Attentive Pragmatics: An Account of Exhaustivity and the Final Rise

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ESSLLI Student Session, August 9th 2013
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Goal of this talk

(1) Which colours (among red, green and blue) does John like?
He likes blue. \(\sim He \ doesn't \ like \ red, \ green.\)
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Conversational implicature (Grice, 1975)

An implicature, the supposition of which is necessary for maintaining the assumption that the speaker is cooperative.
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1. Had sp. believed John likes red, she should have said so.
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An implicature, the supposition of which is necessary for maintaining the assumption that the speaker is cooperative.

1. Had sp. believed John likes red, she should have said so.
2. She didn’t, so she doesn’t believe that he likes red.
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He likes blue. \( \sim He \ does \ n't \ like \ red, \ green. \)

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2. She didn’t, so she doesn’t believe that he likes red.
   \( \ldots \)
3. She believes that he doesn’t like red.
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   … (‘the epistemic step’ - Sauerland, 2004)
3. She believes that he doesn’t like red.
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"[the epistemic] step does not follow from Gricean maxims and logic alone." - Chierchia, et al. (2008)
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Wrong, it does!
Outline

1. Diagnosis
2. Theory
3. Predictions
4. Conclusion
5. Related concepts and puzzles
1. Diagnosis

(2) a. Which colours (among red, green and blue) does John like?  
b. He likes blue.                  \( \sim He \ doesn't \ like \ red \)
 c. He likes blue, or blue and red. \( \sim\frown He \ doesn't \ like \ red \)
1. Diagnosis

(2) a. Which colours (among red, green and blue) does John like?
   b. He likes blue.  \(\sim\) He doesn’t like red
   c. He likes blue, or blue and red.  \(\not\sim\) He doesn’t like red

Intuition
(2b) and (2c) differ in their attentive content.
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- (2c) draws attention to the poss. that John likes blue and red.
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   b. He likes blue. ~ He doesn’t like red
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- (And so does (2a).)
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(2b) and (2c) differ in their *attentive content*.

- (2c) draws attention to the poss. that John likes blue and red.
- (And so does (2a).)
- (2b) doesn’t; it leaves the possibility *unattended*. 
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Apparently, pragmatic reasoning is sensitive to this.
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2. Theory

2.1. Translation into logic
2.2. Semantics
2.3. Pragmatics
2.1. Translation into logic

(3) a. Which colours (among red, green and blue) does John like?
   b. He likes blue.  \(\sim\) He doesn’t like red
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2.1. Translation into logic

(3) a. Which colours (among red and blue) does John like?
   b. He likes blue.  \( \sim \) He doesn’t like red
   c. He likes blue, or blue and red.  \( \not\sim \) He doesn’t like red
2.1. Translation into logic

(3)  a. There are colours (among red and blue) that John likes.
    b. He likes blue. \( \sim \) *He doesn’t like red*
    c. He likes blue, or blue and red. \( \sim \frown \) *He doesn’t like red*
2.1. Translation into logic

(3) a. John likes blue, red, or blue and red.
    b. He likes blue.         \[ \sim \text{He doesn’t like red} \]
    c. He likes blue, or blue and red. \[ \neg \text{He doesn’t like red} \]
2.1. Translation into logic

(3) a. John likes blue, red, or blue and red.
   b. He likes blue.
   c. He likes blue, or blue and red.
2.1. Translation into logic

(3) a. John likes blue, red, or blue and red. \( p \lor q \lor (p \land q) \)
b. He likes blue. \( p \)
c. He likes blue, or blue and red. \( p \lor (p \land q) \)
2.2. Semantics (Roelofsen, 2011)

Possibility: a set of worlds \((a, b)\)

Proposition: a set of possibilities \((A, B, \{\phi\})\)

Informative content: \(\phi \divides \phi\)

Entailment: \(A \text{ entails } B\), iff (i) \(A \subseteq B\); and (ii) for all \(b \in B\), if \(b \cap \\{\phi\} \neq \emptyset\), then \(b \cap \{\phi\} \in A\)

Now, (3c) \(\text{ relates to } (3a)\), but (3b) \(\text{ differs from } (3a)\).
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\[
\begin{align*}
(3a) & \; [p \lor q \lor (p \land q)] & (3b) & \; [p] & (3c) & \; [p \lor (p \land q)]
\end{align*}
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\((3a)\) \([p \lor q \lor (p \land q)]\)  \(\neg\) \((3b)\) \([p]\)  \(\neg\) \((3c)\) \([p \lor (p \land q)]\)
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**Entailment**

\(A \text{ entails } B, A \models B\), iff

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\[ \text{at least as informative} \]

\[ \text{at least as attentive} \]

Now, \((3c) \models (3a)\), but \((3b) \not\models (3a)\).
2.3. Pragmatics

The relevant maxims

1. Quality:
2. Quantity:
3. Relation:
2.3. Pragmatics

The relevant maxims
For a cooperative speaker with information $s$, responding $R$ to $Q$:

1. Quality:
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(4) Did John go to the party?
It was raining.

If it rained, John \{went / didn't go\}.
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(cf. Grice, 1975; Groenendijk and Stokhof, 1984; Roberts, 1996; Spector, 2007)

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3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)

c. He likes blue, or blue and red. \((p \lor (p \land q))\)
3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)

c. He likes blue, or blue and red. \((p \lor (p \land q))\)
   1. \(s \subseteq |p \lor (p \land q)|\)  \(\text{(Quality)}\)
3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)

c. He likes blue, or blue and red. \((p \lor (p \land q))\)

1. \(s \subseteq |p \lor (p \land q)| = |p|\) (Quality)
3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)

c. He likes blue, or blue and red. \((p \lor (p \land q))\)

1. \(s \subseteq |p \lor (p \land q)| = |p|\)  
   (Quality)
2. \(s \notin |q|\)  
   (Quantity)
3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)

c. He likes blue, or blue and red. \((p \lor (p \land q))\)

1. \(s \subseteq |p \lor (p \land q)| = |p|\) (Quality)
2. \(s \notin |q|\) (Quantity)

\(p \lor (p \land q) \equiv p \lor q \lor (p \land q)\)
3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)

c. He likes blue, or blue and red. \((p \lor (p \land q))\)

1. \(s \subseteq |p \lor (p \land q)| = |p|\) (Quality)
2. \(s \not\subseteq |q|\) (Quantity)
3. \(p \lor (p \land q) \models p \lor q \lor (p \land q)\) (Relation)
3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)
   1. \(s \subseteq |p|\) \hspace{1cm} (Quality)

   2. \(s \notin |p|\) \hspace{1cm} (Quantity)

   3. \(p \lor (p \land q) \models p \lor q \lor (p \land q)\) \hspace{1cm} (Relation)

   c. He likes blue, or blue and red. \((p \lor (p \land q))\)
   1. \(s \subseteq |p \lor (p \land q)| = |p|\) \hspace{1cm} (Quality)
   2. \(s \notin |q|\) \hspace{1cm} (Quantity)
   3. \(p \lor (p \land q) \models p \lor q \lor (p \land q)\) \hspace{1cm} (Relation)
3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)
   1. \(s \subseteq |p|\)
   2. \(s \not\subseteq |q|\)

(Quantity)

(Quantity)

(Quality)

(Quantity)

(Relation)

(3) c. He likes blue, or blue and red. \((p \lor (p \land q))\)
   1. \(s \subseteq |p \lor (p \land q)| = |p|\)
   2. \(s \not\subseteq |q|\)
   3. \(p \lor (p \land q) \supseteq p \lor q \lor (p \land q)\)
3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)
   1. \(s \subseteq |p|\)
   2. \(s \notin |q|\)

   \[\begin{align*}
   p & \not\in p \lor q \lor (p \land q) \\
   \text{(Quality)} \\
   \text{(Quantity)}
   \end{align*}\]

c. He likes blue, or blue and red. \((p \lor (p \land q))\)
   1. \(s \subseteq |p \lor (p \land q)| = |p|\)
   2. \(s \notin |q|\)
   3. \(p \lor (p \land q) \Rightarrow p \lor q \lor (p \land q)\)

   \(\text{(Quality)}\)
   \(\text{(Quantity)}\)
   \(\text{(Relation)}\)
3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)

1. \(s \subseteq |p|\)
2. \(s \not\subseteq |q|\)

\(p \nleq p \lor q \lor (p \land q)\)

(Quantity)

(Quality)

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c. He likes blue, or blue and red. \((p \lor (p \land q))\)

1. \(s \subseteq |p \lor (p \land q)| = |p|\)
2. \(s \not\subseteq |q|\)
3. \(- \quad p \lor (p \land q) \equiv p \lor q \lor (p \land q)\)

(Quantity)

(Quantity)

(Relation)
3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)
   1. \(s \subseteq |p|\) \(\Rightarrow \) \(p \not\subseteq p \lor q \lor (p \land q)\) (Quality)
   2. \(s \not\subseteq |q|\) (Quantity)

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3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)

1. \(s \subseteq |p|\)
2. \(s \not\subseteq |q|\)

\[ p \not\subseteq p \lor q \lor (p \land q) \]

\( (\text{Quality})\)

\( (\text{Quantity})\)

c. He likes blue, or blue and red. \((p \lor (p \land q))\)

1. \(s \subseteq |p \lor (p \land q)| = |p|\)
2. \(s \not\subseteq |q|\)
3. \(p \lor (p \land q) \not\subseteq p \lor q \lor (p \land q)\)

\( (\text{Quality})\)

\( (\text{Quantity})\)

\( (\text{Relation})\)
3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)
   1. \(s \subseteq |p|\)
   2. \(s \nsubseteq |q|\)

   \[ p \not\subseteq p \lor q \lor (p \land q) \]

   (Quality)
   (Quantity)

\[
\begin{align*}
\text{c. He likes blue, or blue and red. } & \quad (p \lor (p \land q)) \\
\text{1. } & s \subseteq |p \lor (p \land q)| = |p| \\
\text{2. } & s \nsubseteq |q| \\
\text{3. - } & p \lor (p \land q) \models p \lor q \lor (p \land q) \\
\end{align*}
\]

(Quality)
(Quantity)
(Relation)
3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)
   1. \(s \subseteq |p|\)
   2. \(s \not\subseteq |q|\)

\[ p \not\subseteq p \lor q \lor (p \land q) \]

(Quantity)

(3) c. He likes blue, or blue and red. \((p \lor (p \land q))\)
   1. \(s \subseteq |p \lor (p \land q)| = |p|\)
   2. \(s \not\subseteq |q|\)
   3. \(p \lor (p \land q) \models p \lor q \lor (p \land q)\)

(Quality)

(Quantity)

(Relation)
3. Predictions

(3) a. John likes blue, red, or blue and red. \((p ∨ q ∨ (p ∧ q))\)

b. He likes blue. \((p)\)

1. \(s ⊆ |p|\)
2. \(s \not\subseteq |q|\)
3. \(s ⊆ |p| ∪ |q|\) or \(s ⊆ |p| ∪ |q|\)

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3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)
1. \(s \subseteq |p|\)
2. \(s \not\subseteq \lvert q \rvert\)
3. \(s \subseteq |p| \cup |q|\) or \(s \subseteq |p| \cup |q|\)

(3) c. He likes blue, or blue and red. \((p \lor (p \land q))\)
1. \(s \subseteq |p \lor (p \land q)| = |p|\)
2. \(s \not\subseteq |q|\)
3. - \(p \lor (p \land q) \supseteq p \lor q \lor (p \land q)\)
3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)
1. \(s \subseteq |p|\)
2. \(s \not\subseteq |q|\)
3. \(s \subseteq |p| \cup |q|\) or \(s \subseteq |p| \cup |q|\)

4. \(s \subseteq |q|\)


c. He likes blue, or blue and red. \((p \lor (p \land q))\)
1. \(s \subseteq |p \lor (p \land q)| = |p|\)\) (Quality)
2. \(s \not\subseteq |q|\) (Quantity)
3. \(p \lor (p \land q) \implies p \lor q \lor (p \land q)\) (Relation)
3. Predictions

(3) a. John likes blue, red, or blue and red. \((p \lor q \lor (p \land q))\)

b. He likes blue. \((p)\)

1. \(s \subseteq |p|\)
2. \(s \notin |q|\)
3. \(s \subseteq |p| \cup |q|\) or \(s \subseteq |p| \cup |q|\)

4. \(s \subseteq |q|\) exhaustivity!

(3) c. He likes blue, or blue and red. \((p \lor (p \land q))\)

1. \(s \subseteq |p \lor (p \land q)| = |p|\)
2. \(s \notin |q|\)
3. \(p \lor (p \land q) \models p \lor q \lor (p \land q)\) (Relation)
4. Conclusion

Main finding:
4. Conclusion

Main finding:

- If we feed the maxims *attentive content*
4. Conclusion

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- then the epistemic step follows from the cooperative principle.
4. Conclusion

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- If we feed the maxims *attentive content*
- - which we must anyway, to distinguish between (3b,3c) -
  - then the epistemic step follows from the cooperative principle.

Take-home messages:

- Pragmatic reasoning is sensitive to attentive content.
- *Exhaustivity implicatures are conversational implicatures.*
5. Related concepts and puzzles

5.1. The opinionatedness assumption
5.2. ‘Alternatives’
5.3. ‘Embedded’ implicatures
5.4. Other suitable semantics
5.1. The opinionatedness assumption

Most existing work (Sauerland, 2004):

1. The speaker doesn't believe $q$
2. She believes either $q$ or $\neg q$
3. She believes $\neg q$

Counterexample:

(5) I'm asking the wrong person, but which colours does J. like?
He likes blue. $\frac{\text{He doesn't like red.}}{\text{Instead, in my approach:}}$

Opinionatedness follows from Quality + Relation implicatures
5.1. The opinionatedness assumption

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1. The speaker doesn’t believe \( q \)  

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5.1. The opinionatedness assumption

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1. The speaker doesn’t believe $q$  
   (Quantity)
2. She believes either $q$ or $\neg q$  
   (Context)

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(5) I'm asking the wrong person, but which colours does J. like?
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5.1. The opinionatedness assumption

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5.1. The opinionatedness assumption

Most existing work (Sauerland, 2004):
1. The speaker doesn’t believe \( q \)
2. She believes either \( q \) or \( \neg q \)
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5.1. The opinionatedness assumption

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(5) I’m asking the wrong person, but which colours does J. like? He likes blue. $\sim$ He doesn’t like red.
5.1. The opinionatedness assumption

Most existing work (Sauerland, 2004):

1. The speaker doesn’t believe \( q \) (Quantity)
2. She believes either \( q \) or \( \neg q \) (Context)
   
3. She believes \( \neg q \)

Counterexample:

(5) I’m asking the wrong person, but which colours does J. like?
   He likes blue. \( \sim \) He doesn’t like red.

Instead, in my approach:

- Opinionatedness follows from Quality + Relation implicatures
5.2. ‘Alternatives’

Existing approaches (since Gazdar, 1979):

- ‘Why did the speaker not say “p \land q”?’

More take-home messages

- The ‘alternatives’ are fully determined by the maxims.
- Speakers need not reason in terms of alternatives.
5.2. ‘Alternatives’

Existing approaches (since Gazdar, 1979?):

- ‘Why did the speaker not say “p ∧ q”?’
- Mere ignorance is sufficient reason.
5.2. ‘Alternatives’

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My approach:

- ‘Why did the speaker not say “p \lor (p \land q)”?’
- Ignorance is no excuse.
- Hence something stronger is implied: exhaustivity.

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- The ‘alternatives’ are fully determined by the maxims.
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My approach:
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5.2. ‘Alternatives’

Existing approaches (since Gazdar, 1979?):
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- Mere ignorance is sufficient reason.

My approach:
- ‘Why did the speaker not say “p ∨ (p ∧ q)”?’
- *Ignorance is no excuse.*
- Hence something stronger is implied: exhaustivity.
5.2. ‘Alternatives’

Existing approaches (since Gazdar, 1979?):
- ‘Why did the speaker not say “\(p \land q\)”?’
- Mere ignorance is sufficient reason.

My approach:
- ‘Why did the speaker not say “\(p \lor (p \land q)\)”?’
- *Ignorance is no excuse.*
- Hence something stronger is implied: exhaustivity.

More take-home messages
- The ‘alternatives’ are fully determined by the maxims.
- Speakers need not reason in terms of alternatives.
5.3. ‘Embedded’ implicatures

Chierchia, et al. (2008), and much subsequent discussion

(6) Which books did every student read?
   Every student read O. or K.L. \(\sim\) No student read both.
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The problem

The problem has never been the Gricean approach as such, but rather to find the right ‘alternatives’.
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- (Hence so do the ‘alternatives’.)

The ‘embedded’ implicature of (6) is in fact predicted.
5.4. Other suitable semantics

Attentive semantics is not the only suitable semantics:
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- *Unrestricted Inquisitive Sem.* (Ciardelli, 2009; Westera, 2012)
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Minimally, the semantics must lack the *absorption laws*:

- Absorption: $p \lor (p \land q) \equiv p \equiv p \land (p \lor q)$
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- Absorption: \( p \lor (p \land q) \equiv p \equiv p \land (p \lor q) \)
The end

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Article

- Attentive Pragmatics: Exhaustivity and the Final Rise. *ESSLLI StuS proceedings* (staff.science.uva.nl/~westera/)

Thanks to the *Netherlands Organisation for Scientific Research* (NWO) for financial support; to F. Roelofsen, J. Groenendijk, the audiences of *SemDial, UCSC S-Circle, SPE6, ICL*, K. von Fintel, and many anonymous reviewers for valuable comments.
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Appendix A. Semantics (Roelofsen, 2011)

Ingredients

- *Possibility*: a set of worlds $(a, b)$
- *Proposition*: a set of possibilities $(A, B, \varphi)$
- *Informative content*: $|\varphi| := \cup[\varphi]$
- *A restricted to b*, $A_b := \{a \cap b \mid a \in A, a \cap b \neq \emptyset\}$

Semantics of relevant fragment

1. $[p] = \{\{w \in \textbf{Worlds} \mid w(p) = \text{true}\}\}$
2. $[\varphi \lor \psi] = ([\varphi] \cup [\psi])_{|\varphi|\cup|\psi|} = [\varphi] \cup [\psi]$
3. $[\varphi \land \psi] = ([\varphi] \cup [\psi])_{|\varphi|\cap|\psi|}$

Entailment

$A$ entails $B$, $A \models B$, iff (i) $\cup A \subseteq \cup B$ and (ii) $B \cup A \subseteq A$. 
Appendix B. Roberts’s (1996) ‘relevance’

- ‘My’ Maxim of Relation: $R_s \models Q$
- Roberts’s relevance: $R_{CG} \models Q$  
  ($CG = \text{Common Ground}$)
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- ‘My’ Maxim of Relation: $R_s \sqsubseteq Q$
- Roberts’s *relevance*: $R_{CG} \sqsubseteq Q$  \hfill ($CG = \text{Common Ground}$)

Roberts’s requirement is too strong:

1. $s \subseteq p$
2. $s \subseteq q$
3. $s \subseteq p \cup q$ or $s \subseteq p \cup q$
4. $s \subseteq q$
Appendix B. Roberts’s (1996) ‘relevance’

- ‘My’ Maxim of Relation: $R_s \models Q$
- Roberts’s relevance: $R_{CG} \models Q$ \hspace{1cm} (CG = Common Ground)

Roberts’s requirement is too strong:
- The participants need not already know how $R$ is relevant.
Appendix B. Roberts’s (1996) ‘relevance’

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- Roberts’s relevance: $R_{CG} \models Q$ \hspace{1cm} ($CG = \text{Common Ground}$)

Roberts's requirement is too strong:
- The participants need not \textit{already know} how $R$ is relevant.
- They need only be able to \textit{figure it out}.
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- ‘My’ Maxim of Relation: \( R_s \models Q \)
- Roberts’s relevance: \( R_{CG} \models Q \) \((CG = \text{Common Ground})\)

Roberts’s requirement is too strong:
- The participants need not already know how \( R \) is relevant.
- They need only be able to figure it out.

E.g., in case of exhaustivity:
1. \( s \subseteq |p| \) (Quality)
2. \( s \not\subseteq |q| \) (Quantity)
3. \( s \subseteq \overline{|p| \cup |q|} \) or \( s \subseteq |p| \cup |q| \) (Relation)
4. \( s \subseteq |q| \)
Appendix C. The final rise

(7) Which colours (among red, green and blue) does John like? He likes blue↑.
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(7) Which colours (among red, green and blue) does John like?
   He likes blue ↗.

Conveys uncertainty regarding:
   ▶ whether he really likes blue
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The final rise conveys non-cooperativity.
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Proposal

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- whether ‘blue’ is pronounced correctly
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  ▶ whether ‘blue’ is pronounced correctly (Manner)
  ▶ whether he likes red

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- whether he really likes blue (Quality)
- whether this is sufficient info (Quantity)
- whether ‘blue’ is pronounced correctly (Manner)
- whether he likes red (Relation)

Proposal
The final rise conveys non-cooperativity.
Appendix D. ‘Gricean’?

“that there are, or appear to be, divergences in meaning between, on the one hand, [...] the formal devices - ¬, ∧, ∨, [...] and, on the other, [...] their analogs or counterparts in natural language - such expressions as not, and, or, [...]” (Grice, 1975)
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- Cf. questions, presuppositions, expressive content, ...
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- The semantics treats informative content classically.
- Cf. questions, presuppositions, expressive content, ...
- Also for att. content, the connectives are algebraically ‘basic’.

Besides: this is the only way.
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