Exhaustivity implicatures and attentive content

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Goal of this talk

(1) Of red, green and blue, which colours does John like? He likes blue.  \( \sim He \ doesn't \ like \ red, \ green. \)
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   He likes blue. \( \sim He\ doesn't\ like\ red,\ green. \)

Conversational implicature (Grice, 1975)

An implicature, the supposition of which is necessary for maintaining the assumption that the speaker is cooperative.
Goal of this talk

(1) Of red, green and blue, which colours does John like?
   He likes blue. \(\sim \) He doesn’t like red, green.

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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.
Goal of this talk

(1) Of red, green and blue, which colours does John like?
He likes blue. \[\sim He \, doesn't \, like \, red, \, green.\]

Conversational implicature (Grice, 1975)
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 lacks the belief that he likes red.
Goal of this talk

(1) Of red, green and blue, which colours does John like? He likes blue. \( \sim He\ doesn't\ like\ red,\ green. \)

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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 lacks the belief that he likes red.
   …
3. She believes that he doesn’t like red.
Goal of this talk

(1) Of red, green and blue, which colours does John like? He likes blue. \[ \sim \text{He doesn't like red, green.} \]

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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 lacks the belief that he likes red.
   ... (‘the epistemic step’ - Sauerland, 2004)
3. She believes that he doesn’t like red.
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(1) Of red, green and blue, which colours does John like? He likes blue. \(\sim He\ doesn't\ like\ red,\ green.\)

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3. She believes that he doesn’t like red.

“[the epistemic] step does not follow from Gricean maxims and logic alone.” - Chierchia, et al. (2008)
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“[the epistemic] step does not follow from Gricean maxims and logic alone.” - Chierchia, et al. (2008)

Wrong, it does!
Existing approaches

Most existing work (going back to Mill, 1867):

1. The speaker lacks the belief that John likes red (Quantity)
2. She is opinionated about whether John likes red (Context)
3. She believes that John doesn't like red

Counterexample:
(2) I'm probably asking the wrong person, but of red, green, blue..., which colours does John like?
He likes green and blue.
Not red.

Opinionatedness must be something conveyed by the speaker.
Existing approaches

Most existing work (going back to Mill, 1867):

1. The speaker lacks the belief that John likes red (Quantity)

Counterexample:

(2) I'm probably asking the wrong person, but of red, green, blue ..., which colours does John like? He likes green and blue. Not red.
Existing approaches

Most existing work (going back to Mill, 1867):

1. The speaker lacks the belief that John likes red (Quantity)
2. She is *opinionated* about whether John likes red (Context)

Counterexample:

(2) I’m probably asking the wrong person, but of red, green, blue..., which colours does John like? He likes green and blue. But not red.

Opinionatedness must be something conveyed by the speaker. But how?!
Existing approaches

Most existing work (going back to Mill, 1867):

1. The speaker lacks the belief that John likes red (Quantity)
2. She is *opinionated* about whether John likes red (Context)
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Existing approaches

Most existing work (going back to Mill, 1867):

1. The speaker lacks the belief that John likes red
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Existing approaches

Most existing work (going back to Mill, 1867):

1. The speaker lacks the belief that John likes red  (Quantity)
2. She is *opinionated* about whether John likes red  (Context)
3. She believes that John doesn’t like red

- Counterexample:

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1. The speaker lacks the belief that John likes red (Quantity)
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- Counterexample:

(2) I’m probably asking the wrong person, but of red, green, blue ..., which colours does John like?
He likes green and blue. ~ Not red.

- Opinionatedness must be something conveyed by the speaker.
Existing approaches

Most existing work (going back to Mill, 1867):

1. The speaker lacks the belief that John likes red (Quantity)
2. She is opinionated about whether John likes red (Context)
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- Counterexample:

(2) I’m probably asking the wrong person, but of red, green, blue ..., which colours does John like? He likes green and blue. \( \sim \) Not red.

- Opinionatedness must be something conveyed by the speaker, but how?!
Outline

1. Diagnosis
2. Theory
3. Results
4. Discussion (cancellability)
1. Diagnosis

(3) a. Of red, green and blue, which colours does John like?
   b. He likes blue.
   c. He likes blue, or blue and red.

\( \sim \) He doesn’t like red
\( \not\sim \) He doesn’t like red
1. Diagnosis

(3) a. Of red, green and blue, which colours 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
(3b) and (3c) differ in their attentive content.
1. Diagnosis

(3) a. Of red, green and blue, which colours does John like?  
   b. He likes blue.  
   c. He likes blue, or blue and red.

\(\sim\) He doesn’t like red
\(\sim\) He doesn’t like red

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

- (3c) draws attention to the poss. that John likes blue and red.
1. Diagnosis

(3) a. Of red, green and blue, which colours does John like?
   b. He likes blue.          \(\sim He\ doesn't\ like\ red\)
   c. He likes blue, or blue and red. \(\vdash He\ doesn't\ like\ red\)

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

- (3c) draws attention to the poss. that John likes blue and red.
- (And so does (3a).)
1. Diagnosis

(3) a. Of red, green and blue, which colours 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

Intuition

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

- (3c) draws attention to the poss. that John likes blue and red.
- (And so does (3a).)
- (3b) doesn’t; it leaves the possibility unattended.
1. Diagnosis

(3)  

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

Intuition

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

- (3c) draws attention to the poss. that John likes blue and red.
- (And so does (3a).)
- (3b) doesn’t; it leaves the possibility *unattended*.

Apparentely, pragmatic reasoning is sensitive to this.
1. Diagnosis

(3) a. Of red, green and blue, which colours does John like?
    b. He likes blue.          \( \sim \) He doesn’t like red
    c. He likes blue, or blue and red. \( \sim \neg \) He doesn’t like red

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

- (3c) draws attention to the poss. that John likes blue and red.
- (And so does (3a).)
- (3b) doesn’t; it leaves the possibility *unattended*.

Apparently, pragmatic reasoning is sensitive to this.
(3) a. Of red, green and blue, which colours does John like? 
b. He likes blue. \hspace{1cm} \sim He doesn’t like red 
c. He likes blue, or blue and red. \hspace{1cm} \not\sim He doesn’t like red

Intuition
(3b) and (3c) differ in their **attentive content**.
\begin{itemize}
  \item (3c) draws attention to the poss. that John likes blue and red.
  \item (And so does (3a).)
  \item (3b) doesn’t; it leaves the possibility **unattended**.
\end{itemize}

Apparently, pragmatic reasoning is sensitive to this.
1. Diagnosis

(3) a. Of red, green and blue, which colours does John like?
   b. He likes blue. ∼ He doesn’t like red
   c. He likes blue, or blue and red. ∪ He doesn’t like red

Intuition
(3b) and (3c) differ in their attentive content.
   ▶ (3c) draws attention to the poss. that John likes blue and red.
   ▶ (And so does (3a).)
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Apparently, pragmatic reasoning is sensitive to this.
1. Diagnosis

(3) a. Of red, green and blue, which colours does John like?
   b. He likes blue. \( \sim He \, doesn't \, like \, red \)
   c. He likes blue, or blue and red. \( \vdash He \, doesn't \, like \, red \)

Intuition
(3b) and (3c) differ in their attentive content.
  ▷ (3c) draws attention to the poss. that John likes blue and red.
  ▷ (And so does (3a).)
  ▷ (3b) doesn’t; it leaves the possibility unattended.

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

2.1. Translation into logic
2.2. Semantics
2.3. Pragmatics
(4) a. Which colours (of 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. \( \sim \) He doesn’t like red
2.1. Translation into logic

(4) a. Which colours (of red and blue) does John like?
   b. He likes blue. \[ \neg \] He doesn’t like red
   c. He likes blue, or blue and red. \[ \neg \neg \] He doesn’t like red
2.1. Translation into logic

(4) a. There are colours (among red and blue) that John likes.
   b. He likes blue.  \hspace{2cm} \sim He doesn’t like red
   c. He likes blue, or blue and red.  \hspace{2cm} \not\sim He doesn’t like red
2.1. Translation into logic

(4) a. John likes blue, red, or blue and red.
   b. He likes blue.  \( \sim \) He doesn’t like red
   c. He likes blue, or blue and red.  \( \nabla \) He doesn’t like red
2.1. Translation into logic

(4) 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

(4) 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)

\[ p \lor (p \land q) \] (4a)

\[ p \lor q \lor (p \land q) \] (4b)

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

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

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

Entailment \(A \entails B\), iff (i) \(A \subseteq B\); and (ii) for all \(b \in B\), if \(b \cap A \neq \emptyset\), \(b \cap A \in A\)

Now, (4c) \(\not\entails (4a)\), but (4b) \(\not\slash.left(4a)\).
2.2. Semantics (Roelofsen, 2011)

- *Possibility*: a set of worlds

\[
p \lor (p \land q)
\]

\[
p \lor q \lor (p \land q)
\]

Now, (4c) \(\supseteq\) (4a), but (4b) \(\not\supseteq\) (4a).
2.2. Semantics (Roelofsen, 2011)

- **Possibility**: a set of worlds \((a, b)\)
- **Proposition**: a set of possibilities \((A, B, [\varphi])\)
2.2. Semantics (Roelofsen, 2011)

- **Possibility**: a set of worlds
- **Proposition**: a set of possibilities
- **Informative content**: \(|\varphi| := \bigcup [\varphi]|\)

\[(a, b)\]
\[(A, B, [\varphi])\]
2.2. Semantics (Roelofsen, 2011)

- *Possibility*: a set of worlds
- *Proposition*: a set of possibilities
- *Informative content*: \(|\varphi| := \bigcup[\varphi]\)

\[
\begin{align*}
(4a) \ & [p \lor q \lor (p \land q)] \quad (4b) \ & [p] \quad (4c) \ & [p \lor (p \land q)]
\end{align*}
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2.2. Semantics (Roelofsen, 2011)

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

**Entailment**

$A$ entails $B$, $A \models B$, iff

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

(ii) for all $b \in B$, if $b \cap \bigcup A \neq \emptyset$, $b \cap \bigcup A \in A$
2.2. Semantics (Roelofsen, 2011)

- **Possibility**: a set of worlds
- **Proposition**: a set of possibilities
- **Informative content**: \( |\varphi| := \bigcup \{\varphi\} \)

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\begin{align*}
(4a) & \quad [p \lor q \lor (p \land q)] \\
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(4c) & \quad [p \lor (p \land q)]
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**Entailment**

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

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

(ii) for all \( b \in B \), if \( b \cap \bigcup A \neq \emptyset \), \( b \cap \bigcup A \in A \)

\( (a, b) \)

\( (A, B, [\varphi]) \)

\( at \ least \ as \ informative \)
2.2. Semantics (Roelofsen, 2011)

- **Possibility**: a set of worlds
- **Proposition**: a set of possibilities
- **Informative content**: \(|\varphi| := \bigcup [\varphi]| (a, b)

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

\[(4b) \quad [p] \quad (A, B, [\varphi])\]

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

**Entailment**

\[ A \text{ entails } B, \ A \models B, \text{ iff } \]

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

(ii) for all \( b \in B \), if \( b \cap \bigcup A \neq \emptyset \), \( b \cap \bigcup A \in A \)

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

\[ \rightarrow \text{ at least as attentive} \]
2.2. Semantics (Roelofsen, 2011)

- **Possibility:** a set of worlds
- **Proposition:** a set of possibilities
- **Informative content:** $|\varphi| := \bigcup[\varphi]$

\[
\begin{align*}
(4a) \quad [p \lor q \lor (p \land q)] & \quad \text{(4a)} \\
(4b) \quad [p] & \quad \text{(4b)}
\end{align*}
\]

Entailment

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

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

(ii) for all \(b \in B,\) if \(b \cap \bigcup A \neq \emptyset,\) \(b \cap \bigcup A \in A\)

Now, \((4c) \models (4a),\) but \((4b) \not\models (4a).\)
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:**
2. **Quantity:**
3. **Relation:**
2.3. Pragmatics

The relevant maxims

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

1. **Quality**: $s \subseteq \bigcup R$.
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 $Q$:

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**: 

(5) Did John go to the party?

It was raining.

If it rained, John \{went / didn't go\}.
2.3. 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**: \( \{ r \cap s \mid r \in R \} \models Q \).
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**: $\{r \cap s \mid r \in R\} \sqsubseteq Q$.

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

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

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It was raining.
2.3. 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.
2.3. 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.
2.3. Pragmatics

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

1. **Quality**: $s \subseteq \bigcup R$.
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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{align*}
\text{rp} \quad \text{rp} \\
\text{rp} \quad \text{rp} \\
\text{rp} \quad \text{rp} \\
\text{rp} \quad \text{rp}
\end{align*}
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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. $\rightsquigarrow$ If it rained, John $\{\text{went} / \text{didn’t go}\}$. 
2.3. Pragmatics

The relevant maxims

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

1. **Quality**: $s \subseteq \bigcup R$.

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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.

\[
\text{If it rained, John } \{ \text{went / didn't go} \}.
\]

\[\]
2.3. Pragmatics
(cf. Grice, 1975; Groenendijk and Stokhof, 1984; Roberts, 1996; Spector, 2007)

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.
If it rained, John {went / didn't go}. 
3.1. Results

(4) 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. \((p \lor (p \land q))\)
3.1. Results

(4) 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. \(s \subseteq |p \lor (p \land q)|\)  \(\text{(Quality)}\)
3.1. Results

(4) 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)
3.1. Results

(4) 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. \(s \subseteq |p \lor (p \land q)| = |p|\) \hspace{2cm} (Quality)
      2. \(s \notin |q|\) \hspace{2cm} (Quantity)

3.1. Results

(4) 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)

\[ p \lor (p \land q) \models p \lor q \lor (p \land q) \]
3.1. Results

(4) 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. - \(p \lor (p \land q) \equiv p \lor q \lor (p \land q)\) (Relation)
3.1. Results

(4) 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{3cm} (Quality)


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

1. \(s \subseteq |p \lor (p \land q)| = |p|\) \hspace{3cm} (Quality)

2. \(s \not\subseteq |q|\) \hspace{3cm} (Quantity)

3. - \(p \lor (p \land q) \models p \lor q \lor (p \land q)\) \hspace{3cm} (Relation)
3.1. Results

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

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

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)
3.1. Results

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

\(\begin{align*}
\text{(Quality)} \\
\text{(Quantity)}
\end{align*}\)

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

"exhaustivity!"

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

1. \(s \subseteq |p \lor (p \land q)| = |p|\)
2. \(s \notin |q|\)
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"exhaustivity!"

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

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"exhaustivity!"
3.1. Results

(4) 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. \(s \not\subseteq |q|\)

\[
\begin{array}{c}
\text{pq} \\
\text{pq} \\
\text{pq} \\
\text{pq}
\end{array}
\quad
\begin{array}{c}
\text{pq} \\
\text{pq} \\
\text{pq} \\
\text{pq}
\end{array}
\]

\(p \not\in \text{pq} \lor q \lor (p \land q)\)  
(Quality)  
(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. - \(p \lor (p \land q) \supseteq p \lor q \lor (p \land q)\)  
(Quality)  
(Quantity)  
(Relation)
3.1. Results

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

   \(p \nsubseteq p \lor q \lor (p \land q)\)  \(\text{(Quality)}\)
   \(p \lor q \lor (p \land q)\)  \(\text{(Quantity)}\)

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

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

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

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

   \(p \lor q \lor (p \land q)\)
3.1. Results

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

\[
p \nLeftarrow p \lor q \lor (p \land q)\]  \hspace{1cm} (Quality)  \hspace{1cm} (Quantity)

\[
\begin{array}{c}
pq \hspace{1cm} pq \\
\text{=} \hspace{1cm} \hspace{1cm} \Rightarrow \\
pq \hspace{1cm} pq \\
pq \hspace{1cm} pq
\end{array}
\]

\[
\begin{array}{c}
pq \hspace{1cm} pq \\
pq \hspace{1cm} pq \\
pq \hspace{1cm} pq \\
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\[
\begin{array}{c}
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pq \hspace{1cm} pq \\
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   1. \(s \subseteq |p|\)
   2. \(s \notin |q|\)

\[
p \nLeftarrow p \land (q \lor (p \land q))\]  \hspace{1cm} (Quality)  \hspace{1cm} (Quantity)

\[
\begin{array}{c}
pq \hspace{1cm} pq \\
\text{=} \hspace{1cm} \hspace{1cm} \Rightarrow \\
pq \hspace{1cm} pq \\
pq \hspace{1cm} pq
\end{array}
\]

\[
\begin{array}{c}
pq \hspace{1cm} pq \\
pq \hspace{1cm} pq \\
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\end{array}
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\begin{array}{c}
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\end{array}
\]

\[
\begin{array}{c}
pq \hspace{1cm} pq \\
pq \hspace{1cm} pq \\
pq \hspace{1cm} pq \\
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\end{array}
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3.1. Results

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

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

\[ p \not
\]

\((\text{Quality})\)

\((\text{Quantity})\)

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

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

\((\text{Quality})\)

\((\text{Quantity})\)

\((\text{Relation})\)
3.1. Results

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

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

\[
p \not\subseteq p \lor q \lor (p \land q) \quad \text{(Quality)}
\]

\[
\text{(Quantity)}
\]

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

\[
\text{(Relation)}
\]
3.1. Results

(4) 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} \(p \not\subseteq p \lor q \lor (p \land q)\) \hspace{1cm} (Quality)
   2. \(s \not\subseteq |q|\) \hspace{1cm} (Quantity)
   3. \(s \subseteq |p| \cup |q|\) or \(s \subseteq |p| \cup |q|\) \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. \(s \not\subseteq |q|\) \hspace{1cm} (Quantity)
   3. - \(p \lor (p \land q) \not\subseteq p \lor q \lor (p \land q)\) \hspace{1cm} (Relation)
3.1. Results

(4) 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. \(s \subseteq |p| \lor |q|\) or \(s \subseteq |p| \lor |q|\)

----------

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. \(-\quad p \lor (p \land q) \not\supseteq p \lor q \lor (p \land q)\)  (Relation)
3.1. Results

(4) 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. \(s \not\subseteq |q|\)
   3. \(\lor(p \land q) \models p \lor q \lor (p \land q)\) \(\) (Relation)
3.1. Results

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

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

\[\text{exhaustivity!}\]

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

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

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

\[(\text{Quality})\]  
\[(\text{Quantity})\]  
\[(\text{Relation})\]
3.2. General result

- 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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- Together with Quality, this implies *opinionatedness*.
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- Together with Quality, this implies *opinionatedness*.
- Together with Quantity, this in turn yields exhaustivity.
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Main conclusion:
3.2. General result

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Main conclusion:
- If pragmatic reasoning is sensitive to attentive content
3.2. General result

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Main conclusion:
- If pragmatic reasoning is sensitive to *attentive content* (which it must be, to distinguish between (4b) and (4c));
3.2. General result

- 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.

Main conclusion:
- If pragmatic reasoning is sensitive to attentive content (which it must be, to distinguish between (4b) and (4c));
- then exhaustivity is a conversational implicature.
4. Discussion

4.1. ‘Alternatives’
4.2. Cancellability
4.3. Semantic desiderata
4.4. ‘Gricean’?
4.1. ‘Alternatives’

Existing approaches (since forever):

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

Beware:

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

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

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4.1. ‘Alternatives’

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My approach:

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

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Existing approaches (since forever):
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- ‘Why did the speaker not say “p \lor (p \land q)”?’
- *Ignorance is no excuse.*
4.1. ‘Alternatives’

Existing approaches (since forever):
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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.
4.1. ‘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:
- The ‘alternatives’ are fully determined by the maxims.
- Speakers need not reason in terms of alternatives.
4.2. Cancellability (I)

‘If exhaustivity is a conversational implicature, then why is it sometimes mandatory?’
4.2. Cancellability (I)

Some typical examples of cancellation:

(5) On an unrelated note, it was raining.
4.2. Cancellability (I)

Some typical examples of cancellation:

(5) On an unrelated note, it was raining.
(6) John, or Mary, or both. \( \not \) not both
4.2. Cancellability (I)

Some typical examples of cancellation:

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

(6) John, or Mary, or both. $\not\in not both$

(7) Will one of your parents be home?
Sure, one of them will be home. Indeed, both will be home.

(8) How many people will be home?
One of my parents will be home. Indeed, both will be home.

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

(10) It is raining. Oh, but it has stopped!
The speaker is changing her mind...
4.2. Cancellability (I)

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Some typical examples of cancellation:

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

(6) John, or Mary, or both. \( \not\exists \) *not both*

CI are computed globally; the CI wasn’t there to begin with...

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In (7), the implicature wasn’t there to begin with...

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Some typical examples of cancellation:

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

(6) John, or Mary, or both. \( \not\) not both

CI are computed globally; the CI wasn’t there to begin with...

(7) Will one of your parents be home?
    Sure, one of them will be home. Indeed, both will be home.

(8) How many people will be home?
    One of my parents will be home. \( \not\) Indeed, both will be home.

In (7), the implicature wasn’t there to begin with...

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

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

The speaker is changing her mind...
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- CIs are considered ‘defeasible’, ‘less robust’, ‘voluntary’

Implicature cancellation (strict version)

For a consistent speaker to make a conversational implicature and subsequently cancel it. However...

CIs in the sense of Grice (1975) cannot be cancelled in this sense:

1. CI is necessary for maintaining the cooperativity assumption.
2. The mutual assumption of cooperativity is necessary for CI.
3. Hence, cancelling CI requires the sp. to retroactively:
   - (i) revoke the cooperativity assumption; or
   - (ii) revise what counted as cooperative.
4. The speaker would be either uncooperative, or inconsistent.
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- ‘Cancellation’ (in the sloppy sense) is not a uniform phenomenon:
  - complete absence of implicature
  - contextual disambiguation
  - correction/inconsistency
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  - non-cooperativity

These surely have *different cognitive correlates*?
4.3. Semantic desiderata

No absorption: $p \lor (p \land q) \not\equiv p \not\equiv p \land (p \lor q)$

Questions, the responses to which may be exhaustified, are not partitions. (cf. Groenendijk and Stokhof, 1984)
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- The semantics treats informative content classically.
- Grice wouldn’t be against other dimensions of meaning.
- The connectives are still algebraically ‘basic’.

Besides: this is the only way.
The end

Contact
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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, E. Onea, K. von Fintel, the audiences of *SemDial, UCSC S-Circle, SPE6, ICL, ESSLLI StuS, TbiLLC*, Göttingen, and many anonymous reviewers for valuable comments.
Appendix A. Semantics (Roelofsen, 2011)

Ingredients

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

Semantics of relevant fragment

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

Entailment

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

- ‘My’ Maxim of Relation: \( R_s \models Q \)
- Roberts’s *relevance*: \( R_{CG} \models Q \) \( (CG = \text{Common Ground}) \)
Appendix B. Roberts’s (1996) ‘relevance’

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

Roberts's requirement is too strong:

1. $s \subseteq p \sqcap q$ (Quality)
2. $s \sqsubseteq q \sqcap p$ (Quantity)
3. $s \subseteq p \sqcap q$ or $s \subseteq p \sqcup q$ (Relation)
4. $s \subseteq q \sqcap p$
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- ‘My’ Maxim of Relation: \( R_s \vdash Q \)
- Roberts’s relevance: \( R_{\text{CG}} \vdash Q \) \((CG = \text{Common Ground})\)

Robert's requirement is too strong:
- The participants need not already know how \( R \) is relevant.
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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.

\begin{itemize}
  \item E.g., in case of exhaustivity:
    \begin{enumerate}
      \item $s \subseteq p$ (Quality)
      \item $s \not\subseteq q$ (Quantity)
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E.g., in case of exhaustivity:

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. $s \subseteq \overline{|q|}$
Appendix C. ‘Embedded’ implicatures
Chierchia, et al. (2008), and much subsequent discussion

(10) Which books did every student read?
    Every student read O. or K.L. \(\sim\) No student read both.
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The ‘embedded’ implicature of (5) is in fact predicted.
References