Assertions and Judgements, Epistemics, and Evidentials

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1. Overview

Topics to be covered:

- The nature of assertion as expressing commitments

- Judgements as a separate act from commitments

- Subjective epistemics as expressing strength of judgments

- Evidentials as expressing source of judgements

- Discourse epistemics

2. Assertions as Commitments

2.1 The dynamic view of assertions

(1) Assertions as modifying the common ground,
 "a body of information that is available, or presumed to be available, as a resource
 for communication" (Stalnaker 1978)

(2) Standard view of assertion in dynamic semantics
(Stalnaker 1978, 2002, 2014; Heim 1983, Veltman 1996)
– Common ground is modeled by a set of propositions (context set),
– Assertion of a proposition restricts the input common ground
 to an output common ground by intersection. +
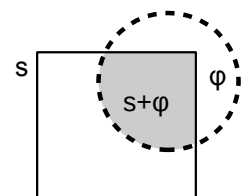
Example: $s + \varphi = s \cap \varphi$

(3) Alternative view: Common ground as sets of propositions
– Assertion of a proposition adds the proposition to the common ground
– Context set: the intersection of the propositions of the common ground
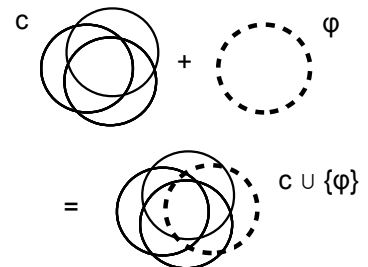
Example: $c + \varphi = c \cup \{\varphi\}$

(4) Advantages of this view:
– Meaningful addition of tautologies, e.g. '2399 is a prime number'
– possible modeling of contradictory common grounds
 (would lead to empty context set)
– possible enrichment by imposing a saliency ordering of the propositions

2.2 How do speakers add propositions to the common ground?

(5) S_1 asserts φ at c: S_1 applies function $f(\varphi) = \lambda c'[c' \cup \{\varphi\}]$ to c

(6) Problems:
  – This assumes that one speaker S_1 has authority over the common ground
  – Does not appreciate that common ground is negotiated
  – Even if φ is accepted to c, it should remain on record that it was S who introduced φ

(7) Concept of **table** in Farkas & Bruce 2010:
  – Common ground has a negotiating area on which participants place propositions
  – After acceptance by other participants, move proposition to permanent common ground
  – Problem: After acceptance, information who introduced which proposition gets lost

(8) Participants convey information due to the rules of a particular game, the CG game.
  But in order that this is not just any arbitrary game, there must be rules attached to it,
  what are those rules?

(9) Stenius 1968: "Produce a sentence in the indicative mood only if its sentence-radical is true."
  Could we play this game differently? No.

(10) Lewis 1972: Convention of truthfulness and trust
  Problem: This is not just a convention, like driving on the right side of the road?

(11) Lauer 2013: How to get from utterances to propositional updates of information states,
  in the current framework, how do you get from (b) to (c):
  a. $c + S_1$: *It is raining.*
  b. $c \cup \{S_1$ **uttered:** *it is raining*$\}$ "cautious update"
  c. $c \cup \{S_1$ uttered: *it is raining*, …, **'it is raining'**$\}$ "credulous update"

2.3 Three approaches to assertion

(12) Bach & Harnish 1979, Lauer 2013 **"I believe"**
  a. Speaker expresses a belief in the truth of a proposition φ
  b. This is reason for Addressee to believe φ as well, if they consider Speaker well-informed,
     not deceiving, speaking in earnest, etc.
  c. Explains **Disbelief Paradox** (Moore): # *It is raining, but I do not believe that it is raining.*
  d. Problem: Difference between *It is raining* and *I believe that it is raining*,
     if we assume that *I believe that I believe that φ ⟺ I believe that φ.*

(13) Bach & Harnish 1979, Truckenbrodt 2006: **"you should believe"**
  a. Spreaker expresses (in addition) the intention that the addressee should form a like belief.
  b. Addressee recognizes this intention and believes φ, if they consider Speaker well-meaning.
  c. Explains **Belief Transfer Paradox**: # *It is raining, but I don't want you to belief it.*
  d. Disbelief paradox: Do not want others to believe what you don't believe!
  d. Problem: *Believe it or not / I don't care whether you believe it / Just for the record, φ*

(14) Ch. S. Peirce, Searle 1969, Brandom 1983, Alston 2000, McFarlane 2011, **"I am to blame"**
  a. Speaker expresses public responsibility for truth of the proposition,
     backed by social sanctions if the proposition is false (and there is no excuse)
  b. The social sanctions act as a guarantee that Speaker does not commit to falsehoods;
     this constitutes reason for the Addressee to assume φ.
  c. Explains **Blame Paradox**: # *It is raining, but I don't want to be blamed if it is not raining.*
  d. Disbelief paradox: When you declare responsibility for φ and for disbelief in φ, you invite
     social sanctions, as you make evident that you do lack sufficient reasons to believe φ
  e. Belief transfer paradox: The typical reason to risk social sanctions is to communicate,
   i.e. to make other people belief in propositions.

(15) In (13), (14), (15), the steps a/b can be seen as a **conversational implicature**
by which the speaker communicates the proposition to the addressee.

(16) Nature of lying:
   (13) makes lying is, strictly speaking, impossible, as assertions are expressions of a belief;
        as expressing a false belief is not lying.
   (14) makes lying morally bad: Do not want others to believe what you don't believe.
   (15) makes lying risky: Don't get caught, you might get sanctioned.
   – In all three cases, lying runs the risk to loose ability to communicate.

2.4 The commitment view, implemented

(17) Implementation of commitment view in Krifka 2015:
   – S_1: *It is raining.* : c + $S_1 \vdash$ **'It is raining'**,
     where $S \vdash \varphi$: the proposition $\lambda i[S$ is in i publicly committed to the truth of $\varphi]$
   – The proposition φ itself is then added as a conversational implicature,
     if no objection, or simple acknowledgement *okay.* c + $S_1 \vdash$ 'It is raining' + **'It is raining'**
   – The source of a proposition, the participant responsible, remains on permanent record
   – As common grounds essentially contain commitments, I call them "**commitment states**".

(18) Possible reactions after c + $S_1 \vdash$ 'It is raining':
   – *No.* S_2 takes up proposition 'It is raining' and asserts its negation,
        resulting in c + $S_1 \vdash$ 'It is raining' + $S_2 \vdash \neg$**'It is raining'**,
        preventing the proposition 'It is raining' from becoming part of c,
   – *Yes.* S_2 takes up proposition 'It is raining' and asserts it,
        resulting in c + $S_1 \vdash$ 'It is raining' + 'It is raining' + $S_2 \vdash$**'It is raining'**,
        making S_2 also publicly responsible for the truth of 'It is raining'

(19) The content of the assertion proper, $S_1 \vdash$ 'It is raining', cannot be addressed directly by S_2,
except by comments like *Don't say that, Take this back, Don't make a fool of yourself.*

(20) Syntactic implementation,
possible head movement of finite verb to CommitP or ActP, movement of subject to Specs
[$_{ActP}$. [$_{CommitP}$ $\vdash$ [$_{TP}$ *it is raining*]]]

(21) Semantic interpretation:
$[\![[_{ActP}$. $[_{CommitP} \vdash [_{TP}$ *it is raining*$]]]]\!]^{S_1,S_2}$, where S_1: speaker, S_2: addressee
= $\lambda c[c + S_1 \vdash [\![[_{TP}$ *it is raining*$]]\!]^{S_1,S_2}]$
= $\lambda c[c + S_1 \vdash \lambda i[$it is raining in i$]]$

2.5 Questions in the commitment view

(22) Extension from commitment states to **"commitment spaces"**:
commitment state + possible continuations
(Cohen & Krifka 2014, Krifka 2014)

(23) Commitment spaces modeled as sets of commitment states C
ordered by set inclusion;
the actual commitments are the smallest commitment state,
the root of the commitment space, $\sqrt{C}$

(24) Update with regular speech acts: C + φ = {c $\in$ C | $\sqrt{C}$ + $\varphi \subseteq$ c}

(25) Allows for denegation, conjunction, disjunction,
conditionalization of speech acts, cf. Krifka 2015, 2017

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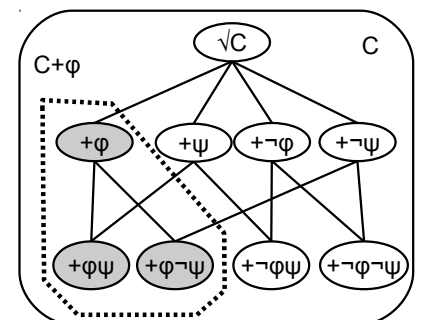
(26) Questions as restrictions of continuations
that do not change the root (meta speech acts)
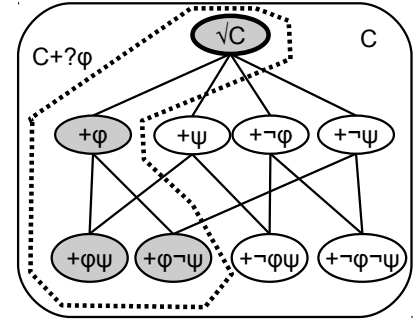 a. monopolar question:
  $C + ?\pi = \{\sqrt{C}\} \cup \{c \in C \mid \sqrt{C} + \varphi \subseteq c\}$
  b. bipolar question by question disjunction:
  $C + [?\varphi \vee ?\neg\varphi] = [C + ?\varphi] \cup [C + ?\neg\varphi]$
  c. wh questions by general disjunction, e.g. *who came*:
  $C + \vee_{x \in \text{PERSON}}[?\text{'x came'}] = \bigcup_{x \in \text{PERSON}}[C + ?\text{'x came'}]$

(27) More specifically: In a monopolar question *Is it raining?*
speaker S_1 imposes on S_2 to update C with $S_2 \vdash$ 'it is raining';
S_2 can a. perform this update,
       b. reject it and answer *no,* $S_2 \vdash \neg$ 'it is raining',
       c. reject it and answer, e.g. by asserting *I don't know,* $S_2 \vdash \neg K_{S_2}\varphi$

(28) Syntactic and semantic implementation of constructing commitment space updates,
Assertions and addressee-oriented questions:

  a. $[\![_{\text{ActP}} [_{\text{Act}^\circ} .] [_{\text{CommitP}} [_{\text{Commit}^\circ} \vdash] [_{\text{TP}} \textit{it is raining}]]]]]\!]^{s,a}$
  $= [\![_{\text{Act}^\circ} .]\!]^{s,a} ([\![_{\text{Commit}^\circ} \vdash]\!]^{s,a} ([\![_{\text{TP}} \textit{it is raining}]\!]^{s,a}))$
  $= \lambda r \lambda C \{c \in C \mid \sqrt{C} + r(\mathbf{s}) \subseteq c\}(\lambda p \lambda x[x \vdash p](\lambda i[\text{it is raining in i}]))$ [.]: committer s
  $= \lambda C \{c \in C \mid \sqrt{C} + \mathbf{s} \vdash \text{'it is raining in i'} \subseteq c\}$

  b. $[\![_{\text{ActP}} [_{\text{Act}^\circ} ?] [_{\text{CommitP}} [\textit{it} _{\text{Commit}^\circ} \vdash \textit{is}] [_{\text{TP}} \_ \_ \textit{raining}]]]]]\!]^{s,a}$
  $= [\![_{\text{Act}^\circ} ?]\!]^{s,a} ([\![_{\text{Commit}^\circ} \vdash]\!]^{s,a} ([\![_{\text{TP}} \textit{it is raining}]\!]^{s,a}))$
  $= \lambda r \lambda C[\{\sqrt{C}\} \cup \{c \in C \mid \sqrt{C} + r(\mathbf{a}) \subseteq c\}](\lambda p \lambda x[x \vdash p](\lambda i[\text{it is raining in i}]))$ [?]: committer a
  $= \lambda C[\{\sqrt{C}\} \cup \{c \in C \mid \sqrt{C} + \mathbf{a} \vdash \text{'it is raining'} \subseteq c\}]$

2.6 Refinements of the commitment view

(29) Subtypes of assertions that relate to degrees of seriousness / social consequences:
  – Explicit performatives: *I swear / claim / suggest that he did not steal the money.*
    cf. strength distinctions of speechact-denoting verbs in Vanderveken 1990
  – Speech act adverbials relating to seriousness: *I honestly did not steal the window.*
  – Invocation of authorities: *Let God be my witness / Jeez, I did not steal the money.*
  – Sanction specification: *For the life of me, I did not steal the money.*
  – Oath phrases:
    a. *wallaahi / winnabi   / wiʔingiil ma-ʔaxatt-iš ḥaaga* (Egyptian Arabic)
      by good / by the prophet / by the bible   I did not steal anything (Mughazi 2003)
    b. *ischwör, Alter, war genau so* (Kiezdeutsch)
      I.swear,   guy,   it was exactly like that (http://www.kiezdeutsch.de/sprachlicheneuerungen.html)

(30) Invoking another authority that is to blame if proposition is false: slifting, according-to
  a. *The weather forecast says it will rain.*   b. *According to the weather forecast, it will rain.*
  c. *It will rain, the weather forecast says.*   d. *Laut (dem) Wetterbericht wird es regnen.*
   (cf. Koev 2017)   loud (the.DAT) weather.forecast will it   rain

(31) What about epistemics, evidentials?
  a. *It probably / certainly is raining.*   b. *I think / believe it is raining.*
  c. *It must / might be raining.*   d. *It seems to be raining.*

(32) Assertion + epistemic modifier for *it likely is raining*; P: probability
  a. von Fintel 2003: $\lambda c[c + \text{speaker has put forward } \varphi \wedge P(\text{'it is raining'}) > 0.5]$
  b. Cohen & Wolf 2011: Assert ('it is raining', P('it is raining') > 0.5); cf. also Piñón 2009.
  c. Wolf 2015: Epistemics are expressive, after Potts 2007: ⟨'it is raining', P('it is raining') > 0.5⟩

Problems:
a. Why is assertion "weakened" by epistemic?
b. Why ✓ *It likely will rain.* but # *It will rain. It likely will rain.*
c. Why no elaboration: *It will rain. #It is likely. / I know it from the weather forecast.*
d. Why are parentheticals slightly off: # *It will – likely – rain.*

(33) Wolf 2015: objective / descriptive vs. subjective / expressive epistemics
a. *It is probable that it will rain tomorrow.* P_{assert} (P(rain) > 0.5) ≥ high
b. *It will probably rain tomorrow.* P_{assert} (P(rain) ≥ high) > 0.5

(34) Problem:
Can **commitment strength** (backed by social sanctions) really be captured by **probability**?

3. Epistemics and Judgements

3.1 Peirce and Frege on Judgement and Assertion

(35) Charles Sanders Peirce on Assent / Judgement vs. Assertion (cf. Tuzet 2006)

[A]n act of **assertion** supposes that, a proposition being formulated, a person performs an act which renders him liable to the penalties of the social law (or, at any rate, those of the moral law) in case it should not be true, unless he has a definite and sufficient excuse;
and an act of **assent** is an act of the mind by which one endeavors to impress the meanings of the proposition upon his disposition, so that it shall govern his conduct, this habit being ready to be broken in case reasons should appear for breaking it.   (CP 2.315)

What is the essence of a **Judgment**? A judgment is the mental act by which the judger seeks to impress upon himself the truth of the proposition. It is much the same as an act of asserting the proposition, or going before a notary and assuming formal responsibility for its truth, except that those acts are intended to affect others, while the judgment is only intended to affect oneself.   (CP 2.252)

(36) Frege on **Gedanke** (Proposition), **Urteil** (Judgement) and **Behauptung** (Assertion)

In einem Behauptungssatz ist also **zweierlei** zu unterscheiden: der Inhalt, den er mit der entsprechenden Satzfrage gemein hat und die Behauptung. (…) In einem Behauptungssatze ist **beides** so verbunden, daß man die Zerlegbarkeit leicht übersieht. Wir unterscheiden demnach
1. das Fassen des Gedankens -- das Denken,
2. die Anerkennung der Wahrheit eines Gedankens – das Urteilen
3. die Kundgebung dieses Urteils -- das Behaupten.   (Frege 1918, *Der Gedanke*).

I propose a correction: All **three** aspects may be combined in an assertion.

3.2 Propositions, Judgements and Assertions

(37) There are **three** distinct semantic operations;
a. Forming a **proposition** / thought φ which has truth conditions
b. Forming a **judgement** of x concerning a proposition φ, a **private** act
c. Forming an **assertion** of x of φ, a **public** act with social consequences

(38) We can distinguish between:
a. S asserts a **simple proposition** φ, in order to introduce φ to the common ground:
S asserts φ, in order to introduce φ
b. S asserts a **judgement** by S about a proposition φ, also to introduce φ to the common ground:
S assert 'S considers φ likely', **also** to introduce φ to the common ground

(39) Reason for asserting judgments:
    a. Weakening of commitment by committing to a proposition that refers to a private act and hence is more protected from possible social sanctions.
    b. Karttunen 1972, Veltman 1996: *It is the mailman* "stronger" than *It must be the mailman*.
    c. Experimental result by Knobe & Yalcin 2014 for extracontextual assessors (<u>E</u>avesdroppers):
        a. S_1: *John is dead.* <u>E</u> knows that John is not dead, judges what S_1 said as false.
        b. S_1: *John might be dead.* <u>E</u> knows that John is not dead, but judges what S_1 said as true.

(40) Lauer 2013 only has (38)(b), i.e. asserting φ is always committing to a judgement (belief) of φ however, there is a difference between S_1: *It is raining.* and S_1: *I believe that it is raining*.

(41) Two uses of judgement/belief clauses, like *I believe that φ*.
    a) With '*I* [prop.attitude] *φ*', speaker S_1 wants to add proposition 'S_1 believes φ' to common ground
    b) With '*I* [pro.attitude] *φ*', speaker S_1 wants to add φ itself to common ground,
        especially if φ is a QUD (Question under Discussion).

(42) Two claims for case (b):
    (i) there are special grammatical forms for (b): epistemic adverbials, embedded root clauses
    (ii) [prop.attitude] must assign high or at least exclude low subjective probability to φ

(43) No negated epistemic adverbials (Bellert 1977, Ernst 2009):
It will likely / *unlikely rain. vs. *It is likely / unlikely that it will rain.* (objective epistemics)

(44) No embedded root phenomena in negative contexts:
Ich glaube, es wird regnen. vs. **Ich glaube nicht, es wird regnen.*
vs. *Ich glaube (nicht), dass es regnen wird.*

3.3 Judgements in syntax and semantics

(45) Subjective modals to express confidence of speaker, addressee, attitude holder:
    a. Peter: *It will likely rain.*   assertion – speaker
    b. Mary, to Peter: *Will it likely rain?*   question – addressee
    c. *Peter thinks that it will likely rain*   propositional attitude – attitude holder: Peter

(46) Assume a **judgement phrase** for expressing the confidence of a judger in a proposition φ;
when asserted, the speaker S commits to the proposition that S has the specified confidence in φ,
in a propositional attitude context, it is expressed that the subject has the specified confidence in φ;
cf. Tenny & Speas 2003, Speas 2004, Evaluative Phrase; Zu 2015, Sentience Layer

(47) The judger aligns with the judge parameter of personal taste / perspective predicates by default:
    a. *The pizza is tasty.*   default judge: speaker
    b. *Is the pizza tasty?*   default judge: addressee
    c. *Peter thinks that the pizza is tasty.*   default judge: subject, here: Peter

(48) Tense Phrases (TPs) and Judgement Phrases (JPs)
    a. TPs are interpreted as propositions with a judge parameter
        that figures in the interpretation of
        perspective predicates, personal taste predicates, logophoric pronouns
        in addition to a parameters for speaker, addressee etc.
        $[\![[_{TP}$ *the pizza is tasty*$]\!]^{s,a,j} = \lambda i[$the pizza is tasty for **j**$]$
    b. JP that makes the judge parameter accessible for semantic operators:
        $[\![[_{JP} [_{J'}$ J $[_{TP}$ *the pizza is tasty*$]]]\!]^{s,a} = \lambda \mathbf{j}[[\![[_{TP}$ *the pizza is tasty*$]\!]^{s,a,j}]$
                      $= \lambda \mathbf{j}\lambda i[$the pizza is tasty for **j** in i$]$
    c. Possible interpretation by centered worlds, Lewis 1979;
        cf. Lasersohn 2005, Coppock & Wechsler 2017: $\lambda \langle j,i \rangle[$the pizza is tasty for j in i$]$

(49) JP can be modulated by subjective epistemic operators:
  – epistemic particles (German *wohl*, Zimmermann 2004; English *perhaps*),
  – epistemic adverbials (*certainly, likely, possibly*)
  – epistemic modals in subjective reading (*may*)

3.4 Subjective vs. objective epistemic operators and judgements

(50) Lyons 1977:   Subjective: Poss + it-is-so + Alfred is unmarried.
  Alfred may be unmarried.   Objective: I-say-so + Poss + Alfred is unmarried.

(51) Papafragou 2006: $[\![might\ \varphi]\!]^{con,i} = \forall x \in G_{con}\ \exists i' \in f_x(i)\ [\![\varphi]\!]^{con,i'}$
  G_{con}: group of knowers whose knowledge is relevant; subjective: $G_{con} = \{speaker(con)\}$,
  G_{con} might be specified, e.g. *as reported by the weather forecast*
  cf. also Kratzer 1981, Tancredi 2007, Portner 2009

(52) Wolf 2012, 2015: **expressive** (better: **judgmental**) vs. **descriptive** epistemic modality

(53) Epistemic adjectives vs. epistemic adverbials:
  a. *It is likely that it will rain.*   – objective
  b. *It likely will rain.*   – subjective

(54) Objective epistemics are at-issue:
  a. S_1: *It is likely that it will rain.* – S_2: *I don't believe it.*
    i) S_2 does not believe that it is likely that it will rain, picking up 'It is likely that it will rain'
    ii) S_2 does not believe that it will rain, picking up embedded 'it will rain'
  b. *It is not likely that it will rain. / It is unlikely that it will rain.*

(55) Subjective epistemics are not-at-issue (Murray 2010)
  a. S_1: *It likely will rain.* – S_2: *I don't believe it.*
    only (ii): S_2 does not believe that it will rain.
  b. * *It not likely will rain. / * It unlikely will rain.*
  c. S_1: *It likely will rain.*
    S_2: *Yes.* S_2: *No.*
      i) 'It will rain'   i) 'It will not rain'
      ii) 'It will likely rain'- confirming act   ii) 'It is not likely that it will rain' – rejecting act
  d. S_1: *It likely will rain.* – S_2: *I don't believe you.* challenges (i), hereby not accepting (ii)

(56) Objective epistemics occur in non-assertive environments, subjective epistemics don't:
  If it is likely that it will rain / If it will $^{??}$likely / *perhaps rain, we should take umbrellas.

3.5 Implementation of subjective / objective epistemics

(57) Assume for concreteness a probability-theoretic approach to epistemics:
  $P(x, i, \varphi)$: the probability that x assigns at index i that φ is true at i

(58) Objective epistemics are proposition-internal, relating to the TP:
  a. $[\![_{TP}\ it\ is\ likely\ that\ it\ will\ rain]\!]^{s,a,j} = \lambda i[P(x, i, \lambda i'[it\ will\ rain\ in\ i']) > 0.5]$,
    x: a contextually salient authority, as unspecified: one with which the speaker aligns
  b. *As reported by the the weather forecast, it is likely that it will rain.*
    $\lambda i[P(report\ of\ the\ w.f.\ in\ i, i, \lambda i'[it\ will\ rain\ in\ i']) > 0.5]$,
    speaker considers w.f. relevant, otherwise there is no add this to the common ground

(59) Subjective epistemics are proposition-external, relate to a judgement phrase, JP:
  a. $[\![_{JP}\ [\ J\ [_{TP}\ it\ will\ rain]]]\!]^{s,a} = \lambda j\lambda i[it\ will\ rain\ in\ i]$ bare JP
  b. $[\![_{JP}\ likely\ [_{JP}\ [\ J\ [_{TP}\ it\ will\ rain]]]]\!]^{s,a} = \lambda j\lambda i[P(j, i, \lambda i'[it\ will\ rain\ in\ i']) > 0.5]$ epistemic adverbial
  c. $[\![_{JP}\ perhaps\ [\ J\ [_{TP}\ it\ will\ rain]]]\!]^{s,a} = \lambda j\lambda i[P(j, i, \lambda i'[it\ will\ rain\ in\ i']) \neq 0]$ epistemic particle
  d. $[\![_{JP}\ [J\ must\ [J\ [_{TP}\ it\ rain]]]]\!]^{s,a} = \lambda j\lambda i[P(j, i, \lambda i'[it\ rains\ in\ i']) = 1]$ epistemic verb

(60) Anaphoric uptake:
   a. S_1: (59)(a,b,c,d), S_2: *I (don't) believe it.* – S_2 does (not) believe that it rains (TP)
   b. S_1: (59)(a,b,c,d), S_2: *I believe so, too.* – S_2 can align with S_1's JP
   a. JPs are not propositions, type **st**, but functions from judges to propositions, type **est**,
      no anaphoric uptake for such functions by *it, that*, but possibly by *so* – (requires testing!)

(61) Some general considerations:
   a. In $[_{ActP} \ldots [_{CommitP} \ldots [_{JP} \ldots [_{TP} \ldots]]]]$, only **TP** can relate to **factual common ground**
   b. Operators in **ActP, CommitP, JP** are just **tools to change** the factual common grounds;
      this explains why JP epistemic operators express a high subjective probability.
   c. We can express what these operators do by propositions,
      e.g. 'S_1 is publicly committed to the truth of the proposition that S_1 considers φ likely',
      but these propositions are **not true independently**, they **come about by speech acts**.
   d. They should not be relegated to an "expressive dimension" in addition to factual information.

(62) But there are ways of dealing with ActP, CommitP, JP in discourse:
   a. Can be talked about: *S_1 claimed that she considered it likely that ...*
   b. Anaphoric means to relate to judgements, acts: *That's right, I agree,*
   c. Other comments on discourse moves *Well said!, Good question!*
   d. Preparations of discourse moves: *Now I have to ask you a difficult question.*

(63) JP is not accessible to negation: **It not likely will rain, *It not perhaps will rain*
   a. JPs cannot be negated, as they are not propositions, type **st**, but of type **est**.
   b. Why: **It unlikely will rain* – Speaker wants to propose TP, $P(s, i, [[TP]])$ must exclude 0,
      if subjective probability is small or includes 0, would not work to convince addressee of φ!
   c. Lowest commitments: *It will perhaps rain*, *It possibly will rain*,
      answer *yes* can agree with JP or assert TP.

3.6 Judgement phrases in assertions and questions

(64) Alignment of Committer of CommitP and Judge of JP:
   S_1: *It will likely rain.* – S_1 claims responsibility for truth of: S_1 thinks it is likely that it will rain.

(65) Committing to a judgement phrase without epistemic modifier:
   $[[[_{CommitP} \; it \; [_{Commit'} \vdash will \; [_{JP} \; [_{J'} \; J \; [_{TP} \; \_\_ \; rain]]]]]]]^{s,a}$
   $= \lambda r \, \lambda x[x \vdash r(x)] \; (\lambda j \lambda i[\text{it will rain in i}])$
   $= \lambda x \; [x \vdash \lambda i[\text{it will rain in i}]]$

(66) Committing to a judgement phrase with subjective epistemic modifier:
   $[[[_{CommitP} \; it \; [_{Commit'} \vdash will \; [_{JP} \; likely \; [_{J'} \; J \; [_{TP} \; \_\_ \; rain]]]]]]]^{s,a}$
   $= \lambda x \; [x \vdash \lambda i[P(x, i, \lambda i[\text{it will rain in i}]) > 0.5]]$

(67) Assertion of commitment phrase with a judgement phrase with epistemic modifier:
   $[[[_{ActP} \; [\; . \; [_{CommitP} \; it \; [\vdash will \; [_{JP} \; likely \; \_\_ \; rain]]]]]]]^{s,a}$
   $= [[[_{Act°} \; . \;]]]^{s,a}([[[_{CommitP} \vdash [_{JP} \; it \; will \; likely \; rain]]]^{s,a})$
   $= \lambda r \lambda C\{c \in C \mid \sqrt{C} + r(s) \subseteq c\}(\lambda x[x \vdash \lambda i[P(x, i, \lambda i[\text{it will rain in i}]) > 0.5]])$
   $= \lambda C \; \{c \in C \mid \sqrt{C} + s \vdash \lambda i[P(s, i, \lambda i[\text{it will likely rain in i}]) > 0.5)] \subseteq c\}$

(68) Additional specification of a commitment phrase operator (just for illustration)
   $[[[_{ActP} \; it \; [\; . \; will \; [_{CommitP} \; honestly \; [\vdash [_{JP} \; likely \; [_{TP} \; \_\_ \; rain]]]]]]]]^{s,a}$
   $= \lambda C \; \{c \in C \mid \sqrt{C} + s \; \text{honestly responsible for:} \; \lambda i[P(s, i, \lambda i[\text{it will rain in i}]) > 0.5] \subseteq c\}$

(69) Questioning a commitment phrase, shift of judge to addressee (interrogativity flip, Faller 2002)
   $[[[_{ActP} \; [\; ? \; will \; [_{CommitP} \; it \; [\vdash [_{JP} \; likely \; \_\_ \; rain]]]]]]]^{s,a}$
   $= [[[_{Act°} \; ? \;]]]^{s,a}([[[_{CommitP} \vdash [_{JP} \; it \; will \; likely \; rain]]]^{s,a})$
   $= \lambda r \lambda C[\{\sqrt{C}\} \cup \{c \in C \mid \sqrt{C} + r(a) \subseteq c\}(\lambda x \; [x \vdash \lambda i[P(x, i, \lambda i[\text{it will rain in i}]) > 0.5]])]$
   $= \lambda C \; [\{\sqrt{C}\} \cup \{c \in C \mid \sqrt{C} + [a \vdash \lambda i[P(a, i, \lambda i[\text{it will rain in i}]) > 0.5)] \subseteq c\}]$

(70) Subjective + objective epistemic operator o.k., not subjective + subjective
It is perhaps likely that it will rain, but * *It will perhaps likely rain*
$[\![_{ActP}$ *it* $[\ .\ is\ [_{CommitP} \vdash [_{JP}$ *perhaps* $[$ J $[_{TP}$ _ _ *likely that it will rain*$]]]]]]]^{s,a}$
$= \lambda C\ \{c \in C\ |\ \surd C + s \vdash \lambda i[P(s, i, \lambda i \exists x[P(x, i, \lambda i[\text{it will rain in i}]) > 0.5)]) \neq 0]\ \subseteq c\}$

3.7 Judgement phrases in propositional attitudes

(71) a. *John thinks that it likely will rain.*
b. *John came to think that it will likely rain.*

(72) Not easy to reconcile with the assertion modifier approach.

(73) Embedded judgement phrase:
$[\![_{JP}$ *it* $[_{J'}$ *likely* $[_{J'}$ J *will* $[_{TP}$ _ _ *rain*$]]]]]^{s,a}$
$= \lambda \mathbf{j} \lambda i[P(\mathbf{j}, i, \lambda i[\text{it will rain in i}]) > 0.5]$

(74) Filling argument slot of propositional attitude predicate
$[\![_{TP}$ *John thinks* $[_{CP}$ *that* $[_{JP}$ *it likely will rain*$]]]]^{s,a,j}$
$= \lambda i[\text{think}(i)(\mathbf{john})([\![_{JP}\ \textit{it likely will rain}]\!]^{s,a}(\mathbf{john})]$
$= \lambda i[\text{think}(i)(\mathbf{john})(\lambda i[P(\mathbf{john}, i, \lambda i[\text{it will rain in i}]) > 0.5)]$
$= \lambda i[P(\mathbf{john}, i, \lambda i[\text{it will rain in i}]) > 0.5)$
John has a thought that can be characterized as: he considers it > 0.5 likely that it will rain.

(75) a. *John thinks that perhaps it will rain.*   subjective epistemic
b. *#John doubts that perhaps it will rain.*   subjective epistemic
c. *John doubts that it is likely to rain.*   objective epistemic

(76) **John doubts that perhaps it will rain.*
$[\![\textit{doubt that } \varphi]\!] = \text{think}\ (\neg\varphi),$
negation does not have scope over a JP, as negation is a propositional operator

(77) High negation in questions is possible:
Isn't this perhaps too simple?
Cf. Krifka 2015 for high negation in questions as applying to CommitP;
speaker tests whether addressee would refrain from committing to the unnegated proposition
$= \lambda C\ [\{\surd C\} \cup \{c \in C\ |\ \surd C + \neg[\mathbf{S_2} \vdash \lambda i[\text{this is too simple in i}]] \subseteq c\}]$

3.8 Non-at-issuenesss

(78) Assumption here:
a. Regular semantic representation: $[_{ActP}\ [_{CommitP}\ [_{JP}\ [_{TP}\ ]]]]$
b. Material in JP, CommitP are tools to make TP-material become part of the common ground
c. Only TP material can address factual points, question under discussion.

(79) Differs from approaches that have the effect of JP / CommitP on a separate, "expressive" layer,
e.g. Wolf 2014;
explains why #*It is raining (I think it is likely.)* is odd,
as it involves a full commitment to 'It is raining'

(80) Example with speaker attitude in JP vs. TP:

a. S_1: *It will likely rain.*
$[\![_{ActP}\ \textit{it}\ [\vdash \textit{will}\ [_{CommitP}\ [\vdash [_{JP}\ \textit{likely}\ [_{JP}\ [\ J\ [_{TP}\ \_\ \_\ \textit{rain}]]]]]]]]]^{s,a}$
$= \lambda C[C + S_1 \vdash \lambda i[P(S_1\ i, \lambda i[\text{it will rain}]) > 0.5]]$
S_2: *I don't believe it.* (= that it will rain.)

b. S$_1$: *I think it is likely that it will rain.*

[[$_{ActP}$ *I* [*J think* [$_{CommitP}$ [⊢ [$_{JP}$ [*J* [$_{TP}$ _ _ *it is likely that it will rain*]]]]]]]]^{s,a}
= λC[C + S$_1$⊢λi[P(S$_1$, i, λi[it will rain])]]

S$_2$: *I don't believe it.* (i) that you think it is likely (ii) that it will rain.

3.9 Evaluation dimensions beyond Truth

(81) Dimensions: the True, the Good, the Beautiful; here we have a closer look at the Good.

(82) a. *Es regnet leider / gottseidank / (un)glücklicherweise.*   subjective, not-at-issue
'Unfortunately / fortunately, it is raining.'
b. *Es ist schade / gut, dass es regnet.*   objective, at-issue
'It is (un)fortunate that it is raining'

(83) Flip / shift with subjective goodness evaluations?
a. **Regnet es leider?*   'It is unfortunately raining?'
Ist es schade, dass es regnet?   'Is it unfortunate that it is raining?'
b. *#Peter glaubt, dass es leider regnet, aber ich finde es gut.*
'Peter thinks that it is unfortunately raining, but I like it.'
Peter glaubt, dass es schade ist, dass es regnet, aber ich finde es gut.
'Peter thinks that it is unfortunate that it is raining, but I like it.'
c. *#Peter findet, dass es leider regnet.*
Peter findet es schade, dass es regnet, aber ich finde es gut.
'Peter finds it unfortunate that it is raining, but I like it.'

(84) Subjective goodness always related to the speaker, modeled as expressive meaning:
a. [[$_{TP}$ *leider* [$_{TP}$ *es regnet*]]]^{s,a,j}
= λi[it is raining in i], expressive: λi'[s considers λi[it is raining in i] unfortunate in i']
b. [[$_{TP}$ *es ist schade, dass es regnet*]]
= λi'[x considers λi[it is raining in i] unfortunate in i'], expressive: –
c. [[$_{TP}$ *ich finde es schade, dass es regnet*]]^{s,a,j}
= λi'[s considers λi[it is raining in i] unfortunate in i']: expressive: –

(85) Interactions of the True with the Good:
a. *Es wird wahrscheinlich leider regnen.*   'It will probably rain;
b. *Es wird leider wahrscheinlich leider.*   the proposition 'it will rain' is dispreferred

4. Evidentials and judgements

(86) Evidentials often difficult to tease apart from epistemics,
do not express the confidence of a judger that a proposition is true,
but rather the source of the judgement (de Haan 2000, Hacquard 2011),
e.g. a person, a rumor, a sensory channel

(87) Here I propose no separate projection for evidentials,
but that they specify the judge parameter of a judge phrase;
consequence: evidentials are always not-at-issue, as judge phrases are not-at-issue

4.1 Non-reportative Evidentials: Sensory, Inferential

(88) Non-reportative evidentials specify the nature of the judge relation,
e.g. sensory channel: hearing, source of knowledge: inferential

(89) Example: **auditory evidentials**,   *fápli-yá:li-hawa-t*
e.g. Koasati (Kimball 1991)   be.windy-ABILITY-AUDIT-PAST
'one could hear the wind occasionally'

(90) $[\![_{JP}\text{AUDITORY }[J [_{TP} \textit{it is raining}]]]\!] = \lambda\mathbf{j}\lambda i[\text{hear}_i(\mathbf{j}, [\![\textit{it is raining}]\!]^{s,a,j})]$,
where hear$_i$(j, φ): in i, person j has auditory evidence for the truth of φ

(91) Example: **inferential evidentials**   *es regnet wohl*
e.g. German *wohl*   'presumably it is raining'

(92) Doherty 1979: presenting a hypothesis,
Zimmermann 2004: expressing a conjecture ("Vermutung") by speaker or addressee,

(93) $[\![_{JP}\text{INFER }[J [_{TP} \textit{it is raining}]]]\!] = \lambda\mathbf{j}\lambda i[\text{infer}_i(\mathbf{j}, [\![\textit{it is raining}]\!]^{s,a,j})]$,
where infer$_i$(j, φ); in i, person j has inferential evidence for the truth of φ

(94) Assertion of non-reportative evidentials serve to reduce the blame if proposition is false, as sensory evidence / inferential evidence is not always to be trusted.

(95) Meaning contribution of *wohl* is not-at-issue (Zimmermann 2004):
S$_1$: *Es regnet wohl.*
S$_2$: *Das glaube ich nicht.* 'I don't believe it', i.e. S$_1$ strictly believes that it is not raining.

(96) Interrogative flip, as j is specified as addressee in questions: *Regnet es wohl?*

4.2 Reportative Evidentials

(97) Reportative evidentials shift the evidence holder

(98) Example hearsay evidential; cf. Schenner 2008. *Es soll regnen.* 'Reportedly, it will rain'

(99) Not-at-issue   – S$_2$: *Das glaube ich nicht.* 'I do not believe that', i.e. that it will rain.
meaning contribution: – $^{??}$*Wenn es regnen soll, dann müssen wir einen Schirm mitnehmen.*

(100) $[\![_{JP}\textit{es }[\textit{soll }[_{TP}\_ \textit{regnen}]]]\!]^{s,a} = \lambda j\lambda i\exists\mathbf{x}[\mathbf{x}\vdash_i\text{'it will rain'}]$, i.e. some x claims that it will rain.

(101) $[\![_{CommitP}\textit{es }[\vdash [_{JP}\_ [\textit{soll }[_{TP}\_ \textit{regnen}]]]]\!]^{s,a} = s\vdash\lambda i\exists\mathbf{x}[\mathbf{x}\vdash_i\text{'it will rain'}]$,
i.e. speaker s is responsible for the proposition that some x claims that it will rain

(102) S$_1$: *Laut Wetterbericht wird es regnen.* 'According to the weather forecast it will be raining.'

Possibly at-issue meaning contribution:
a. S$_2$: *Das glaube ich nicht.* i) 'I do not believe that it will rain' (preferred)
                    ii) 'I do not believe that the weather forecast predicted so'
b. *Wenn es laut Wetterbericht regnet, müssen wir einen Schirm mitnehmen.*
c. *Laut Wetterbericht regnet es nicht.* i) According to the w.r., it will not rain.
                    ii) $^{??}$*It is not the case that according to the w.r. it will rain.*

(103) Possibly interpretable in TP or JP?
a. $[\![_{TP}\textit{laut WB }[\textit{wird es regnen}]]\!]^{s,a,j}$ $= \lambda i[\text{weather-report}\vdash_i\text{'it will rain'}]$
b. $[\![_{JP}\textit{laut WB }[J \textit{ wird }[_{TP}\textit{es regnen }\_]]]\!]$ $= \lambda j\lambda i[\lambda i[\text{weather-report}\vdash_i\text{'it will rain'}]]$

Asserting reportative evidential helps to introduce proposition when source is trusted, while the speaker can shift responsibility to the indicated source,

(104) Similar use with embedded clauses, especially with root clause syntax in German:
Der Wetterbericht sagt (*nicht), es wird regnen. (Simons 2007; Krifka 2014 for proxy speech acts)

5. Excursions: Egophoricity and Allocutive Agreement

5.1 Egophoricity as referring to judge

(105) Egophoric (Conjunct-Disjunct) Systems: Katmandu Newari (Hale 1980, Heargraves 2005):
Alignment of committer with subject.

    a. *jĩ: a:pwa twan−ā*   b. *chã   a:pwa twan−a.*
       1.ERG much   drink-PST.**EGO**   2.ERG much drink-PST
       'I drank a lot.'   'you drank a lot'

    c. *jĩ: a:pwa twan−a   lā?*   d. *chã a:pwa twan−ā   lā?*
       1.ERG much   drink-PST Q   2.ERG much drink-PST.**EGO** Q
       'Did I drink a lot?'   'Did you drink a lot?'

    d. *wã: a:pwa twan−a.*   e. *wã: a:pwa twan−a lā?*
       3.ERG much   drink-PST.DJ   3.ERG much   drink-PST.DJ
       'S/he drank a lot.'   'Did s/he drink a lot?'

(106) In reportative evidentials, reported claims:

    a. *Syām-ā   a:pwa twan-ā   hã.*   b. *Syām-ā   a:pwa twan-a   hã.*
       Syam-ERG much   drink-PST.CJ EVID   Syam-ERG much   drink-PST.DJ EVID
       'According to Sam$_i$, he$_i$ drank a lot.'   'It is said that Sam drank a lot.'

    b. *Syam-ã wã   a:pwa twan-a / twan-ā   dhakā dhāl-a*
       Syam-ERG 3.ERG much   drink-PST / drink-PST-**EGO** COMP   say-PERF
       'Sam$_i$ said that he$_j$ / he$_i$ drank a lot.'

(107) Modeling in terms of judgement phrase:
    a. Ego marking: Judge = Subject (restricted to subjects with intentional θ role in Newari)
    b. In embedded clauses, reportative evidentials: Judger = reportative source
    c. In assertions / questions: mediated by commitment phrase, judger = speaker / addressee

(108) Suggested implementation:
    a. Recall that up to the TP level there is an index for the judge, j: $[\![\,[_{TP} \ldots]\,]\!]^{s,a,j}$
    b. Subject of (intentional) verbs combines with VP + Tense°: $[_{TP}\ [_{DP}\ \alpha\ ]_i\ [_{T'}\ [_{VP} \ldots]\ [_{T°} \ldots]]]$
    c. EGO marking expresses j = subject: $[_{TP}\ [_{DP}\ \alpha\ ]\ [\ [_{T'}\ [_{VP} \ldots]\ [_{T°} \ldots]]\ \text{EGO}\ ]]$,
       with $[\![\ [_{T'} \ldots] \text{ EGO }]\!]^{s,j,p} = [\![\text{EGO}]\!]^{s,j,p}([\![[_{T'} \ldots]]\!]^{s,j,p}) = \lambda x : \mathbf{x=j}\ [\![[_{T'} \ldots]]\!]^{s,a,j}(x)$, where x: subject
    d. In assertions, j is set to speakers; in questions, j is set to addressee
    f. No syntactic binding between speaker / addressee and subject required,
       no syntactic representation of speaker and addressee as in neo-performative analyses
       of Tenny & Speas 2003, Zu (2015), Coppock & Wechsler (2017)

(109) Hale 1980, Coppock & Wechsler 2017: Rhetorical questions are different:

    a. *Ji   ana wan-ā   lā?*   b. *Cha wal-a   lā?*
       1.ABS there go-PST.**EGO** Q   2.ABS come-PST Q
       'Did I go there? (most certainly not!)'   'Did you come? (most certainly not!)'

    c. Interpretation of this type of rhetorical question:
       a. Speaker puts own judgement as the only legal continuation.
       b. $[\![\,[_{Act°}\ ?!\ ]\,]\!]^{s,a} = \lambda r\ \lambda C\ [\,\{\sqrt{C}\}\ \cup\ \{c \in C \mid \sqrt{C} + r(\mathbf{s}) \subseteq c\}\,]$ (not **a**, as in regular questions)
       c. If no reaction by addressee, affirming reaction: regular continuation
       d. Negative reaction rejects commitment by the initial speaker – offensive move.

5.2 Politeness, allocutive agreement: refering to speaker, addressee

(110) Hallmark: no flip with questions, no shift with propositional attitudes;
interpreted with respect to s / a parameter in TP

(111) Politeness distinctions in German

    a. Referring to addressee
        a. $[\![du]\!]^{s,a,j}$ = a, if socially close to s
        b. $[\![Sie]\!]^{s,a,j}$ = a, if socially distant to s

    b. Politeness distinctions in referring to third person referents in German:
        a. $[\![Herr\ Klein]\!]^{s,a,j}$ = Thomas Klein, if s or a socially distant to Thomas Klein
        b. $[\![Thomas]\!]^{s,a,j}$, $[\![Tom]\!]^{s,a,j}$ = Thomas Klein, if s and a socially close to Thomas Klein

(112) Allocutive agreement in Basque; Oyharçabal 1993, Zu 2015
    i. $[\![[_{T'}\ [_{VP}\ \ldots]\ [_{T°}\ \ldots]]\ \text{-}k]\!]^{s,a,j}$ = λx: **male(a)**, familiar(s,a), x≠a $[\![[_{T'}\ [_{VP}\ \ldots]\ [_{T°}\ \ldots]]]\!]^{s,a,j}(x)$
    ii. $[\![[_{T'}\ [_{VP}\ \ldots]\ [_{T°}\ \ldots]]\ \text{-}k]\!]^{s,a,j}$ = λx: **female(a)**, familiar(s,a), x≠a $[\![[_{T'}\ [_{VP}\ \ldots]\ [_{T°}\ \ldots]]]\!]^{s,a,j}(x)$
    -k and *-n* are agreement affixes on finite verb.

(113) Plural speaker agreement in Jingpo (Tibeto-Burman) expressing bonding, Zu 2013
    $[\![[_{T'}[_{VP}\ \ldots]\ [_{T°}\ \ldots]]\ \text{-}kä\text{?}\ ]\!]^{s,a,j}$ = λx: bonding(s,a) $[\![[_{T'}\ \ldots\ ]\!]^{s,a,x}(x)$,
    cf. *How are we doing today* in nurse speak, $[\![we]\!]^{s,a,j}$ = a iff bonding(s,a)

5.3 Addressee reference on the ActP level

(114) Addressee agreement in Jingpo questions (Tibeto-Burman), Zu 2013, 2015
    i. $[\![[_{Act°}\ ?\ ]\!]^{s,a}$ = λrλC [{√C} ∪ {c∈ C | √C + ∃**x**[r(**x**)] ⊆ c}]   – committer unspecified
    ii. $[\![[_{Act°}\ ?\ \text{-}n\ ]\!]^{s,a}$ = λrλC: sg(**a**) [{√C} ∪ {c∈ C|√C + [r(**a**)] ⊆ c}] – single addressee
    iii. $[\![[_{Act°}\ ?\ \text{-}mə]\!]^{s,a}$ = λrλC $\bigcup_{\mathbf{x}\in\mathbf{a}}$ [{√C} ∪ {c∈ C|√C + [r(**x**)] ⊆ c}] – to every addressee

6.   Discourse epistemics

6.1 German *mögen / mag*

(115) literal meaning: 'to want, to like', cognate with *may,* historically 'be able to', cf. *vermögen*

(116) *Das mag in der Theorie stimmen, taugt aber nicht für die Praxis.*
    '(granted that) this may hold in theory, but is not useful for practical purposes'

(117) Objective epistemic modal? Probably not.
    a. S$_1$: *Das mag in der Theorie stimmen.*
       S$_2$: *I don't believe it.*
       'I do not believe that it holds in theory', rather than 'I do not believe that it can hold in theory'
    b. *Wenn das in der Theorie stimmen mag, dann muss die Theorie schlecht sein.*
       'If this may hold in theory, the theory must be bad.'

(118) Subjective epistemic modal?
    a. Not really, as it cannot serve to introduce a proposition into discourse.
       S$_1$: *Wir mögen die Atmosphäre durch SO$_2$-Injektionen abkühlen können, aber...*
          'We may be able to cool down the atmosphere with SO$_2$ injections, but...'
       S$_2$: #*Du behauptest ernsthaft, dass wir mit SO$_2$-Injektionen die Erde abkühlen können?*
          'You seriously claim that we can cool down the atmosphere with SO$_2$ injections?
          o.k. after *Wir können möglicherweise die Atmosphäre durch SO$_2$-Injektionen abkühlen...*

    b. Does not occur in propositional attitudes, different from other subjective epistemics:
       a. **Peter weiß, dass es regnen <u>mag</u>.* vs. *Peter weiß, dass es regnen <u>soll</u> / <u>kann</u>.*
           Peter   knows that it rain   MAG   Peter knows that it rain   REPORT / POSS

(119) Difficult to be used as polarity question, o.k. with constituent question
    a. ?? *Mag das in der Theorie stimmen?*
    b. *Wer mag da an die Tür geklopft haben?*
      'Who might have knocked at the door?', not expecting addressee to be able to answer.

(120) What is rather going on:
    Speaker grants a proposition to the addressee without claiming it,
    cf. Cohen & Krifka 2014 for *John drank at most 3 martinis*.

(121) Explains:
    – *mag* clauses do not express a claim, not even a weak one
    – *mag* clauses are not used as an addressee-oriented question

6.2 Implementation of discourse epistemics

(122) Idea: *mag* φ guarantees that φ in at least one continuation of input commitment space C,
    cf. interpretation of modals in dynamic semantics as checks of input states, Veltman 1996.

(123) $C + [\![mag\ \varphi]\!] = \{c \in C \mid \exists c' \in C\ [\varphi \in c']\}$;
    if φ is not part of any continuation: results in the empty set, which is to be avoided;
    hence effectively it is presupposed that $\exists c' \in C[\varphi \in c']$

(124) C might be accommodated accordingly to satisfy the requirement of this update;
    if $C + [\![mag\ \varphi]\!]$ undefined, change C conservatively to C′, update $C' + [\![mag\ \varphi]\!]$

(125) Syntactic implementation: *mag* as head of ActP
    $[\![_{\text{ActP}}\ das\ [\ .\ mag\ [_{\text{CommitP}} \vdash [_{\text{JP}} J\ [_{\text{TP}}\ \_\ in\ der\ Theorie\ stimmen]]]]]]\!]^{s,a}$
    $= [\![_{\text{Act°}}\ .\ mag\ ]\!]^{s,a}([\![_{\text{CommitP}} \vdash [_{\text{JP}} J\ [_{\text{TP}}\ das\ in\ der\ Theorie\ stimmen]]]]\!]^{s,a})$
    $= \lambda r \lambda C \{c \in C \mid \exists c' \in C\ [r(s) \in c']\}(\lambda x[x \vdash \text{'this is right in theory'}])$
    $= \lambda C \{c \in C \mid \exists c' \in C[s \vdash \text{'this is right in theory'}] \in c']\}$
    i.e. C must contain at least one c′ for which it holds that speaker s is committed
    to the truth of the proposition 'this is right in theory'.

(126) Odd in polarity questions, cf. (119)(a),
    if we assume that *mag* sets s variable to speaker, different from standard questions,
    this would result in the same meaning:
    $[\![_{\text{ActP}}\ [\ ?\ mag\ [_{\text{CommitP}} \vdash [_{\text{JP}} J\ [_{\text{TP}}\ das\ in\ der\ Theorie\ stimmen]]]]]]\!]^{s,a}$
    $= [\![_{\text{Act°}}\ ?\ mag\ ]\!]^{s,a}([\![_{\text{CommitP}} \vdash [_{\text{JP}} J\ [_{\text{TP}}\ das\ in\ der\ Theorie\ stimmen]]]]\!]^{s,a})$
    $= \lambda r \lambda C[\{\sqrt{C}\} \cup \{c \in C \mid \exists c' \in C\ [r(s) \in c']\}(\lambda x[x \vdash \text{'this is right in theory'}])$
    $= \lambda C[\{\sqrt{C}\} \cup \{c \in C \mid \exists c' \in C[s \vdash \text{'this is right in theory'}] \in c']\}]$,
    notice that root is not changed in (125) either.

(127) Occurrence in constituent questions, cf. (119)(b):
    a. Constituent questions normally express a disjunction over question acts, cf. Krifka 2015
      $[\![_{\text{ActP}}\ wer\ [\ ?\ [_{\text{CommitP}} \vdash [_{\text{JP}} J\ [_{\text{TP}}\ \_\ ist\ gekommen]]]]]]\!]^{s,a}$
      $= V_{x \in \text{PERSON}}\ \lambda C\ [\{\sqrt{C}\} \cup \{c \in C \mid \sqrt{C} + a \vdash \text{'x arrived'}\}]$
      $= \lambda C\ [\bigcup_{x \in \text{PERSON}} [\{\sqrt{C}\} \cup \{c \in C \mid \sqrt{C} + a \vdash \text{'x arrived'}\}]]$
      restricts C to immediate moves where a asserts 'x arrived', where x varies over persons

b. Constituent question with *mag* phrase, where *mag* sets judger to s.

$[[_{ActP}\ wer\ [?\ mag\ [_{CommitP} \vdash [_{JP}\ J\ [_{TP}\ \_\ gekommen\ sein]]]]]]^{s,a}$

$= V_{x\in PERSON}\ \lambda C[\{\surd C\}\ \cup\ \{c\in C\ |\ \exists c'\in C[s\vdash\text{'x arrived'}]\}]$

$= \lambda C\ [\bigcup_{x\in PERSON}\ [\{\surd C\}\ \cup\ \{c\in C\ |\ \surd C + s\vdash\text{'x arrived'}\}]]$

requires that C is such that speaker is open to assume for any x that x arrived;

does not require addressee to answer that question,

but addressee can pick up TP meaning and provide the indicated information.

(128) Other discourse epistemics? Future tense:

Dieses Tier dort – das wird ein Esel sein.

'that animal over there – this will (turn out to) be a donkey'

in all inertia developments of the common ground, φ will turn up in a commitment state c,

application of regular future meaning to the future development of the common ground.

(129) Combination with other modal operators:

a. Epistemic modal (objective, subjective?)

Es mag regnen können, aber wir machen auf jeden Fall einen Spaziergang.

it MAG rain   POSS

'Granted that it might rain, but in any case, we go on a walk.'

b. Evidential, possibly with shift to addressee?

Es mag wohl regnen, aber wir machen auf jeden Fall einen Spaziergang.

'Granted that you have evidence that it is raining, but...'

(130) *Es mag   vielleicht   möglich   sein, dass dein Vorschlag semantisch plausibel ist,*

      | | |

  discourse subjective   objective

er hat aber leider viele syntaktische Fragen unbeantwortet gelassen.

'Granted that it is perhaps possible that your proposal is semantically plausible,
 but it unfortunately left many syntactic issues unanswered.'

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