Exhaustivity is a conversational implicature

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Semantics Research Group, Tokyo, October 25th 2013
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1.1. Aims of this talk

(1) Of John, Bill and Mary, who came to the party?
- John came.  \(\sim\) Mary and Bill didn’t.  \(\text{(exhaustivity)}\)
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As a speaker, how can you:

> *Ensure* that your answer is interpreted exhaustively?
1.1. Aims of this talk

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   - John came. \(\sim\) Mary and Bill didn’t. \(\text{(exhaustivity)}\)

As a speaker, how can you:

- *Ensure* that your answer is interpreted exhaustively?
- *Prevent* that your answer is interpreted exhaustively?
1.2. Exhaustivity as a conversational implicature

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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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Wrong, it does!
1.3. Existing ‘Gricean’ approaches

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2. She lacks the belief that Mary came (Quantity)
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- It is empirically inadequate:

(2) I’m probably asking the wrong person, but of John, Bill and Mary, who came to the party?
- John and Bill came. ¬*Not Mary.*
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- Opinionatedness must be something *conveyed by the speaker.*
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1. The sp. is *opinionated* about whether Mary came 
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3. She believes that Mary didn’t come
   - It is empirically inadequate:
   (2) I’m probably asking the wrong person, but of John, Bill and Mary, who came to the party?
     - John and Bill came. $\sim$ *Not Mary.*
   - Opinionatedness must be something *conveyed by the speaker,* but how?!
1.4. The bigger picture

The standard Gricean account of exhaustivity is not *generative*:
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Attempted ‘remedies’:
- Replacing ‘relevance’ by lexical scales (since Horn, 1972).
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  (mainly since Chierchia, *et al.*, 2008).
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- It requires a contextual *opinionatedness assumption*;
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**Attempted ‘remedies’:**
- Replacing ‘relevance’ by lexical scales (since Horn, 1972).
- Blindly negating alternatives by covert operators
  (mainly since Chierchia, *et al.*, 2008).

I will show that none of this is necessary.
Part I: Exhaustivity is a conversational implicature.

Part II: Intonation and exhaustivity
Part I: Exhaustivity is a conversational implicature.

- Without the opinionatedness assumption.

Part II: Intonation and exhaustivity
Part I: Exhaustivity is a conversational implicature.

- Without the opinionatedness assumption.
- Through the maxim of Relation.

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Part II: Intonation and exhaustivity

- Focus further reduces contextual uncertainty.
Part I: Exhaustivity is a conversational implicature.

- Without the opinionatedness assumption.
- Through the maxim of Relation.

Part II: Intonation and exhaustivity

- Focus further reduces contextual uncertainty.
- How the final rise prevents exhaustivity.
Part I: Exhaustivity is a conversational implicature.

2. Diagnosis
3. Theory
4. Results
2. Diagnosis

(3) a. Of John, Bill and Mary, who came to the party?
   b. John came.  ~ Mary didn’t come
2. Diagnosis

(3) a. Of John, Bill and Mary, who came to the party?
   b. John came.  \(\sim\) Mary didn’t come
   c. John came, or Mary and John.  \(\not\sim\) Mary didn’t come
2. Diagnosis

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Intuition
(3b) and (3c) differ in their attentive content.
2. Diagnosis

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   b. John came.  \sim Mary didn’t come
   c. John came, or Mary and John.  \not\vdash Mary didn’t come

Intuition

(3b) and (3c) differ in their attentive content.

- (3c) draws attention to the poss. that Mary came too.
2. Diagnosis

(3) a. Of John, Bill and Mary, who came to the party?
   b. John came.                              \(\sim\) Mary didn’t come
   c. John came, or Mary and John.           \(\not\sim\) Mary didn’t come

Intuition
(3b) and (3c) differ in their \textit{attentive content}.

\begin{itemize}
\item (3c) draws attention to the poss. that Mary came too.
\item (And so does (3a).)
\end{itemize}
2. Diagnosis

(3) a. Of John, Bill and Mary, who came to the party?
   b. John came. \hspace{1cm} \sim Mary didn’t come
   c. John came, or Mary and John. \hspace{1cm} \lor Mary didn’t come

Intuition

(3b) and (3c) differ in their attentive content.

- (3c) draws attention to the poss. that Mary came too.
- (And so does (3a).)
- (3b) doesn’t; it leaves the possibility unattended.
2. Diagnosis

(3) a. Of John, Bill and Mary, who came to the party?
   b. John came.  ~ Mary didn’t come
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Apparently, pragmatic reasoning is sensitive to this.
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\end{itemize}

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   b. John came.        \(\sim\) Mary didn’t come
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Intuition
(3b) and (3c) differ in their **attentive content**.

- (3c) draws attention to the poss. that Mary came too.
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(3) a. Of John, Bill and Mary, who came to the party?  
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(3b) and (3c) differ in their attentive content.

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Apparently, pragmatic reasoning is sensitive to this.
3. Theory

3.1. Translation into logic
3.2. Semantics
3.3. Pragmatics
3.1. Translation into logic

(4) a. Of John, Bill and Mary, who came to the party?
   b. John came.                           ~ Mary didn’t come
   c. John came, or Mary and John.         ⊤ Mary didn’t come
3.1. Translation into logic

(4) a. Of John and Mary, who came to the party?
   b. John came. \[ \sim Mary \text{ didn’t come} \]
   c. John came, or Mary and John. \[ \not\sim Mary \text{ didn’t come} \]
3.1. Translation into logic

(4) a. Of John and Mary, some came to the party.
    b. John came.   \[ \neg \text{Mary didn’t come} \]
    c. John came, or Mary and John.   \[ \text{Mary didn’t come} \]
3.1. Translation into logic

\[ (4) \]

a. John came, or Mary, or John and Mary.

b. John came. \[ \sim \text{Mary didn’t come} \]

c. John came, or Mary and John. \[ \not\sim \text{Mary didn’t come} \]
3.1. Translation into logic

(4) a. John came, or Mary, or John and Mary.
   b. John came.
   c. John came, or Mary and John.
3.1. Translation into logic

(4) a. John came, or Mary, or John and Mary. \[ p \lor q \lor (p \land q) \]
b. John came. \[ p \]
c. John came, or Mary and John. \[ p \lor (p \land q) \]
3.2. Semantics (Roelofsen, 2011)
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- *Possibility*: a set of worlds \((a, b)\)
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- **Possibility**: a set of worlds \((a, b)\)
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- **Informative content**: \(|\varphi| := \bigcup[\varphi]|
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\[
(4a) \ [p \lor q \lor (p \land q)] \quad (4b) \ [p] \quad (4c) \ [p \lor (p \land q)]
\]
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- **Possibility**: a set of worlds \((a, b)\)
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\[(4a) \quad [p \lor q \lor (p \land q)]\]
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\begin{align*}
(4a) & \quad [p \lor q \lor (p \land q)] \\
(4b) & \quad [p] \\
(4c) & \quad [p \lor (p \land q)]
\end{align*}
\]

**Entailment**

\(A\) **entails** \(B\), \(A \models B\), iff

(i) \(\bigcup A \subseteq \bigcup B\); and

(ii) for all \(b \in B\), if \(b \cap \bigcup A \neq \emptyset\), \(b \cap \bigcup A \in A\)
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- **Possibility**: a set of worlds \((a, b)\)
- **Proposition**: a set of possibilities \((A, B, [\varphi])\)
- **Informative content**: \(|\varphi| := \bigcup [\varphi]\

\[(4a) \quad [p \lor q \lor (p \land q)]\]
\[(4b) \quad [p]\]
\[(4c) \quad [p \lor (p \land q)]\]

**Entailment**

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

(i) \(\bigcup A \subseteq \bigcup B\); and

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→ at least as informative
3.2. Semantics (Roelofsen, 2011)

- **Possibility**: a set of worlds \((a, b)\)
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Entailment

\(A\) entails \(B\), \(A \models B\), iff

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\textcolor{red}{\rightarrow \text{at least as informative}}

\textcolor{red}{\rightarrow \text{at least as attentive}}
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Now, \((4c) \models (4a)\), but \((4b) \not\models (4a)\).
3.3. Pragmatics

The relevant maxims

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

(5) Did John go to the party?
It was raining.
If it rained, John {went / didn't go}.
The relevant maxims
For a cooperative speaker with information $s$, responding $R$ to $Q$:

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3. **Relation**: $\{ r \cap s \mid r \in R \} \models Q$. 

\[ \text{Did John go to the party?} \]
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\[ \text{If it rained, John } \{ \text{went } / \text{didn't go} \}. \]
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It was raining.
3.3. Pragmatics

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

1. **Quality**: $s \subseteq \bigcup R$.
2. **Quantity**: For all $Q' \subseteq Q$, if $s \subseteq \bigcup Q'$ then $\bigcup R \subseteq \bigcup Q'$.
3. **Relation**: $\{ r \cap s \mid r \in R \} \supseteq Q$.

(5) Did John go to the party?
It was raining.

\[
\begin{aligned}
\text{rp} & \quad \text{rp} \\
\text{rp} & \quad \text{rp} \\
\text{rp} & \quad \text{rp} \\
\end{aligned}
\quad = \quad
\begin{aligned}
\text{rp} & \quad \text{rp} \\
\text{rp} & \quad \text{rp} \\
\text{rp} & \quad \text{rp} \\
\end{aligned}
\quad \Rightarrow \quad
\begin{aligned}
\text{rp} & \quad \text{rp} \\
\text{rp} & \quad \text{rp} \\
\text{rp} & \quad \text{rp} \\
\end{aligned}
\]
3.3. Pragmatics

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

1. **Quality**: \( s \subseteq \bigcup R \).
2. **Quantity**: For all \( Q' \subseteq Q \), if \( s \subseteq \bigcup Q' \) then \( \bigcup R \subseteq \bigcup Q' \).
3. **Relation**: \( \{ r \cap s \mid r \in R \} \models Q \).

(5) Did John go to the party?
It was raining.
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For a cooperative speaker with information $s$, responding $R$ to $Q$:

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3. **Relation**: $\{r \cap s \mid r \in R\} \models Q$.

(5) Did John go to the party?
It was raining.

\[ \begin{array}{ccc}
  \text{rp} & \text{rp} & \text{rp} \\
  \text{rp} & \text{rp} & \text{rp} \\
  \text{rp} & \text{rp} & \text{rp} \\
\end{array} \quad = \quad \begin{array}{ccc}
  \text{rp} & \text{rp} & \text{rp} \\
  \text{rp} & \text{rp} & \text{rp} \\
\end{array} \quad \models \quad \begin{array}{ccc}
  \text{rp} & \text{rp} & \text{rp} \\
  \text{rp} & \text{rp} & \text{rp} \\
\end{array} \]
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(5) Did John go to the party?
It was raining. $\rightsquigarrow$ If it rained, John $\{\text{went} / \text{didn't go}\}$. 
3.3. Pragmatics
(cf. Grice, 1975; Groenendijk and Stokhof, 1984; Roberts, 1996; Spector, 2007)

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

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3. **Relation**: $\{ r \cap s \mid r \in R \} \models Q$. 

\[ \text{Did John go to the party?} \]
\[ \text{It was raining.} \]
\[ \therefore \text{If it rained, John } \{ \text{went / didn't go} \}. \]
4. Results

4.1. Examples
4.2. What’s happening
4.3. ‘Alternatives’?
4.4. Main conclusion
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

   b. John came. \((p)\)

   c. John came, or Mary and John. \((p \lor (p \land q))\)
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

  b. John came. \((p)\)

c. John came, or Mary and John. \((p \lor (p \land q))\)

  1. \(s \subseteq |p \lor (p \land q)|\) \hspace{1cm} \text{(Quality)}
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

b. John came. \((p)\)

c. John came, or Mary and John. \((p \lor (p \land q))\)

1. \(s \subseteq |p \lor (p \land q)| = |p|\) (Quality)
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

b. John came. \((p)\)

c. John came, or Mary and John. \((p \lor (p \land q))\)

1. \(s \subseteq |p \lor (p \land q)| = |p|\) (Quality)
2. \(s \not\subseteq |q|\) (Quantity)
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

b. John came. \((p)\)

c. John came, or Mary and John. \((p \lor (p \land q))\)

1. \(s \subseteq |p \lor (p \land q)| = |p|\)  
(\text{Quality})

2. \(s \notin |q|\)
\[
p \lor (p \land q) \supset p \lor q \lor (p \land q)
\]
(\text{Quantity})
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

b. John came. \((p)\)

c. John came, or Mary and John. \((p \lor (p \land q))\)
   
   1. \(s \subseteq |p \lor (p \land q)| = |p|\)  
      
      2. \(s \notin |q|\)  
      
      3. \(\vdash p \lor (p \land q) \vdash p \lor q \lor (p \land q)\)
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

b. John came. \((p)\)
   1. \(s \subseteq |p|\)  

   (Quality)

   (4) c. John came, or Mary and John. \((p \lor (p \land q))\)
   1. \(s \subseteq |p \lor (p \land q)| = |p|\)  

   (Quality)
   2. \(s \nsubseteq |q|\)  

   (Quantity)
   3. - \([p \lor (p \land q)] \Rightarrow p \lor q \lor (p \land q)\)  

   (Relation)
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

b. John came. \((p)\)
   1. \(s \subseteq |p|\)  
      \(\text{(Quality)}\)
   2. \(s \not\subseteq |q|\)  
      \(\text{(Quantity)}\)

c. John came, or Mary and John. \((p \lor (p \land q))\)
   1. \(s \subseteq |p \lor (p \land q)| = |p|\)  
      \(\text{(Quality)}\)
   2. \(s \not\subseteq |q|\)  
      \(\text{(Quantity)}\)
   3. \(p \lor (p \land q) \models p \lor q \lor (p \land q)\)  
      \(\text{(Relation)}\)
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

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

   \(p \not\subseteq p \lor q \lor (p \land q)\)  \hspace{1cm} \text{(Quality)}
   \(p \not\subseteq p \lor q \lor (p \land q)\)  \hspace{1cm} \text{(Quantity)}


c. John came, or Mary and John. \((p \lor (p \land q))\)
   
   1. \(s \subseteq |p \lor (p \land q)| = |p|\)  \hspace{1cm} \text{(Quality)}
   2. \(s \not\subseteq |q|\)  \hspace{1cm} \text{(Quantity)}
   3. -  \hspace{1cm} p \lor (p \land q) \supseteq p \lor q \lor (p \land q)\)  \hspace{1cm} \text{(Relation)}
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

b. John came. \((p)\)
   1. \(s \subseteq |p|\) \(\neg p \not\subsetneq p \lor q \lor (p \land q)\) \((\text{Quality})\)
   2. \(s \not\subseteq |q|\)

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4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

b. John came. \((p)\)

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

\(p \not\subseteq p \lor q \lor (p \land q)\)  \((Quality)\)

\(p \not\subseteq p \lor (p \land q)\)  \((Quantity)\)

---

c. John came, or Mary and John. \((p \lor (p \land q))\)

1. \(s \subseteq |p \lor (p \land q)| = |p|\)  \((Quality)\)
2. \(s \not\subseteq |q|\)  \((Quantity)\)
3. - \(p \lor (p \land q) \not\subseteq p \lor q \lor (p \land q)\)  \((Relation)\)
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

b. John came. \((p)\)

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

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

(Quantity)

(4) c. John came, or Mary and John. \((p \lor (p \land q))\)

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

(Relation)
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

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

\[\begin{array}{c}
\square_p \quad \square_p \\
\square_p \quad \square_q \\
\square_q \quad \square_p \\
\square_p \quad \square_q
\end{array}\]

\[\begin{array}{c}
\square_q \quad \square_p \\
\square_q \quad \square_p
\end{array}\]

(c. John came, or Mary and John. \((p \lor (p \land q))\)
   1. \(s \subseteq |p \lor (p \land q)| = |p|\)
   2. \(s \not\subseteq |q|\)
   3. - \(p \lor (p \land q) \models p \lor q \lor (p \land q)\)
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

b. John came. \((p)\)
   1. \(s \subseteq |p|\)
   2. \(s \notin |q|\)

\(\not\models p \lor q \lor (p \land q)\)

(Quantity)


c. John came, or Mary and John. \((p \lor (p \land q))\)
   1. \(s \subseteq |p \lor (p \land q)| = |p|\)
   2. \(s \notin |q|\)
   3. \(\models p \lor (p \land q) \models p \lor q \lor (p \land q)\)

(Quality)

(Quantity)

(Relation)
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

b. John came. \((p)\)

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

(4) c. John came, or Mary and John. \((p \lor (p \land q))\)

1. \(s \subseteq |p \lor (p \land q)| = |p|\) \hspace{1cm} (Quality)
2. \(s \not\subseteq |q|\) \hspace{1cm} (Quantity)
3. - \(p \lor (p \land q) \models p \lor q \lor (p \land q)\) \hspace{1cm} (Relation)
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

b. John came. \((p)\)

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


c. John came, or Mary and John. \((p \lor (p \land q))\)

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

(exhaustivity!)
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

b. John came. \((p)\)
   1. \(s \subseteq |p|\)
   2. \(s \not\subseteq |q|\)
   3. \(s \subseteq |p| \cup |q|\) or \(s \subseteq |p| \cup |q|\)
   4. \(s \subseteq |q|\)

-(Quality)
-(Quantity)
-(Relation)

-(Quality)
-(Quantity)
-(Relation)

-(Quality)
-(Quantity)
-(Relation)

-(Quality)
-(Quantity)
-(Relation)
4.1. Examples

(4) a. John came, Mary came, or both came \((p \lor q \lor (p \land q))\)

b. John came. \((p)\)

1. \(s \subseteq |p|\) \\
2. \(s \not\subseteq |q|\) \hspace{1cm} p \not\subseteq p \lor q \lor (p \land q) \hspace{1cm} \) (Quality) \\
3. \(s \subseteq |p| \cup |q|\) or \(s \subseteq |p| \cup |q|\) \hspace{1cm} \) (Quantity) \\
   \hline \\
4. \(s \subseteq |q|\) exhaustivity!

---

c. John came, or Mary and John. \((p \lor (p \land q))\)

1. \(s \subseteq |p \lor (p \land q)| = |p|\) \hspace{1cm} \) (Quality) \\
2. \(s \not\subseteq |q|\) \hspace{1cm} p \lor (p \land q) \subseteq p \lor q \lor (p \land q) \hspace{1cm} \) (Quantity) \\
3. - \hspace{1cm} \) (Relation)
4.2. What’s happening?

More generally:

- The maxim of Relation requires that:
  for each possibility the speaker *leaves unattended*, the speaker knows how it depends on the information she provided.
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- The maxim of Relation requires that:
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- Together with Quality, this implies *opinionatedness*. 
4.2. What’s happening?

More generally:

- The maxim of Relation requires that: for each possibility the speaker leaves unattended, the speaker knows how it depends on the information she provided.
- Together with Quality, this implies opinionatedness.
- Together with Quantity, this in turn yields exhaustivity.
4.2. What’s happening?

More generally:

- The maxim of Relation requires that:
  for each possibility the speaker *leaves unattended*, the speaker
  knows how it depends on the information she provided.
- Together with Quality, this implies *opinionatedness*.
- Together with Quantity, this in turn yields exhaustivity.

Minimally, the semantics must lack the *absorption laws*:

- Absorption: \( p \lor (p \land q) \equiv p \equiv p \land (p \lor q) \)
4.3. ‘Alternatives’

Existing approaches (since forever):

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

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.

Beware:

 Speakers need not reason in terms of alternatives.
4.3. ‘Alternatives’

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- ‘Why did the speaker not say “\( p \lor (p \land q) \)”?’
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4.3. ‘Alternatives’

Existing approaches (since forever):
- ‘Why did the speaker not say “$p \land q$”?’
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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.

Beware:
- Speakers need not reason in terms of alternatives.
Main conclusion:

- If pragmatic reasoning is sensitive to *attentive content*
4.4. Main conclusion

Main conclusion:

- If pragmatic reasoning is sensitive to *attentive content* (which it must be, to distinguish between (3b) and (3c));
4.4. Main conclusion

Main conclusion:

- If pragmatic reasoning is sensitive to *attentive content* (which it must be, to distinguish between (3b) and (3c));
- then *exhaustivity is a conversational implicature*. 
End of Part I
Part II: Intonation and exhaustivity

5. Focus
6. The final rise
5. Focus

5.1. Focus is necessary for exhaustivity
5.2. Domain restriction
5.3. How to enforce exhaustivity?
5.4. Hungarian vs. English focus
5.5. Experiments
5.1. Focus is necessary for exhaustivity

To ensure an exhaustive interpretation:

- It must be mutually known what the QUD is.
5.1. Focus is necessary for exhaustivity

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Focus principle (Beaver and Clark, 2008)

Some part of a declarative utterance must evoke all of the possibilities of the QUD.
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Focus principle (Beaver and Clark, 2008)

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(6) Who ate the tofu?
    \[ \text{[John]}_F \text{ ate the tofu.} \] / \# John ate the \[ \text{[tofu]}_F \].
5.1. Focus is necessary for exhaustivity

To ensure an exhaustive interpretation:

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(6) Who ate the tofu?  
    [John]_F ate the tofu. / # John ate the [tofu]_F.

(7) What did John eat?  
    # [John]_F ate the tofu. / John ate the [tofu]_F.
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To ensure an exhaustive interpretation:

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Some part of a declarative utterance **must** evoke all of the possibilities of the QUD.

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- Focus is necessary for exhaustivity (as a C.I.).
5.1. Focus is necessary for exhaustivity

To ensure an exhaustive interpretation:

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Some part of a declarative utterance must evoke all of the possibilities of the QUD.

(6) Who ate the tofu?
    [John]$_F$ ate the tofu. / # John ate the [tofu]$_F$.

(7) What did John eat?
    # [John]$_F$ ate the tofu. / John ate the [tofu]$_F$.

- Focus is *necessary* for exhaustivity (as a C.I.).
- However, it is not yet *sufficient*...
5.2. Domain restriction

(6) Who ate the tofu?
    [John]_F ate the tofu.  ~  No one else did.
5.2. Domain restriction

(6) Who ate the tofu?

\[ \text{[John]}_F \text{ ate the tofu.} \quad \sim \text{No one else did.} \]

Focus alone is not *sufficient*, because:
5.2. Domain restriction

(6) Who ate the tofu?
   [John]_F ate the tofu.  \[\sim\text{No one else did.}\]

Focus alone is not *sufficient*, because:

- Unless if we know the QUD’s *domain restriction*,

5.2. Domain restriction

(6) **Who** ate the tofu?

[John]_F ate the tofu. \[\sim\] No one else did.

Focus alone is not *sufficient*, because:

- Unless if we know the QUD’s *domain restriction*,
- we don’t know what the exhaustivity *means* (it could be vacuous)
5.2. Domain restriction

(6) Who ate the tofu?
   \[\text{[John]}_F \text{ ate the tofu.} \quad \sim \quad \text{No one else did.}\]

Focus alone is not *sufficient*, because:
- Unless if we know the QUD’s *domain restriction*,
- we don’t know what the exhaustivity *means*
  (it could be vacuous)

But this too can be fixed:

(8) *Of John, Bob and Mary, who ate the tofu?*
   \[\text{[John]}_F \text{ ate the tofu.} \quad \sim \quad \text{Bob and Mary didn’t.}\]
5.3. Interim summary

How can a speaker enforce exhaustivity?

- Part I: no need for an opinionatedness assumption.
5.3. Interim summary

**How can a speaker enforce exhaustivity?**

- Part I: no need for an opinionatedness assumption.
- Focus is *necessary* for exhaustivity.
5.3. Interim summary

How can a speaker enforce exhaustivity?

- Part I: no need for an opinionatedness assumption.
- Focus is necessary for exhaustivity.
- With an explicit domain, it is also sufficient.
5.3. Interim summary

**How can a speaker enforce exhaustivity?**

- Part I: no need for an opinionatedness assumption.
- Focus is *necessary* for exhaustivity.
- With an explicit domain, it is also *sufficient*.

This predicts that exhaustivity in (8) is *mandatory*:

(8) *Of John, Bob and Mary, who ate the tofu?*
    
    [John]$_F$ ate the tofu.  # Indeed, John and Bob did.
5.3. Interim summary

How can a speaker enforce exhaustivity?

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This predicts that exhaustivity in (8) is mandatory:

(8) Of John, Bob and Mary, who ate the tofu?

[John]$_F$ ate the tofu. # Indeed, John and Bob did.

This raises several issues:
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How can a speaker enforce exhaustivity?

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(8) *Of John, Bob and Mary, who ate the tofu?*  
    
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This raises several issues:

- What about *cancellability* (appendix).
5.3. Interim summary

How can a speaker enforce exhaustivity?

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(8) Of John, Bob and Mary, who ate the tofu?
    [John]$_F$ ate the tofu. # Indeed, John and Bob did.

This raises several issues:

- What about cancellability (appendix).
- What about Hungarian focus? (5.4)
5.3. Interim summary

How can a speaker enforce exhaustivity?

- Part I: no need for an opinionatedness assumption.
- Focus is *necessary* for exhaustivity.
- With an explicit domain, it is also *sufficient*.

This predicts that exhaustivity in (8) is *mandatory*:

(8) *Of John, Bob and Mary, who ate the tofu?*
    
   \[\text{[John]}_F \text{ ate the tofu.} \neq \text{Indeed, John and Bob did.}\]

This raises several issues:

- What about *cancellability* (appendix).
- What about Hungarian focus? (5.4)
- What about experiments? (5.5)
5.4. Hungarian vs. English focus

Hungarian focus is more obligatory (Szabolcsi, 1981):

(9) [Amy and Ben]$_F$ saw Cleo. $\equiv$ [Amy]$_F$ saw Cleo.
(10) [Amy és Ben]$_F$ látta Cleot. $\not\equiv$ [Amy]$_F$ látta Cleot.
5.4. Hungarian vs. English focus

Hungarian focus is more obligatory (Szabolcsi, 1981):

(9) [Amy and Ben]$_F$ saw Cleo. $\equiv$ [Amy]$_F$ saw Cleo.
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- But if English focus can already enforce exhaustivity...
5.4. Hungarian vs. English focus

Hungarian focus is *more* obligatory (Szabolcsi, 1981):

(9) $[\text{Amy and Ben}]_F$ saw Cleo. $\equiv [\text{Amy}]_F$ saw Cleo.
(10) $[\text{Amy és Ben}]_F$ látta Cleot. $\not\equiv [\text{Amy}]_F$ látta Cleot.

- But if English focus can already enforce exhaustivity...
- then how can Hungarian focus be *even stronger*?
5.4. Hungarian vs. English focus

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- But if English focus can already enforce exhaustivity...
- then how can Hungarian focus be *even stronger*?

The only possible explanation:

- Hungarian focus conveys that the domain is ‘wide’.
5.4. Hungarian vs. English focus

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The only possible explanation:

- Hungarian focus conveys that the domain is ‘wide’.
- Prediction: no difference when domain is explicit.
5.4. Hungarian vs. English focus

Hungarian focus is *more* obligatory (Szabolcsi, 1981):

(9) [Amy and Ben]$_F$ saw Cleo. ≡ [Amy]$_F$ saw Cleo.
(10) [Amy és Ben]$_F$ látta Cleot. \(\neq\) [Amy]$_F$ látta Cleot.

- But if English focus can already enforce exhaustivity...
- then how can Hungarian focus be *even stronger*?

The only possible explanation:

- Hungarian focus conveys that *the domain is ‘wide’*.
- Prediction: no difference when domain is explicit.

(12) Of Amy, Ben, and John, [Amy and Ben]$_F$ saw Cleo.

\(\neq\) Of Amy, Ben, and John, [Amy]$_F$ saw Cleo.
5.5. Experiments

Why do experiments show such mixed results?
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- QUD and focus are left implicit;
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  (or the wrong foci are compared (Zondervan, 2010))
- Domain restriction is left implicit;
5.5. Experiments

Why do experiments show such mixed results?

- QUD and focus are left implicit;
  (or the wrong foci are compared (Zondervan, 2010))
- Domain restriction is left implicit;
- Level of granularity is left implicit;
5.5. Experiments

Why do experiments show such mixed results?

- QUD and focus are left implicit;
  (or the wrong foci are compared (Zondervan, 2010))
- Domain restriction is left implicit;
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- The experimental task may disable maxims;
5.5. Experiments

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- QUD and focus are left implicit; (or the wrong foci are compared (Zondervan, 2010))
- Domain restriction is left implicit;
- Level of granularity is left implicit;
- The experimental task may disable maxims;
- Intonation is not controlled for.
5.5. Experiments

Why do experiments show such mixed results?

» QUD and focus are left implicit;
   (or the wrong foci are compared (Zondervan, 2010))
» Domain restriction is left implicit;
» Level of granularity is left implicit;
» The experimental task may disable maxims;
» Intonation is not controlled for.  (coming up next)
6. The final rise

6.1. The sentence-final rise

6.2. Deriving the readings

6.3. General results

6.4. Contrastive topic (work in progress)

6.5. The bigger picture
6.1. The sentence-final rise

(13) Of John, Bill and Mary, who came to the party?
    John came↘.                      ~ Mary and Bill didn’t.
6.1. The sentence-final rise

(13) Of John, Bill and Mary, who came to the party?
    John came ↗.
    \(\not\) Mary and Bill didn’t.
6.1. The sentence-final rise

(13) Of John, Bill and Mary, who came to the party?
    John came↗.  \[→\text{Mary and Bill didn’t.}\]
    \[→\text{...wait, there’s more.}\]
6.1. The sentence-final rise

(13) Of John, Bill and Mary, who came to the party?
   John came ↑.  ↞ Mary and Bill didn’t.
   ↞ ...wait, there’s more.
   ↞ ...perhaps that implies sth. about M&B?
6.1. The sentence-final rise

(13) Of John, Bill and Mary, who came to the party?
    John came ↗.
    ↗ Mary and Bill didn’t.
    ∼ ...wait, there’s more.
    ∼ ...perhaps that implies sth. about M&B?
    ∼ ...but I’m not sure.
6.1. The sentence-final rise

(13) Of John, Bill and Mary, who came to the party?
    John came↗.
  ↗ Mary and Bill didn’t.
  ↘ ...wait, there’s more.
  ↘ ...perhaps that implies sth. about M&B?
  ↘ ...but I’m not sure.
  ↘ ...did I make myself clear?
6.1. The sentence-final rise

(13) Of John, Bill and Mary, who came to the party?
    John came \( \uparrow \) \( L \).
    \( \sim \) ...wait, there’s more.
    \( \sim \) ...perhaps that implies sth. about M&B?
    c. John came \( \uparrow \) \( H \).
    \( \sim \) ...but I’m not sure.
    \( \sim \) ...did I make myself clear?

1. The final rise marks the violation of a maxim.
2. Its pitch conveys emotivity. (Banziger & Scherer, 2005)
3. This reflects the severity of the violation: \( \uparrow \) \( H \): Quality/Manner; (cf. Ward & Hirschberg, 1992) \( \uparrow \) \( L \): Quantity/Relation.

This proposal is new in its generality, not in spirit.
6.1. The sentence-final rise

(13) Of John, Bill and Mary, who came to the party?

John came $\uparrow^L$. $\because$ Mary and Bill didn’t.
$\therefore$ ...wait, there’s more.
$\therefore$ ...perhaps that implies sth. about M&B?

C. John came $\uparrow^H$.

$\therefore$ ...but I’m not sure.
$\therefore$ ...did I make myself clear?
6.1. The sentence-final rise

(13) Of John, Bill and Mary, who came to the party?
   John came \( \uparrow \) \( L \). \( \nearrow \) Mary and Bill didn’t.
   \( \sim \) ...wait, there’s more. (Quantity)
   \( \sim \) ...perhaps that implies sth. about M&B? (Relation)
   c. John came \( \uparrow \) \( H \).
      \( \sim \) ...but I’m not sure.
      \( \sim \) ...did I make myself clear?
6.1. The sentence-final rise

(13) Of John, Bill and Mary, who came to the party?
John came $\uparrow^L$. $\not\nearrow$ Mary and Bill didn’t.
$\leadsto$ ...wait, there’s more. (Quantity)
$\leadsto$ ...perhaps that implies sth. about M&B? (Relation)
c. John came $\uparrow^H$.
$\leadsto$ ...but I’m not sure.
$\leadsto$ ...did I make myself clear?

Proposal

1. The final rise marks the violation of a maxim.
6.1. The sentence-final rise

(13) Of John, Bill and Mary, who came to the party?

John came $\nearrow^L$. $\not\nearrow$ Mary and Bill didn’t.

$\not\nearrow$ ...wait, there’s more. (Quantity)

$\not\nearrow$ ...perhaps that implies sth. about M&B? (Relation)

$\nearrow$ c. John came $\nearrow^H$.

$\not\nearrow$ ...but I’m not sure. (Quality)

$\not\nearrow$ ...did I make myself clear?

Proposal

1. The final rise marks the violation of a maxim.
6.1. The sentence-final rise

(13) Of John, Bill and Mary, who came to the party?
  John came $\uparrow^L$. $\nLeftarrow$ Mary and Bill didn’t.
  $\leadsto$ ...wait, there’s more. (Quantity)
  $\leadsto$ ...perhaps that implies sth. about M&B? (Relation)
  c. John came $\uparrow^H$.
  $\leadsto$ ...but I’m not sure. (Quality)
  $\leadsto$ ...did I make myself clear? (Manner)

Proposal

1. The final rise marks the violation of a maxim.
6.1. The sentence-final rise

(13) Of John, Bill and Mary, who came to the party?
    John came \( \nearrow L \). \( \not\nearrow \) Mary and Bill didn’t.
    \( \nearrow \) ...wait, there’s more. (Quantity)
    \( \nearrow \) ...perhaps that implies sth. about M&B? (Relation)
    c. John came \( \nearrow H \).
        \( \nearrow \) ...but I’m not sure. (Quality)
        \( \nearrow \) ...did I make myself clear? (Manner)

Proposal

1. The final rise marks the violation of a maxim.
2. Its pitch conveys emotivity. (Banziger & Scherer, 2005)
6.1. The sentence-final rise

(13) Of John, Bill and Mary, who came to the party?

John came $\rightarrow^L$.
Mary and Bill didn’t.

$\sim$ ...wait, there’s more. (Quantity)
$\sim$ ...perhaps that implies sth. about M&B? (Relation)

C. John came $\rightarrow^H$.

$\sim$ ...but I’m not sure. (Quality)
$\sim$ ...did I make myself clear? (Manner)

Proposal

1. The final rise marks the violation of a maxim.
2. Its pitch conveys emotivity. (Banziger & Scherer, 2005)
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   $\rightarrow^H$: Quality/Manner; (cf. Ward & Hirschberg, 1992)
   $\rightarrow^L$: Quantity/Relation.
6.1. The sentence-final rise

(13) Of John, Bill and Mary, who came to the party?
    John came $\nearrow L$.                   $\not\nearrow$ Mary and Bill didn’t.
    $\nearrow$ ...wait, there’s more.       (Quantity)
    $\nearrow$ ...perhaps that implies sth. about M&B? (Relation)
c. John came $\nearrow H$.
    $\nearrow$ ...but I’m not sure.       (Quality)
    $\nearrow$ ...did I make myself clear? (Manner)

Proposal

1. The final rise marks the violation of a maxim.
2. Its pitch conveys emotivity. (Banziger & Scherer, 2005)
3. This reflects the severity of the violation:
   $\nearrow H$: Quality/Manner;            (cf. Ward & Hirschberg, 1992)
   $\nearrow L$: Quantity/Relation.

This proposal is new in its generality, not in spirit.
6.2. Deriving the readings

(14) Of J and M, who came to the party?
    John came ↗.

\[ (p \lor q \lor (p \land q)) \]
\[ (p) \]
6.2. Deriving the readings

(14) Of J and M, who came to the party?            \((p \lor q \lor (p \land q))\)
    John came \(\uparrow\).

Readings

...wait, there’s more. \(\checkmark\) (Quantity)
...perhaps that implies sth. about Mary? \(\checkmark\) (Relation)
...but I’m not sure. \(\checkmark\) (Quality)
...did I make myself clear? \(\checkmark\) (Manner)
6.2. Deriving the readings

(14) Of J and M, who came to the party? \( (p \lor q \lor (p \land q)) \)

John came \( \uparrow \).

1. \( s \subseteq \overline{p} \)  
   (Quality)
2. \( s \not\subseteq \overline{q} \)  
   (Quantity)
3. \( s \subseteq \overline{p} \cup \overline{q} \) or \( s \subseteq \overline{p} \cup \overline{q} \)  
   (Relation)

Readings

...wait, there’s more.  
   (Quantity)
...perhaps that implies sth. about Mary?  
   (Relation)
...but I’m not sure.  
   (Quality)
...did I make myself clear?  
   (Manner)
6.2. Deriving the readings

(14) Of J and M, who came to the party? \((p \lor q \lor (p \land q))\)

John came \(\uparrow\).

1. \(s \subseteq |p|\)
2. \(s \notin |q|\)
3. \(s \subseteq \overline{|p| \cup |q|}\) or \(s \subseteq \overline{|p| \cup |q|}\)
4. The speaker thinks she is clear, concise, etc.

Readings

...wait, there’s more. \((\text{Quantity})\)
...perhaps that implies sth. about Mary? \((\text{Relation})\)
...but I’m not sure. \((\text{Quality})\)
...did I make myself clear? \((\text{Manner})\)
6.2. Deriving the readings

(14) Of J and M, who came to the party? \((p \lor q \lor (p \land q))\)

John came \(\uparrow\).

1. \(s \notin |p|\)
2. \(s \notin |q|\)
3. \(s \subseteq |p| \cup |q|\) or \(s \subseteq |p| \cup |q|\)
4. The speaker thinks she is clear, concise, etc.

Readings

...wait, there’s more. \((\text{Quantity})\)
...perhaps that implies sth. about Mary? \((\text{Relation})\)
...but I’m not sure. \((\text{Quality})\)
...did I make myself clear? \((\text{Manner})\)
6.2. Deriving the readings

(14) Of J and M, who came to the party? \((p \lor q \lor (p \land q))\)
John came \(\uparrow\).

1. \(s \notin |p|\)
2. \(s \notin |q|\)
3. \(s \subseteq |p| \cup |q|\) or \(s \subseteq |p| \cup |q|\)
4. The speaker thinks she is clear, concise, etc.

Readings

...wait, there’s more. \((\text{Quantity})\)
...perhaps that implies sth. about Mary? \((\text{Relation})\)
✓ ...but I’m not sure. \((\text{Quality})\)
...did I make myself clear? \((\text{Manner})\)
6.2. Deriving the readings

(14) Of J and M, who came to the party? \((p \lor q \lor (p \land q))\)
John came \(\uparrow\).

1. \(s \subseteq |p|\)  
   (Quality)

2. \(s \notin |q|\)  
   (Quantity)

3. \(s \subseteq \overline{|p| \cup |q|}\) or \(s \subseteq \overline{|p| \cup |q|}\)  
   (Relation)

4. The speaker thinks she is clear, concise, etc.  
   (Manner)

Readings

...wait, there’s more.  
   (Quantity)

...perhaps that implies sth. about Mary?  
   (Relation)

✓ ...but I’m not sure.  
   (Quality)

✓ ...did I make myself clear?  
   (Manner)
6.2. Deriving the readings

(14) Of J and M, who came to the party? (p ∨ q ∨ (p ∧ q))
    John came ↗.
    1. s ⊆ |p| (Quality)
    2. s ⊆ |q| (↑)
    3. s ⊆ |p| ∪ |q| or s ⊆ |p| ∪ |q| (Relation)
    4. The speaker thinks she is clear, concise, etc. (Manner)

Readings

...wait, there’s more. (Quantity)
...perhaps that implies sth. about Mary? (Relation)
✓ ...but I’m not sure. (Quality)
✓ ...did I make myself clear? (Manner)
6.2. Deriving the readings

(14) Of J and M, who came to the party? \( (p \lor q \lor (p \land q)) \)

John came \( \uparrow \).

1. \( s \subseteq |p| \)
2. \( s \subseteq |q| \)
3. \( s \subseteq \overline{|p| \cup |q|} \) or \( s \subseteq \overline{|p| \cup |q|} \)
4. The speaker thinks she is clear, concise, etc.

Readings

✓ ...wait, there’s more. \( (\text{Quantity}) \)
  ...perhaps that implies sth. about Mary? \( (\text{Relation}) \)
✓ ...but I’m not sure. \( (\text{Quality}) \)
  ...did I make myself clear? \( (\text{Manner}) \)
6.2. Deriving the readings

(14) Of J and M, who came to the party? \((p \lor q \lor (p \land q))\)

John came ↗.

1. \(s \subseteq |p|\) (Quality)
2. \(s \not\subseteq |q|\) (Quantity)
3. \(s \subseteq \overline{|p| \cup |q|}\) or \(s \subseteq \overline{|p| \cup |q|}\) (Relation)
4. The speaker thinks she is clear, concise, etc. (Manner)

Readings

✓ ...wait, there’s more. (Quantity)

...perhaps that implies sth. about Mary? (Relation)

✓ ...but I’m not sure. (Quality)

...did I make myself clear? (Manner)
6.2. Deriving the readings

(14) Of J and M, who came to the party? \((p \lor q \lor (p \land q))\)

John came \(\uparrow\).

1. \(s \subseteq |p|\) (Quality)
2. \(s \not\subseteq |q|\) (Quantity)
3. \(s \not\subseteq |p| \cup |q|\) and \(s \not\subseteq |\overline{p}| \cup |\overline{q}|\) (\(\uparrow\))
4. The speaker thinks she is clear, concise, etc. (Manner)

Readings

✓ ...wait, there’s more. (Quantity)
   ...perhaps that implies sth. about Mary? (Relation)
✓ ...but I’m not sure. (Quality)
✓ ...did I make myself clear? (Manner)
6.2. Deriving the readings

(14) Of J and M, who came to the party? \((p \lor q \lor (p \land q))\)

John came ↗.

1. \(s \subseteq |p|\) (Quality)
2. \(s \notin |q|\) (Quantity)
3. \(s \notin \overline{|p|} \cup |q|\) and \(s \notin \overline{|p|} \cup \overline{|q|}\)
4. The speaker thinks she is clear, concise, etc. (Manner)

Readings

✓ ...wait, there’s more. (Quantity)
✓ ...perhaps that implies sth. about Mary? (Relation)
✓ ...but I’m not sure.
   ...did I make myself clear?
6.2. Deriving the readings

(14) Of J and M, who came to the party? 

John came ↑.

1. \( s \subseteq |p| \) (Quality)
2. \( s \not\subseteq |q| \) (Quantity)
3. \( s \subseteq |p| \cup |q| \) or \( s \subseteq |p| \cup |q| \) (Relation)
4. The speaker thinks she is clear, concise, etc. (Manner)

Readings

✓ ...wait, there’s more. (Quantity)
✓ ...perhaps that implies sth. about Mary? (Relation)
✓ ...but I’m not sure. (Quality)
   ...did I make myself clear? (Manner)
6.2. Deriving the readings

(14) Of J and M, who came to the party? \((p \lor q \lor (p \land q))\)

John came ↗.

1. \(s \subseteq |p|\) \hspace{1cm} (Quality)
2. \(s \nsubseteq |q|\) \hspace{1cm} (Quantity)
3. \(s \subseteq |p| \cup |q|\) or \(s \subseteq |p| \cup |q|\) \hspace{1cm} (Relation)
4. The speaker doesn’t think she’s clear, concise, etc. \((\uparrow)\)

Readings

✓ ...wait, there’s more. \hspace{1cm} (Quantity)
✓ ...perhaps that implies sth. about Mary? \hspace{1cm} (Relation)
✓ ...but I’m not sure. \hspace{1cm} (Quality)
   ...did I make myself clear? \hspace{1cm} (Manner)
6.2. Deriving the readings

(14) Of J and M, who came to the party? \((p \lor q \lor (p \land q))\)
John came \(\uparrow\).

1. \(s \subseteq |p|\) \hspace{1cm} (Quality)
2. \(s \notin |q|\) \hspace{1cm} (Quantity)
3. \(s \subseteq \overline{|p|} \cup |q|\) or \(s \subseteq \overline{|p|} \cup \overline{|q|}\) \hspace{1cm} (Relation)
4. The speaker doesn’t think she’s clear, concise, etc. \(\uparrow\)

Readings

✓ ...wait, there’s more. \hspace{1cm} (Quantity)
✓ ...perhaps that implies sth. about Mary? \hspace{1cm} (Relation)
✓ ...but I’m not sure. \hspace{1cm} (Quality)
✓ ...did I make myself clear? \hspace{1cm} (Manner)
6.2. Deriving the readings

Of J and M, who came to the party? 

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

John came. 

1. \(s \subseteq |p|\) 
2. \(s \not\subseteq |q|\) 
3. \(s \subseteq \overline{|p| \cup |q|} \) or \(s \subseteq \overline{|p| \cup |q|} \) 
4. The speaker doesn’t think she’s clear, concise, etc. 

Readings

✓ ...wait, there’s more. 
✓ ...perhaps that implies sth. about Mary? 
✓ ...but I’m not sure. 
✓ ...did I make myself clear?
6.3. General results

My approach unifies existing approaches:

- Quality: 'lack of belief in proposition expressed' (Truckenbrodt, 2006)
- Relation: 'uncertain relevance'/'scalar uncertainty' (Ward & Hirschberg, 1985)
- Relation: 'rise-fall-rise quantifies over focus alternatives' (Constant, 2012)
- Quantity: 'unfinishedness' (Bartels, 1999)
- Manner reading: Usually treated as a side-effect.

Noteworthy:

- For the Relation readings, attentive content is crucial.
- In all but the last reading, exhaustivity is absent.
- Conjunctive lists: Quantity (I will say more!);
  Disjunctive lists: Relation (I will attend more!)
6.3. General results

My approach unifies existing approaches:

- Quality: ‘lack of belief in proposition expressed’
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- Relation: ‘uncertain relevance’/’scalar uncertainty’
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Noteworthy:

For the Relation readings, attentive content is crucial.

In all but the last reading, exhaustivity is absent.

Conjunctive lists: Quantity (I will say more!);
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My approach unifies existing approaches:

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Work in progress

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To say: 'I'm only answering a subquestion' (Büring, 2003)

(14) Who had what for lunch?

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My approach suggests a compositional account of CT.

The maxims of Quantity and Relation can be violated regarding a subset of the QUDs possibilities.

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- Facial expressions, gestures, ...
End of Part II
7. Main conclusions

Part I: Exhaustivity is a conversational implicature

If pragmatic reasoning is sensitive to attentive content, then exhaustivity is a conversational implicature.

Part II: Intonation and exhaustivity

Focus makes the Gricean story even more generative. Beware of implicit domain restrictions. The final rise conveys a maxim violation.
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The End

Articles

- *Exhaustivity through the maxim of Relation*  
  (*LENLS* proceedings, see staff.science.uva.nl/~westera/)
- ‘*Attention, I’m violating a maxim!*’  
  (submitted, available through me)

Thanks to the *Netherlands Organisation for Scientific Research* (NWO) for financial support; to F. Roelofsen, J. Groenendijk, C. Cummins, K. Von Fintel, A. Ettinger, J. Tyler, M. Križ, the audiences of *SemDial, S-Circle* (UCSC), *SPE6, ICL, CISI, ESSLLI StuS, LIRA, Göttingen, INSEMP*, and many anonymous reviewers for valuable comments.
Grice on cancellability

A putative conversational implicature that \( p \) is explicitly cancellable if [...] it is admissible to add “but not \( p \)”, or “I do not mean to imply that \( p \)” [...].

(Grice, 1975, p. 44.)
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[...] since it is possible to opt out of the observation of [the Cooperative Principle], it follows that a conversational implicature can be cancelled in a particular case. (p.57)
Textbook examples

Some typical examples of cancellation:

(8) On an unrelated note, it was raining.

(9) John, or Mary, or both.

CI are computed globally...

(cf. Geurts, 2010)

(10) Will one of your parents be home?

Sure, one of them will be home. Indeed, both will be home.

(11) How many people will be home?

One of my parents will be home. # Indeed, both will be home.

In (10), the CI wasn't there to begin with...

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(12) John or Mary. Oh, but I did not mean to imply not both.

(13) It is raining. Oh, but it has stopped!

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4. The speaker would be either uncooperative, or inconsistent.
Exhaustivity

In sum:

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In my account:

- Attentively, conjunction and disjunction denote union.
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The problem has never been the Gricean approach as such, but rather *how to find the right ‘alternatives’*.

In my account:

- *Attentively*, conjunction and disjunction denote *union*.
- Hence, embedding simply *accumulates* attentive content.
‘Embedded’ exhaustivity

E.g., Chierchia, *et al.*, (2008++):

(6) John, Mary or Bob came.
    \( \sim \) Only one of them came.

(7) Each of the students read Othello or King Lear.
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- *Attentively*, conjunction and disjunction denote *union*.
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- E.g., for each of the students, there is attentive content...

Many ‘embedded’ implicatures are in fact predicted.
‘Mention-some’ contexts

Contexts where, supposedly, exhaustivity is absent:

(16) Where can I buy an Italian newspaper?
    In the kiosk around the corner. \( \narrow \) Nowhere else.
‘Mention-some’ contexts

Contexts where, supposedly, exhaustivity is absent:

(16) Where can I buy an Italian newspaper?
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But is it really absent?
‘Mention-some’ contexts

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But is it really absent?
    ▶ We get exhaustivity as usual, but on a restricted domain.
    ▶ No ‘mention-some’ when the domain is explicit:

(17) Of the three nearby kiosks, where can I buy an IN?
     In the kiosk around the corner. \(\not\rightarrow\) Not in the other kiosks.
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Contexts where, supposedly, exhaustivity is absent:

(16) Where can I buy an Italian newspaper?
    In the kiosk around the corner. \(\not\sim\) Nowhere else.
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(17) Of the three nearby kiosks, where can I buy an IN?
    In the kiosk around the corner. \(\sim\) Not in the other kiosks.

(Alternatively, use a final rise...)

Semantics

Restriction

A restricted to $b$, $A_b := \{ a \cap b \mid a \in A, a \cap b \neq \emptyset \}$

Semantics (Roelofsen, 2011)

1. $[p] = \{ \{ w \in \textbf{Worlds} \mid w(p) = \text{true} \} \}$
2. $[\neg \varphi] = \{ \bigcup \varphi \}$ if $\bigcup \varphi$ is nonempty; $\emptyset$ otherwise.
3. $[\varphi \lor \psi] = ([\varphi] \cup [\psi])|_{\varphi \cup \psi} = [\varphi] \cup [\psi]$
4. $[\varphi \land \psi] = ([\varphi] \cup [\psi])|_{\varphi \cap \psi}$
Semantics

Restriction

\( A \) restricted to \( b \), \( A_b := \{ a \cap b \mid a \in A, a \cap b \neq \emptyset \} \)

Semantics (Roelofsen, 2011)

1. \([p] = \{ \{ w \in \textbf{Worlds} \mid w(p) = \text{true} \} \}\)
2. \([-\varphi] = \{ \bigcup[\varphi] \} \) if \( \bigcup[\varphi] \) is nonempty; \( \emptyset \) otherwise.
3. \([\varphi \lor \psi] = (\{ [\varphi] \cup [\psi] \})_{|[\varphi] \cup [\psi]} = [\varphi] \cup [\psi] \)
4. \([\varphi \land \psi] = (\{ [\varphi] \cup [\psi] \})_{|[\varphi] \cap [\psi]} \)

Attentive semantics is not the only suitable semantics:

- *Unrestricted Inquisitive Sem.* (Ciardelli, 2009; Westera, 2012)
Semantics

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A restricted to \(b\), \(A_b := \{a \cap b \mid a \in A, a \cap b \neq \emptyset\}\)

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Attentive semantics is not the only suitable semantics:

- Unrestricted Inquisitive Sem. (Ciardelli, 2009; Westera, 2012)

Minimally, the semantics must lack the absorption laws:

- Absorption: \(p \lor (p \land q) \equiv p \equiv p \land (p \lor q)\)
Semantic desiderata

- No absorption laws.
Semantic desiderata

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- Questions, the responses to which may be exhaustified, are *not* partitions.

   (cf. Groenendijk and Stokhof, 1984)
Semantic desiderata

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- Questions, the responses to which may be exhaustified, are *not* partitions.
  
  (cf. Groenendijk and Stokhof, 1984)

- Wh-words are existential quantifiers over sets.
‘Gricean’?

“That there [appear to be] divergences in meaning between [...] the formal devices [and] their analogs or counterparts in natural language” (Grice, 1975)
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- The semantics treats informative content classically.
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Besides: this is the only way.
Focus vs. ‘only’

The foregoing is not to say that focus ‘means’ ‘only’:
Focus vs. ‘only’

The foregoing is not to say that focus ‘means’ ‘only’:

(14) If \([\text{John}]_F\) was there, Mary was there. \(\equiv\) (c.f., Horn, 1972)
\(\neq\) If only John was there, Mary was there.
Focus vs. ‘only’

The foregoing is not to say that focus ‘means’ ‘only’:

(14) If [John]$_F$ was there, Mary was there. \hspace{1em} (c.f., Horn, 1972)
    \neq \text{If only John was there, Mary was there.}

(15) [John]$_F$ was there, and [Mary]$_F$ too.
    \neq \text{Only John was there, and only Mary.}
Focus vs. ‘only’

The foregoing is not to say that focus ‘means’ ‘only’:

(14) If \([\text{John}]_F\) was there, Mary was there. \((\text{c.f., Horn, 1972})\)
    \(\not\equiv\) If only John was there, Mary was there.

(15) \([\text{John}]_F\) was there, and \([\text{Mary}]_F\) too.
    \(\not\equiv\) Only John was there, and only Mary.

But at least for ‘simple’ sentences:

- ‘\([\text{Subject}]_F\) predicate’ \(\sim\) ‘only \([\text{Subject}]_F\) predicate’.
Formal results

Recall: A entails Q, $A \models Q$, iff
(i) $\cup A \subseteq \cup Q$; and
(ii) for all $q \in Q$, $q \cap \cup A = \emptyset$ or $q \cap \cup A \in A$
Formal results

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Relation implicature
For a cooperative speaker with info \( s \), responding \( A \) to \( Q \):
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Formal results

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Relation implicature for singleton answer
And if responding $\{a\}$ to $Q$ for some $a \in Q$: 
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Other maxims of Relation

i. $R_s \models Q$ (mine)

ii. $R_{CG} \models Q$ (Roberts's (1996) contextual entailment)

iii. $R_h \models Q$ (≈ GS's (1984) pragmatic answer)

ii. and iii. are too strong: the participants need not already know how $R$ is relevant. They need only be able to figure it out. (left implicit here)

(5) Did John go to the party? It was raining. If it rained, John { went / didn't go }.
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\begin{itemize}
  \item The participants need not \textit{already know} how \( R \) is relevant.
\end{itemize}

(5) Did John go to the party? 
   It was raining. 
   \( \Rightarrow \) If it rained, John \{went / didn’t go\}.
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Relatedness and knowledge

\[ R_s \models Q \quad \text{‘the speaker knows how } R \text{ is related to } Q \]
Relatedness and knowledge

\[ R_s \models Q \quad \text{‘the speaker knows how } R \text{ is related to } Q' \]

Relatedness

\( A \) is \textit{related} to \( Q \) in world \( w \) iff for some fact \( f \), \( w \in f \), \( A_f \models Q \).

Now:

\[ \text{Within a world, everything is related.} \]
Relatedness and knowledge

\[ R_s \models Q \quad \text{‘the speaker knows how } R \text{ is related to } Q \text{’} \]

**Relatedness**

A is *related* to \( Q \) in world \( w \) iff for some fact \( f \), \( w \in f \), \( A_f \models Q \).

- The speaker *knows that* A is related to \( Q \) iff in all \( w \in s \), A is rel. to \( Q \).
Relatedness and knowledge

\( R_s \models Q \) \quad ‘the speaker *knows how* \( R \) is related to \( Q \)’

**Relatedness**

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- The speaker *knows that* \( A \) is related to \( Q \) iff in all \( w \in s \), \( A \) is rel. to \( Q \).
- The speaker *knows how* \( A \) is related to \( Q \) iff in all \( w \in s \), \( A \) is related to \( Q \) *by the same* \( f \).
Relatedness and knowledge

\[ R_s \models Q \quad \text{‘the speaker knows how } R \text{ is related to } Q' \]

Relatedness

A is related to Q in world w iff for some fact f, \( w \in f \), \( A_f \models Q \).

- The speaker knows that A is related to Q iff in all \( w \in s \), A is rel. to Q.
- The speaker knows how A is related to Q iff in all \( w \in s \), A is related to Q by the same f.

Now:

- For all A, Q true in w: there is a fact f, \( w \in f \), s.t. \( A_f \models Q \).
Relatedness and knowledge

\( R_s \models Q \) ‘the speaker knows how \( R \) is related to \( Q \)’

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Now:

- For all \( A, Q \) true in \( w \):
  there is a fact \( f \), \( w \in f \), s.t. \( A_f \models Q \).
  (e.g., let \( f \) be \( \{w\} \))
Relatedness and knowledge

\[ R_s \models Q \] ‘the speaker knows how \( R \) is related to \( Q \)’

Relatedness

\( A \) is related to \( Q \) in world \( w \) iff for some fact \( f \), \( w \in f \), \( A_f \models Q \).

- The speaker knows that \( A \) is related to \( Q \) iff in all \( w \in s \), \( A \) is related to \( Q \).
- The speaker knows how \( A \) is related to \( Q \) iff in all \( w \in s \), \( A \) is related to \( Q \) by the same \( f \).

Now:

- For all \( A, Q \) true in \( w \):
  there is a fact \( f \), \( w \in f \), s.t. \( A_f \models Q \).
  (e.g., let \( f \) be \( \{w\} \))

Within a world, everything is related.
Logical relatedness

Just as [logical consequence] rules the validity of argumentation, [logical relatedness] rules the coherence of information exchange.

(Groenendijk and Roelofsen, 2009)
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(22) Dogs and cats are mammals.  
Dogs are mammals.  
(Logical cons.)
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Dogs are animals. (Non-logical cons.)
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Dogs are animals.  
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Relatedness

A is related to Q in world w iff for some fact f, w ∈ f, A_f ⊨ Q.

- Logical iff f captures all and only the laws of logic.
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Relatedness
A is related to Q in world w iff for some fact f, w ∈ f, A_f |= Q.

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Relatedness

A is related to Q in world w iff for some fact f, w ∈ f, A_f ⊨ Q.

- Logical iff f captures all and only the laws of logic.
- Non-logical iff f is a contingency.

Logical consequence is logical relatedness.
Objective/subjective cooperativity

The maxims can be (and have been) defined in two ways:

- **Objective**: Say only what is true, relevant, etc.
- **Subjective**: Say only what you think is true, relevant, etc.

My account of the final rise relies on subjective maxims:

- Violating 'say only what you think is true' = uncertainty
- Violating 'say only what is true' = lying

But an account based on objective maxims would also work:

- Final rise: 'For some maxim, I'm not sure whether or how I comply with it'.
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Exhaustivity without Quantity

Example given by Fox (forthcoming):

(25) There’s money in box A or in box B!

\[(p \lor q) \sim \text{Not in both.}\]
Exhaustivity without Quantity

Example given by Fox (forthcoming):

(25) There’s money in box A or in box B! \[(p \lor q)\]

\[\sim \text{Not in both.}\]

But a quizmaster is not expected to comply with Quantity!
Exhaustivity without Quantity

Example given by Fox (forthcoming):

(25) There’s money in box A or in box B! $(p \lor q)$
    $\sim$ Not in both.

But a quizmaster is not expected to comply with Quantity!

However, she does comply with Relation, Quality, Manner:
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\(\sim\) Not in both.

But a quizmaster is not expected to comply with Quantity!

However, she does comply with Relation, Quality, Manner:

1. \(s \subseteq |p| \cup |q|\) (Quality)
2. - (Quantity disabled)
3. \(s \subseteq |p| \cup |q| \cup (|p| \cap |q|)\) or \(s \subseteq |p| \cup |q| \cup |p| \cap |q|\) (Relation)
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4. \(s \subseteq (|p| \cap |q|)\) or \(s \subseteq |p| \cap |q|\) (from 1 and 2)
Exhaustivity without Quantity

Example given by Fox (forthcoming):

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3. \( s \subseteq (|p| \cup |q| \cup (|p| \cap |q|)) \) or \( s \subseteq |p| \cup |q| \cup |p| \cap |q| \) (Relation)

4. \( s \subseteq (|p| \cap |q|) \) or \( s \subseteq |p| \cap |q| \) (from 1 and 2)
5. Comply with the maxims transparently. (Manner)
Exhaustivity without Quantity

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4. \[s \subseteq (|p| \cap |q|)\] or \[s \subseteq |p| \cap |q|\] (from 1 and 2)
5. Comply with the maxims transparently. (Manner)
6. The quizmaster does not want to give it away.
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But a quizmaster is not expected to comply with Quantity!

However, she \textit{does} comply with Relation, Quality, Manner:

1. \(s \subseteq |p| \cup |q|\) \quad \text{(Quality)}
2. - \quad \text{(Quantity disabled)}
3. \(s \subseteq \overline{|p| \cup |q|} \cup (|p| \cap |q|)\) or \(s \subseteq |p| \cup |q| \cup |p| \cap |q|\) \quad \text{(Relation)}

\[\text{__________} \]
4. \(s \subseteq (|p| \cap |q|)\) or \(s \subseteq \overline{|p| \cap |q|}\) \quad \text{(from 1 and 2)}
5. Comply with the maxims transparently. \quad \text{(Manner)}
6. The quizmaster does not want to give it away.
\[\text{__________} \]
7. \(s \subseteq \overline{|p| \cap |q|}\) \quad \text{(from 4, 5 and 6)}
References (i)

- Geurts (2010). Quantity implicatures.
References (ii)