Hurford's constraint, the semantics of disjunction, and the nature of alternatives

Ivano Ciardelli
joint work with Floris Roelofsen

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Inquisitive semantics and alternative semantics

- Both propose a refinement of standard intensional semantics in which sentences are associated with a set of propositions.
- Both use this semantic enrichment to deal with questions as well as to refine the semantics of some operators, in particular disjunction.
- For this reason, they are sometimes treated as interchangeable.
- In fact there are some important differences between the two.

Foundations

AltSem: all expressions denote sets. InqSem: the fundamental semantic relation is not truth at a world but support at an info state.

Composition

AltSem composes meanings by a special rule (point-wise function application), InqSem uses standard function application (and std type-theory in general).

Semantic structure

Inquisitive semantics has a strong logical underpinning (entailment, algebra) which is missing for alternative semantics.

We have discussed these differences in previous work.
(Roelofsen 2013; Ciardelli, Roelofsen and Theiler 2016)

Today

An empirical domain where the two come apart: Hurford disjunctions.

(1) #John is an American or a Californian.

Plan

1. We'll look at some puzzles about such disjunctions, and the solution that has emerged in the literature.
2. We'll see that InqSem, but not AltSem, preserves this solution and allows us to extend it to a broader empirical domain.
3. We'll discuss how this difference is connected to more fundamental differences:
   - the different way propositional alternatives are construed;
   - the different structure of the semantic space and "status" of OR.

Part I

Background: Hurford's constraint and redundancy

Hurford disjunctions

One disjunct (logically or contextually) entails the other.

(2) a. #John is an American or a Californian.
b. #That painting is of a man or a bachelor.
c. #The value of x is greater than 6 or different from 6.

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c. #The value of x is greater than 6 or different from 6.

Hurford's constraint (Hurford 1974)

A disjunction is felicitous only if neither disjunct entails the other.

Gazdar 1979

A systematic way of producing counterexamples to Hurford's constraint.

(3) a. Mary read most or all of these books.
b. Mary has three or four kids.
c. Mary is having dinner with Bob, or with Bob and Charlie.

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Two questions

1. What motivates Hurford's constraint?
2. Why does this constraint not apply to Gazdar's sentences?

Question 1

Why is it bad to disjoin two clauses when one entails the other?

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General idea (Simons 2001, Katzir and Singh 2013, Meyer 2013, 14)

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Local Redundancy Principle (Katzir and Singh 2013)

A sentence is deviant in context c if its LF contains a binary node $O(A, B)$ with

- $[\![O(A, B)]\!]_c = [\![A]\!]_c$ or
- $[\![O(A, B)]\!]_c = [\![B]\!]_c$

Standard assumptions

- $[\![A]\!]_c = \{w \in c \mid A \text{ is true in } c\}$
- $[\![B]\!]_c = \{w \in c \mid B \text{ is true in } c\}$
- $B \models_c A \iff [\![B]\!]_c \subseteq [\![A]\!]_c$
- $[\![\mathrm{OR}(A, B)]\!]_c = [\![A]\!]_c \cup [\![B]\!]_c$

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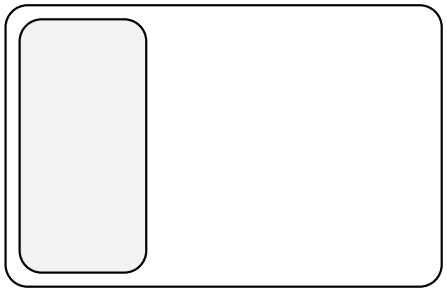
Predicting Hurford's constraint

- Suppose $B \models_c A$, i.e., $[\![B]\!]_c \subseteq [\![A]\!]_c$
- Then $[\![\mathrm{OR}(A, B)]\!]_c = [\![A]\!]_c \cup [\![B]\!]_c = [\![A]\!]_c$
- The OR node violates the local redundancy constraint, so the sentence is predicted to be deviant.
- NB: the prediction relies crucially on a specific account of disjunction.



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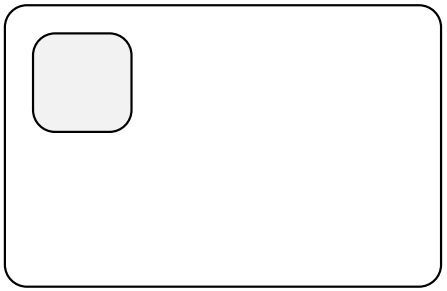

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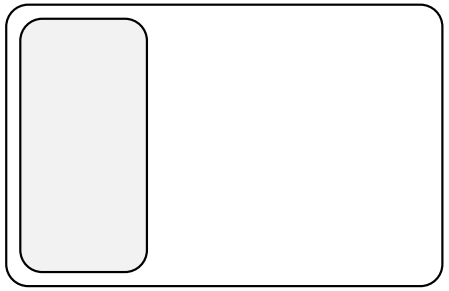

$\mathrm{OR}(A, B)$

Question 2

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Local exhaustification (Chierchia, Fox, and Spector 2009,12)

- The LF of a sentence may contain occurrences of a silent operator exh.
- exh strengthens the meaning of the constituent to which it applies, making it exhaustive relative to the alternatives for that constituent.

Accounting for the felicity of Gazdar's sentences

- The weak disjunct can receive an exhaustive interpretation under which it is no longer entailed by the strong one.

(4) a. Mary read most of these books. $\rightsquigarrow$ most but not all
b. Mary has three kids. $\rightsquigarrow$ exactly three
c. Mary is having dinner with Bob. $\rightsquigarrow$ only with Bob

- Besides the LF OR(A, B), we also have the LF OR(exhA, B).
- In all these cases $[\![\text{exh}A]\!]_c$ and $[\![B]\!]_c$ are non-empty and disjoint.
- $[\![\text{OR}(\text{exh}A, B)]\!]_c = [\![\text{exh}A]\!]_c \cup [\![B]\!]_c$ is distinct from $[\![\text{exh}A]\!]_c$ and $[\![B]\!]_c$.
- OR is not redundant in this LF.
- Since there is an LF which does not violate the redundancy constraint, these sentences are not deviant.

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- The weak disjunct doesn't have an interpretation in which it is independent of the strong one (plausibly due to the structure of the set of alternatives).

(5)	a.	John is an American.	$\not\rightsquigarrow$	American but not Californian
	b.	That painting is of a man.	$\not\rightsquigarrow$	man but not bachelor
	c.	x is different from 6.	$\not\rightsquigarrow$	different but not greater than 6

- Insertion of exh cannot make the disjuncts logically independent.
- Although the LF OR(exhA, B) is available, this doesn't save the sentence.

- This explanation also makes some non-obvious predictions.
- For a Gazdar-type disjunction, the only acceptable LF is one involving exh.
- The only reading for (6) is equivalent to (7).

(6) Either Mary solved exercises 1 and 2, or she solved all the exercises.

(7) Either Mary solved only exercises 1 and 2, or she solved all the exercises.

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- This seems correct!

Summing up

we get a plausible explanation for the observations about Hurford disjunctions by combining:

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At least, this work for the observations we put on the table so far.
. . . but this is not the whole picture.

Part II

Hurford's constraint in questions

- Work on Hurford's constraint has focused on disjunctive statements.
- However, exactly the same patterns can be observed in questions.

(8) a. #Is John American, or Californian?
b. #Is that painting of a man, or of a bachelor?
c. #Is the value of x is greater than 6, or different from 6?

(9) a. Did Mary read most, or all of these books?
b. Does Mary have three or four kids?
c. Is Mary having dinner with Bob, or with Bob and Charlie?

Two questions, again

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Our answer to Question 2 does:

- Hurford's constraint is generally in force;
- a Hurford disjunction is acceptable to the extent that insertion of exh yields an LF which does not violate Hurford's constraint;
- if so, this LF gives the only reading of the sentence.

Again, this makes predictions: for those questions which are felicitous, the only interpretation is the one involving exh.

This seems correct:

(10) Did Mary solve exercises 1 and 2, or did she solve all the exercises?

Someone asking (10) presupposes that Mary solved either only 1 and 2, or all, and asking which of these two possibilities holds.

What about Question 1?

Can we still explain HC in terms of structural redundancy?

- The explanation assumed a truth-conditional account of disjunction as forming the union of two propositions.
- But this cannot be the role of OR in alternative questions.
- In the case of an alternative question, the propositions expressed by the two disjuncts are not merged into one.
- Rather they are kept apart, each contributing a separate alternative.
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- Rather they are kept apart, each contributing a separate alternative.
- So the above explanation of HC does not directly apply.
- Whether HC is predicted or not depends crucially on one's account of disjunction in alternative questions.

Alternative semantics (Hamblin 1973)

- Expressions denote sets of objects of the corresponding type.
- Sentential clauses denote sets of propositions.
- Basic clauses denote the singleton set of their standard proposition:

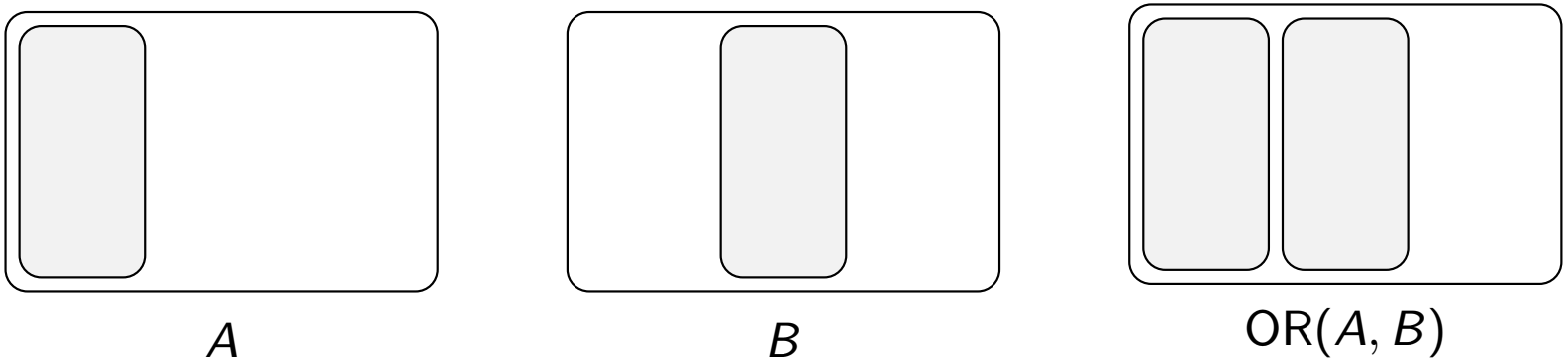
(11) a. John is American
b. $[\![A]\!] = \{|A|\}$

Disjunction in alternative semantics

- Disjunction still performs union, but at the level of sets of propositions.

(12) a. John is American $\rightsquigarrow$ A
b. John is Brazilian $\rightsquigarrow$ B

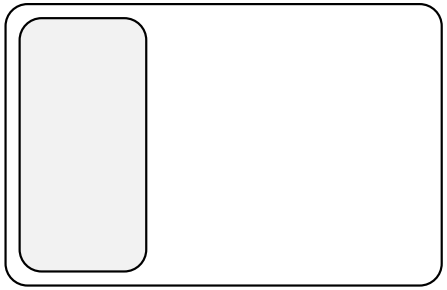
- $[\![\mathrm{OR}(A, B)]\!] = [\![A]\!] \cup [\![B]\!] = \{|A|\} \cup \{|B|\} = \{|A|, |B|\}$
- This allows us to interpret alternative questions



- Now consider a Hurford configuration:

(13) a. John is American $\rightsquigarrow$ A
b. John is Californian $\rightsquigarrow$ C

- $[\![\mathrm{OR}(A, C)]\!] = \{|A|\} \cup \{|C|\} = \{|A|, |C|\}$.
- This is different from both $\{|A|\}$ and $\{|C|\}$.
- Thus, the disjunction operation is not redundant.
- The explanation of HC does not carry over.



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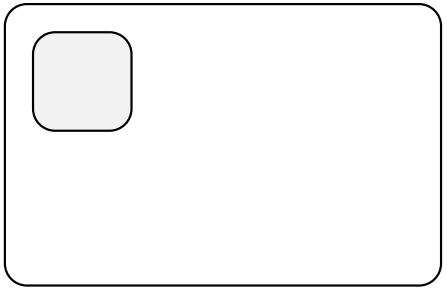

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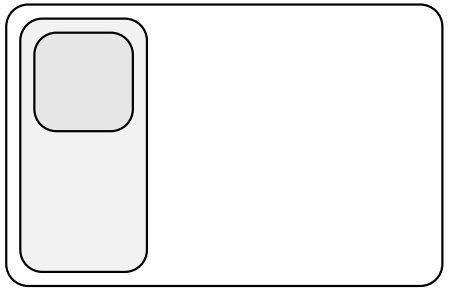


$\mathrm{OR}(A, C)$

Inquisitive Semantics

- The basic semantic notion is support at an information state, $s \models \varphi$.
- An information state is modeled as a set of worlds.
- The semantic value of φ in context c if the set of states that support it.

$$[\![\varphi]\!]_c = \{s \subseteq c \mid s \models \varphi\}$$

- The alternatives for φ in c are the $\subseteq$-maximal info states that support φ, i.e., the ones that support φ with a minimal amount of information.

$$\mathrm{Alt}_c(\varphi) = \max_{\subseteq}([\![\varphi]\!]_c)$$

- Alternatives in inquisitive semantics are not a primitive notion, but they are characterized in terms of the more fundamental notion of support.
- This implies that one alternative is never included in another.

Support for a basic clause

(14) John is American $\rightsquigarrow$ A

- (14) is supported if the information in s implies that John is American.
- $s \models A \iff s \subseteq |A|$
- $[\![A]\!] = \{s \mid s \subseteq |A|\} = \{|A|\}^{\downarrow}$
- $\mathrm{Alt}(A) = \{|A|\}$

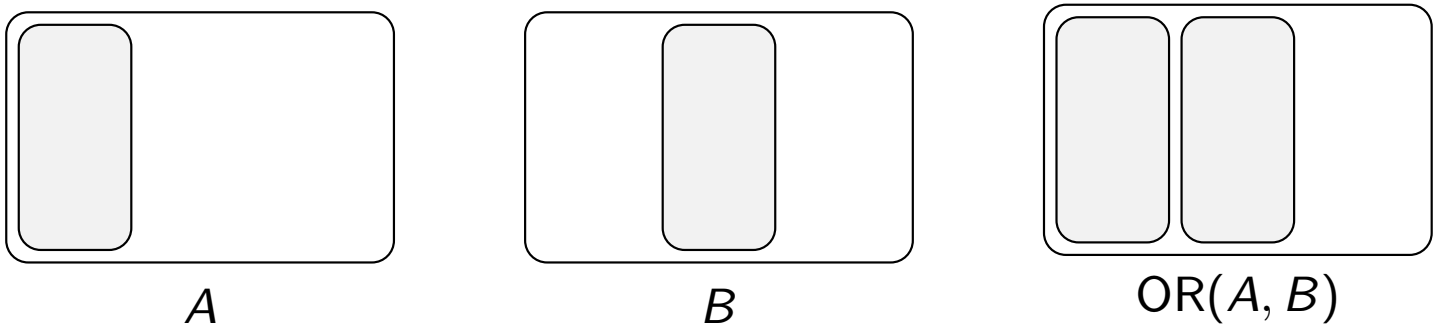
Disjunction in inquisitive semantics

Like in classical and alternative semantics, disjunction performs union.

$$[\![\mathrm{OR}(A, B)]\!] = [\![A]\!] \cup [\![B]\!]$$

(15) a. John is American $\rightsquigarrow$ A
b. John is Brazilian $\rightsquigarrow$ B

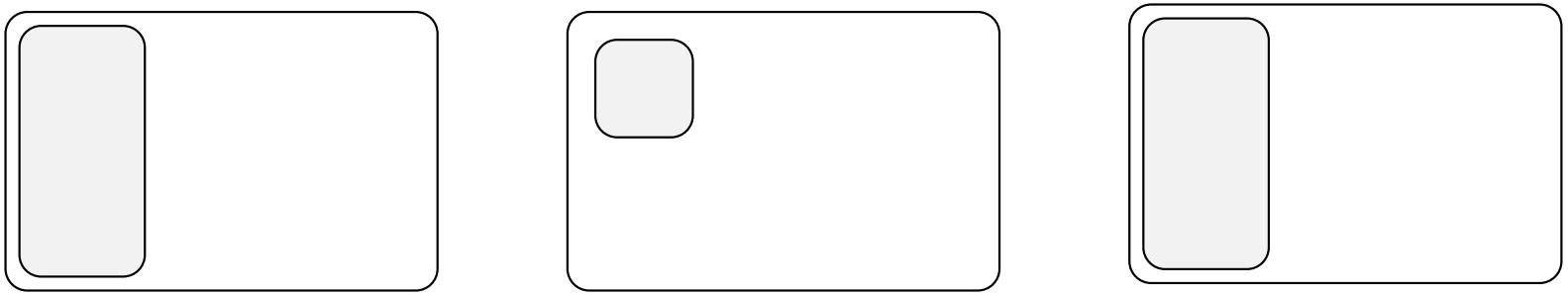
- $[\![\mathrm{OR}(A, B)]\!] = \{|A|\}^{\downarrow} \cup \{|B|\}^{\downarrow} = \{|A|, |B|\}^{\downarrow}$
- $\mathrm{Alt}(\mathrm{OR}(A, B)) = \{|A|, |B|\}$
- As in alternative semantics, disjunction can yield multiple alternatives.



Hurford disjunctions in inquisitive semantics

(16) a. John is American $\rightsquigarrow$ A
b. John is Californian $\rightsquigarrow$ C

- $|C| \subset |A|$
- $s \subseteq |C|$ implies $s \subseteq |A|$
- $[\![C]\!] = \{s \mid s \subseteq |C|\} \subseteq \{s \mid s \subseteq |A|\} = [\![A]\!]$
- $[\![\mathrm{OR}(A, C)]\!] = [\![A]\!] \cup [\![C]\!] = [\![A]\!]$
- A Hurford disjunction comes out equivalent to its weak disjunct.
- In Hurford configurations, OR is a redundant operation.



A C $\mathrm{OR}(A, C)$

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- All of them!
- Disjunction is treated uniformly across these cases.
- The LFs of these sentences contain a node OR(A, C).
- All of them contain structural redundancy at the level of this node.

Summing up

- In InqSem, a Hurford-type disjunction is always redundant, regardless of the particular construction in which it occurs.
- A ban against redundant operations provides a uniform explanation for Hurford's constraint across declaratives and interrogatives.
- InqSem allows us to preserve the explanation of HC in declaratives, and to generalize it to interrogatives.

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- InqSem allows us to preserve the explanation of HC in declaratives, and to generalize it to interrogatives.
- Given an InqSem analysis of imperatives (cf. Ciardelli and Aloni 2016) the explanation extends to them as well.

(18) #Let x be different from 5 or greater than 5.

Part III

Hurford's constraint as a window onto semantic structure

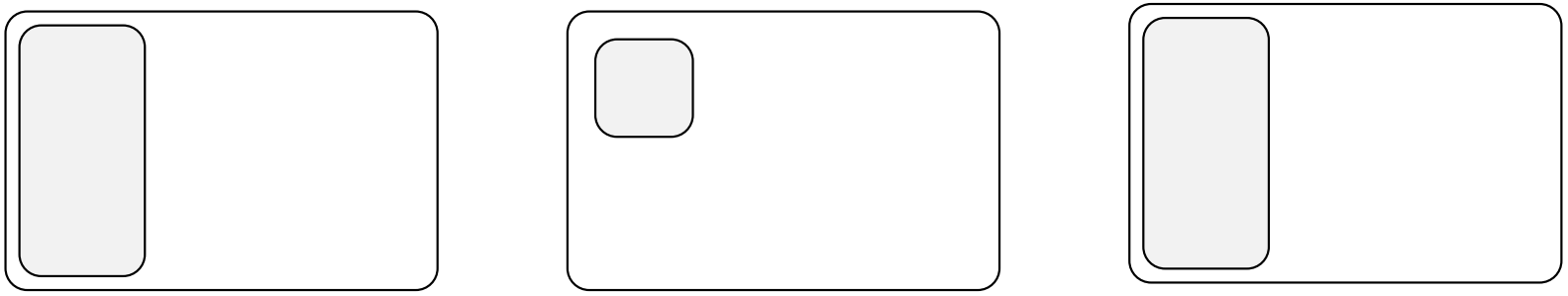
- Hurford disjunctions bring out a difference between InqSem and AltSem.
- The explanation for HC in terms of redundancy is preserved in InqSem, but not in AltSem.
- We now want to connect this to two more fundamental differences:
  1. The way the notion of alternatives is construed (primitive vs. derived).
  2. The structure of the semantic space and the status of the connectives.

Issue 1: HC and the nature of alternatives

- In both AltSem and InqSem, sentential clauses are associated with a set of propositions called alternatives.
- In AltSem, the notion of alternative is a primitive notion.
- In InqSem, alternatives are characterized as $\subseteq$-maximal supporting states. This implies that an alternative can never be properly included in another.
- That is, by definition in InqSem alternatives are never nested.

- In AltSem, nested sets of alternatives are allowed.
- Thus, AltSem makes more semantic objects available.
- Hurford disjunctions are exactly the way to express nested sets.
- However, these sentences are felicitous only if they can be re-interpreted in such a way that the set of alternatives becomes non-nested.
- This suggests that there is something wrong with nested sets of alternatives, which triggers the need for re-interpretation.
- From the perspective of AltSem, this is surprising, since nested sets are just as good as non-nested ones.

- In InqSem the puzzle does not arise: nested sets simply do not exist.
- They are not ruled out by some stipulation; rather, it follows from the way in which alternatives are construed that they are never nested.
- Hurford disjunctions do not express some special meanings; they express regular meanings in a cumbersome way.
- They involve redundant disjuncts which fail to contribute an alternative.
- This is what makes it possible to explain their infelicity.



A C $\mathrm{OR}(A, C)$

Issue 2: HC and semantic structure

Consider the fundamental semantic relation of entailment.
As in truth-conditional semantics, so also in inquisitive semantics:

- Entailment can be characterized in terms of inclusion:

$$A \models B \iff [\![A]\!] \subseteq [\![B]\!]$$

- The space of meanings ordered by entailment forms a lattice.
  For all meanings $[\![A]\!]$ and $[\![B]\!]$ we have:
  - a meet (greatest lower bound), given by $[\![A]\!] \cap [\![B]\!]$
  - a join (least upper bound), given by $[\![A]\!] \cup [\![B]\!]$
- Conjunction and disjunction express meet and join.

While InqSem enriches the truth-con. framework, it retains its lattice structure; this allows it to preserve the essence of the classical treatment of AND and OR.

- The same is not true for alternative semantics.
- Here, inclusion is not a suitable characterization of entailment, and it is not clear how entailment should be defined.
- This makes it impossible to preserve the algebraic treatment of conjunction and disjunction as meet and join.

From lattice structure to redundancy

- Take a semantic space $\mathcal{M}$ ordered by a relation of strength, $\leq$.
- Suppose the space $\langle \mathcal{M}, \leq \rangle$ is a lattice, i.e., suppose any meanings M, M' have a meet $M \wedge M'$ and and join $M \vee M'$.
- Suppose sentences are interpreted within this semantic space.
- Then we can define entailment, conjunction and disjunction as:
  - $A \models B \iff [\![A]\!] \leq [\![B]\!]$
  - $[\![\text{AND}]\!] = \lambda M.\lambda M'.M \wedge M'$
  - $[\![\text{OR}]\!] = \lambda M.\lambda M'.M \vee M'$
- By definition of join, $M' \leq M$ implies $M \vee M' = M$.
- Thus, $B \models A$ implies $[\![\text{OR}(A, B)]\!] = [\![A]\!] \vee [\![B]\!] = [\![A]\!]$.
- Thus, redundancy of OR in Hurford configurations follows directly from its treatment as a join operation.

- Both truth-conditional and inquisitive semantics instantiate this template.
- Hurford disjunctions are redundant for the same underlying reason: they involve a join operation on two arguments one below the other.
- Similarly, the fact that redundancy is not predicted in AltSem is connected to the fact that the lattice treatment of connectives is not preserved.
- This illustrates how the structural features of a semantic framework are not just important from a logical and philosophical point of view, but can also be crucial to its empirical predictions.

Conclusion

- Hurford's constraint: a disjunction is felicitous only if the disjuncts do not entail each other.
- The explanation of this fact is based on two ingredients:
  - a ban against LFs containing redundant operations;
  - a truth-functional account of disjunction, that makes $\mathrm{OR}(A, B) \equiv A$ when $B \models A$.
- However, we saw that HC is also at play in alternative questions, where disjunction cannot be truth-functional.
- So, the explanation given in the literature does not cover these cases.

- Whether an explanation in terms of redundancy still applies depends on how disjunction works; in particular, on whether we have:

$$\mathrm{OR}(A, B) \equiv A \text{ when } B \models A$$

- This is indeed so in InqSem, but not in AltSem.

- This difference is connected to some more fundamental differences:
  1. the different conception of alternatives (non-nested in InqSem);
  2. differences in semantic structure and status of the connectives: InqSem preserves the account of disjunction as join wrt entailment.

- Inquisitive semantics + redundancy ban predicts HC uniformly across disjunctive declaratives and interrogatives.

- Thereby we improve on the standard explanation of HC, which is restricted to disjunctive declaratives.

Thank you!

A different explanation for HC in questions?

- One might think that we don't need redundancy to explain HC in AltQ.
- Assume that alt. questions presuppose that one of the disjuncts holds.
- Then (19) presupposes that John is American.

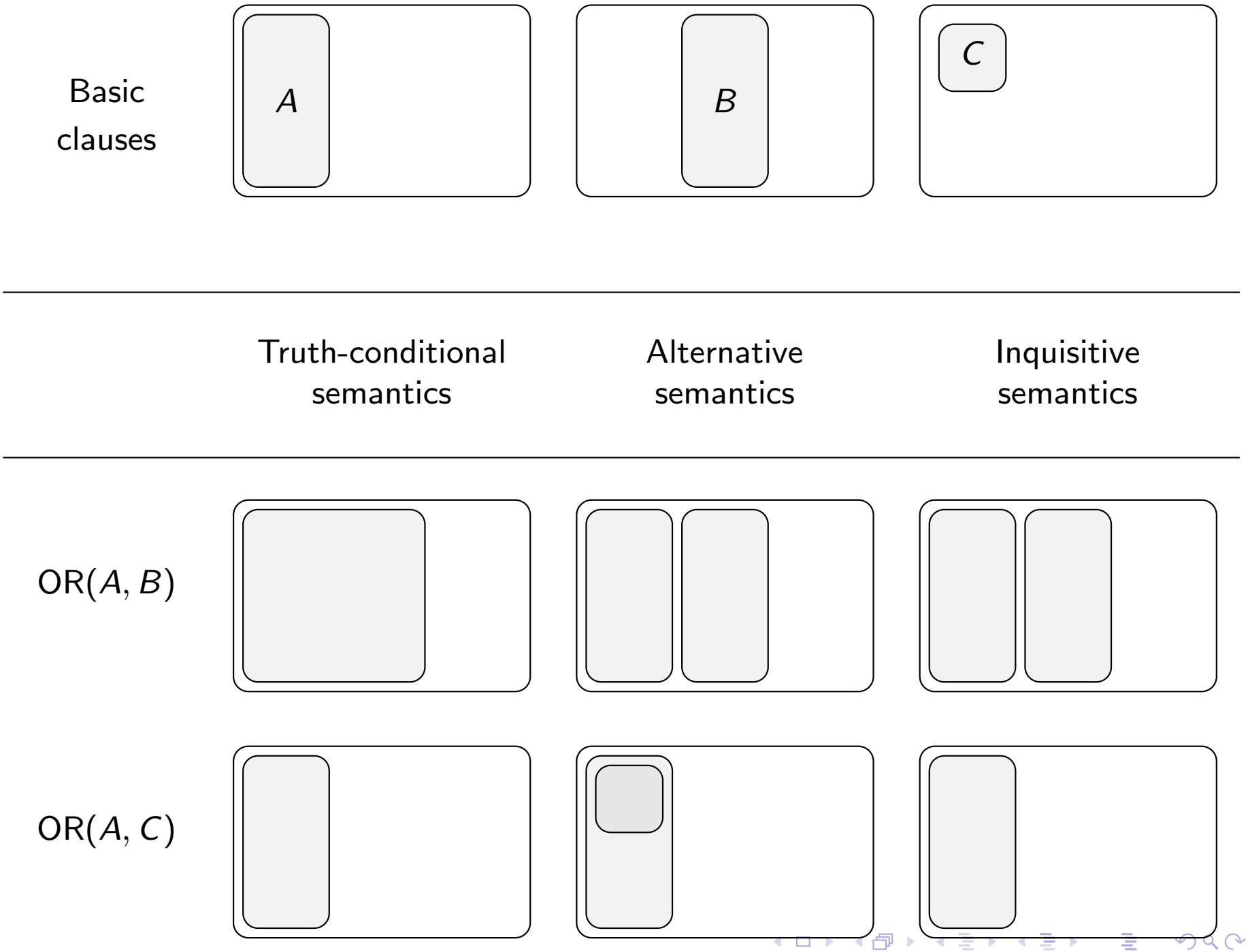
  (19) #Is John American, or Californian?

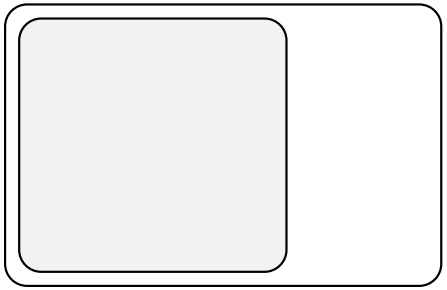
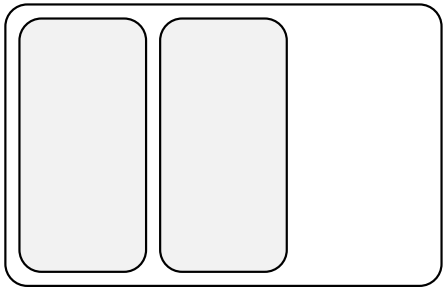
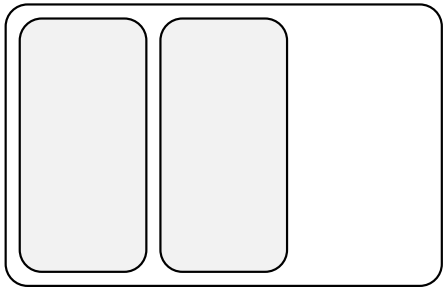
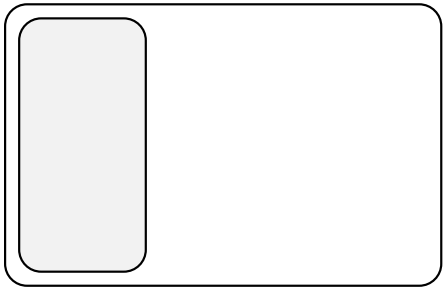
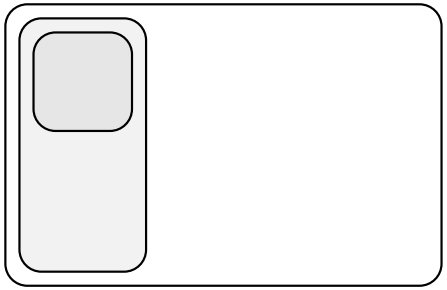
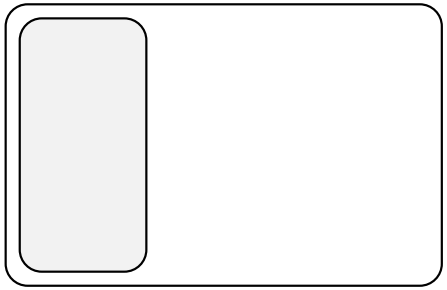
- But given this presupposition, the question is trivially resolved.
- Thus, the question is in a sense self-defeating.
- One may suspect that this is the reason why (19) is odd.

- However, the oddness persist in (20):

  (20) #Is John Russian, American, or Californian?

- Although (20) presupposes that John is Russian or American, this does not resolve the issue.
- So (20) is not self-defeating in the way that (19) is.
- But it is just as infelicitous.


Basic clauses
A
B
C
Truth-conditional semantics
Alternative semantics
Inquisitive semantics
OR(A, B)
OR(A, C)

	Truth-conditional semantics	Alternative semantics	Inquisitive semantics
OR(A, B)			
OR(A, C)			

- The fact that $A \vee B$ yields alternatives is crucial to analyze alt. questions.
- The fact that $A \vee C \equiv A$ is crucial to explain Hurford's constraint.

Karttunen semantics

- The structure of an alternative question is $\mathrm{OR}(?A, ?B)$.
- ? is called Proto-question operator:

$$[\![?A]\!]_w = \begin{cases} \{|A|\} & \text{if } w \in |A| \\ \emptyset & \text{otherwise} \end{cases}$$

- OR is taken to perform union.
- Extension of an alternative question:

$$[\![\mathrm{OR}(?A, ?B)]\!]_w = [\![?A]\!]_w \cup [\![?B]\!]_w = \{p \in \{|A|, |B|\} \mid w \in p\}$$

- The meaning $[\![\varphi]\!]$ of an expression is its intension, $w \mapsto [\![\varphi]\!]_w$.

HC is not predicted in Karttunen semantics either.

(21) Is John American, or Californian?

- $[\![\mathrm{OR}(?A, ?C)]\!]$ maps w to the set $\{p \in \{|A|, |C|\} \mid w \in p\}$.
- This is different from both $[\![?A]\!]$ and $[\![?C]\!]$.
- The LF of (21) does not contain any redundant operations.
- Again, the infelicity of (21) is not predicted.