Disjuntive questions[*]
—prosody, syntax, and semantics—

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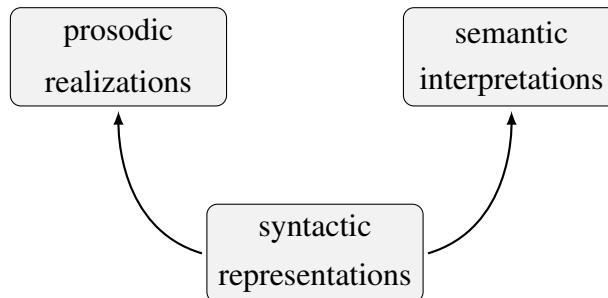
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1   Introduction

- Sentences can be pronounced in different ways, and different intonation patterns often result in different semantic interpretations.

- This is true in particular for disjunctive questions:

  (1)   Did Sally bring wine-or-juice↑?   **yes / no**   YES/NO QUESTION

  (2)   Did Sally bring wine↑ or juice↓?   **wine / juice**   ALTERNATIVE QUESTION

- Which prosodic factors distinguish alternative questions from disjuntive yes/no questions?

- How exactly do these differences in prosody affect semantic interpretation?

- Overall assumption:

  - Differences in prosody reflect differences in syntactic representation
  - Differences in syntactic representation give rise to differences in semantic interpretation

- Theoretical challenges:

    1. Specify a grammar that generates a suitable range of syntactic representations
    2. Specify how syntactic representation are mapped to semantic interpretations
    3. Specify how syntactic representation are mapped to prosodic realizations

- In order to determine what a 'suitable range of syntactic representations' is, it is useful to identify the prosodic factors that are crucial in disambiguation

- So our first step will be to investigate this experimentally

- Approach:

    – Compare minimal pairs of utterance types that differ prosodically in only one respect.
    – If there is a robust semantic difference between two such utterance types, then the prosodic factor in question may be taken to reflect a difference in syntactic representation, which in turn gives rise to the observed difference in semantic interpretation

- Roadmap:

    §2: prosody
    §3: syntax
    §4: semantics
    §5: syntax-semantics interface
    §7: conclusion

2 Prosody

- <u>Canonical prosodies:</u>   (examples adapted from Bartels, 1999)

    (3)   **Canonical alternative question prosody**

            Would you like mineral water   or lemonade?
            a. (H*   H-) (H*   L-L%)
            b. (L*   H-) (H*   L-L%)

    (4)   **Canonical disjunctive yes-no question prosody**

            Would you like mineral water or lemonade?
            a. (H*   H*   H-H%)
            b. (L*   L*   H-H%)

- <u>Alternative questions:</u>   (Bartels, 1999; Quirk *et al.*, 1985; Rando, 1980; Schubiger, 1958)

    – All disjuncts are accented and usually pronounced in separate prosodic phrases
    – If pronounced in separate prosodic phrases, non-final disjuncts end with a pitch rise
    – The final disjunct ends with falling intonation
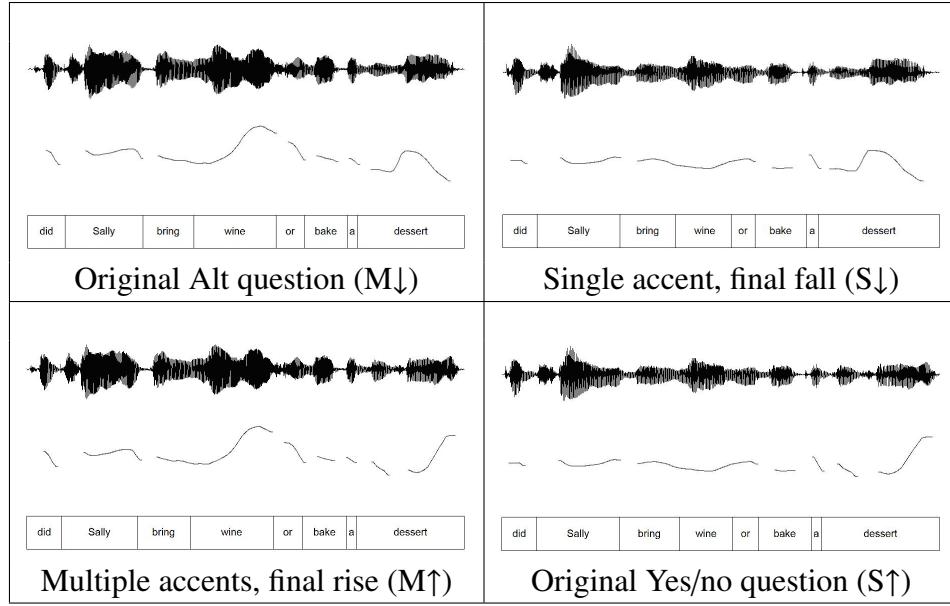
- Disjunctive yes/no questions: (Bartels, 1999)

    - Pitch accents on non-final disjuncts are optional (displayed in gray)

    - A prosodic phrase boundary between the disjuncts is rare

    - A final rise is typical in yes/no questions, although final falls do occur
      in specific contexts (e.g. Hedberg *et al.*, 2004)

- Two prosodic factors:

    - ACCENTUAL CHARACTERISTICS

      presence versus absence of separate pitch accents and prosodic phrase boundaries

    - FINAL CONTOUR

      fall versus rise

- Which of these factors is crucial in determining the interpretation of disjunctive questions?

- Hypothesis A: (Aloni and van Rooij, 2002; Han and Romero, 2004b; Beck and Kim, 2006)

    - **Accentual characteristics are crucial**

    - A disjunctive question is interpreted as an alternative question if and only if
      all disjuncts are accented (and pronounced in separate prosodic phrases).

- Hypothesis B: (Bartels, 1999)

    - **The final contour is crucial**

    - An alternative question interpretation only arises in the presence of a final fall.

2.1   Experiment

- Participants were presented with disjunctive questions with varying prosodic contours,
  and were asked to choose between two possible paraphrases.

- Prosodic contours

		ACCENT	
		Multiple	*Single*
FINAL	*Fall*	M↓	S↓
FINAL	*Rise*	M↑	S↑

S↑ is the canonical contour of YES/NO QUESTIONS
M↓ is the canonical contour of ALTERNATIVE QUESTIONS

Original Alt question (M↓)	Single accent, final fall (S↓)
Multiple accents, final rise (M↑)	Original Yes/no question (S↑)

- <u>Example of an experimental item:</u>

  (5)   Did Sally bring wine or bake a desert?   M↓ / M↑ / S↓ / S↑

      Paraphrase options:
      a.   Which of these things did Sally do: bring wine or bake a dessert?
      b.   Did Sally do any of these things: bring wine or bake a dessert?
      c.   Other _____

- <u>Generation of the experimental items:</u>

    – Canonical contours were directly recorded
    – Non-canonical contours were obtained from the canonical ones by *splicing*

- <u>Results:</u>   (see table 1 and figure 1)

    – S↑ received mostly yes/no question paraphrases, as expected

    – M↓ received mostly alternative question paraphrases, as expected

    – **M↑ received mostly yes/no question paraphrases**,
      as expected on Hypothesis B, but not on Hypothesis A

    – **S↓ received mostly alternative question paraphrases**,
      as expected on Hypothesis B, but not on Hypothesis A

    – Multiple accents/phrases did not force an alternative question interpretation on their own. However, they did raise the likelihood of such an interpretation.

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- Conclusion:[1]
    - The final contour is the most important disambiguating prosodic factor;
    - Accentual characteristics also play a role, but they are not decisive.

| | Paraphrase choice | | | |
Heard	Alternative question	Yes/no question	"Other"	**Total**
M↓ Alternative question	204	16	2	222
M↑ Multiple accents, final rise	35	185	2	222
S↑ Yes/no question	24	197	1	222
S↓ Single accent, final fall	181	39	2	222
Total	444	437	7	888

Table 1: Number of responses for each stimulus type
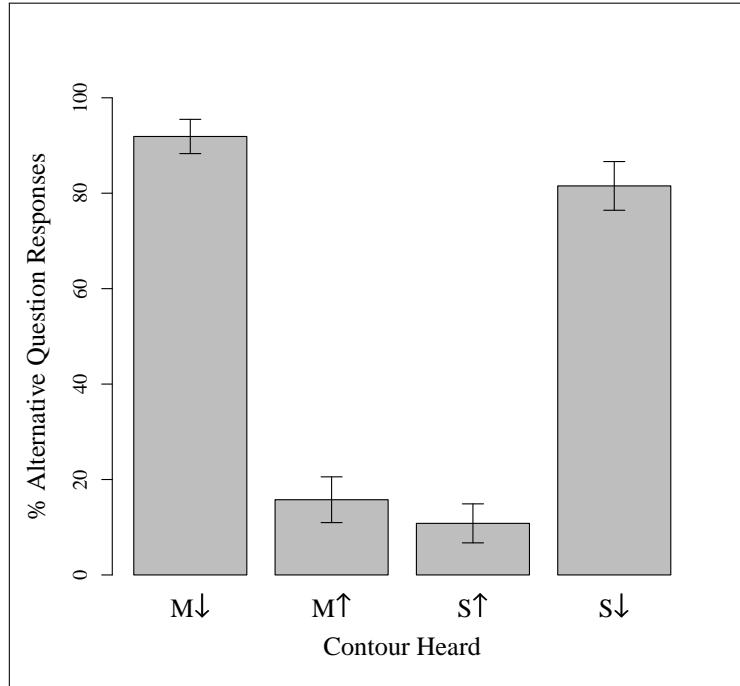
Figure 1: Proportion of ALT QUESTION responses for each contour (±95% confidence interval)

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[1]See the full paper for statistical analysis and more in-depth discussion of the experimental results.

3 Syntax

- Differences in accentual characteristics and final pitch movement presumably reflect differences in underlying syntactic representation.

- What exactly should we take these syntactic differences to be?

- We will argue that:

  1. Syntactically, alt questions consist of two interrogative clauses, joined by disjunction;
  2. The syntactic structure of alt questions determines their accentual characteristics;
  3. Disjunctive phrases may or may not come with an intonational morpheme E;
  4. Prosodically, E induces a falling pitch movement on the final disjunct;
  5. Semantically, E signals, roughly, that exactly one of the disjuncts holds;
  6. We will therefore refer to E as an *exclusive strengthening operator*.

- So there are two ways in which alt questions differ syntactically from yes/no questions:

  - **Structural difference**: interrogative disjunctions vs. disjunctive interrogatives;
  - **Morphological difference**: exclusive strengthening vs. no exclusvie strengthening.

- There is also a third type of disjunctive question: (Roelofsen and van Gool, 2010)

  (6)   Did Sally bring wine↑ or did she bring juice↑?   ***yes / ✓ no**   OPEN QUESTION

- Prosodically, open questions exhibit the M↑ intonation pattern, i.e., they have:

  - essentially the same accentual characteristics as alt questions: **multiple accents/phrases**
  - essentially the same final contour as canonical yes/no questions: a **final rise**

- Syntactically, we will assume that open questions:

  - consist of two interrogative clauses joined by disjunction, just like alternative questions;
  - do not involve an exclusive strengthening operator, just like yes/no questions.

- Summary:

(7)   Syntactic representation   Prosody   Interpretation

   a.   [C_{+Q} did Sally bring wine or juice]   S↑   yes/no question
   b.   [C_{+Q} did S bring wine] or [C_{+Q} did S bring juice]   M↑   open question
   c.   [[C_{+Q} did S bring wine] or [C_{+Q} did S bring juice]]$_E$ M↓   alternative question

- Our grammar also generates a fourth syntactic representation:

   d.   [C_{+Q} did Sally bring [wine or juice]$_E$]

- However, in section 5 we will see that this representation is semantically illicit.

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3.1 Arguments for the existence of interrogative disjunctions

- Most previous work treats alternative questions as disjunctive interrogatives, $[C_{+Q} \text{___ or ___}]$, rather than interrogative disjunctions, $[[C_{+Q} \text{___}] \text{ or } [C_{+Q} \text{___}]]$.

  (e.g. Han and Romero, 2004b; Beck and Kim, 2006)

- Many authors even seem to assume implicitly that the grammar does not generate interrogative disjunctions at all.

- However, there are good reasons to assume that it does.

- Argument 1: auxiliary inversion in unembedded disjunctive questions

  (8)   **Did** Sally bring wine or **did** she bring juice?

- Notice: (8) cannot be interpreted as a yes/no question

- It must be interpreted as an open question or an alt question, depending on the final contour

- Argument 2: **whether** in embedded disjunctive questions

  (9)   I want to know whether Sally brought wine or whether she brought juice.

- Argument 3: overt interrogative disjunctions in Hausa and Tangale (Haida, 2009), Persian (Mameni, 2010), and Japanese (Nobu Akagi, Masashi Hashimoto, and Misato Hiraga, p.c.):

(10)   Ko: za: kà   ta:shì ko: kò: za: kà   zaunà: gida:?   (Hausa)
        Q FUT 2sg.m.subj go-up or **Q** FUT 2sg.m.subj remain home
        Are you going to get up or are you going to stay at home?

(11)   Mairo ed-ug   ɗom (ya) ya: lakikoro (ya)?   (Tangale)
        Mairo eat-PERF beans **Q**   or   rice   **Q**
        Did Mairo eat beans or rice?

(12)   āyā sārā raft balé yā āyā sārā raft operā?   (Persian)
        Q Sara went ballet or **Q**   Sara went opera?
        'Did Sara go to the ballet or did Sara go to the opera?'

(13)   Kaoru ga   kita ka soretomo Mari ga   kita ka?   (Japanese)
        Kaoru NOM came **Q** or-ALT   Mari NOM came **Q**
        'Did Kaoru come or did Mari come?'

3.2 Why alternative and open questions are interrogative disjunctions

- We assume that alternative and open question interpretations can only be derived from syntactic representations that consist of two separate interrogative clauses joined by disjunction;

- As a consequence, every sentence that is interpreted as an alternative or open question, but does not consist of two full interrogative clauses at the surface, must involve **ellipsis**.

- Prediction: alternative / open question interpretations only arise if:

  - the presumed unelided form is grammatical, and
  - the presumed ellipsis process is licensed.

  Otherwise, alternative / open question interpretations do *not* arise.

- Argument 1: **either**

  (14)   Did Sally bring either wine or juice?   *ALT *OPEN

- On our assumptions, it would only be possible to interpret (14) as an alternative or open question if it could be construed as an elided version of (15):

  (15)   Did Sally bring either wine or did she bring juice?

- (15) is ungrammatical, for reasons presumably having to do with the distribution of *either*; (Larson, 1985; Schwarz, 1999; Den Dikken, 2006; Kaplan, 2007; Hofmeister, 2010, a.o.)

- Thus, it is correctly predicted that (14) does not have an alt or open question interpretation.

- Argument 2: **Focus**

  (16)   Did only Sally$_F$ bring wine or juice?   *ALT *OPEN

- To account for this case, we need an additional assumption about the licensing of ellipsis:

- Focus deletion constraint   (Heim, 1997; Merchant, 2001; Han and Romero, 2004a)
  A focused constituent can only be elided if the entire associated focus domain is elided with it.

- Illustration: (from Han and Romero, 2004a)

  (17)   Mary only [told John to eat fruit$_F$ in the morning], and
          Sue only [told him to eat fruit$_F$ in the morning] as well.

  (18)   Mary only [told John to eat fruit$_F$ in the morning], and
          *Sue only [told him to] as well.

- The focus deletion constraint correctly predicts that (18) is ungrammatical, because it involves deletion of a focused constituent without deletion of the entire associated domain.

- The focus deletion constraint also implies that (16) cannot be an elided version of (19):

  (19)   Did only [Sally$_F$ bring wine] or did only [Sally$_F$ bring juice]?

- Thus, we correctly predict that (16) cannot be interpreted as an alternative or open question.

- These data have also been accounted for by Han and Romero (2004a), Beck and Kim (2006). The full paper provides a detailed comparison, arguing that our account improves on both previous accounts.

3.3 How syntactic structure affects accentual characteristics

- Syntactic structure affects:

    - **prosodic phrasing**: prosodic phrases align with syntactic phrases
    - the placement of **contrastive focus**, and associated **pitch accents**

- <u>Contrastive focus interface constraint</u>   (to be refined)   (Kratzer and Selkirk, 2010)

  Constituents from the surrounding discourse must be *focus-represented* whenever possible.

- <u>Focus representation</u>   (Kratzer and Selkirk, 2010)

  One constituent β focus-represents another constituent α if and only if:

    - $[\![\alpha]\!]^O \neq [\![\beta]\!]^O$, and
    - $[\![\alpha]\!]^O \in [\![\beta]\!]^F$

- Illustration:

  (20)   Sally will bring a French wine or an Italian wine to the party.

       $\Rightarrow$ **obligatory contrastive focus** on *French* and *Italian*

- Counterexample:

  (21)   Sally will bring wine or juice to the party.

       $\Rightarrow$ **no obligatory contrastive focus** on *wine* and *juice*

- <u>Trivial focus representation</u>   (Kratzer and Selkirk, 2010)

  If α and β are of semantic type τ, then β is a trivial focus-representation of α iff $[\![\beta]\!]^F = D_\tau$.

- <u>Contrastive focus interface constraint</u>   (final version)   (Kratzer and Selkirk, 2010)

  Constituents from the surrounding discourse must be *focus-represented* whenever possible, unless the result is a trivial focus-representation.

- Implications for disjunctive questions:

  (22) [C_{+Q} did Sally bring wine or juice]   YES/NO

        ⇒ **no obligatory contrastive focus** on *wine* and *juice*

  (23) [C_{+Q} did Sally bring wine] or [C_{+Q} did she bring juice]$_{(E)}$ OPEN, ALT

        ⇒ **obligatory contrastive focus** on *wine* and *juice*

- Summing up:

  1. Alternative / open questions consist of two interrogative clauses joined by disjunction;
  2. The structure of alt and open questions gives rise to a prosodic phrase break and multiple contrastive foci.

3.4 Motivation for tying exclusive strengthening to disjunction

- We assume the existence of an intonational morpheme, E, which:

  - Syntactically, attaches to disjunctive phrases
  - Semantically, signals (roughly speaking) that exactly one of the disjuncts holds
  - Prosodically, triggers a final fall (and possibly also a rise on non-final disjuncts)

- Another approach would be to assume a dedicated 'alternative question operator' that has the desired exclusive strengthening effect built into it (see, e.g., Rawlins, 2008).

- Tying exclusive strengthening to disjunction:

  - opens the way for an analysis of alternative questions as interrogative disjunctions
  - opens the way for a unified account of exclusive strengthening effects in interrogative and non-interrogative disjunctions:

    (24) Will Sally bring wine↑ or juice↓?   ⇒ she will bring exactly one of the two

    (25) Sally will bring wine↑ or juice↓.   ⇒ she will bring exactly one of the two

4 Semantics

- So far we determined:

  - which prosodic features are crucial in disambiguating disjunctive questions
  - how these prosodic differences can be linked to differences in syntactic representation

- Next task:

  - associate the presumed syntactic representations with suitable semantic values

- Plan:

  1. Identify the range of semantic contrasts that should be captured
  2. Identify/develop a semantic framework whose notion of meaning is fine-grained enough to capture all the relevant contrasts, but not more fine-grained/complex than necessary
  3. Specify the semantic values of some prototypical disjunctive questions, and show that the relevant contrasts are indeed captured
  4. Specify a general, compositional interpretation procedure, and show that this leads to desirable predictions also for 'less prototypical' disjunctive questions (section 5)

4.1 Basic data to be accounted for

Three types of data:

- licensing and interpretation of *yes/no answers* (§4.1.1)

- the *exclusive component* of alternative questions (§4.1.2)

- *safe*, *issue-resolving*, and *issue-dispelling responses* (§4.1.3, §4.1.4 and §4.1.5)

4.1.1 Yes/no answers

(26) Did Sally bring wine-or-juice↑?   YES/NO QUESTION
    a. No. ⇒ neither
    b. Yes. ⇒ at least one

(27) Did Sally bring wine↑ or did she bring juice↓?   ALTERNATIVE QUESTION
    a. #No.
    b. #Yes.

(28) Did Sally bring wine↑ or did she bring juice↑?   OPEN QUESTION
    a. No. ⇒ neither
    b. #Yes. ⇒ yes what?!

4.1.2 The exclusive component of alternative questions

- Alternative questions, roughly, imply that exactly one of the disjuncts holds

- Importantly, this implication is **not directly challengable**:

(29)   Did Sally bring wine↑ or juice↓?
- a. ?? No, she didn't bring either.
- b. ?? No, she brought both.

- c. ✓ Actually, she didn't bring either.
- d. ✓ Actually, she brought both.

(30)   Sally brought exactly one of the two beverages.
- a. ✓ No, she didn't bring either.
- b. ✓ No, she brought both.

- Implications that are not directly challengable are generally referred to as **non-at-issue** implications (see Potts, 2005; Roberts *et al.*, 2009, among others). Some examples:

(31)   John <u>stopped</u> smoking.

Implications:

(−) John used to smoke.
(+) He currently does not smoke.

Responses:

a. ?? No, he never smoked.
b. ✓ Actually, he never smoked.

(32)   <u>Only</u> John passed the test.

Implications:

(−) John passed the test.
(+) Nobody else passed the test.

Responses:

a. ?? No, John didn't pass the test.
b. ✓ Actually, John didn't pass.

(33)   John <u>almost</u> passed the test.

Implications:

(−) John did not pass the test.
(+) He came close to passing the test.

Responses:

a. ?? No, he passed the test.
b. ✓ Actually, he passed the test.

(34)   The <u>damn</u> lawyer finally settled.

Implications:

(−) The lawyer is a nasty guy.
(+) The lawyer settled.

Responses:

a. ?? No, he's a nice guy.
b. ✓ Actually, he's a nice guy.

- So the exlusive component of an alternative question is a non-at-issue implication

- Next, let us determine more precisely what the implication actually amounts to

- Consider:

(35)   Did Sally bring wine↑ or juice↑ or both↓?

- Notice that the last disjunct entails the first and the second

- (35) implies that Sally brought at least one of the two beverages, perhaps both

- But if she brought both, then all three disjuncts would be true

- So **(35) does not imply that exactly one of the disjuncts holds**

- Another telling case:

  (36) # Did Sally bring wine↑ or juice↑ or exactly one of the two↓?

- In this case, neither of the disjuncts entails any of the other disjuncts

- Still, **there are no situations in which exactly one of the disjuncts is true**

- Presumably as a consequence of this, **the sentence is perceived as odd**

- Our semantics should explain this anomaly

4.1.3   Safe responses

- Semantic theories of questions are usually expected to predict the range of 'appropriate answers' to a given question.

- However, this is only a meaningful requirement if the notion of an 'appropriate answer' is made sufficiently precise.

- Consider:

  (37)   Is John coming to the party?
  - a.   Yes, he's coming.
  - b.   No, he's not coming.
  - c.   Yes, he's coming and he's bringing his wife.
  - d.   Well, if Mary is coming, then John is coming as well.
  - e.   Yes, John is coming and his cat likes broccoli.
  - f.   It's raining.

- Anyone will probably agree that (37a) and (37b) are appropriate answers.

- Perhaps, many people will also find (37c) an appropriate answer, and maybe also (37d).

- But is (37e) an appropriate answer? Or (37f)?

- If a theory predicts that (37e) is an appropriate answer, is that good or bad?

- The pre-theoretical notion of an 'appropriate answer' is too vague to form the basis for a general requirement for semantic theories of questions.

- A more precise notion that we could consider is that of a **safe response**.

- Definition: φ is a safe response to $?\psi$ if and only if any cooperative speaker who asks $?\psi$ in order to gather new information (and not, e.g., to 'test' the knowledge of his interlocutor) would not be able to coherently reject φ as a response to $?\psi$

  (this is the basic idea behind the notion of **compliance** in Groenendijk and Roelofsen, 2009)

- This is a **very strict notion of answerhood**: (37a-b) are safe responses to (37), but (37c-f) are not, as illustrated by the following dialogues:

  (38) a. Frank: Is John coming to the party?
        b. Susan: No, he's not coming.   **safe**
        c. Frank: # That can't be true, he *is* coming.

  (39) a. Frank: Is John coming to the party?
        b. Susan: Yes, he's coming and he's bringing his wife.   **not safe**
        c. Frank: ✓ That can't be true, his wife is on a trip to Morocco.

  (40) a. Frank: Is John coming to the party?
        b. Susan: Well, if Mary is coming, then John is coming as well.   **not safe**
        c. Frank: ✓ That can't be true, if Mary is coming, then John certainly isn't.

- A semantic theory of questions, together with pragmatic principles of cooperative inquisitive behavior, should be able to predict whether a response to a given question is safe or not.

- This holds in particular for a semantic theory of disjunctive questions.

- Here are some of the desired predictions for our prototypical yes/no question:

  (41) **Yes/no question**: Did Sally bring wine-or-juice↑?

  (42) Some **safe** responses:
        a. Yes, she brought wine or juice.
        b. Yes, she brought wine.
        c. Yes, she brought juice.
        d. No, she didn't bring either.

  (43) Some **non-safe** responses:
        a. Yes, in fact she brought both wine and juice.
        b. Yes, she brought wine, and she also brought an apple pie.
        c. No, she brought an apple pie.
        d. No, she didn't bring anything.

- Notice that the safe responses do not only include the ones that either confirm or deny that Sally brought wine or juice, but also the more specific ones that actually specify which of the two beverages Sally brought.

- Open questions exhibit exactly the same pattern:

  (44)   **Open question**: Did Sally bring wine↑ or did she bring juice↑?

  (45)   Some **safe** responses:
           a.   She brought wine or juice.
           b.   She brought wine.
           c.   She brought juice.
           d.   No, she didn't bring either.

  (46)   Some **non-safe** responses:
           a.   Yes, in fact she brought both wine and juice.
           b.   Yes, she brought wine, and she also brought an apple pie.
           c.   No, she brought an apple pie.
           d.   No, she didn't bring anything.

- (45a) is not a very *satisfactory* response in this case, but that does not take away the fact that it is *safe*—it cannot be coherently rejected by a speaker who cooperatively asked (44).

- Alternative questions exhibit a slightly different pattern:

  (47)   **Alternative question**: Did Sally bring wine↑ or did she bring juice↓?

  (48)   Some **safe** responses:
           a.   She brought wine or juice.
           b.   She brought wine.
           c.   She brought juice.

  (49)   Some **non-safe** responses:
           a.   She brought both wine and juice.
           b.   She brought wine, and she also brought an apple pie.
           c.   She brought an apple pie.
           d.   She didn't bring anything.
           e.   **She didn't bring either.**

- The response in (49e), which was safe in the case of yes/no questions and open questions, is now one of the non-safe responses.

- Otherwise, the pattern is identical to that for yes/no questions and open questions.

- In particular, (48a), just like (45a), is not very helpful, but it *is* safe.

4.1.4   Issue-resolving responses

- Besides safe responses, our theory should also recognize *issue-resolving* responses.

- We will focus on *minimal* issue-resolving responses—responses that provide sufficient information to resolve the given issue, but not more than necessary.

> (50) **Yes/no question**: Did Sally bring wine-or-juice↑?
>
> Minimal issue-resolving responses:
> a.   Yes, she brought wine or juice.
> b.   No, she didn't bring wine or juice.

> (51) **Open question**: Did Sally bring wine↑ or did she bring juice↑?
>
> Minimal issue-resolving responses:
> a.   She brought wine.
> b.   She brought juice.
> c.   No, she didn't bring wine or juice.

> (52) **Alternative question**: Did Sally bring wine↑ or did she bring juice↓?
>
> Minimal issue-resolving responses:
> a.   She brought wine.
> b.   She brought juice.

- Notice that not every safe response is issue-resolving.
  Also, vice versa, not every issue-resolving response is safe

- In order to be issue-resolving, a response should provide *sufficient* information

- In order to be safe, a response should *not* provide *too much* information

4.1.5 Issue-dispelling responses

- Besides safe and issue-resolving responses, our theory should also recognize responses that *dispel* a given issue without resolving it in the intended way

- One way to dispel a given issue is to reject one of the non-at-issue implications:

> (53) Did your brother stop smoking?
>
> Some issue-dispelling responses:
> a.   Actually, he never smoked.
> b.   Actually, I don't have a brother.

- Responses that reject the exclusive component of an alt question have the same status:

> (54) Did Sally bring wine↑ or did she bring juice↓?
>
> Some issue-dispelling responses:
> a.   Actually, she brought both.
> b.   Actually, she didn't bring either.

- Summary of core semantic data:

  - licensing and interpretation of yes/no answers
  - exclusive component of alternative questions
  - safe, issue-resolving, and issue-dispelling responses

- Next step:

  - explore how much of the data can be accounted for by a straightforward analysis of disjunctive questions in *inquisitive semantics and pragmatics*.

  (Groenendijk and Roelofsen, 2009; AnderBois, 2010; Ciardelli and Roelofsen, 2011, a.o.)

4.2   Inquisitive semantics and pragmatics

4.2.1   Propositions as proposals

- Traditionally, semantic meaning is identified with *informative* content.

- In inquisitive semantics, the meaning of a sentence embodies both its *informative* and its *inquisitive* content.

- Sentences are taken to express **proposals** to update the common ground in one or more ways.

- If a sentence proposes two or more alternative updates, it is **inquisitive**: it requests a response that provides enough information to establish at least one of the proposed updates.

- Formally, a proposition is taken to be a set of **possibilities**.

- Each possibility is a set of **possible worlds**, representing a potential update of the common ground.

- Example:

  The propositions expressed by (55a) and (55b) are depicted in figure 2.

  (55)   a.   Sally brought wine.
         b.   Did Sally bring wine?

  In this figure, 11 is a world in which Sally brought both wine and juice, 10 a world in which she brought wine but no juice, etc.

- The proposition expressed by a sentence φ is denoted by $[\![\varphi]\!]$, and the elements of $[\![\varphi]\!]$ are called the *possibilities for* φ.

(a) ⟦(55a)⟧   (b) ⟦(55b)⟧
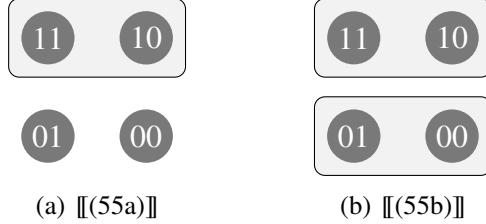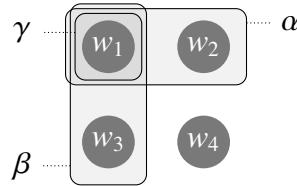
Figure 2: Some simple propositions visualized.

- A sentence φ, expressing the proposition ⟦φ⟧, is taken to:

  1. **provide** the information that the actual world is contained in at least one of the possibilities in ⟦φ⟧, and to

  2. **request** a response from other participants that provides enough information to establish at least one of the proposed updates.

- In some cases, it is sufficient to *accept* the information that φ itself already provides;

- But if ⟦φ⟧ contains two or more alternative possibilities, additional information will be required to establish at least one of these possibilities. In this case, φ is inquisitive.

- Illustration:

  - ⟦(55a)⟧ consists of a single possibility, namely the possibility that Sally brought wine

    * It provides the information that the actual world lies within this possibility, and

    * it does not request any additional information, since the information that it provides is already sufficient to establish the unique update that it proposes.

    * So (55a) is **informative** but **not inquisitive**.

  - ⟦(55b)⟧ consists of two possibilities, the possibility that Sally brought wine, and the possibility that she did not bring wine.

    * It provides the information that the actual world lies in one of these possibilities, but that is trivially the case. So the sentence is **not informative**.

    * However, it *is* **inquisitive**: it requests a response that provides enough information to establish either that Sally brought wine, or that she didn't.

- Formal definitions:

  1. The **informative content** of φ, info(φ), is defined as $\bigcup$⟦φ⟧

  2. φ is **informative** iff info(φ) does not cover the entire logical space

  3. φ is **inquisitive** iff there is no $\alpha \in$ ⟦φ⟧ such that info(φ) $\subseteq \alpha$

- Another way to characterize inquisitive sentences:

  - φ is **inquisitive** iff info(φ) $\notin$ ⟦φ⟧

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4.2.2 Alternative and residual possibilities

- A proposition $[\![\varphi]\!]$ may contain possibilities that do not play any role in determining the informative and inquisitive content of φ.

- Illustration:

- φ provides the information that the actual world lies in at least one of $\{\alpha, \beta, \gamma\}$

- But that is the just as informative as saying that the actual world lies in at least one of $\{\alpha, \beta\}$

- So γ **does not really play a role in determining the informative content of** φ.

- φ requests a response that provides enough information to establish at least one of $\{\alpha, \beta, \gamma\}$.

- But that is the same as requesting a response that provides enough information to establish at least one of $\{\alpha, \beta\}$.

- Any response that satisfies the former request also satisfies the latter, and vice versa.

- So γ **does not really play a role in determining the inquisitive content of** φ either.

- More generally:

  – The informative and inquisitive content of a sentence φ are completely determined by the possibilities in $[\![\varphi]\!]$ that are not properly contained in a maximal possibility in $[\![\varphi]\!]$.

- Alternative and residual possibilities

  For any sentence φ and any possibility $\alpha \in [\![\varphi]\!]$:

  – α is called an **alternative possibility** for φ if it is not properly contained in a maximal possibility in $[\![\varphi]\!]$;

  – α is called a **residual possibility** for φ if it is properly contained in a maximal possibility in $[\![\varphi]\!]$.

- The distinction between alternative and residual possibilities will play an important role in our account of *yes* and *no* answers below

- It also allows for another way of characterizing inquisitive sentences

- Another way of characterizing inquisitive sentences

  φ is **inquisitive** iff $[\![\varphi]\!]$ contains at least two alternative possibilities

4.2.3 Attentive content

- So far we focused on **informative** and **inquisitive** content.

- But propositions can be taken to embody more than just informative and inquisitive content.

- In particular, propositions can also be taken to embody **attentive** content.
  (Ciardelli, Groenendijk, and Roelofsen, 2010)

- A proposal to update the common ground in one or more ways inherently draws attention to all the potential updates that it proposes.

- Thus, it is natural to think of a sentence φ as drawing attention to all the possibilities in $[\![\varphi]\!]$.

- Attentive content will play an important role in our account of safe responses.

- It will become clear in a moment how exactly, but the intuition is very simple:

  - By drawing attention to a possibility, a speaker indicates that this is a 'live' possibility;
  - Therefore, any response that provides just enough information to establish such a possibility will be safe.

4.2.4 Inquisitive pragmatics

- Gricean pragmatics generally assume a classical, truth-conditional semantics.

- Inquisitive semantics enriches the notion of semantic meaning.

- This naturally gives rise to a richer pragmatics as well.

- Gricean maxims specify what it means for a speaker to **provide information** in a rational/cooperative way.

- Inquisitive pragmatics specifies more generally what it means for conversational participants to **exchange information** in a rational/cooperative way.

- Sincerity Maxims: (Groenendijk and Roelofsen, 2009; Ciardelli *et al.*, 2010)

  - **Informative sincerity**: a speaker who utters a sentence φ must believe that the actual world indeed lies in at least one of the possibilities for φ;
  - **Inquisitive sincerity**: if φ is inquisitive, then the speaker must be unable to supply the information that φ requests herself;
  - **Attentive sincerity**: every possibility that φ draws attention to must be a 'live' possibility for the speaker, i.e., every possibility for φ must be consistent with the speaker's information state.

- Inquisitive pragmatics comprises more than these qualitative, speaker-oriented sincerity maxims, but this is all we will need for our present purposes.

- We will see that attentive sincerity is of particular importance to account for safe responses.

(a) ⟦(56)⟧	(b) ⟦(57)⟧	(c) ⟦(58)⟧
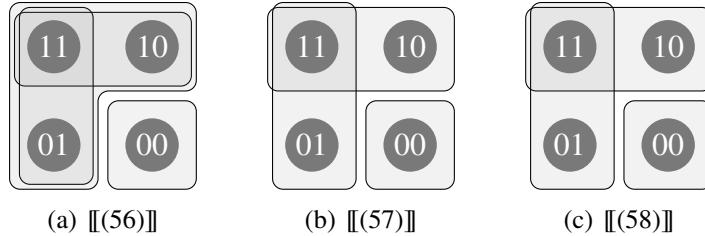
Figure 3: The propositions expressed by different types of disjunctive questions.

4.2.5 Inquisitive semantic values for disjunctive questions

- We will assume that (56)–(58) express the propositions depicted in figure 3 (as mentioned above, we will show how to derive these propositions compositionally in section 5).

(56)   Did Sally bring wine-or-juice↑?   yes/no

(57)   Did Sally bring wine↑ or did she bring juice↑?   open

(58)   Did Sally bring wine↑ or did she bring juice↓?   alternative

- To what extent does this semantic analysis account for the data discussed in section 4.1?

    - We did not make any assumptions yet about the meaning and use of *yes* and *no*.

    - The basic framework of inquisitive semantics only deals with at-issue content.

    - So we cannot account for yes/no answers and exclusive strengthening effects yet.

- However, the analysis *does* account for safe and issue-resolving responses to yes/no and open questions.

- Safe and issue-dispelling responses to yes/no questions:

(56)   Did Sally bring wine-or-juice↑?

(59)   Some **safe** responses:
    a.   Yes, she brought wine or juice.
    b.   Yes, she brought wine.
    c.   Yes, she brought juice.
    d.   No, she didn't bring wine or juice.

(60)   Some **non-safe** responses:
    a.   Yes, in fact she brought both wine and juice.
    b.   Yes, she brought wine, and she also brought an apple pie.
    c.   No, she brought an apple pie.
    d.   No, she didn't bring anything.

(61)   Minimal **issue-resolving** responses:
   a.   Yes, she brought wine or juice.
   b.   No, she didn't bring wine or juice.

- Account of safe and non-safe responses:

  – The responses in (59) each correspond exactly with one of the possibilities in ⟦(56)⟧.

  – All these possibilities must be compatible with the information state of anyone who utters (56) and is attentively sincere in doing so.

  – This explains why the responses in (59) are safe.

  – On the other hand, nothing implies that the information state of a speaker who sincerely utters (56) has to be consistent with the responses in (60).

  – This explains why these responses are not safe.

  – Notice that **attentive sincerity** plays a crucial role here.

- Note on traditional semantic analyses of yes/no questions:

  – Yes/no questions like (56) are generally assumed to express a proposition consisting of **just two possibilities**, the possibility that Sally brought wine or juice, and the possibility that she did not bring wine or juice.

  – For us, these are the **alternative possibilities** in ⟦(56)⟧.

  – Besides these alternative possibilities, ⟦(56)⟧ also contains two **residual possibilities**.

  – This allows us to account for the fact that (59b) and (59c) are safe responses to (56).

  – Traditional accounts would not directly recognize (59b) and (59c) as safe responses.

- Account of minimal issue-dispelling responses:

  – The **minimal amount of information** that is needed to resolve the issue raised by a sentence is determined by the **maximal possibilities** for that sentence.

  – This also holds in the case of (56): the responses in (61) each correspond exactly with a **maximal possibility** in ⟦(56)⟧.

  – This correspondence between maximal possibilities and minimal issue-resolving responses is exactly what is expected.

- Safe and issue-dispelling responses to open questions:

(57)   Did Sally bring wine↑ or did she bring juice↑?

(62)   Some **safe** responses:
   a.   She brought wine or juice.
   b.   She brought wine.
   c.   She brought juice.
   d.   She didn't bring wine or juice.

(63)　Some **non-safe** responses:
- a.　She brought both wine and juice.
- b.　She brought wine, and she also brought an apple pie.
- c.　She brought an apple pie.
- d.　She didn't bring anything.

(64)　Minimal **issue-resolving** responses:
- a.　She brought wine.
- b.　She brought juice.
- c.　No, she didn't bring wine or juice.

- Safe and non-safe responses are accounted for as before, relying on attentive sincerity.

- Issue-resolving responses are also accounted for as before: minimal issue-resolving responses correspond to maximal possibilities.

- General prediction concerning safe responses　　　　　(to be further generalized)

  - If $?\psi$ does not have any non-at-issue content, then φ will be a safe response to $?\psi$ iff $\mathsf{info}(\varphi)$ contains a possibility for $?\psi$.

- General prediction concerning issue-resolving responses　　　(to be further generalized)

  - If $?\psi$ does not have any non-at-issue content, then φ will be an issue-resolving response to $?\psi$ iff $\mathsf{info}(\varphi)$ is contained in a possibility for $?\psi$.

  - If $?\psi$ does not have any non-at-issue content, then φ will be a *minimal* issue-resolving response to $?\psi$ iff $\mathsf{info}(\varphi)$ coincides with a maximal possibility for $?\psi$.

- Next step:

  - Account for the licensing and interpretation of yes/no answers.

4.3　Highlighting

- Basic idea:[2]

  - Sentences *highlight* some of the possibilities that they propose;

  - Highlighted possibilities serve as antecedents for subsequent anaphoric elements;

  - Among such anaphoric elements are the answer particles *yes* and *no*.

---

[2]The notion of highlighting was introduced in (Roelofsen and van Gool, 2010). Closely related ideas have been developed independently by Farkas and Bruce (2009); Farkas (2010, 2011). Roughly, what we call the *proposition* expressed by a sentence correponds to the *projected set* in Farkas and Bruce's terminology, while highlighted possibilities correspond to *what's on the table* in their framework.

- Interpretation of *yes* and *no*   (to be refined)

    - A *yes* answer to a question $?\psi$ presupposes that there is exactly one highlighted alternative for $?\psi$.

    - If this presupposition is met, *yes* confirms the highlighted alternative.

    - A *no* answer simply rejects all the highlighted possibilities for $?\psi$.

- Confirming and reversing responses: (cf. Farkas and Bruce, 2009)

    - Highlighted possibilities correspond to *confirming* responses

    - Non-highlighted possibilities, if there are any, correspond to *reversing* responses

    (65)   Sam is home.

         a.   Yes, he's home. $\Rightarrow$ confirming response

         b.   No, he isn't home. $\Rightarrow$ reversing response

    (66)   Is Sam home?

         a.   Yes, he's home. $\Rightarrow$ confirming response

         b.   No, he isn't home. $\Rightarrow$ reversing response

4.3.1   Initial motivation: opposing polar questions

- Initial motivation for highlighting comes from an old puzzle concerning polar questions:

    (67)   Is the door open?   (68)   Is the door closed?

         a.   Yes $\Rightarrow$ the door is open   a.   Yes $\Rightarrow$ the door is closed

         b.   No $\Rightarrow$ the door is closed   b.   No $\Rightarrow$ the door is open

- In the inquisitive semantics developed so far, (67) and (68) are entirely equivalent

- Yet, there is a clear empirical difference between these two questions:

    - in response to (67), *yes* means that the door is open and *no* that the door is closed

    - in response to (68), *yes* means that the door is closed and *no* that the door is open

- The puzzle becomes even more challenging if we compare (67) and (68) with (69):

    (69)   Is the door open↑ or closed↓?

         a. # Yes

         b. # No

- In the semantics developed so far, (69) is equivalent to (67) and (68).

- However, unlike (67) and (68), (69) does not license *yes* or *no* at all.

(a) ⟦(67)⟧   (b) ⟦(68)⟧   (c) ⟦(69)⟧
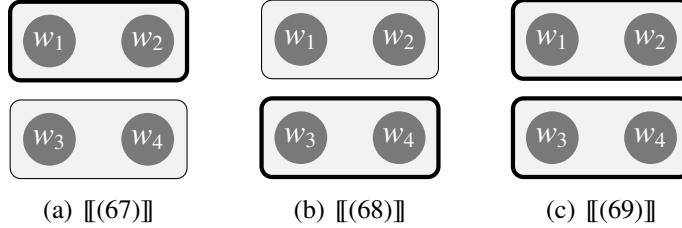
Figure 4: The possibilities proposed and highlighted by opposing polar questions.

- The contrast between (67) and (68) is sometimes presented as a general argument against 'proposition set' approaches to questions, which include the classical theories of Hamblin (1973), Karttunen (1977), and Groenendijk and Stokhof (1984).

- It has inpired several alternative approaches to the semantics of questions such as:

    – the structured meaning approach (von Stechow, 1991; Krifka, 2001)

    – the dynamic approach (Aloni and van Rooij, 2002)

    – the orthoalgebraic approach (Blutner, 2009)

- We choose not to pursue a full-fledged alternative to the proposition set approach, but rather to extend it in a suitable way, by assuming that sentences highlight some of the possibilities that they propose.[3]

- In particular, we assume that:

    – (67) highlights the possibility that the door is open,

    – (68) highlights the possibility that the door is closed,

    – (69) highlights both of these possibilities

    (again, in section 5 these results will be derived compositionally)

- This is depicted in figure 4, where:

    – w_1 and w_2 are worlds where the door is open,

    – w_3 and w_4 are worlds where the door is closed,

    – possibilities with a thick border are highlighted.

---

[3]It should be noted that Groenendijk and Stokhof (1984, pp.321–323) actually provide an explicit account of the interpretation of *yes* and *no* that captures the difference between (67) and (68). The account does not directly predict the infelicity of *yes* and *no* as answers to (69), but nevertheless it shows that 'proposition set' approaches to questions are not inherently incapable of dealing with these facts. They just need to be extended in an appropriate way.

- These assumptions account for the differences between (67), (68), and (69)

- In the case of (67), there is **exactly one highlighted alternative**. So:

  - *yes* is licensed; it confirms the highlighted alternative, conveying that the door is open;
  - *no* denies the highlighted alternative, conveying that the door is closed.

- In the case of (68), there is again **exactly one highlighted alternative**. So:

  - *yes* is licensed; it confirms the highlighted alternative, conveying that the door is closed;
  - *no* denies the highlighted alternative, conveying that the door is open.

- In the case of (69), there are **two highlighted alternatives**. So:

  - *yes* is not licensed—its presupposition is not met;
  - *no* signals that the door is neither open nor closed, which is contradictory.

4.3.2   Further motivation: other constructions sensitive to highlighting

- Constructions other than *yes* and *no* seem sensitive to highlighting as well.

- Anaphoric elements:[4]

  (70)   a.   Is the door open? **Then** the doctor is in.
         b.   Is the door closed? **Then** the doctor is in.
         c.   Is the door open↑ or closed↓? # **Then** the doctor is in.

  (71)   a.   Is the door open? **Otherwise**, please wait.
         b.   Is the door closed? **Otherwise**, please wait.
         c.   Is the door open↑ or closed↓? # **Otherwise**, please wait.

- There are clear empirical differences between (70a), (70b), and (70c):

  - (70a) implies that the doctor is in if the door is *open*;
  - (70b) implies that the doctor is in if the door is *closed*;
  - (70c) is infelicitous.

- Explanation in terms of highlighting:

  - The question in (70a) highlights the possibility that the door is open;
  - The question in (70b) highlights the possibility that the door is closed;
  - These highlighted possibilities serve as the antecedent for anaphoric *then*.
  - (70c) highlights both possibilities.

---

[4]Similar examples are discussed by Starr (2009) and by Mameni (2010) (for different reasons).

– Assuming that *then*, just like *yes*, presupposes a unique highlighted possibility, this explains why (70c) is infelicitous.

- Question embedding verbs:[5]

  (72)   a.   John knows whether the door is open.
         b.   John knows whether the door is closed.

  (73)   a.   John doubts whether the door is open.
         b.   John doubts whether the door is closed.

- (72a) and (72b) are truth-conditionally equivalent:

  – John knows whether the door is open if and only if he knows whether the door is closed.

- **(73a) and (73b) are not truth-conditionally equivalent**:

  – in a situation where John suspects that the door is open, we can truely say that he doubts whether the door is closed, but not that he doubts whether the door is open.

- This asymmetry cannot be explained if the embedded questions in (73a) and (73b), *whether the door is open* and *whether the door is closed*, have exactly the same semantic value.

- Explanation in terms of highlighting:

  – The embedded questions highlight different possibilities;
  – The semantics of *doubt* depends on the possibility highlighted by its complement.

4.3.3   Highlighted possibilities for disjunctive questions

- Assume that the highlights for our prototypical disjunctive questions are as in figure 5.

  (again, in section 5 we will show how to derive these semantic values compositionally)

  (74)   Did Sally bring wine-or-juice↑?   yes/no

  (75)   Did Sally bring wine↑ or juice↑?   open

  (76)   Did Sally bring wine↑ or juice↓?   alternative

- To what extent does this explain the licensing and the interpretation of *yes* and *no* in response to disjunctive questions?

---

[5]These observations were inspired by Karttunen's (1977) squib on *doubting whether*. Related observations have also been made more recently by Rawlins (2008); Biezma and Rawlins (2010).

(a) yes/no   (b) open   (c) alternative
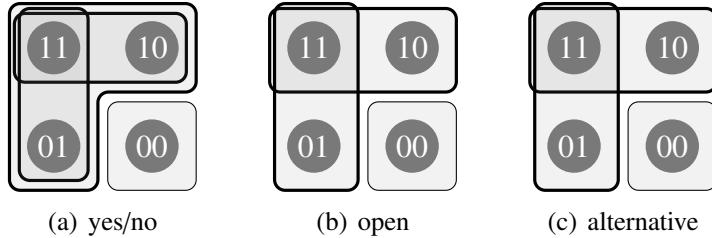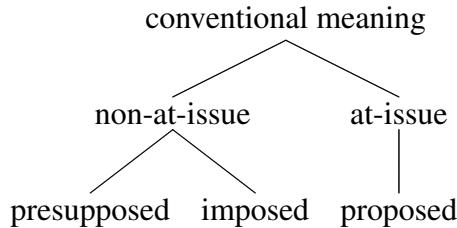
Figure 5: Highlighted and non-highlighted possibilities for disjunctive questions.

- Yes/no questions:
    - (74) highlights exactly one alternative possibility. So:
    - *yes* is predicted to be licensed, conveying that Sally did bring wine or juice   ✓
    - *no* is also predicted to be licensed, conveying that Sally did not bring wine or juice ✓

- Open questions:
    - (75) highlights two alternative possibilities. So:
    - *yes* is predicted not to be licensed   ✓
    - *no* is predicted to be licensed, conveying that Sally brought neither wine nor juice   ✓

- Alternative questions:
    - (76) highlights two alternative possibilities. So:
    - *yes* is predicted not to be licensed   ✓
    - *no* is predicted to be licensed, conveying that Sally brought neither wine nor juice   ∗

- In order to explain why *no* is not an appropriate answer to (76), we need to have a closer look at the exclusive component of alternative questions. To this we turn next.

4.4 The exclusive component

- We saw that the exclusive component of an alternative question is **not directly challengable**

- In this sense, the exclusive component constitutes a **non-at-issue** implication

- It is customary in the literature to distinguish different types of non-at-issue implications

- Many authors classify the exclusive component of alternative questions as a **presupposition** (Rawlins, 2008; Aloni and Égré, 2008; Aloni *et al.*, 2009; Biezma, 2009; AnderBois, 2010; Biezma and Rawlins, 2010; Haida, 2010, a.o.)

- Other authors classify it as a **conventional implicature** (Karttunen and Peters, 1976)

- Proposed and imposed updates

  - We think of the exclusive component of an alternative question as an update that is **imposed** on the common ground, rather than **proposed**

  - Updates that are imposed on the common ground are not intended to be negotiated

  - Precisely in this sense they constitute non-at-issue content

- Impositions and presuppositions

  - Within the general class of non-at-issue content, imposed updates are to be distinguished from presuppositions

  - Clearly, imposing an update on the common ground is different from placing a requirement on the input common ground

- Overall taxonomy of conventional meaning

```
                    conventional meaning
                    /              \
            non-at-issue          at-issue
            /        \               |
     presupposed   imposed        proposed
```

- Imposed updates outside the realm of alternative questions:

  - The distinction between proposed and imposed updates is also adopted by AnderBois, Brasoveanu, and Henderson (2010) in their analysis of **appositives**, and by Murray (2009) in her analysis of **evidentials**.

  - It is also closely related to Horn's (2002) notion of **assertorically inert** implications, and to the notion of **suggestions** in (Groenendijk, 2008; Groenendijk and Roelofsen, 2009; Balogh, 2009; Roelofsen and van Gool, 2010).

- Visualizing imposed updates

  - The propositions and impositions expressed by our prototypical disjunctive questions are depicted in figure 6.

  - Worlds with a light shade of gray are eliminated by the imposed update.

4.4.1 Accepting and challenging imposed updates

- Imposed updates can be accepted or challenged by a responder.

- Acceptance is the default. That is, if an imposed update is not explicitly challenged, then all conversational participants take it to be commonly accepted, and the update is effectuated.

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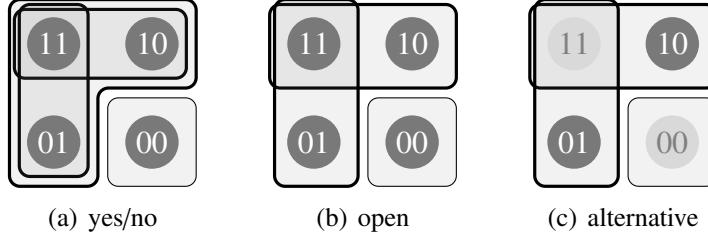
Figure 6: Propositions and impositions for our prototypical disjunctive questions.

- Imposed updates can be challenged, but not using the direct disagreement particle *no*.

- Instead, a 'less direct' disagreement particle such as **actually** or **in fact** must be used.

- This is why alternative questions do not license *no* as an answer.[6]

4.4.2 Refined predictions about safe, issue-resolving, and issue-dispelling responses

- In section 4.2.5, we stated our general predictions about safe and issue-resolving responses in the absence of non-at-issue content.

- Now that non-at-issue content has entered the picture, these predictions should be refined.

- Refined general prediction concerning safe responses

    - φ is a safe response to $?\psi$ if and only if $\mathsf{info}(\varphi)$ contains a possibility for $?\psi$, and $\mathsf{info}(\varphi)$ is compatible with the non-at-issue content of $?\psi$.

- This prediction is in accordance with the observations concerning safe and non-safe responses to alternative questions made in section 4.1:

(77)   Did Sally bring wine↑ or juice↓?

(78)   Some **safe** responses:
   a.   She brought wine or juice.
   b.   She brought wine.
   c.   She brought juice.

(79)   Some **non-safe** responses:
   a.   She brought both wine and juice.
   b.   She brought wine, and she also brought an apple pie.
   c.   She brought an apple pie.
   d.   She didn't bring anything.
   e.   She didn't bring wine or juice.

---

[6]In the paper, we show explicitly that a *no* response to an alternative question always challenges the update that the question imposes on the common ground.

- Account for safe responses:

  - info(78b) and info(78c) each coincide with one of the possibilities for (77)
  - info(78a) coincides with the union of these two possibilities
  - (78a)–(78c) are all compatible with the imposition of (77)
  - Thus, these responses are correctly predicted to be safe

- Account for non-safe responses:

  - info(79a) does not contain any of the possibilities for (77)
  - The same holds for (79b)–(79d)
  - So these responses are straightforwardly predicted not to be safe, without making reference to the update imposed by (77)
  - This is different for (79e)
  - info(79e) coincides with one of the possibilities for (77)
  - However, info(79e) is incompatible with the imposition of (77)
  - Therefore (79e) is also correctly predicted not to be a safe response

- General predictions concerning issue-resolving responses

  - φ is an issue-resolving response to $?\psi$ if and only if info(φ) is contained in a possibility for $?\psi$, and info(φ) is compatible with the non-at-issue content of $?\psi$
  - φ is a *minimal* issue-resolving response to $?\psi$ iff info(φ) coincides with a maximal possibility for $?\psi$, and info(φ) is compatible with the non-at-issue content of $?\psi$

- General prediction concerning issue-dispelling responses

  - φ is an issue-dispelling response to $?\psi$ if info(φ) is incompatible with the non-at-issue content of $?\psi$

- These predictions account for the observations made in section 4.1 concerning minimal issue-resolving and issue-dispelling responses to alternative questions:

  (80)   Did Sally bring wine↑ or juice↓?

  Minimal issue-resolving responses:
  a.   She brought wine.
  b.   She brought juice.

  Issue-dispelling responses:
  c.   Actually, she brought both.
  d.   Actually, she didn't bring either.

- Account for minimal issue-dispelling responses

    - (80a-b) each correspond with a maximal possibility for (80)
    - Moreover, both responses are compatible with the imposition of (80)
    - Thus, these responses are correctly predicted to be minimal issue-resolving responses

- Account for issue-dispelling responses

    - The responses in (80c-d) are incompatible with the imposition of (80)
    - Thus, they are correctly predicted to dispel the given issue without resolving it in the intended way

5   The syntax-semantics interface

- We have shown that assigning certain semantic values to our prototypical disjunctive questions leads to an account of the empirical observations discussed in section 4.1.

- However, we have not shown yet how to derive these semantic values compositionally.

- We will provide an outline of our account of the syntax-semantics interface here.

- More details are provided in the paper.

- Basic architecture: **alternative semantics**   (Hamblin, 1973, a.o.)

    - Every syntactic constituent φ is associated with a **denotation set** $[\![\varphi]\!]$
    - Semantic values are composed by means of **pointwise function application**

- Addition I: **highlighting**

    - For every φ, some elements of $[\![\varphi]\!]$ are highlighted, others are not highlighted
    - $[\![\varphi]\!]^+$ denotes the set of objects in $[\![\varphi]\!]$ that are highlighted
    - $[\![\varphi]\!]^-$ denotes the set of objects in $[\![\varphi]\!]$ that are not highlighted

- Addition II: **ordinary** and **strengthened** semantic values   (Chierchia, 2004, a.o.)

    - Every φ is associated with an ordinary semantic value, $[\![\varphi]\!]$
    - but also with a **strengthened semantic value**, $[\![\varphi]\!]_S$
    - Just like $[\![\varphi]\!]$, $[\![\varphi]\!]_S$ has highlighted and non-highlighted elements
    - $[\![\varphi]\!]_S^+$ denotes the set of objects in $[\![\varphi]\!]_S$ that are highlighted
    - $[\![\varphi]\!]_S^-$ denotes the set of objects in $[\![\varphi]\!]_S$ that are not highlighted

- Crucial syntactic elements of disjunctive questions to account for:

    - Question operator ($\approx$ interrogative complementizer)
    - Disjunction
    - Exclusive strengthening operator

5.1 Interrogative complementizers

- The semantic contribution of C_{+Q} is defined in such a way that every constituent of the form $[C_{+Q}\ \varphi]$ is a proper polar question, in the following sense:

  - There are always **exactly two alternative possibilities** for $[C_{+Q}\ \varphi]$.

    These two alternatives correspond to minimal issue-dispelling responses:
    - * one provides the information that the actual world lies in $\bigcup[\![\varphi]\!]$
    - * the other provides the information that the actual world does *not* lie in $\bigcup[\![\varphi]\!]$

  - $[C_{+Q}\ \varphi]$ always **highlights exactly one alternative possibility**, namely $\bigcup[\![\varphi]\!]$.

    This means that:
    - * $[C_{+Q}\ \varphi]$ always licenses *yes* and *no* as responses
    - * *yes* conveys that the actual world lies in $\bigcup[\![\varphi]\!]$
    - * *no* conveys that the actual world does not lie in $\bigcup[\![\varphi]\!]$

  These effects are achieved as follows:

- Semantic contribution of interrogative complementizers
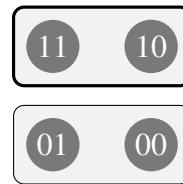
  For any clausal constituent φ:

  - $[\![C_{+Q}\ \varphi]\!]^+ := [\![\varphi]\!] \cup \{\,\bigcup[\![\varphi]\!]\,\}$
  - $[\![C_{+Q}\ \varphi]\!]^- := \{\,\overline{\bigcup[\![\varphi]\!]}\,\}$

  - $[\![C_{+Q}\ \varphi]\!]_S^+ := [\![\varphi]\!]_S \cup \{\,\bigcup[\![\varphi]\!]_S\,\}$
  - $[\![C_{+Q}\ \varphi]\!]_S^- := \{\,\overline{\bigcup[\![\varphi]\!]_S}\,\}$

- Example of an atomic yes/no question:

  (81) $[\![C_{+Q}\ \text{did Sally bring wine}]\!]^+ = \{\,\lambda w.\ \text{Sally brought wine in } w\,\}$
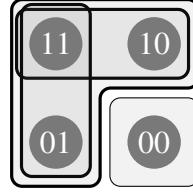
  $[\![C_{+Q}\ \text{did Sally bring wine}]\!]^- = \{\,\lambda w.\ \text{Sally didn't bring wine in } w\,\}$

- Example of a disjunctive yes/no question: (anticipating our treatment of disjunction)

  (82) $[\![C_{+Q}\ \text{did Sally bring wine or juice}]\!]^+ = \left\{ \begin{array}{c} \lambda w.\ \text{S brought wine in } w, \\ \lambda w.\ \text{S brought juice in } w, \\ \lambda w.\ \text{S brought wine or juice in } w \end{array} \right\}$

  $[\![C_{+Q}\ \text{S brought wine or juice}]\!]^- = \{\,\lambda w.\ \text{S didn't bring wine or juice in } w\,\}$

5.2 Disjunction

- We will first consider the standard treatment of disjunction in alternative semantics.

- We will see that this yields unsatisfactory results when disjoining interrogative clauses.

- The solution will make crucial use of the distinction between highlighted and non-highlighted possibilities.

- Standard treatment of disjunction in alternative semantics   (Alonso-Ovalle, 2006)

  For any two constituents φ and ψ that have the same semantic type:

  – $[\![\varphi \text{ or } \psi]\!] := [\![\varphi]\!] \cup [\![\psi]\!]$

- Notice that this definition does not tell us which elements of $[\![\varphi \text{ or } \psi]\!]$ are *highlighted*.

- Nor does it tell us what the *strengthened* semantic value of $[\![\varphi \text{ or } \psi]\!]$ is.

- The most straightforward adaptation of Alonso-Ovalle's treatment to our setting would be:

- Semantic contribution of disjunction   (first try, based on Alonso-Ovalle, 2006)

  For any two constituents φ and ψ that have the same semantic type:

  – $[\![\varphi \text{ or } \psi]\!]^+ := [\![\varphi]\!]^+ \cup [\![\psi]\!]^+$ – $[\![\varphi \text{ or } \psi]\!]_S^+ := [\![\varphi]\!]_S^+ \cup [\![\psi]\!]_S^+$

  – $[\![\varphi \text{ or } \psi]\!]^- := [\![\varphi]\!]^- \cup [\![\psi]\!]^-$ – $[\![\varphi \text{ or } \psi]\!]_S^- := [\![\varphi]\!]_S^- \cup [\![\psi]\!]_S^-$

- Problem: **open questions**

  – This treatment of disjunction yields problematic results for open questions:

  (83)   Did Sally bring wine↑ or did she bring juice↑?

         $[[C_{+Q}$ Sally brought wine] or $[C_{+Q}$ she brought juice]]

  – Given the rules presented so far, (83) expresses the proposition depicted in figure 7(a)

  – This proposition differs from the desired one, depicted in figure 7(b)

  – In particular, (84a) and (84b) are wrongly predicted to resolve the issue raised by (83):[7]

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[7]This is also a problem for the semantics proposed by Haida (2009, 2010). Haida recognizes the problem and attempts to resolve it pragmatically. We offer a semantic solution.

(a) undesirable result   (b) desired result
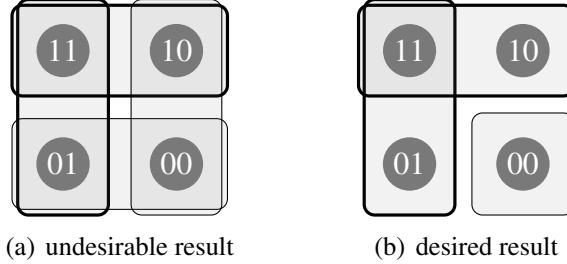
Figure 7: Compositionally deriving the proposition expressed by open questions.

(84) **Wrongly predicted issue-resolving responses**
    a.   She didn't bring wine.
    b.   She didn't bring juice.

- Solution:

  - Make use of the distinction between **highlighted** and **non-highlighted** possibilities

  - Recall: non-highlighted possibilities correspond to **reversing** responses

  - To reverse a disjunctive assertion or question it is not sufficient to reverse just one of the disjuncts, **both disjuncts must be reversed**

- Illustration:

  - Confirming and reversing responses to disjunctive assertions and questions:

    (85)   Sam or Julie is home.
        a.   Yes, Sam is home. $\Rightarrow$ confirming first disjunct
        b.   Yes, Julie is home. $\Rightarrow$ confirming second disjunct
        c.   No, neither of them is home. $\Rightarrow$ **reversing both disjuncts**

    (86)   Is Sam↑ home or is Julie↑ home?
        a.   Yes, Sam is home. $\Rightarrow$ confirming first disjunct
        b.   Yes, Julie is home. $\Rightarrow$ confirming second disjunct
        c.   No, neither of them is home. $\Rightarrow$ **reversing both disjuncts**

- Semantic contribution of disjunction   (final version, $\sqcap$ denotes pointwise intersection)

  For any two constituents φ and ψ that have the same semantic type:

  - $[\![\varphi \text{ or } \psi]\!]^+ := [\![\varphi]\!]^+ \cup [\![\psi]\!]^+$ – $[\![\varphi \text{ or } \psi]\!]_S^+ := [\![\varphi]\!]_S^+ \cup [\![\psi]\!]_S^+$

  - $[\![\varphi \text{ or } \psi]\!]^- := [\![\varphi]\!]^- \sqcap [\![\psi]\!]^-$ – $[\![\varphi \text{ or } \psi]\!]_S^- := [\![\varphi]\!]_S^- \sqcap [\![\psi]\!]_S^-$

- This gives the desired results, both for disjunctive yes/no questions and for open questions.

5.3 Exclusive strengthening

- Strengthening clausal disjunctions

  For any disjunctive constituent φ of type (st):

  - $[\![\varphi_E]\!]^+ := [\![\varphi]\!]^+$
  - $[\![\varphi_E]\!]^- := [\![\varphi]\!]^-$

  - $[\![\varphi_E]\!]_S^+ := \text{EXC} [\![\varphi]\!]_S^+$
  - $[\![\varphi_E]\!]_S^- := \emptyset$
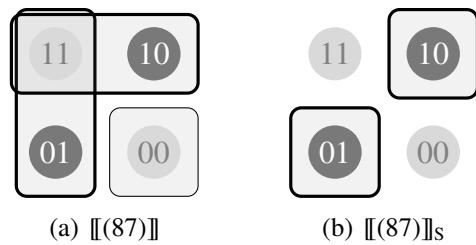
  where:

  - $\text{EXC}(\Sigma) := \{ \text{EXC}(\alpha, \Sigma) \mid \alpha \in \Sigma \}$
  - $\text{EXC}(\alpha, \Sigma) := \alpha - \bigcup \{ \beta \mid \beta \in \Sigma \text{ and } \alpha \not\subseteq \beta \}$

- Intuitively, EXC takes a set of possibilities and narrows each of these possibilities down so that we obtain a set of mutually exclusive possibilities.

- The crucial part of the definition is that of $\text{EXC}(\alpha, \Sigma)$

  - For every possibility β in Σ, EXC removes the overlap between α and β from α
  - unless α is fully contained in β (in that case, removing the overlap between α and β from α would reduce α to the empty set).

- Strengthened propositions and impositions

  - The imposition expressed by φ is derived from $[\![\varphi]\!]$ and $[\![\varphi]\!]_S$
  - The imposition of φ eliminates exactly those worlds that are in $\bigcup [\![\varphi]\!]$ but not in $\bigcup [\![\varphi]\!]_S$
  - As before, worlds that are eliminated by imposed updates will be displayed with a lighter shade of gray

- Illustration **prototypical alternative question**

  (87)   Did Sally bring wine↑ or did she bring juice↓?
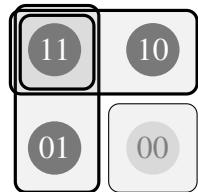
  $[[C_{+Q} \text{ did Sally bring wine] or } [C_{+Q} \text{ did Sally bring juice]]}_E$

(a) $[\![(87)]\!]$ (b) $[\![(87)]\!]_S$
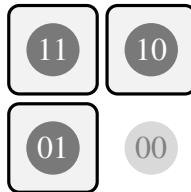
- Illustration **A or B or both**

  (88)   Did Sally bring wine↑ or juice↑ or both↓?

  $[[C_{+Q}$ —— wine] or $[C_{+Q}$ —— juice] or $[C_{+Q}$ —— both]]$_E$
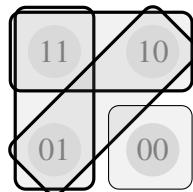
  (a) $[\![(88)]\!]$ (b) $[\![(88)]\!]_S$
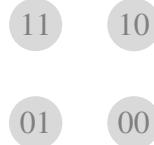
- Illustration **A or B or exactly one of the two**

  (89)   #Did Sally bring wine↑ or juice↑ or exactly one of the two↓?

  $[[C_{+Q}$ —— wine] or $[C_{+Q}$ —— juice] or $[C_{+Q}$ —— exactly one]]$_E$

  (a) $[\![(89)]\!]$ (b) $[\![(89)]\!]_S$

- The distribution of exclusive strengthening

    - Exclusive strengthening does not only occur in alternative questions
    - It applies to disjunctive phrases in general, both in interrogative and in declarative constructions
    - However, its distribution is **restricted** in interesting ways

- Examples

  (90)   # Did anyone bring wine↑ or juice↓?

  (91)   # If Sally brings wine↑ or juice↓, Fred will be happy.

  (92)   Sally didn't bring wine↑ or juice↓.   ⇒ disjunction must take wide scope

  (93)   Sally failed to bring wine↑ or juice↓.   ⇒ disjunction must take wide scope

  (94)   None of the girls brought wine↑ or juice↓.   ⇒ disjunction must take wide scope

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(95)   Exactly two girls brought wine↑ or juice↓.   ⇒ disjunction must take wide scope

(96)   Every girl brought wine↑ or juice↓.   ⇒ disjunction can take narrow scope

- Generalization

  - Exclusive strengthening can occur in the scope of upward monotonic operators, but not in the scope of downward monotonic operators, non-monotonic operators, in the antecedent of a conditional, or in the scope of a question operator.

- The Strengthening Condition   (see the paper for detailed discussion)

  - A clausal LF constituent φ is licensed only if $[\![\varphi]\!]_S$ inquisitively entails $[\![\varphi]\!]$.

- Inquisitive entailment   (Groenendijk and Roelofsen, 2009; Ciardelli and Roelofsen, 2011)

  - One proposition A inquisitively entails another proposition B if and only if every possibility $\alpha \in A$ is contained in some possibility $\beta \in B$.

- Intuition

  - Exclusive strengthening is only licensed if its strengthening effect is preserved by the operators scoping over it.
  - Very similar to NPIs; only, NPIs are themselves *weakening*, and need a downward entailing operator to turn that weakening effect into a strengthening effect.

6   Conclusion

- Prosody

  - The final contour is the most important prosodic factor distinguishing alternative questions from equally worded yes/no questions;
  - Accentual characteristics also play a role, but are not decisive.

- Syntax

  - Alt and open questions consist of two interrogative clauses, joined by disjunction;
  - Yes/no questions consist of a single interrogative clause, containing a disjunctive phrase;
  - Syntactic structure affects contrastive focus marking and prosodic phrase boundaries;
  - Disjunctive phrases may come with an exclusive strengthening operator, E;
  - Prosodically, E induces a falling pitch movement on the final disjunct.

- Semantics

  - Inquisitive semantics and pragmatics provide a suitable framework to account for safe and issue-resolving responses;

- – A distinction between highlighted and non-highlighted possibilities was made to account for the licensing and interpretation of yes/no answers;
- – A distinction between proposed and imposed updates was made to charaterize the exclusive component of alt questions, and to account for issue-dispelling responses.

- Syntax-semantics interface

  - – Interrogative complementizers were treated as polar question operators;
  - – Our treatment of disjunction makes crucial use of the distinction between highlighted and non-highlighted possibilities;
  - – The exclusive strengthening operator is responsible for the exclusive component of alternative questions;
  - – The distribution of exclusive strengthening is restricted in interesting ways;
  - – We provided a semantic account of this restricted distribution, in terms of the Strengthening Condition.

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