ohio State University, 91-136.

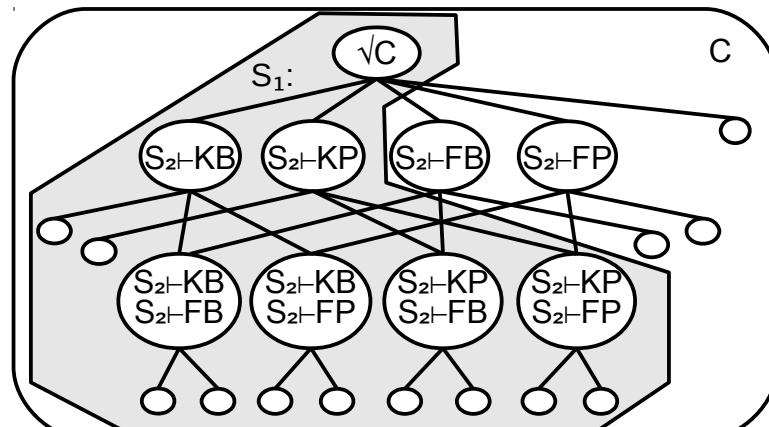
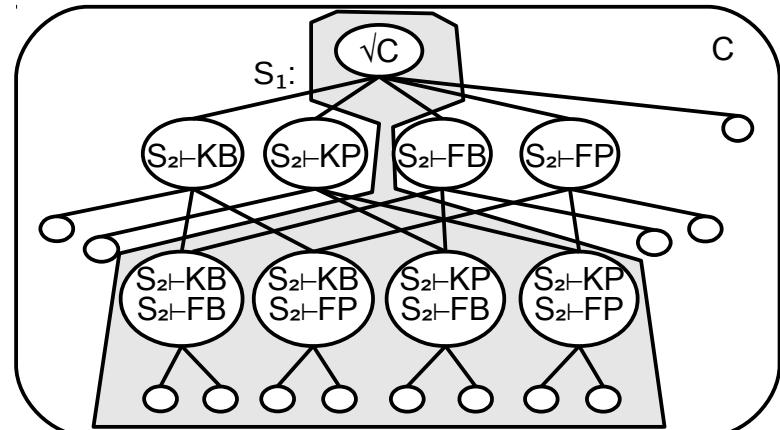
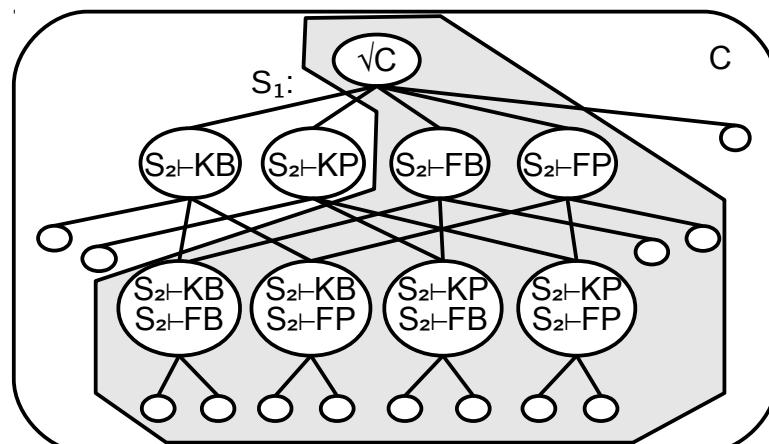
Büring, Daniel. 2003. On D-trees, beans, and B-accents. *Linguistics and Philosophy* 26: 511-545.

Tomioka, Satoshi. 2010. Contrastive topics operate on speech acts. In: Zimmermann, Malte & Caroline Féry, (eds), *Information structure: Theoretical, typological and experimental perspectives*. Oxford University Press, 115-138.

Question conjunction

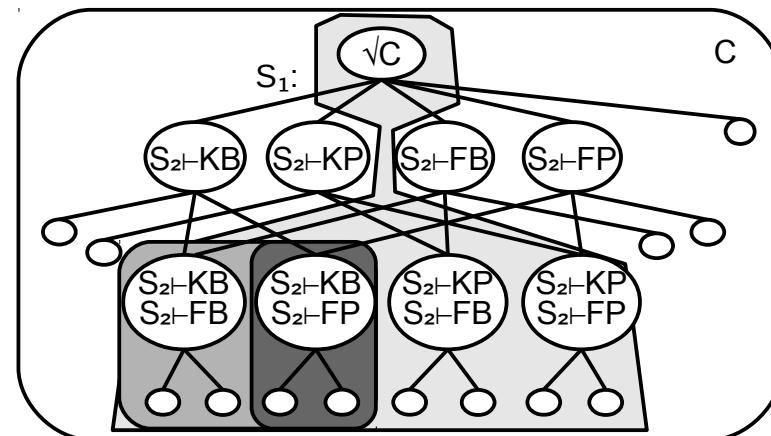
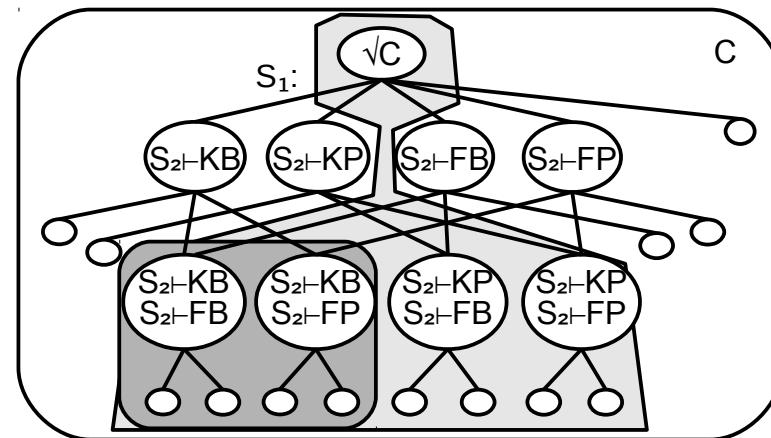
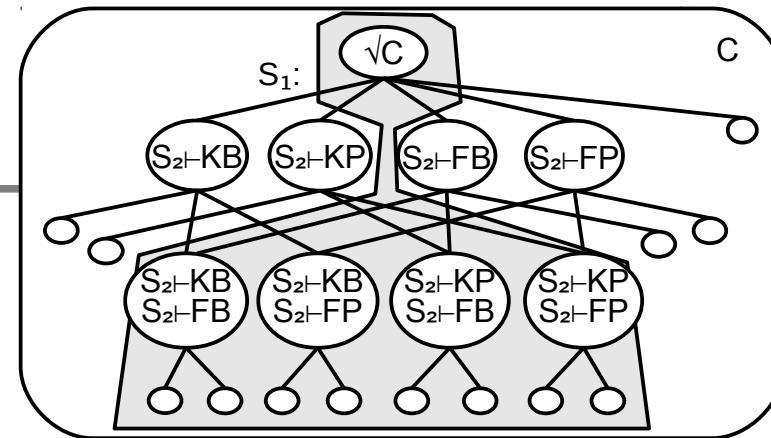
- Conjoined question:

- S_1 , to S_2 : *Wohin fährt Karl, und wohin fährt Fritz?*
- $\llbracket [_{\text{ActP}} \text{wohin fährt Karl}] \rrbracket^{S_1 S_2} \& \llbracket [_{\text{ActP}} \text{wohin fährt Fritz}] \rrbracket^{S_1 S_2}$
 $= \lambda C[\llbracket [_{\text{ActP}} \text{wohin fährt Karl}] \rrbracket^{S_1 S_2}(C) \cap \llbracket [_{\text{ActP}} \text{wohin fährt Fritz}] \rrbracket^{S_1 S_2}(C)]$

 \cap $=$ 

Answering conjoined questions

- Partial answers to conjoined question
 - S_1 , to S_2 : *Wohin fährt Karl, und wohin fährt Fritz?*
 - S_2 : $[KARL]_{CT} \text{ fährt nach } [BERLIN]_F$ und $[FRITZ]_{CT} \text{ fährt nach } [POTSDAM]_F$
 - First answer conjunct does not lead to a single-rooted commitment space
 - second answer results in a single-rooted commitment space
- Role of Contrastive Topic:
 - Presupposes conjoined question
 - Can be accommodated
 - The question conjuncts differ in their CT-alternatives
- Difference F and CT alternatives:
 - F alternatives presuppose disjunction
 - CT alternatives presuppose conjunction
 - CT scopes over F



Contribution of CT in Speech Acts

Recall contribution of focus in speech acts:

- Set of alternatives expresses a **disjunctive** condition on input CS:
- $C + \langle \lambda x \mathfrak{A}[x], f, \text{ALT}(f) \rangle = C + \mathfrak{A}[f]$, provided that $C = [\{\sqrt{C}\} \cup C + V_{x \in \text{ALT}(f)} \mathfrak{A}[x]]$

Contribution of contrastive topic in speech acts:

- Contrastive topic introduces CT-alternatives for speech acts with focus
- CT-alternatives express a **conjunctive** condition on input CS
- $C + \langle \lambda y \mathfrak{A}[y], t, \text{ALT}(t) \rangle = C + \mathfrak{A}[t]$, provided that $C = \&_{y \in \text{ALT}(t)} \mathfrak{A}[y]$
where $\lambda y \mathfrak{A}[y]$: topic background, t : topic meaning, $\text{ALT}(t)$: topic alternatives

Contrastive topic + focus:

- Representation by structured meanings $\langle \lambda y \langle \lambda x A[x][y], f, \text{ALT}(f) \rangle, t, \text{ALT}(t) \rangle$, cf. Krifka 1991
- Or sets of sets of alternatives, cf. Büring 1998
- $C + \langle \lambda y \langle \lambda x A[x][y], f, \text{ALT}(f) \rangle, t, \text{ALT}(t) \rangle = C + \langle \lambda x A[x][t], f, \text{ALT}(f) \rangle$
provided that $C = C + \&_{y \in \text{ALT}(t)} \langle \lambda x A[x][y], f, \text{ALT}(f) \rangle$
- Assertion part by accommodation of C: $[\{\sqrt{C}\} \cup C + V_{x \in \text{ALT}(f)} \mathfrak{A}[x][t]] + \mathfrak{A}[f][t]$
- Provision part by accommodation of C: $[C + \&_{y \in \text{ALT}(t)} [\{\sqrt{C}\} \cup V_{x \in \text{ALT}(f)} \mathfrak{A}[x][y]]]$
- Provision part and assertion part by accommodation of C:

$$[\{\sqrt{C} + \&_{y \in \text{ALT}(t)} [\{\sqrt{C}\} \cup V_{x \in \text{ALT}(f)} A[x][y]]\}]$$

$$\cup [C + \&_{y \in \text{ALT}(t)} [\{\sqrt{C}\} \cup V_{x \in \text{ALT}(f)} A[x][y]]] + V_{x \in \text{ALT}(f)} \mathfrak{A}[x][t] + \mathfrak{A}[f][t]$$

Contrastive Topics

Contribution of CT in Assertions

Example with contrastive topic:

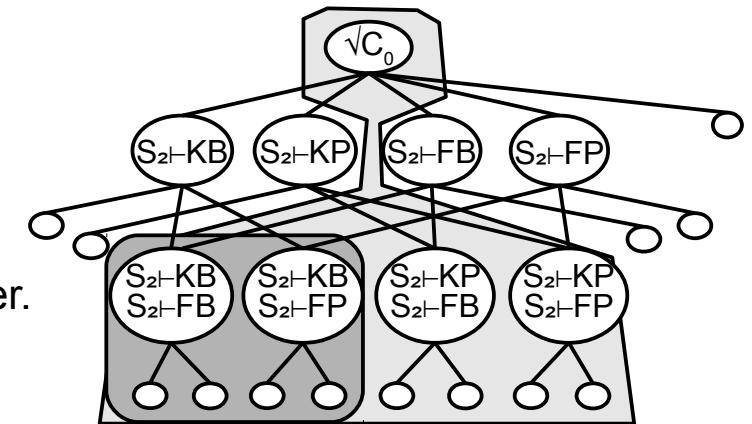
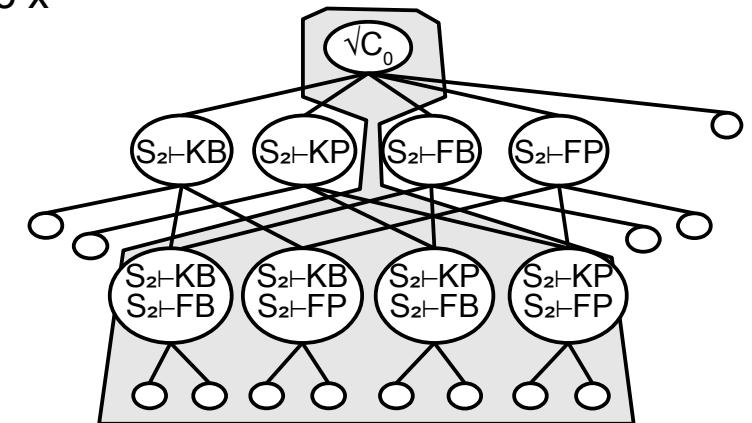
- $\llbracket [_{\text{ActP}} [\text{KARL}]_{\text{CT}} \text{ fährt nach } [\text{BERLIN}]_{\text{F}}] \rrbracket^{S_1 S_2}$
- $= \langle \lambda y \langle \lambda x \lambda C [C + S_1 \vdash yx], B, \{B, P\}, K, \{K, F\} \rangle, \text{ where } yx: 'y \text{ goes to } x'$

Provision for input commitment space C_0 :

- $C_0 + \langle \lambda y \langle \lambda x \lambda C [C + S_1 \vdash yx], B, \{B, P\}, K, \{K, F\} \rangle \rangle$
- requires that $C_0 = C_0 + \&_{y \in \{K, F\}} \langle \lambda x \lambda C [C + S_1 \vdash yx], B, \{B, P\} \rangle$
- i.e. $C_0 = [C_0 + \langle \lambda C [C + S_1 \vdash Kx], B, \{B, P\} \rangle]$
 $\quad \& [C_0 + \langle \lambda C [C + S_1 \vdash Fx_f], B, \{B, P\} \rangle]$
- where $C_0 + \langle \lambda C [C + S_1 \vdash Kx], B, \{B, P\} \rangle$
 $= C_0 + \bigvee_{x \in \{B, P\}} \{\sqrt{C} + S_1 \vdash Kx\}, = C_0 + \{\sqrt{C_0}\} \cup S_1 \vdash KB \cup S_1 \vdash KP$
 and $C_0 + \langle \lambda C [C + S_1 \vdash Fx], B, \{B, P\} \rangle$
 $= C_0 + \bigvee_{x \in \{B, P\}} \{\sqrt{C} + S_1 \vdash Fx\} = C_0 + \{\sqrt{C_0}\} \cup S_1 \vdash FB \cup S_1 \vdash FP$
- that is, in C_0 the following question is asked:
 - *Wohin fährt Karl, und wohin fährt Fritz,
 nach Berlin oder Potsdam?*
 - *Fährt Karl nach BERLIN oder POTSDAM,
 und fährt Fritz nach BERLIN oder POTSDAM?*
- Hence,, $[_{\text{ActP}} [\text{KARL}]_{\text{CT}} \text{ fährt nach } [\text{BERLIN}]_{\text{F}}]$ only a partial answer.

Assertion at commitment space C_0 :

- $C_0 + \langle \lambda y \langle \lambda x \lambda C [C + S_1 \vdash yx], B, \{B, P\}, K, \{K, F\} \rangle \rangle$
- C_0 satisfies requirement $C_0 = [\{\sqrt{C_0}\} \cup [S_1 \vdash KB] \cup [S_1 \vdash KP]]$
- then updated: $[\{\sqrt{C_0}\} \cup [S_1 \vdash KB] \cup [S_1 \vdash KP]] + [S_1 \vdash KP]$



- Contrastive topics need an additional focus:
 - * $[KARL]_{CT} \text{ fährt nach Berlin}$.
 - $C + \langle \lambda y \lambda C [C + S_1 \vdash yB], K, \{K, F\} \rangle = C + S_1 \vdash KB$, provided that $C = [C + S_1 \vdash KB] \cup [C + S_1 \vdash FB]$
 - Note: this necessarily presupposes the asserted information
 - Whenever the assertion is defined, it cannot be express anything new
 - Ungrammatical, due to L-analyticity, Gajewski 2002.
- Exception: questions (cf. Constant 2012)
 - (*Und*) *wohin fährt [KARL]CT morgen?*
 - *Fährt [KARL]CT morgen nach Berlin (oder nicht)?*
 - Reason: Question restricts the properties for the CT-alternatives
- Example:
 - $C_0 + [[_{ActP} wohin [[fährt ?] [[KARL]_{CT} [\vdash] [_{TP} t_{Karl} t_{wohin} t_{fährt}]]]]]_{S_1 S_2}$
 - $= [C_0 + \langle \lambda y [[wohin fährt y]]_{S_1 S_2}, K, \{K, F\} \rangle]$
 - Requirement, accommodated: $C_0 = [C_0 + [[wohin fährt K]]_{S_1 S_2}] \& [C_0 + [[wohin fährt F]]_{S_1 S_2}]$
 - Question asked: $C_0 + [[wohin fährt K]]_{S_1 S_2}$
 - After this question is answered, question $[[wohin fährt F]]_{S_1 S_2}$ remains.
- Also in polarity questions:
 - *Fährt [KARL]CT nach Berlin?*, different from *Fährt [KARL]F nach Berlin?* (final rise vs. fall)
 - Assume a bipolar question: *Fährt [KARL]CT nach Berlin oder nicht?*

Conclusion

- Linguistic information is structured (beyond being compositional)
 - One important structuring feature is focus, indicating alternatives to the information actually expressed
 - These alternatives correspond to the alternatives indicated by the question, or accommodate such a question.
 - Questions can be modeled by their effect on the preferred development of the shared information
- Proposed framework to model such developments: Commitment Spaces
 - Allows for modeling of monopolar (biased) questions and of disjunctive questions
 - Allows for modeling focus in monopolar questions (disjunctive alternatives)
 - Allows for modeling constituent questions as disjunctive monopolar questions
 - Allows for modeling contrastive topics (conjunctive alternatives), both in answers and in questions
- Nature of assertions and questions
 - With assertions, speaker commits to a proposition, the proposition itself becomes common ground by conversational implicature
 - With questions, speaker requests commitments to proposition(s) by addressee
- Further uses of Commitment Spaces:
 - Superlatives like *At most three students went to Berlin.* (Cohen & Krifka 2014)
 - Question tags as conjunctions / disjunctions: *Karl went to Berlin, didn't he / did he?* (Krifka 2015)
 - Conditionals sentences as conditional assertions/questions etc., (Krifka in progress)

