Inquisitive Semantics

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http://www.illc.uva.nl/inquisitive-semantics

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Course Schedule

1. Inquisitive Semantics and Pragmatics
2. Attentive *might*
3. Algebraic foundations
4. Disjunctive questions
5. Polarity particles

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Inquisitive Semantics and Pragmatics

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The Inquisitive Turn

- Meaning is information exchange potential
  - Information exchange is a dynamic process of raising and resolving issues
    - Inquisitive meanings directly reflect this, they embody both information and issues
- When the notion of meaning changes, so does the logic that comes with it
- When the notion of meaning changes, so does the pragmatics that comes with it

Overview

- Getting the picture
- Inquisitive semantics
- Inquisitive pragmatics
- Inquisitive logical notions
- Inquisitive implicatures

Getting the Picture

Propositions as Proposals

- The meaning of a sentence is a proposition
- We look upon a proposition as a proposal to enhance the common ground
- A proposition may present alternative possibilities to enhance the common ground
- The responder is invited to choose among proposed alternatives

Propositions and Possibilities

- A possibility is a non empty set of indices (possible worlds)
- Two possibilities count as alternatives iff the one is not included in the other
- A proposition is a set of alternative possibilities

The Language

- The language under consideration is a standard language of propositional logic
- It contains a finite set of atomic sentences, negation, conjunction, disjunction, implication
  - Some non-standard features of the language will be added by definition
- A suitable index v is a binary valuation for the atoms; by ω we denote the set of all indices

Inquisitive Propositions

- A proposition is inquisitive iff it contains more than one possibility
- A proposition is classical iff it contains at most a single possibility
  - Classical propositions are not inquisitive
- A sentence φ is inquisitive / classical if φ expresses an inquisitive / classical proposition

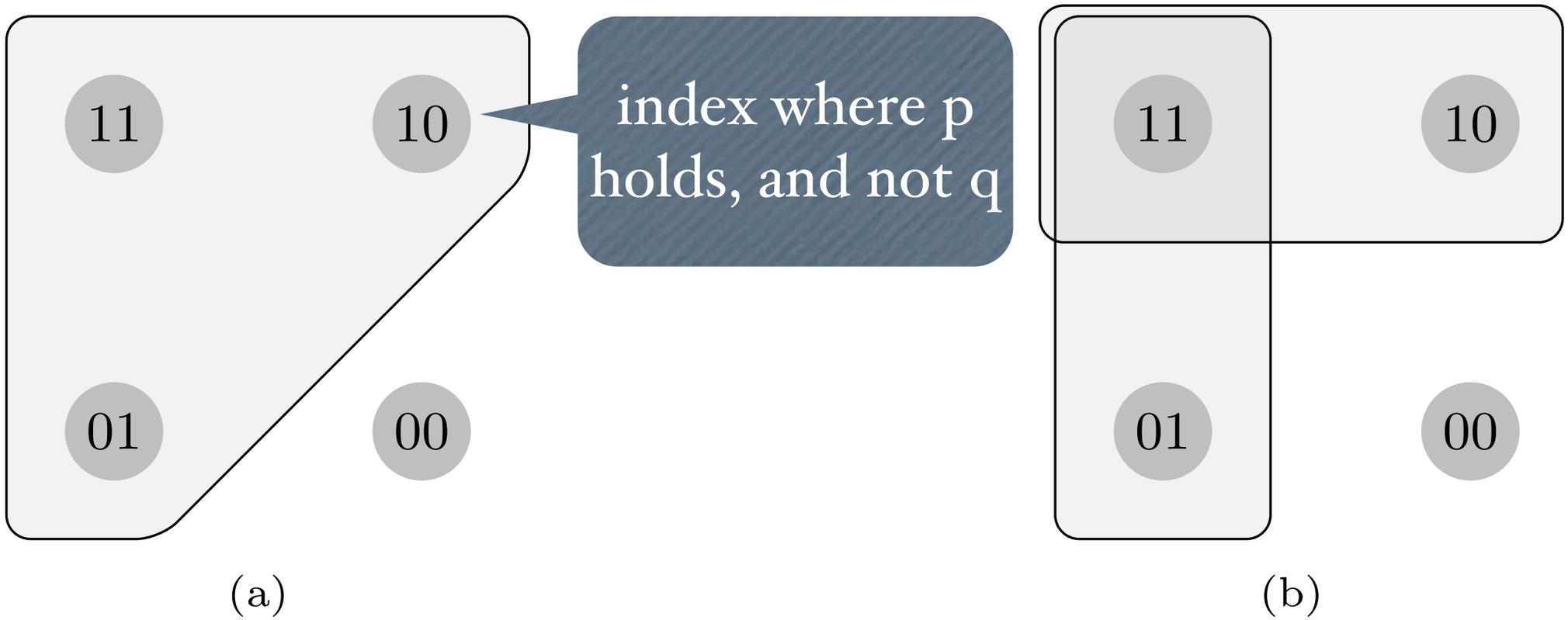


Fig. 1. (a) the traditional and (b) the inquisitive picture of $p \vee q$

Two Possibilities for Disjunction

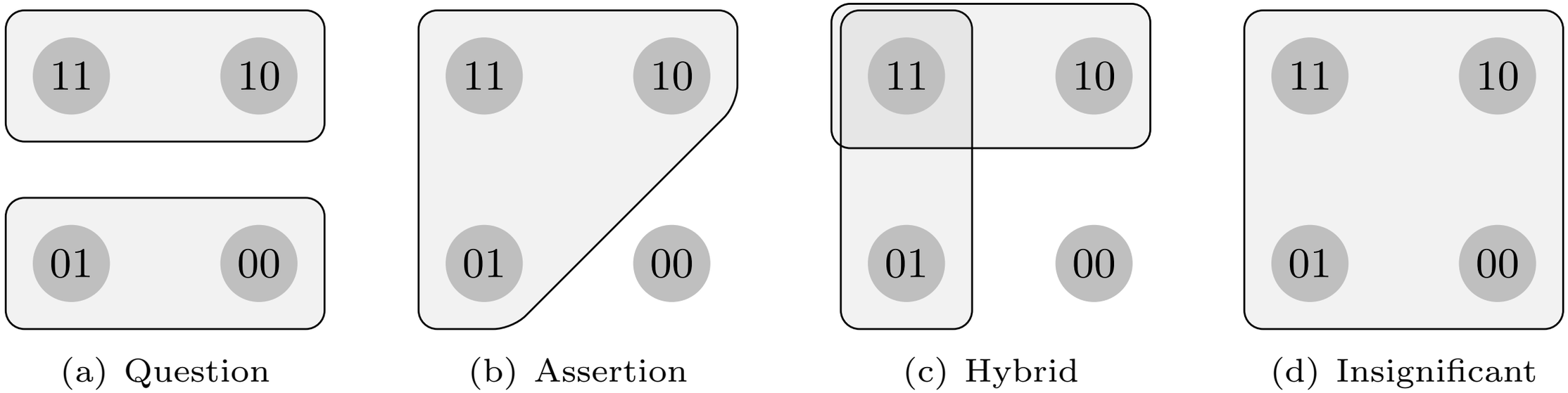
Hybrid Disjunction

- The disjunction $p \vee q$ is inquisitive
- But $p \vee q$ also proposes to exclude indices, those indices where neither p nor q holds
- This means that $p \vee q$ is also informative
- The disjunction $p \vee q$ is a hybrid sentence

Semantic Categories

	inquisitive	informative
hybrid	yes	yes
question	yes	no
assertion	no	yes
insignificant	no	no

classical



(a) Question (b) Assertion (c) Hybrid (d) Insignificant

Fig. 5. One example for each of the four semantic categories.

Semantic Categories Exemplified

Non-inquisitive Closure !φ

- The non-inquisitive proposition classically expressed by φ is expressed in inquisitive semantics by its non-inquisitive closure !φ

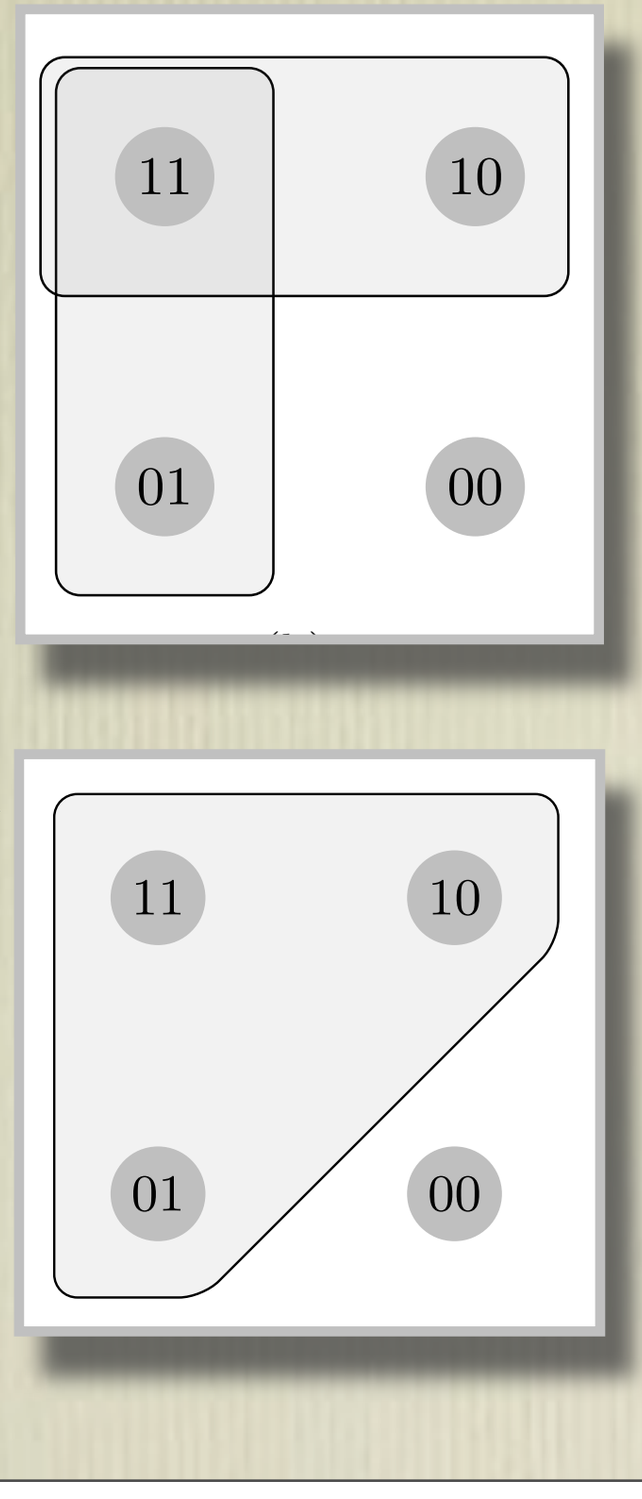
- The proposition expressed by !φ always consists of (at most) a single possibility, which is the union of the possibilities for φ

p ∨ q

hybrid

assertion

!(p ∨ q)



Negation

- The non-inquisitive closure !φ, is defined in terms of negation as ¬¬φ

- The proposition expressed by ¬φ contains (at most) one possibility, consisting of all indices that are not in any of the possibilities for φ

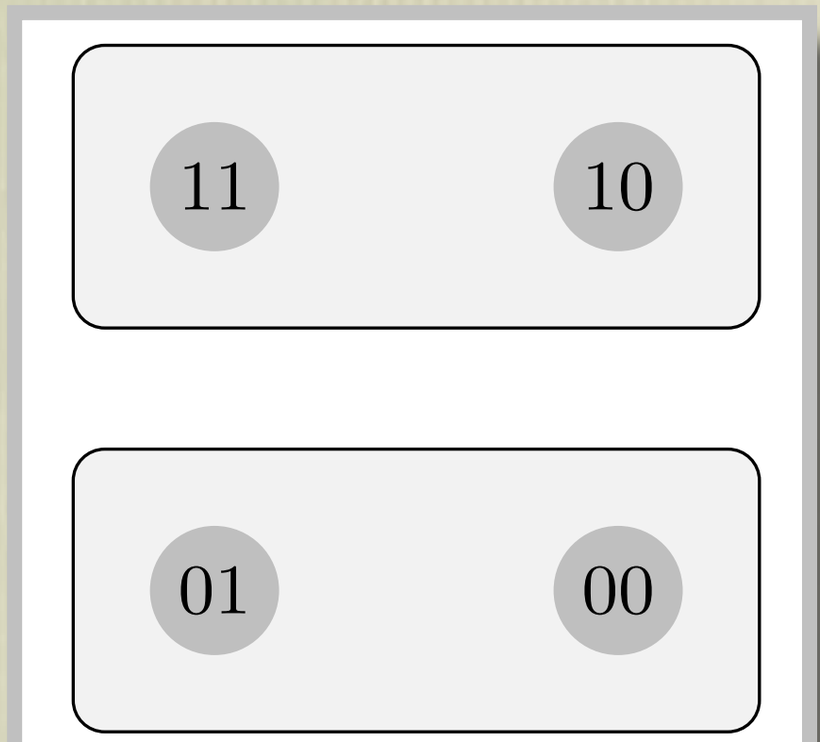
- Hence, the proposition expressed by ¬¬φ will always contain (at most) one possibility, which is the union of the possibilities for φ

- It follows from this analysis of negation that ¬¬φ and φ are not fully equivalent
- They are from an informative perspective: ¬¬φ and φ always exclude the same possibility
- But whereas φ can be inquisitive, ¬¬φ never is
- That is why !φ is called the non-inquisitive closure of φ

Polar Questions

- A classical tautology like $p \vee \neg p$ is associated with two possibilities as well: the possibility that p and the possibility that $\neg p$

- In inquisitive semantics, $p \vee \neg p$ can be taken to express the polar question whether p



$p \vee \neg p$

abbreviated as $?p$

Non-informative Closure ?φ

- In general, a non-informative sentence $\varphi \vee \neg\varphi$ can express a question, adding the possibility that $\neg\varphi$ as an alternative to the possibility or possibilities for φ

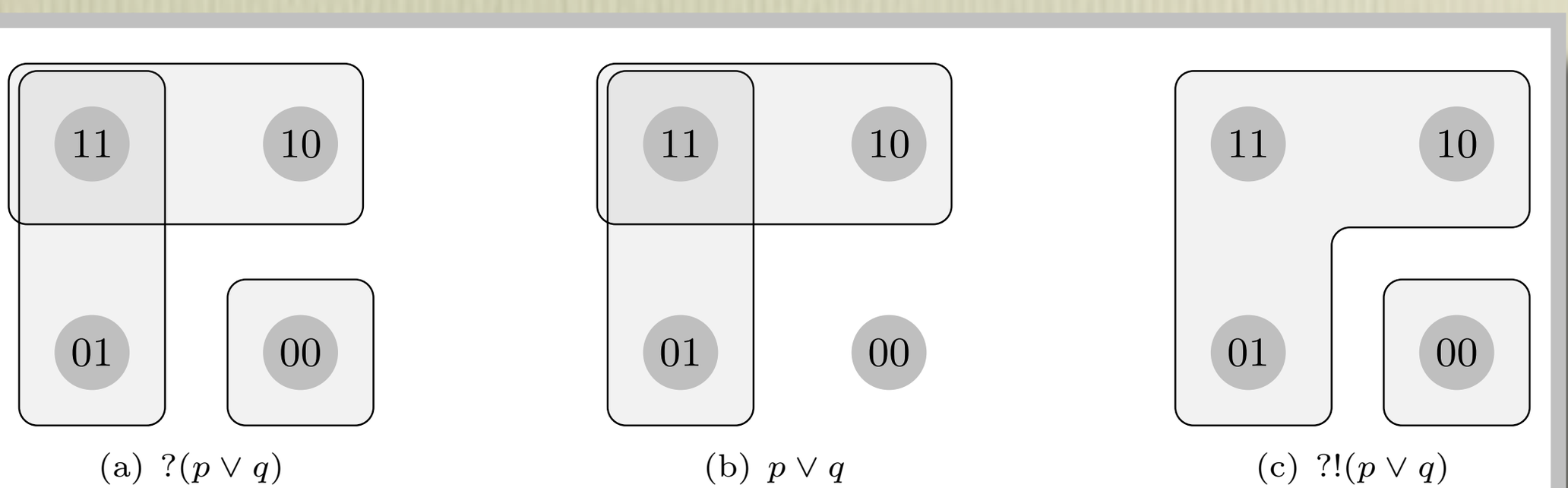
- Therefore $\varphi \vee \neg\varphi$ is abbreviated as $?\varphi$, and is called the non-informative closure of φ

- The non-inquisitive closure $!?\varphi$ of $?\varphi$, i.e., $!(\varphi \vee \neg\varphi)$ is always an insignificant sentence: it is neither inquisitive nor informative

Alternative and Polar Question

?(p ∨ q) and ?!(p ∨ q)

- To be discussed at the end to illustrate some features of inquisitive pragmatics



(a) $?(p \vee q)$ (b) $p \vee q$ (c) $?!(p \vee q)$

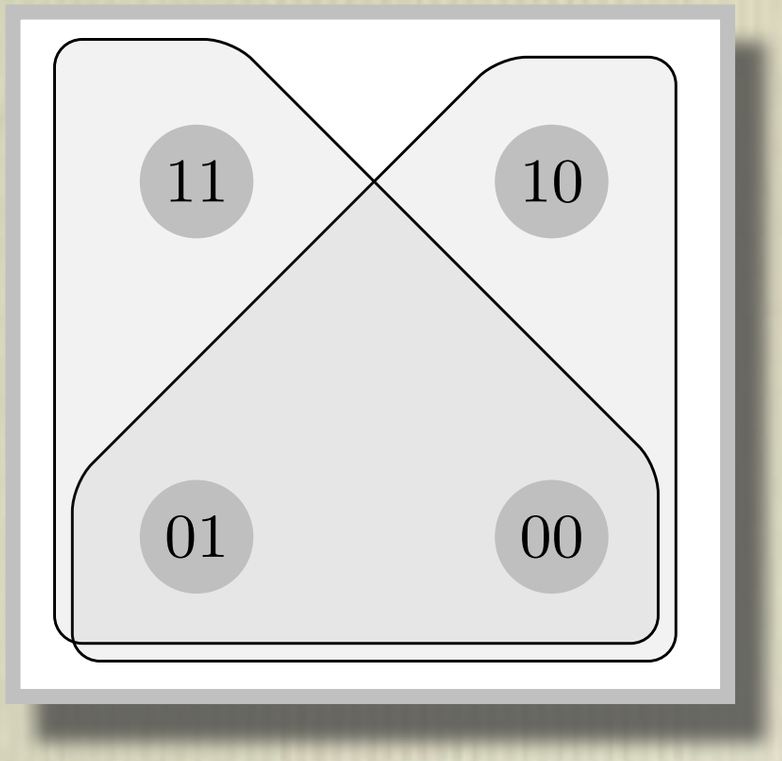
Fig. 9. Alternative question, hybrid disjunction, and polar disjunctive question.

Conditional Question

- Implication is defined in such a way that $p \to q$ is a classical material implication

- But with an inquisitive consequent as in $p \to ?q$ implications can become inquisitive

- There are two possibilities for $p \to ?q$ corresponding to $p \to q$ and $p \to \neg q$



$$p \to ?q$$

$$p \to (q \vee \neg q)$$

$$(p \to q) \vee (p \to \neg q)$$

Inquisitive Semantics

States

- We evaluate sentences relative to information states, which are non-empty sets of indices (like possibilities)

- We use σ, ς as variables ranging over states
- We read $\varsigma \subseteq \sigma$ as ς is a substate of σ
- Note that $\varsigma \subseteq \sigma$ implies that ς is a non-empty subset of σ

Support

- The semantics is recursively defined in terms of the notion of support of a sentence φ in a state σ, denoted as:
  - $\sigma \models \varphi$
- That $\sigma \models \varphi$ will mean that φ is neither informative nor inquisitive in σ

Inquisitive Propositional Semantics

1. $\sigma \models p$ iff for all $v \in \sigma$: $v(p) = 1$

2. $\sigma \models \neg\varphi$ for no $\varsigma \subseteq \sigma : \varsigma \models \varphi$

3. $\sigma \models (\varphi \wedge \psi)$ iff $\sigma \models \varphi$ and $\sigma \models \psi$

4. $\sigma \models (\varphi \vee \psi)$ iff $\sigma \models \varphi$ or $\sigma \models \psi$

5. $\sigma \models (\varphi \rightarrow \psi)$ iff for all $\varsigma \subseteq \sigma$: if $\varsigma \models \varphi$, then $\varsigma \models \psi$

Persistence

- The core fact about the semantics is persistence:
  - If $\sigma \vDash \varphi$, then for all $\varsigma \sqsubseteq \sigma : \varsigma \vDash \varphi$
- If a state supports a sentence, then so do all of its substates
- Given that the set of all indices ω is finite, persistence allows us to focus on $\sqsubseteq$ - maximal states that support a sentence

Support and Propositions

- The proposition expressed by φ, [φ] is the set of $\subseteq$ - maximal states that support φ
- [φ] will always consist of alternative possibilities
- We call the elements of [φ] possibilities for φ
- If [φ] = ∅, we say there is no possibility for φ
- If the union of the possibilities for φ does not equal ω, we say that φ excludes a possibility

Truth-sets

- The truth set of φ, denoted by |φ| is the set of indices where φ is classically true
  - |φ| corresponds to the union of the possibilities in [φ]
    - If φ is an assertion, then [φ] = {|φ|}
    - If φ is a contradiction, then [φ] = ∅
    - If φ is a tautology, then [φ] = {ω}

Propositions Relativized
(definition 8)

- We can relativize a proposition [φ] to a state σ, written as σ[φ], where
  - σ[φ] is the set of ⊆ - maximal substates ς of σ such that ς ⊨ φ
- σ[φ] is a set of alternative possibilities, which we call the possibilities for φ in σ
- φ excludes a possibility in σ iff the union of the possibilities for φ in σ does not equal σ

Propositions as Proposals

- Let σ be the current state of the common ground
- The elements of σ[φ] can be seen as alternative possibilities to enhance the common ground
  - Note:
    - σ supports φ iff σ[φ] = {σ}
    - ω[φ] is the same as [φ], the proposition expressed by φ

Inquisitiveness and Informativeness
(definitions 9, 10, fact 7)

- φ is inquisitive in σ iff there is more than one possibility for φ in σ

  - φ is acceptable in σ iff there is at least one possibility for φ in σ

  - φ is eliminative in σ iff φ excludes a possibility in σ

- φ is informative in σ iff φ is acceptable and eliminative in σ

Inquisitive Pragmatics

Common Ground

- Central pragmatic notion is the common ground
  - ‘the set of possible worlds compatible with what speaker and hearer can be presumed to take for granted at a given point in the conversation’ [Stalnaker]
- The common ground is an information state, a non-empty set of indices
- The common ground is public, ‘externally’ established by the moves in the conversation

Pragmatic Principles

- The leading pragmatic principle is
  - Enhance the common ground!
- To enhance the common ground there should be a common ground to begin with
  - Maintain the common ground!
- The common ground is maintained as long as (the union of the) the states of all participants remain(s) included in the common ground

External and Internal Common Ground

- The external common ground is established by cooperative communicative actions of the participants in a conversation
  - Publicly accessible for all participants
- The internal common ground is formed by the union of the states of all participants
  - Not accessible for the participants

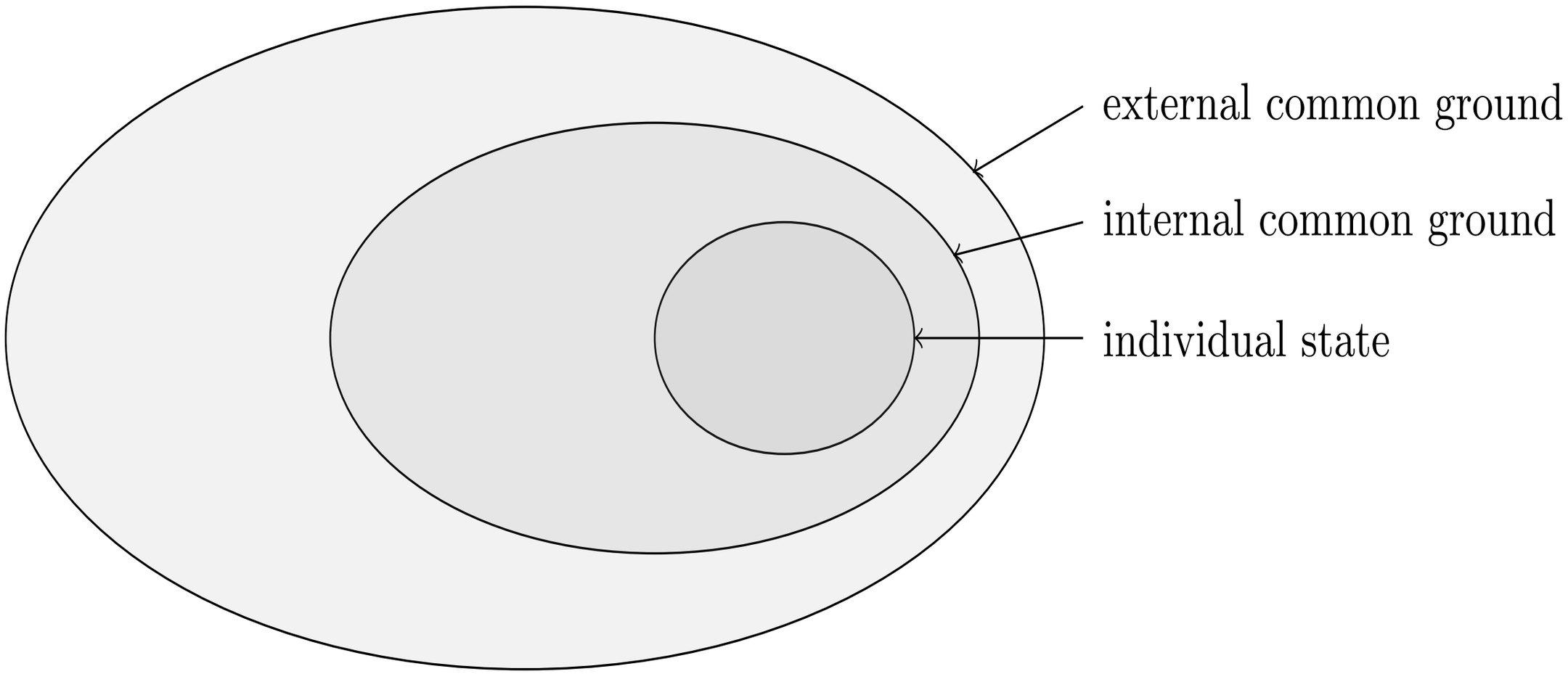


Fig. 7. An individual information state, the internal, and the external common ground.

External and Internal Common Ground

Conversational Principles

- The general principles of maintaining and enhancing the common ground give rise to more specific conversational principles
- These conversational principles can be motivated from the general pragmatic principles
  - See the paper

Significance
(definition 12)

- An utterance in a conversation should be informative or inquisitive in the current state of the common ground

Sincerity
(definition 13)

- Let φ be a sentence uttered by a speaker with state ς, and σ the common ground at the point where φ is uttered

- Informative Sincerity: φ should not be eliminative in ς.

- Inquisitive Sincerity: if φ is inquisitive in σ, then φ should be inquisitive in ς.

Transparancy (definition 14)

- Let φ be a sentence, *r* a hearer with state ϱ.
  - If φ is unacceptable in ϱ, *r* should publicly announce this, upon which φ is not absorbed into the common ground
  - If no objections are made by any participant, φ is absorbed into the common ground and into every individual information state.

	formal requirement	*Principle*
speaker oriented	significance	Enhance the CG!
	informative sincerity	Maintain the CG!
	inquisitive sincerity	Enhance the CG!
hearer oriented	transparancy	Maintain the CG!

Quality, Relation and Quantity

- Significance, sincerity, and tranparancy are absolute qualitative requirements to guarantee that the common ground is maintained and minimally enhanced
- The logical notion of compliance is a strict notion of relatedness
- The logical notion of homogeneity adds quantity preferences

Inquisitive Logical Notions

Entailment

- Two equivalent ways to define entailment
  - φ entails ψ iff every state that supports φ supports ψ as well
  - φ entails ψ iff every possibility for φ is included in a possibility for ψ
- Entailment does not give rise to a proper characterization of answerhood and subquestionhood in all cases (see paper)

Definition Compliance
(definition 15)

φ is compliant with ψ iff

1. Every possibility in [φ] is the union of a set of possibilities in [ψ]

2. Every possibility in [ψ] restricted to |φ| is contained in a possibility in [φ]

- The second condition only plays a role when both φ and ψ are inquisitive; and '*restricted to* |φ|' only plays a role when φ is informative

Classical Compliance (Fact 9, 10)

- If ψ is a classical sentence, then φ is compliant with ψ iff is φ equivalent with ψ, i.e., [φ] = [ψ]

- This applies to assertions and insignificant sentences

- An assertion can only be compliantly met by obediently confirming it

Compliance and Answerhood (fact 11)

- If ψ is a question and φ an assertion, then φ is compliant with ψ iff |φ| coincides with the union of a set of possibilities for ψ
  - The notion of compliance embodies a notion of partial answerhood
  - Over-informative answers to questions do not count as compliant responses

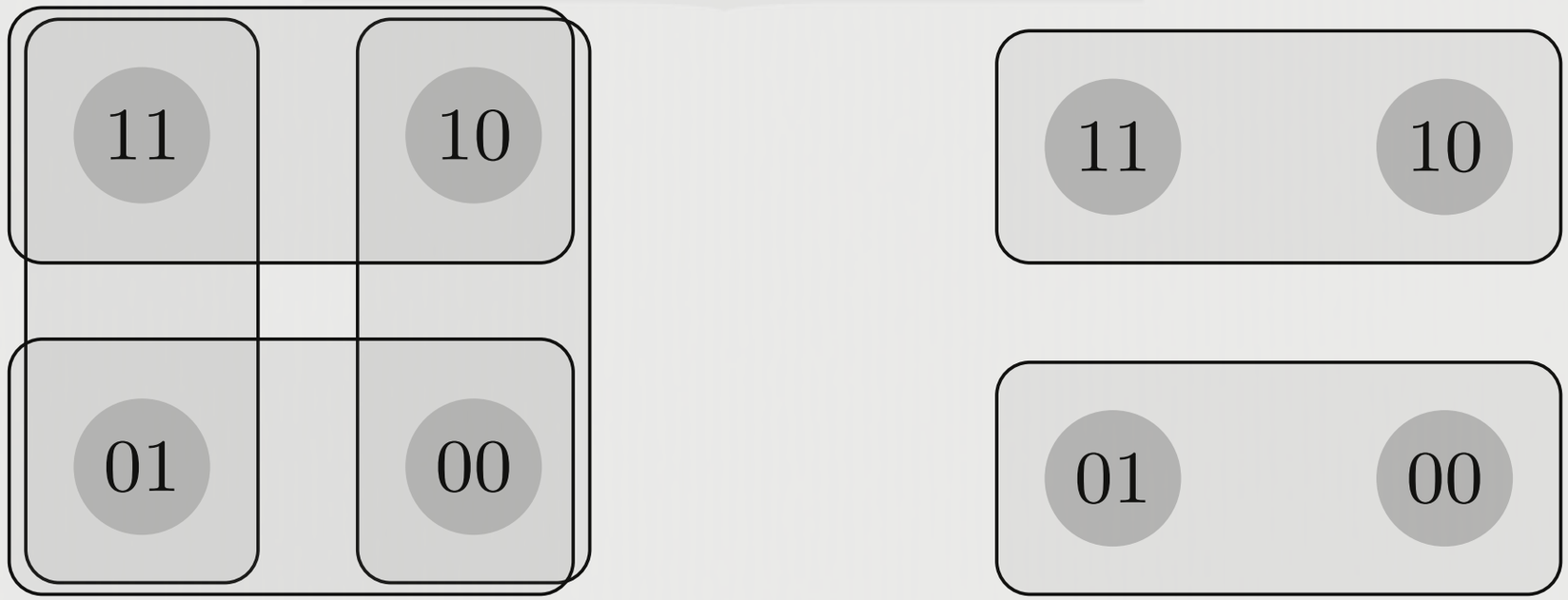
Compliance and Subquestions (fact 12)

- If both ψ and φ are questions, then φ is compliant with ψ iff

  1. Every possibility in $[\varphi]$ is the union of a set of possibilities in $[\psi]$

  2. Every possibility in $[\psi]$ is contained in a possibility in $[\varphi]$

- The effect of the second clause is that φ may not 'ignore' possibilities for ψ



(a) $?p \vee ?q$ (b) $?p$

Fig. 8. $?p$ is not compliant with $?p \vee ?q$.

Non-compliance

Homogeneity
(definition 16, 17)

- Where compliance concerns relatedness, homogeneity concerns quantitative preferences

- φ is at least as homogeneous as ψ iff

  1. φ is at least as informative as ψ

     i.e., in every state where ψ is eliminative, φ is eliminative as well

  2. φ is at most as inquisitive as ψ

     i.e., in every state where ψ is not inquisitive, φ is not inquisitive either

- Like for the qualitative notions, these quantitative preferences can be motivated from optimizing the chances to enhance the common ground

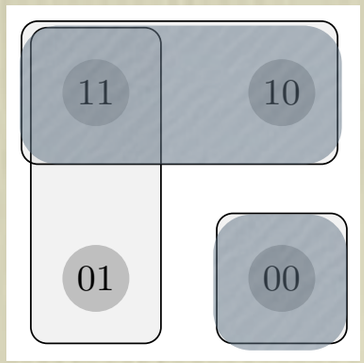
- See the paper

Compliance and Homogeneity
(fact 15, definition 18, 19)

- Compliance implies homogeneity
- Homogeneity leads to comparative compliance
  - Let φ and χ be compliant with ψ
    - φ is more compliant with ψ than χ iff φ is more homogeneous than χ
- Conversational Principle:
  - Be as compliant as you can!

Inquisitive Implicatures

Not Neither (1)



- Consider the alternative question in (1)

(3) Will ALF or BEA go to the party? ?(p ∨ q)

a. ALF will go to the party. p

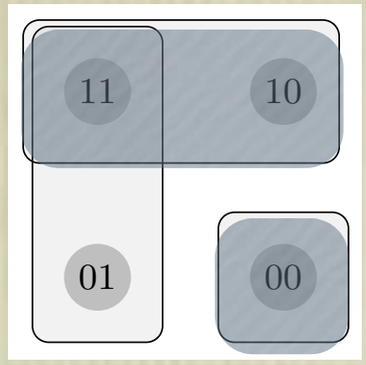
b. #Neither Alf nor Bea will go. ¬p ∧ ¬q

- # indicates that the response in (b) favors conversational marking, e.g., by an interjection like: *Well, actually...*

(1) Will ALF or BEA go to the party?

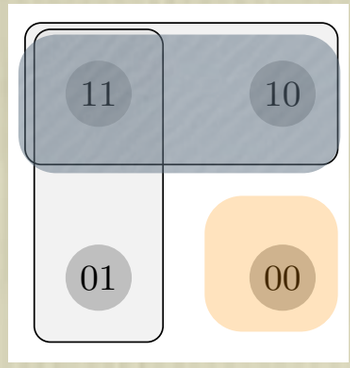
a. ALF will go to the party.

b. #Neither Alf nor Bea will go.



- Both (a) and (b) are optimally compliant responses to (1).
  - Still, (b) is an unexpected response that needs marking
- Proposed pragmatic explanation: (1) generates a suggestion that is canceled by (b)

Not Neither (2)



- Consider the hybrid disjunction in (2)

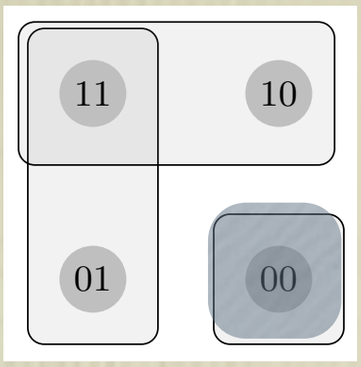
(2) ALF or BEA will go to the party $p \vee q$

a. ALF will go to the party. p

b. No. Neither Alf nor Bea will go. $\neg p \wedge \neg q$

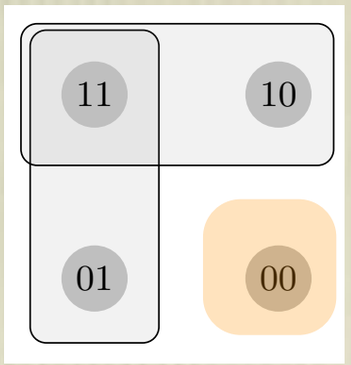
- The interjection *No* in (b) signals a non-compliant response, a rejection of the proposal made by (2)

Not Neither (1) and (2)



(1) Will ALF or BEA go to the party?

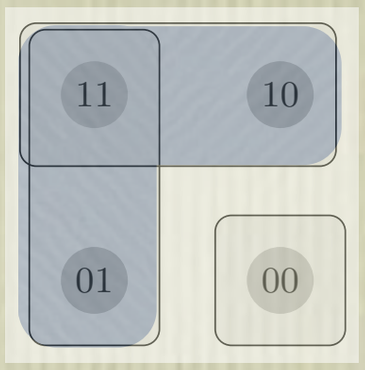
b. Well, actually, neither Alf nor Bea will go.



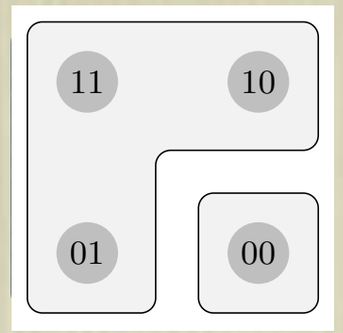
(2) ALF or BEA will go to the party

b. No, neither Alf nor Bea will go.

- Rejecting a proposal (semantics), and canceling a suggestion (pragmatics), are marked in different ways



Alternative and Polar



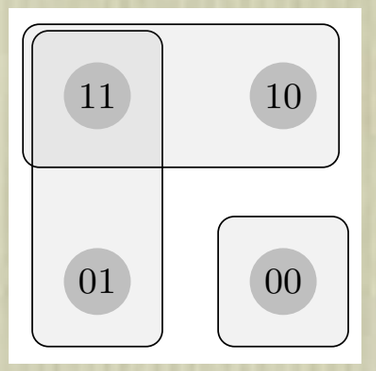
- Compare the polar question in (3) with the alternative question in (1), distinguished from each other by intonation

(3) Will Alf or Bea go to the party? $?!(p \vee q)$

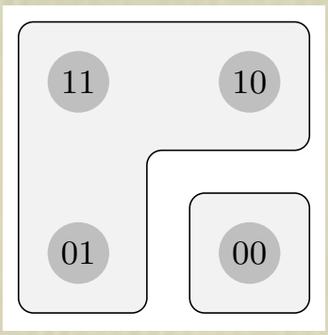
a. (Yes.) Alf or Bea will go. $!(p \vee q)$

b. (No.) Neither Alf nor Bea will go. $\neg p \wedge \neg q$

- The neither answer needs no marking now, but notice also that (3-a) is an odd response to (1)



Not Neither Suggestion



- This suggestion is triggered by homogeneity
- Crucial observation to make: the polar question $?!(p \vee q)$ is less inquisitive, and hence more homogeneous, than the alternative question $?(p \vee q)$, and hence quantitatively preferred by comparative compliance
- Unless this is overruled by a qualitative requirement: $?!(p \vee q)$ is not inquisitively sincere, whereas $?(p \vee q)$ is

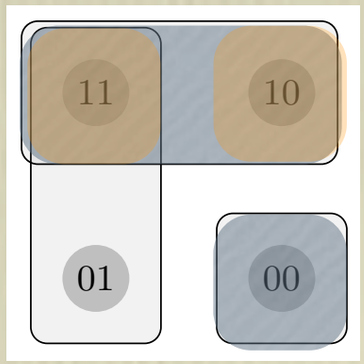
- It can only be the case that ?!(p ∨ q) is not inquisitive in the state of the speaker, whereas ?(p ∨ q) is, in case the possibility that neither p nor q is (virtually) excluded in her state

- That is why the alternative question ?(p ∨ q) suggests that not neither p nor q

- That explains why the neither answer needs marking for going against expectations

- It also explains why !(p ∨ q), though compliant, is an odd response to ?(p ∨ q), since the information it provides was already suggested

Not Both



- Two more responses to the alternative question in (1)

(1) Will ALF or BEA go to the party? ?(p ∨ q)

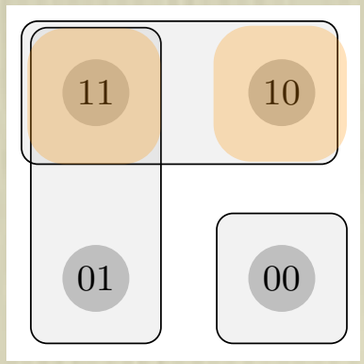
a. ALF will go to the party. p

b. #Neither Alf nor Bea will go. ¬p ∧ ¬q

c. #Both Alf and Bea will go. p ∧ q

d. Only Alf will go, Bea will not go. p ∧ ¬q

Not Both c-d



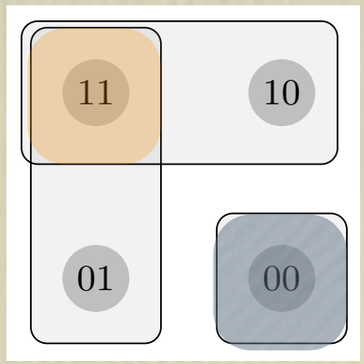
(1) Will ALF or BEA go to the party? ?(p ∨ q)

c. #Both Alf and Bea will go. p ∧ q

d. Only Alf will go, Bea will not go. p ∧ ¬q

- That (c) needs marking is not explained by its non-compliance, since (d) is not compliant either, and needs no marking
- Apparently, non-compliance of (d) pragmatically plays no role

Not Both b-c



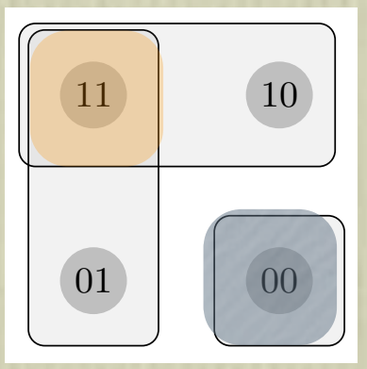
(1) Will ALF or BEA go to the party? $?(p \vee q)$

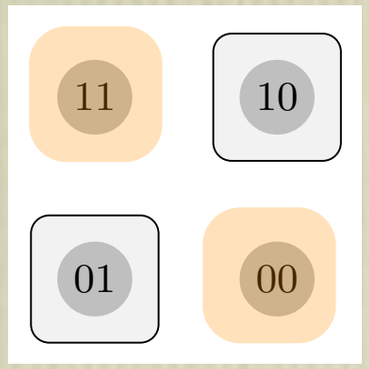
b. #Neither Alf nor Bea will go. $\neg p \wedge \neg q$

c. #Both Alf and Bea will go. $p \wedge q$

- We get a uniform explanation for the similar marking of (b) and (c) if both go against a suggestion: (1) both suggests not neither and not both

Not Neither and Not Both

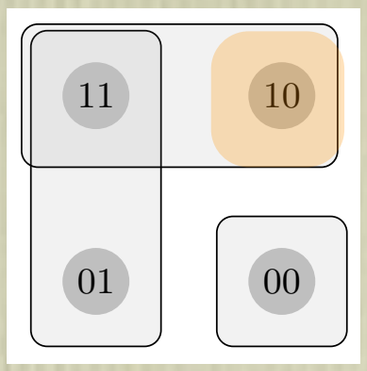




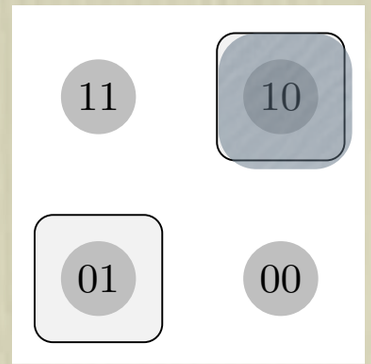
what $?(p \vee q)$ says

what $?(p \vee q)$ suggests

- Both $\neg p \wedge \neg q$ and $p \wedge q$ are not compliant relative to the enhancement of the common ground that $?(p \vee q)$ suggests



Only, Not Both

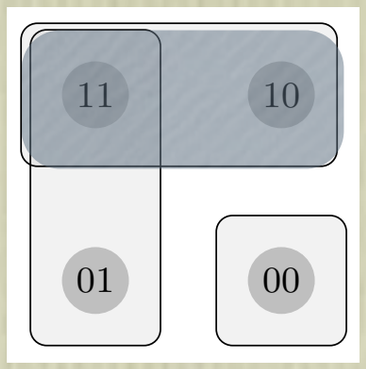


(1) Will ALF or BEA go to the party? $?(p \vee q)$

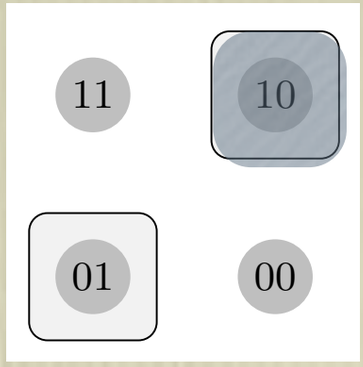
d. Only Alf will go, Bea will not go. $p \wedge \neg q$

- Although $p \wedge \neg q$ is not compliant with what $?(p \vee q)$ says, it is compliant with what $?(p \vee q)$ suggests

- $p \wedge \neg q$ explicitly goes along with the suggestion that not both



Not Both

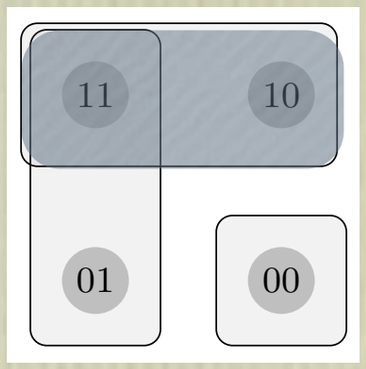


(1) Will ALF or BEA go to the party? $?(p \vee q)$

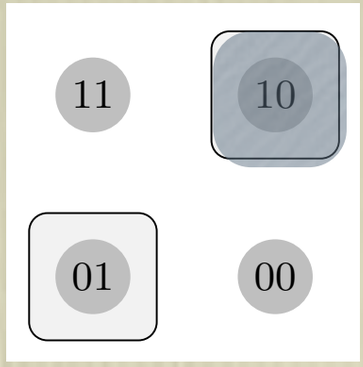
a. ALF will go to the party. p

d. Only Alf will go, Bea will not go. $p \wedge \neg q$

- Like (d) explicitly goes along with the suggestion not both, (a) implicitly does so
- The overall conversational effect of (a) and (d) is precisely the same



Not Both



(1) Will ALF or BEA go to the party? $?(p \vee q)$

a. ALF will go to the party. p

- Restricted to the state corresponding to what $?(p \vee q)$ suggests the response that p implicates that $p \wedge \neg q$

- The implicature comes about (or is canceled) by interaction of the participants: one makes a suggestion, the other does follow it or not

Not Both Suggestion

- The assumption that an alternative question $?(p \vee q)$ suggests not both p and q, helps to explain the nature of certain responses

- Pragmatic motivation: the response $p \wedge q$ which is more homogeneous than p, is blocked by not being compliant with $?(p \vee q)$

- Blocking such a better enhancement of the common ground only makes sense if the speaker considers $p \wedge q$ (virtually) unacceptable

Conclusions

- Inquisitive semantics provides a richer notion of meaning by adding inquisitiveness to informativeness

- The semantics gives rise to a richer notion of entailment, and new logical notions like compliance and homogeneity

- The semantics and the logic gives rise to additional and richer Gricean pragmatic principles that give new directions to the explanation of linguistic phenomena

http://www.illc.uva.nl/inquisitive-semantics

Hybrid Non-compliance

- $p \vee q$ is not compliant with $p \vee q \vee r$, nor the other way around
  - $p \vee q \vee r$ is less informative than $p \vee q$
  - $p \vee q$ is more inquisitive than $p \vee q \vee r$

Hybrid Non-compliance

- In the following examples *No* is not denial, but marks non-compliance

1. ALF or BEA will go to the party.

2. No. ALF or BEA, or COR will go.

3. No. ALF or BEA will go.

4. (Yes, yes, yes.) ALF will go.