Inquisitive and alternative semantics

Jeroen Groenendijk and Floris Roelofsen

Workshop on alternative-based semantics

Nantes, October 29, 2010

www.illc.uva.nl/inquisitive-semantics

Inquisitive semantics

AnderBois, Balogh, Ciardelli, Groenendijk, Haida, Kaufmann, Mameni, Mascarenhas, Pruitt, Roelofsen, Sano, van Gool, a.o.

Alternative semantics

Aloni, Alonso-Ovalle, Kratzer, Menendez-Benito, Shimoyama, Simons, Rawlins, a.o.

Commonalities?
Differences?

Notational variants?
Competing theories?
Complementary efforts?

Inquisitive semantics

AnderBois, Balogh, Ciardelli, Groenendijk, Haida, Kaufmann, Mameni, Mascarenhas, Pruitt, Roelofsen, Sano, van Gool, a.o.

Alternative semantics

Aloni, Alonso-Ovalle, Kratzer, Menendez-Benito, Shimoyama, Simons, Rawlins, a.o.

Commonalities
Differences

Notational variants?
Competing theories?
Complementary efforts

Inquisitive semantics

AnderBois, Balogh, Ciardelli, Groenendijk, Haida, Kaufmann, Mameni, Mascarenhas, Pruitt, Roelofsen, Sano, van Gool, a.o.

Alternative semantics

Aloni, Alonso-Ovalle, Kratzer, Menendez-Benito, Shimoyama, Simons, Rawlins, a.o.

Commonalities

Differences

Notational variants?

Competing theories?

Complementary efforts

Overview

Bird's eye view

- Commonalities
- Differences

Street view

- Inquisitive semantics as a semantic framework
- Repercussions for logic
- Repercussions for pragmatics

Final remarks

- From framework to theories

Bird's eye view

Commonalities

Formal machinery

- The formal machinery developed by both frameworks makes essential use of alternatives.

Empirical focus

- Theories that are based on alternative or inquisitive semantics often focus on a similar range of linguistic constructions, namely those that are taken to 'introduce alternatives': interrogatives, disjunction, indefinites, indeterminate pronouns.

First difference

Purposes

- The main purpose of alternative semantics is to facilitate a compositional semantics of constructions involving indefinites/disjunction/indeterminate pronouns.

- The main purpose of inquisitive semantics is to develop a new notion of semantic meaning, which does not only embody informative content, but also inquisitive (and attentive) content.

Second difference

Improvement vs enrichment

- Alternative semantics makes previous theories better at doing what they were always intended to do: deriving the truth-conditions / context change potential of a sentence in a compositional way

- Inquisitive semantics enriches previous frameworks: it allows formal semantic theories to capture aspects of meaning that previous theories were never even *intended* to capture

Second difference

Improvement vs enrichment

- Alternative semantics makes previous theories better at doing what they were always intended to do: deriving the truth-conditions / context change potential of a sentence in a compositional way

- Inquisitive semantics enriches previous frameworks: it allows formal semantic theories to capture aspects of meaning that previous theories were never even *intended* to capture

Compare:

- From extensional to intensional semantics
- From static to dynamic semantics

Third difference

Repercussions

- Inquisitive semantics enriches the notion of semantic meaning
- This gives rise to a richer pragmatics as well
  - Maxims concerned with informative content,
    but also with inquisitive and attentive content
- It also leads to a richer logic
  - Informative, inquisitive, and hybrid notions of entailment
  - Logical notions of relatedness, e.g. compliance
- Alternative semantics leaves the notion of meaning in tact.
  As such, it has no direct repercussions for pragmatics or logic.

Summary

Commonalities

- alternative-based formal machinery
- similar empirical focus

Differences

- completely different purposes
- improve vs enrich
- repercussions for logic and pragmatics

Street view

Street view

Semantics

- Propositions as proposals
- Projection operators
- Algebraic operators

Logic

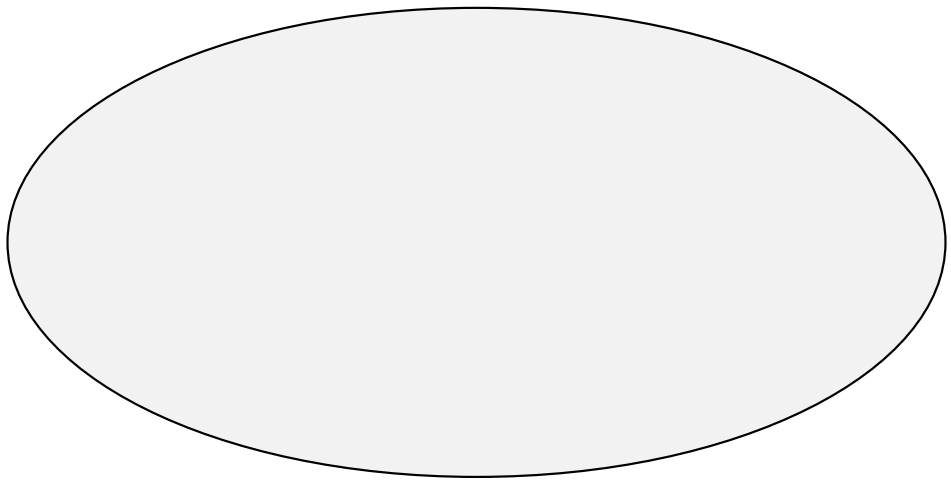
- Informative, inquisitive, and hybrid entailment
- Compliance

Pragmatics

- Sincerity
- Transparency
- Relation

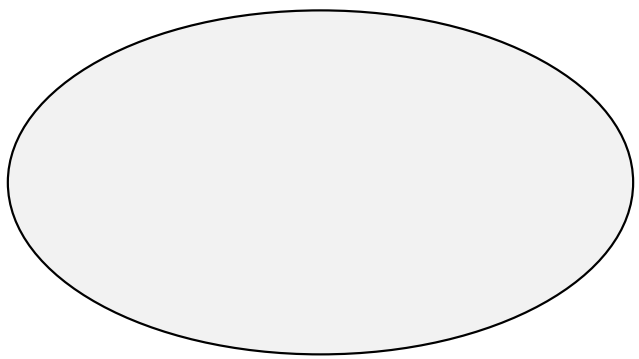
The Traditional Picture

- Meaning = informative content
- Providing information = eliminating possible worlds



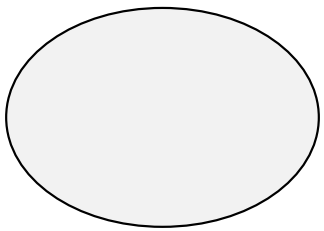
The Traditional Picture

- Meaning = informative content
- Providing information = eliminating possible worlds



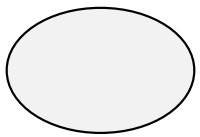
The Traditional Picture

- Meaning = informative content
- Providing information = eliminating possible worlds



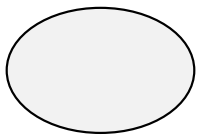
The Traditional Picture

- Meaning = informative content
- Providing information = eliminating possible worlds



The Traditional Picture

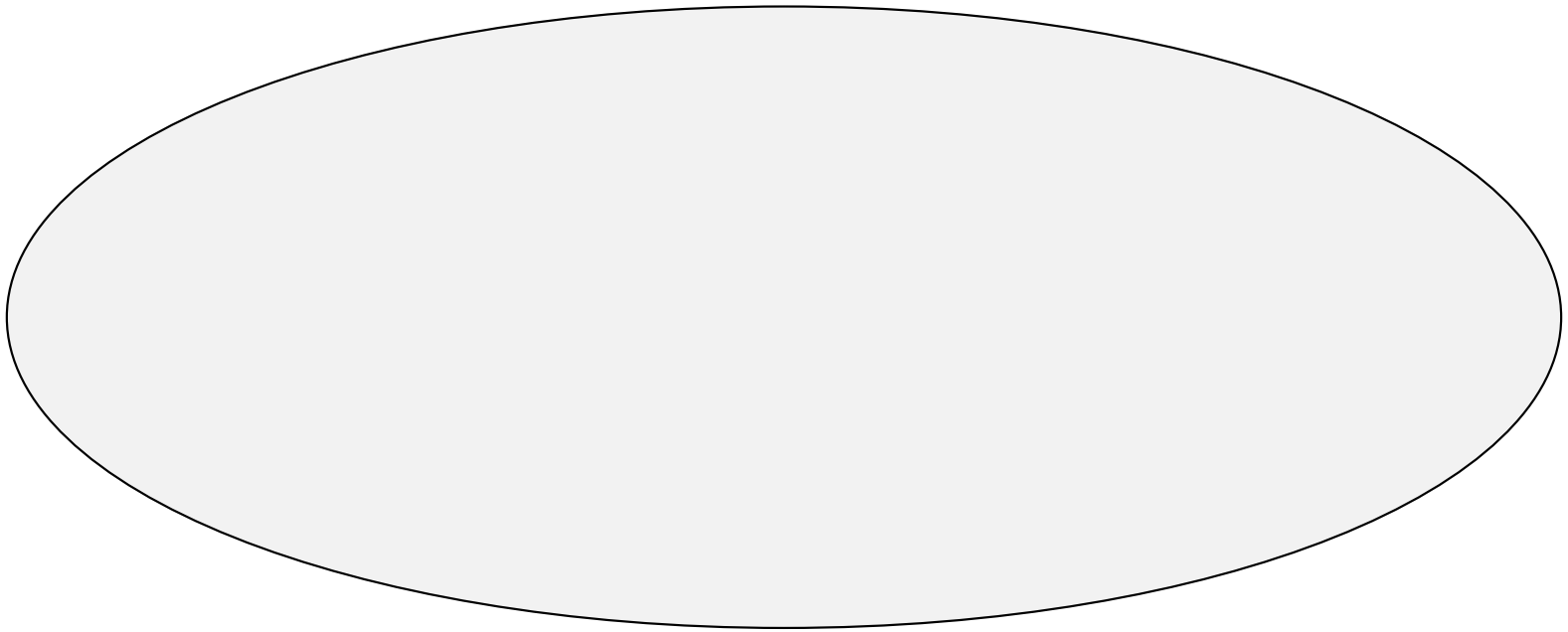
- Meaning = informative content
- Providing information = eliminating possible worlds



- Captures only one type of language use: providing information
- Does not reflect the cooperative nature of communication

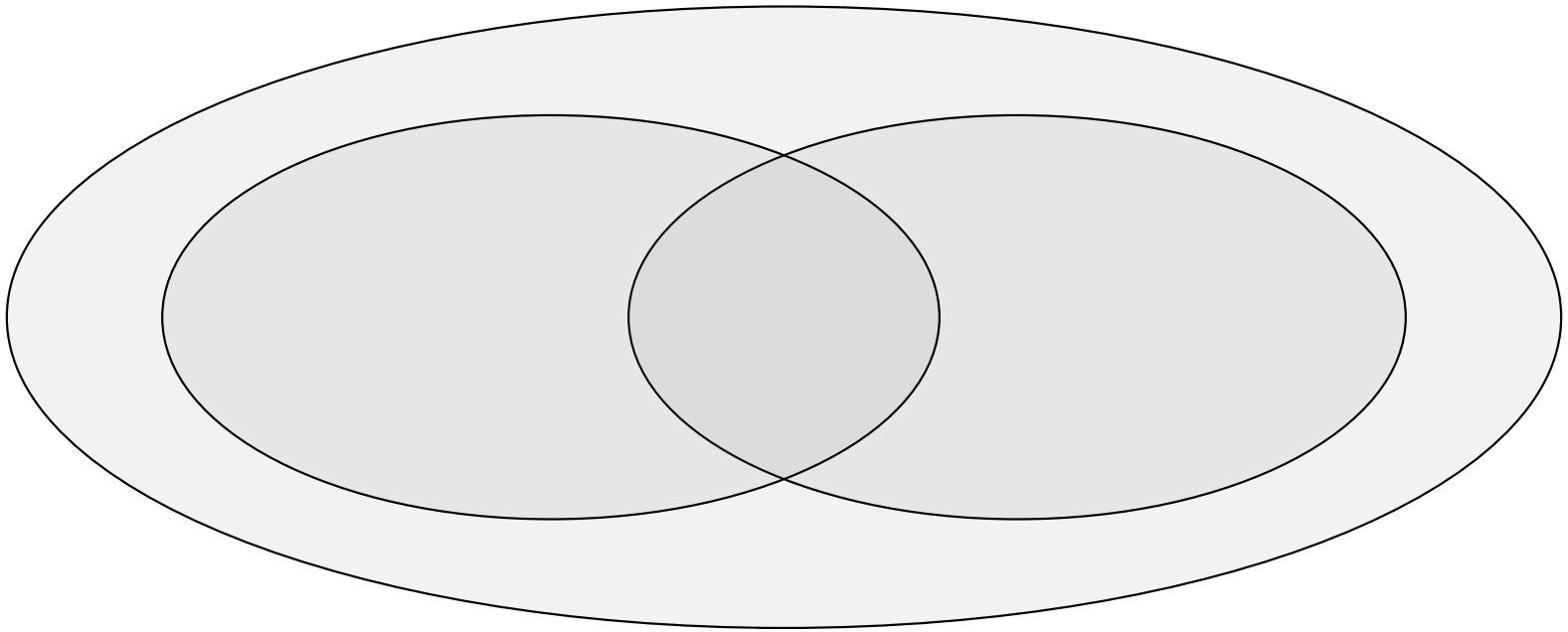
The Inquisitive Picture

- Propositions as proposals
- A proposal consists of one or more possibilities
- An inquisitive proposal offers several alternative possibilities



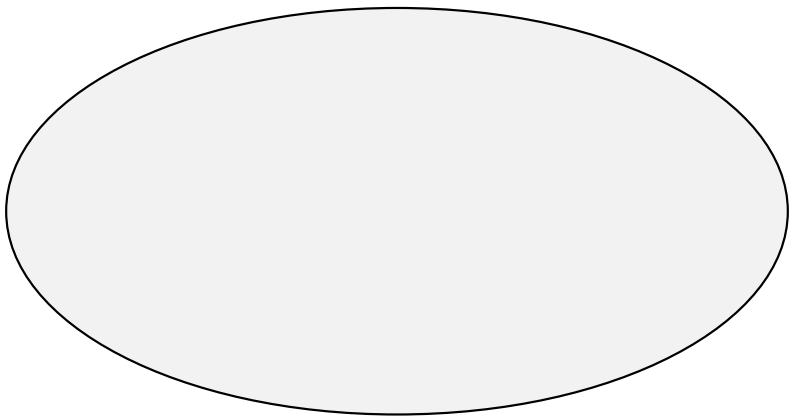
The Inquisitive Picture

- Propositions as proposals
- A proposal consists of one or more possibilities
- An inquisitive proposal offers several alternative possibilities



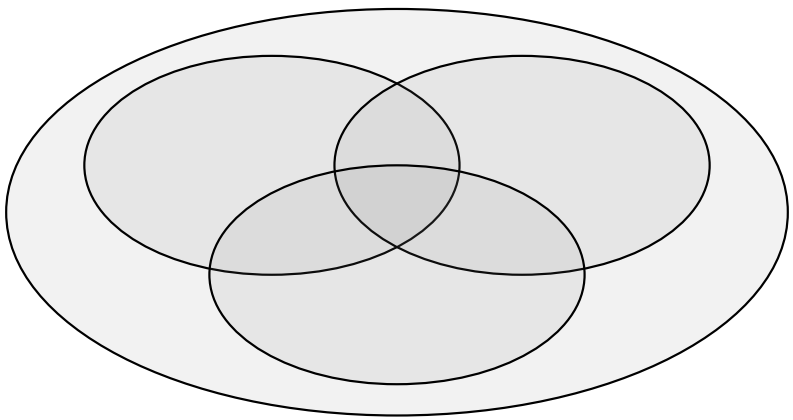
The Inquisitive Picture

- Propositions as proposals
- A proposal consists of one or more possibilities
- An inquisitive proposal offers several alternative possibilities



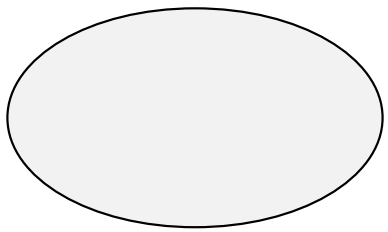
The Inquisitive Picture

- Propositions as proposals
- A proposal consists of one or more possibilities
- An inquisitive proposal offers several alternative possibilities



The Inquisitive Picture

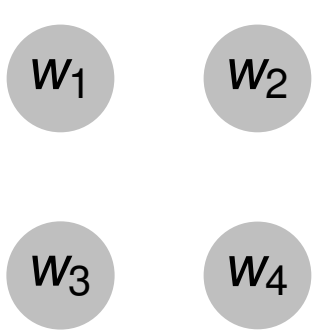
- Propositions as proposals
- A proposal consists of one or more possibilities
- An inquisitive proposal offers several alternative possibilities



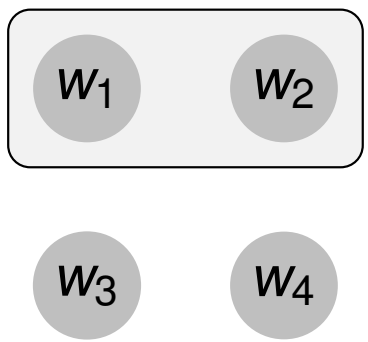
Worlds, possibilities, and propositions

- Start with a universe of possible worlds
- Possibility: set of possible worlds
- Proposition: set of possibilities

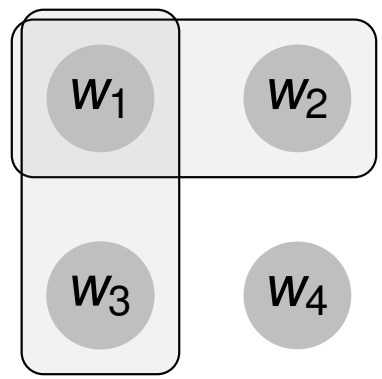
Illustration



worlds

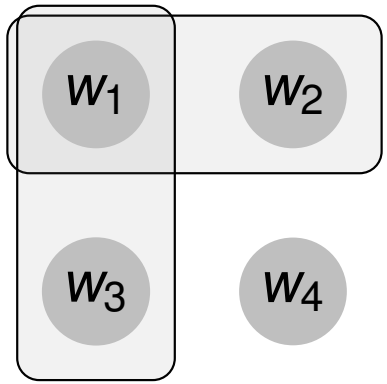


possibility



proposition

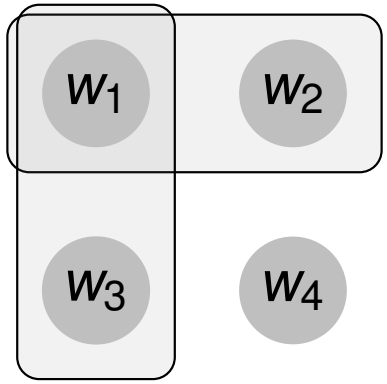
Information, issues, and attention



A proposition π:

- draws attention to all the possibilities in π
- provides the information that at least one of these possibilities contains the actual world
- requests enough information to establish for at least one of these possibilities that it indeed contains the actual world

Information, issues, and attention

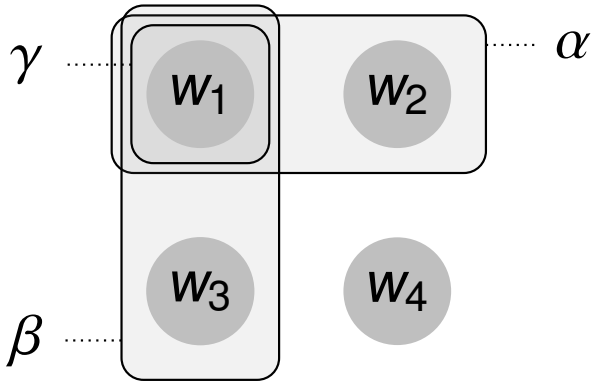


A proposition π:

- draws attention to all the possibilities in π
- provides the information that at least one of these possibilities contains the actual world
- requests enough information to establish for at least one of these possibilities that it indeed contains the actual world

$\Rightarrow$ a single semantic object captures attentive, informative, and inquisitive content all at once

Alternative and residual possibilities

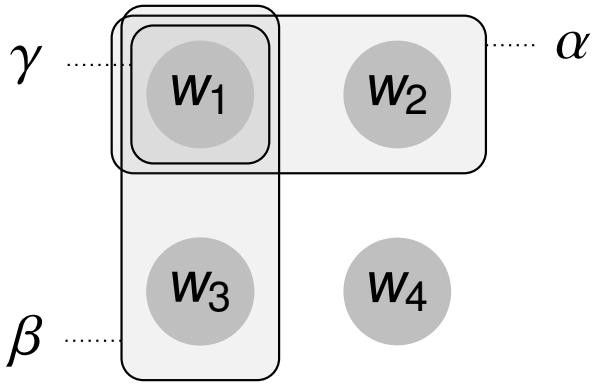


Three possibilities:

$$\begin{aligned} \alpha &= \{w_1, w_2\} \\ \beta &= \{w_1, w_3\} \\ \gamma &= \{w_1\} \end{aligned}$$

- Providing the information that at least one of $\{\alpha, \beta, \gamma\}$ contains the actual world is the same as providing the information that at least one of $\{\alpha, \beta\}$ contains the actual world
- Requesting enough information to establish at least one of $\{\alpha, \beta, \gamma\}$ is the same as requesting enough information to establish at least one of $\{\alpha, \beta\}$
- So: as long as we are only interested in capturing informative and inquisitive content, γ is irrelevant

Alternative and residual possibilities

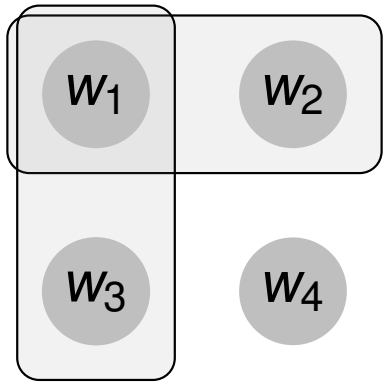


Three possibilities:

$$\begin{aligned} \alpha &= \{w_1, w_2\} \\ \beta &= \{w_1, w_3\} \\ \gamma &= \{w_1\} \end{aligned}$$

- In generally, for any proposition π, we distinguish:
- Residual possibilities
  - properly contained in a maximal possibility in π
  - only play a role in capturing attentive content
- Alternative possibilities
  - not properly contained in a maximal possibility in π
  - completely determine informative and inquisitive content

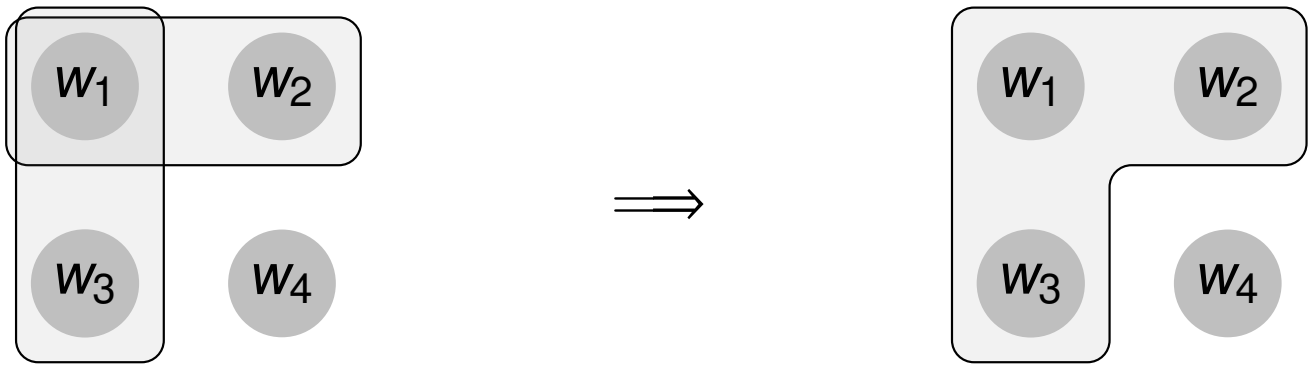
Informative content



- A proposition π provides the information that the actual world is contained in at least one of the possibilities in π
- So, the informative content of π, info(π), is determined by the union of all the possibilities in π:

$$\text{info}(\pi) = \bigcup \pi$$

Informative content

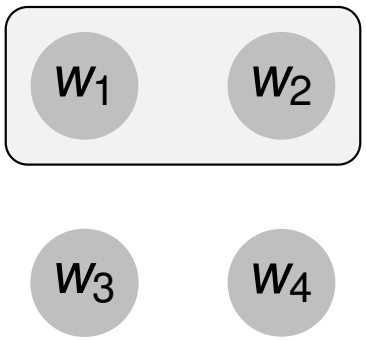


- A proposition π provides the information that the actual world is contained in at least one of the possibilities in π
- So, the informative content of π, info(π), is determined by the union of all the possibilities in π:

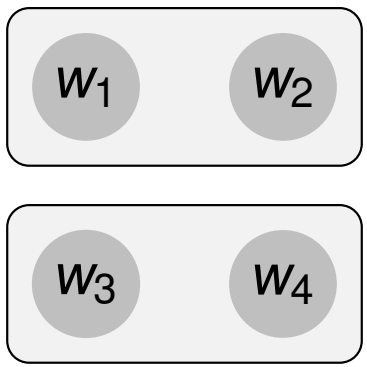
$$\text{info}(\pi) = \bigcup \pi$$

Informative, inquisitive, and attentive propositions

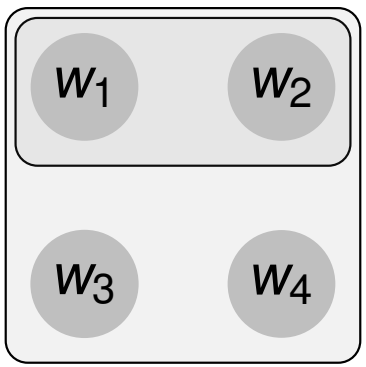
- π is informative iff it proposes to eliminate at least one world
- π is inquisitive iff it offers at least two alternative possibilities
- π is attentive iff it contains at least one residual possibility



purely informative



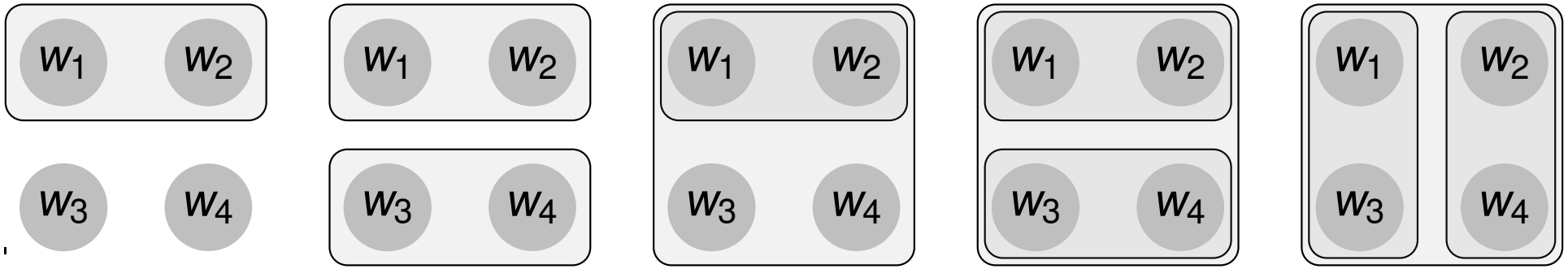
purely inquisitive



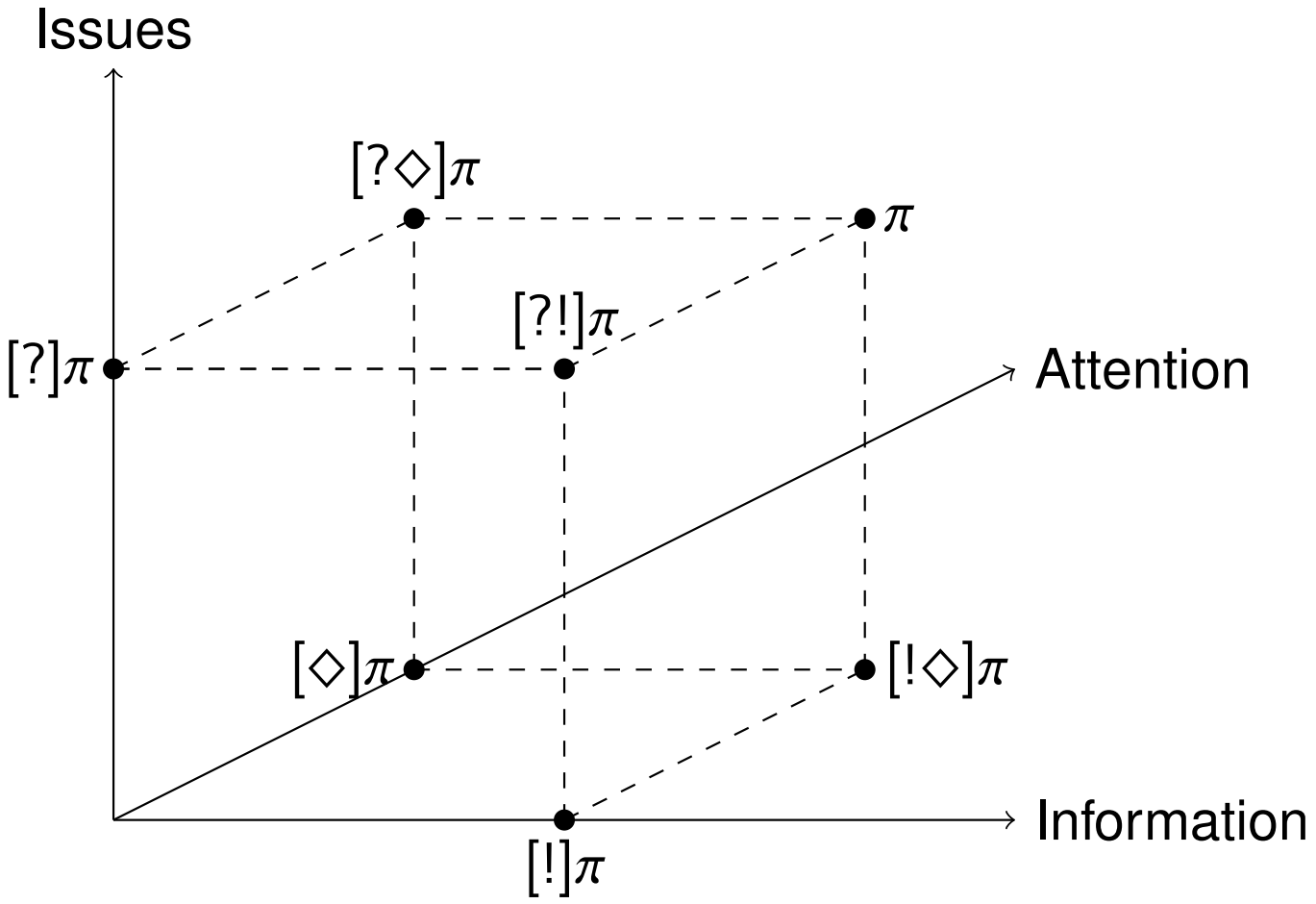
purely attentive

Interlude: relevance for natural language semantics

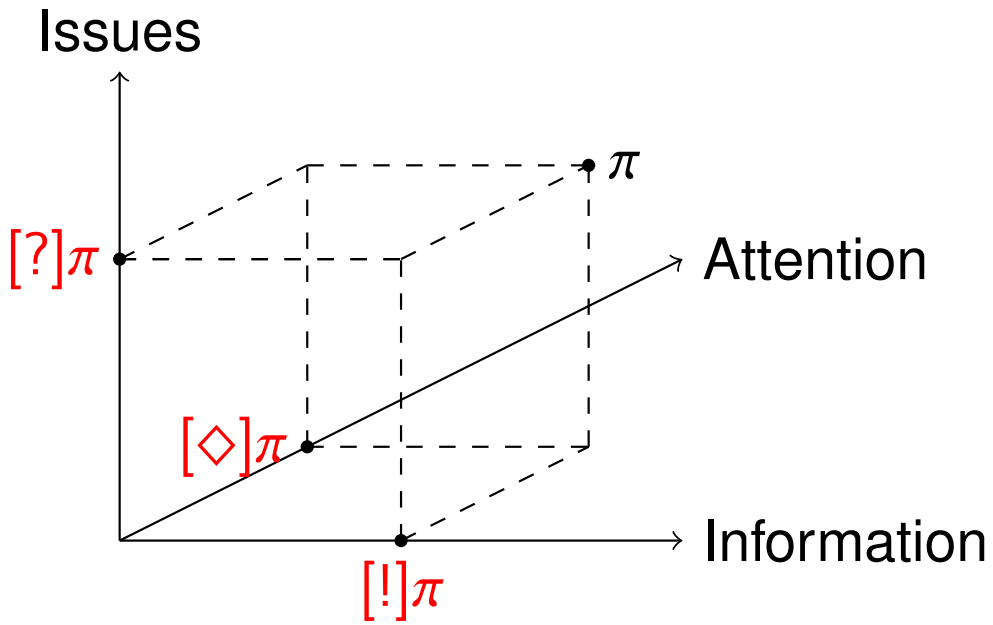
(1)	John is in London.	informative
(2)	Is John in London?	inquisitive
(3)	John might be in London.	attentive
(4)	John is in London or he is not in London.	attentive
(5)	Mary is in Paris or she is not in Paris.	attentive



Back to propositions in abstracto: projections

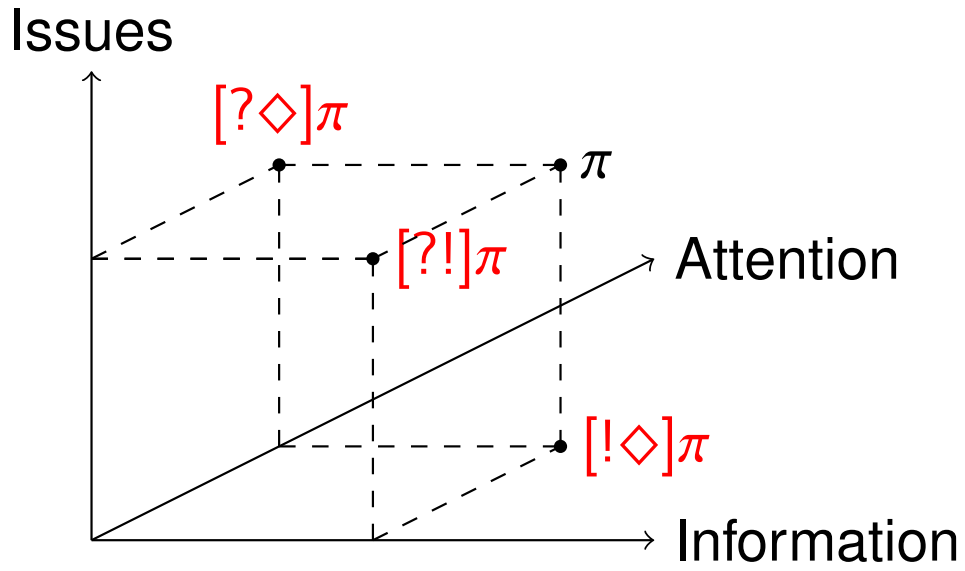


Projections onto the axes



$[!]\pi$ purely informative projection
$[?]\pi$ purely inquisitive projection
$[\Diamond]\pi$ purely attentive projection

Projections onto the planes



$[?\diamond]\pi$ non-informative projection
$[!\diamond]\pi$ non-inquisitive projection
$[?!]\pi$ non-attentive projection

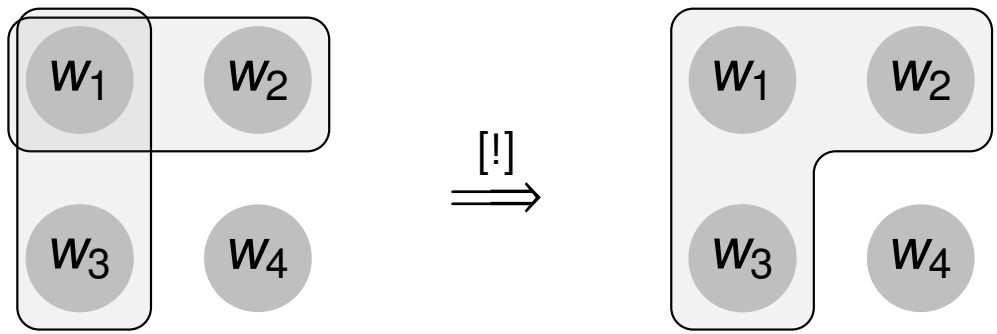
Example: purely informative projection

Requirements

- $[!]\pi$ should preserve the informative content of π
- $[!]\pi$ should be non-inquisitive
- $[!]\pi$ should be non-attentive

Implementation

- $[!]\pi = \{\bigcup \pi\}$



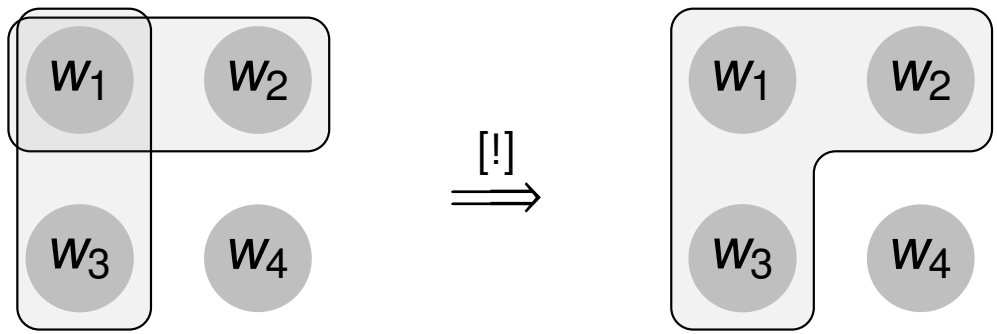
Example: purely informative projection

Requirements

- $[!]\pi$ should preserve the informative content of π
- $[!]\pi$ should be non-inquisitive
- $[!]\pi$ should be non-attentive

Implementation

- $[!]\pi = \{\bigcup \pi\}$



$\approx$ 'existential closure' in alternative semantics

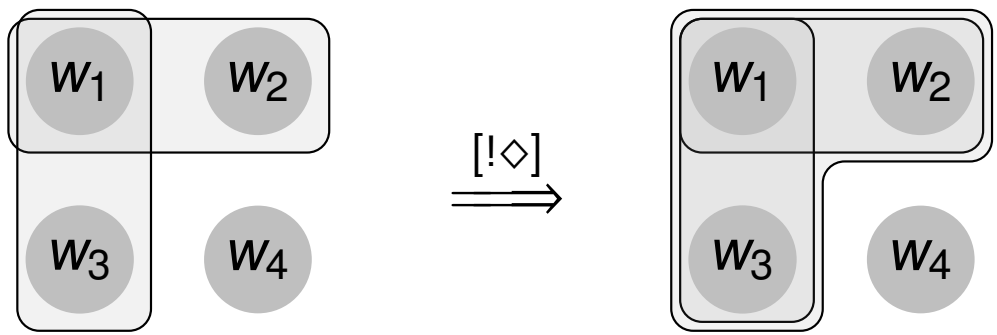
Another example: non-inquisitive projection

Requirements

- $[!\diamond]\pi$ should preserve the informative content of π
- $[!\diamond]\pi$ should be non-inquisitive
- $[!\diamond]\pi$ should preserve the attentive content of π

Implementation

- $[!\diamond]\pi = \pi \cup \{\bigcup \pi\}$



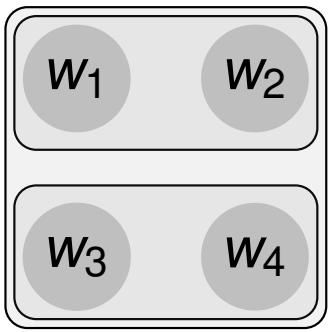
Interlude: relevance for natural language semantics

- It makes sense to think of $[!\Diamond]$ as the semantic contribution of declarative complementizers

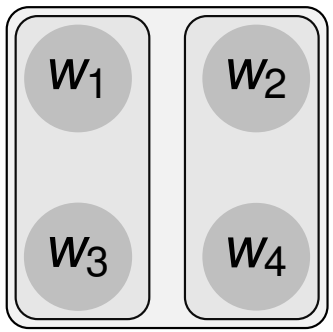
- Earlier examples:

(4) John is in London or he is not in London.

(5) Mary is in Paris or she is not in Paris.



(4)



(5)

Ordering propositions, join and meet

Classically

- Propositions are ordered in terms of informative content
- $\pi \geq \pi'$ iff π provides at least as much information as π'
- Formally: $\pi \geq \pi' \iff \pi \subseteq \pi'$

Join and meet

- Relative to $\geq$, every two classical propositions have
  - a greatest lower bound (aka their meet)
  - a least upper bound (aka their join)
- The meet of two propositions amounts to their union
- The join of two propositions amounts to their intersection
- Disjunction and conjunction are usually seen as the syntactic counterparts of these semantic operations

Ordering propositions in inquisitive semantics

- In inquisitive semantics, propositions can be ordered in terms of their informative content, but also in terms of their inquisitive or attentive content, or a combination thereof
- We focus here on the case where propositions are only intended to capture informative and inquisitive content
- In this setting, propositions are sets of alternative possibilities
- The order between them has an informative and an inquisitive component

Ordering propositions

- $\pi \geq_{\text{info}} \pi'$ iff π provides at least as much information as π':

$$\text{info}(\pi) \subseteq \text{info}(\pi')$$

- $\pi \geq_{\text{inq}} \pi'$ iff π requests at least as much information as π':

$$\forall \alpha \in \pi.\ \exists \beta \in \pi'.\ \alpha \cap \text{info}(\pi') \subseteq \beta$$

- $\pi \geq \pi'$ if and only if $\pi \geq_{\text{info}} \pi'$ and $\pi \geq_{\text{inq}} \pi'$

Join and meet

- As before, relative to $\geq$, every two propositions have
  - a greatest lower bound (aka their meet)
  - a least upper bound (aka their join)
- To determine the meet of two propositions, we first take their union, and then filter out residual possibilities:

$$\textsc{meet}(\pi, \pi') = \textsc{alt}(\pi \cup \pi')$$

- To determine the join of two propositions, we first take their pointwise intersection (denoted by $\sqcap$), and then filter out residual possibilities:

$$\textsc{join}(\pi, \pi') = \textsc{alt}(\pi \sqcap \pi')$$

- Disjunction and conjunction can still be seen as the syntactic counterparts of these semantic operations

$\langle \Sigma, \geq \rangle$ is not a Boolean algebra

- The existence of meets and joins implies that the set of all propositions Σ, together with the order $\geq$, forms a lattice
- Moreover, Σ has:
  - a smallest element, $\top = \{W\}$
  - a greatest element, $\bot = \{\emptyset\}$
- This means that $\langle \Sigma, \geq \rangle$ forms a bounded lattice
- However, notably, $\langle \Sigma, \geq \rangle$ does not form a Boolean algebra
- That is, not every $\pi \in \Sigma$ has a complement π' such that:

$$\begin{aligned} \textsc{meet}(\pi, \pi') &= \top \\ \textsc{join}(\pi, \pi') &= \bot \end{aligned}$$

$\langle \Sigma, \geq \rangle$ is a Heyting algebra

- We do have that for every two propositions π, π' there is a unique minimal element δ of Σ such that $\textsc{join}(\pi, \delta) = \pi'$
- This element δ is called the relative pseudo-complement of π with respect to π', and is denoted as:

$$\pi \Rightarrow \pi'$$

- The existence of relative pseudo-complements implies that $\langle \Sigma, \geq \rangle$ forms a Heyting algebra
- The (non-relative) pseudo-complement of π is defined as:

$$\sim \pi := \pi \Rightarrow \bot$$

- Implication and negation could be seen as the syntactic counterparts of $\Rightarrow$ and $\sim$, respectively

Intermediate conclusions

- The main purpose of inquisitive semantics is to offer a new notion of semantic meaning: propositions as proposals
- This new type of propositions can be studied from a purely semantic perspective—without reference to any formal or natural language
- This gives rise to projection operators like [?] and [!], and algebraic operators like JOIN, MEET, $\Rightarrow$, and $\sim$
- Complementizers and connectives in formal and natural languages could be seen as syntactic counterparts of these semantic operators

Logic

Traditionally

- logic is concerned with entailment and (in)consistency
- given these concerns, it makes sense to identify semantic meaning with informative content

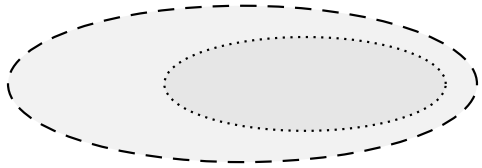
Vice versa

- if semantic meaning is identified with informative content, and propositions are construed as sets of possible worlds
- then there are only three possible relations between two propositions: inclusion, overlap, and disjointness
- these correspond to entailment and (in)consistency
- other relations between propositions cannot be captured

Entailment and (in)consistency

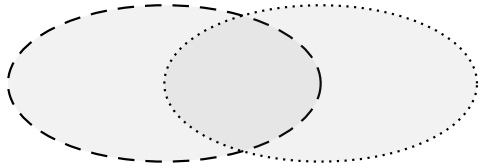
If propositions are construed as sets of possible worlds then two propositions can only be related in one of the following three ways

inclusion



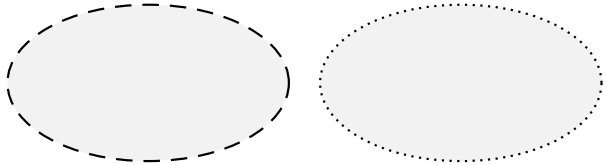
entailment

overlap



consistency

disjointness



inconsistency

Inquisitive logic

A new perspective

- Enriching the notion of semantic meaning leads to a new perspective on logic as well

New logical notions

- Besides classical entailment, we get a notion of inquisitive entailment: φ inquisitively entails ψ iff whenever φ is resolved, ψ is resolved as well;
- We also get logical notions of relatedness. In particular, φ is a compliant response to ψ iff it addresses the issue raised by ψ without providing any redundant information.

Inquisitive logic

A new perspective

- Enriching the notion of semantic meaning leads to a new perspective on logic as well

New logical notions

- Besides classical entailment, we get a notion of inquisitive entailment: φ inquisitively entails ψ iff whenever φ is resolved, ψ is resolved as well;
- We also get logical notions of relatedness. In particular, φ is a compliant response to ψ iff it addresses the issue raised by ψ without providing any redundant information.

Note: classical notions are preserved; the logical agenda is extended, not revised (compare, e.g., with intuitionistic logic)

Pragmatics

Pragmatics specifies how cooperative speakers should use the sentences of a language, given a particular context and the semantic meaning of those sentences

Classical (Gricean) pragmatics

- identifies semantic meaning with informative content
- is speaker-oriented

- Quality: say only what you believe to be true
- Quantity: be as informative as possible
- Relation: say only things that are relevant for the purposes of the conversation

Inquisitive pragmatics

A new perspective

- Enriching the notion of semantic meaning leads to a new perspective on pragmatics as well

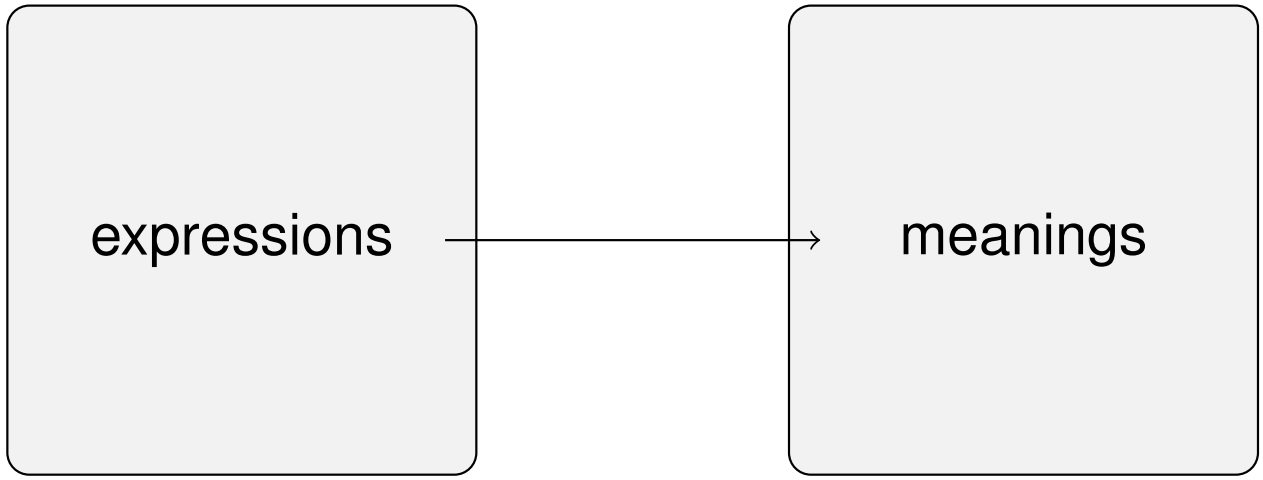
Inquisitive pragmatics

- based on informative, but also inquisitive/attentive content
- speaker-oriented, but also hearer-oriented

- Sincerity: say only what you know, ask only what you want to know
- Transparency: publicly announce unacceptability of a proposal
- Quantity: say more, ask less
- Relation: be optimally *compliant*

Final remarks

- Natural language semantics seeks to assign appropriate meanings to linguistic expressions in a systematic way



- Much work in inquisitive semantics so far has focussed on developing a richer space of meanings, and investigating the internal properties of these meanings, independently of the expressions in natural language that they may be assigned to
- This work establishes a framework for natural language semantics, but not really a theory of natural language

Wh-questions

- To underline this point, consider the case of *wh*-questions
- Inquisitive semantics, qua framework, does not make any claims about the proper semantic analysis of *wh*-questions
- It offers a general framework to capture inquisitive content
- Hamblin's, Karttunen's, and Groenendijk & Stokhof's theories can all be expressed and compared in this framework
- The framework as such does not favor any of these theories
- Indeed, combinations are also possible

From framework to theory

- There is already some work connecting the new type of meanings with specific constructions in natural language
- However, much remains to be done on this front
- And this is exactly where the techniques developed in alternative semantics are bound to be extremely useful!

Conclusion

- Inquisitive and alternative semantics are not notational variants or competing theories
- They are complementary efforts, using the same basic formal machinery, for very different purposes
- Alternative semantics offers an attractive compositional account of various constructions involving disjunction, indefinites, and indeterminate pronouns
- Inquisitive semantics offers a new notion of semantic meaning, that is intended to capture not only informative content, but also inquisitive and attentive content

Thank you

Netherlands Organisation for Scientific Research

www.illc.uva.nl/inquisitive-semantics

Special thanks to Nate Charlow, Kai von Fintel, and the reviewers of this workshop for stimulating comments and questions.