Roses and flowers: an informativeness implicature in probabilistic pragmatics

Roger Levy, Leon Bergen, and Noah Goodman

24th Conference on Semantics and Linguistic Theory

30 May 2014
The empirical phenomenon
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• Suppose that $X$ is a superordinate term for $x$
The empirical phenomenon

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- Then coordinate phrases of the form

  \[ x \text{ and } X \quad X \text{ and } x \]
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- Then coordinate phrases of the form $x$ and $X$  
  $X$ and $x$

occur with non-trivial frequency!
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The only ominous sign... was... competition in the beef and meat business.
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*The only ominous sign...was...competition in the beef and meat business.*

$x=$beef  
$X=$meat
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In cities…where doctors and surgeons practiced in proximity…
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We sell roses and flowers for Mother’s Day.
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The only ominous sign...was...competition in the beef and meat business.

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We sell roses and flowers for Mother’s Day.
These examples abound…
These examples abound...
These examples abound...

*tulips and flowers*
These examples abound...

pork and meat

tulips and flowers
These examples abound…

pork and meat

tulips and flowers

horse and animal
These examples abound…

pork and meat

tulips and flowers

horse and animal

physicists and scientists
These examples abound...

pork and meat

orchids and flowers

tulips and flowers

horse and animal

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These examples abound...

pork and meat

tulips and flowers

orchids and flowers

surgeons and doctors

physicists and scientists

horse and animal
These examples abound…

- *pork and meat*
- *orchids and flowers*
- *tulips and flowers*
- *shamans and healers*
- *horse and animal*
- *surgeons and doctors*
- *physicists and scientists*
These examples abound...

- shirts and clothing
- pork and meat
- orchids and flowers
- tulips and flowers
- shamans and healers
- horse and animal
- surgeons and doctors
- physicists and scientists
These examples abound…

- trees and firs
- pork and meat
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• Goals for the talk:
These examples abound…

trees and firs
pork and meat
shirts and clothing
orchids and flowers
tulips and flowers
shamans and healers
horse and animal
surgeons and doctors
physicists and scientists

• Goals for the talk:
  • Briefly investigate the construction’s history
These examples abound…

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- physicists and scientists

• **Goals for the talk:**
  - Briefly investigate the construction’s history
  - Establish what *roses and flowers* means
These examples abound...

trees and firs
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  • Establish what *roses and flowers* means
  • Show why this construction is a theoretical challenge
These examples abound...

trees and firs
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• Goals for the talk:
  • Briefly investigate the construction’s history
  • Establish what *roses and flowers* means
  • Show why this construction is a theoretical challenge
  • Show how rational speech-act theory meets this challenge
• Early attestations (COHA reaches back to 1800)

Large clusters…had been…tied to sundry nails and pegs…to form an arch of flowers and roses.

(1856, Harriet Beecher Stowe, Dred: A Tale of the Great Dismal Swamp)

It lies north-east and south-west, and its sides adorned with meadows, lofty trees and firs.

(1812, John Pinkerton, A General Collection of the Best and Most Interesting Voyages and Travels in All Parts of the World)
Historical picture

- Are these constructions changing in frequency? Apparently not!
• Are these constructions changing in frequency? Apparently not!
Historical picture

- Are these constructions changing in frequency? Apparently not!
• Are these constructions changing in frequency?
  Apparently not!

Historical picture

- roses and other flowers
- flowers and roses

1800

2000
Historical picture
Historical picture
What does *roses and flowers* mean?
What does *roses and flowers* mean?

- The intuition: a speaker’s commitment with the utterance

*roses and flowers*
What does *roses and flowers* mean?

- The intuition: a speaker’s commitment with the utterance *roses and flowers*
  is the same as their commitment with the utterance *roses and other flowers*
What does *roses and flowers* mean?

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- Simple experiment for verification:
What does *roses and flowers* mean?

- The intuition: a speaker’s commitment with the utterance *roses and flowers* is the same as their commitment with the utterance *roses and other flowers*

- Simple experiment for verification:

  *The road to the airport was lined with roses and flowers.*

  **Q:** How many types of flowers do you think there were lining the road to the airport?
What does *roses and flowers* mean?

- The intuition: a speaker’s commitment with the utterance *roses and flowers* is the same as their commitment with the utterance *roses and other flowers*.

- Simple experiment for verification:

  *The road to the airport was lined with roses and flowers.*

  **Q:** How many types of flowers do you think there were lining the road to the airport?

- Critical measurement: does a respondent answer with a number greater than one?
A simple experiment
A simple experiment

- Mechanical Turk study, five conditions:
A simple experiment

- Mechanical Turk study, five conditions:

  The road to the airport was lined with roses.
A simple experiment

- Mechanical Turk study, five conditions:

  *The road to the airport was lined with roses.*
  *The road to the airport was lined with flowers.*
A simple experiment

- Mechanical Turk study, five conditions:

  The road to the airport was lined with **roses**.
  The road to the airport was lined with **flowers**.
  The road to the airport was lined with **flowers and roses**.
A simple experiment

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- Query was always the same:

  Q: How many types of flowers do you think there were lining the road to the airport?
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• Mechanical Turk study, five conditions:

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• Query was always the same:

Q: How many types of flowers do you think there were lining the road to the airport?

• 250 participants (50 per condition)
Experiment results (with 95% CIs)

- **Roses**: 0.00% answers
- **Flowers**: 0.25% answers
- **Flowers and Roses**: 0.50% answers
- **Roses and Flowers**: 0.75% answers
- **Roses and Other Flowers**: 1.00% answers

More than one type of flower
Experiment results (with 95% CIs)

Ordering choice doesn’t affect interpretation

% answers MORE THAN ONE type of flower

- roses
- flowers
- flowers and roses
- roses and flowers
- roses and other flowers

Ordering choice doesn’t affect interpretation.
Experiment results (with 95% CIs)

% answers
MORE THAN ONE
type of flower

Ordering choice doesn’t affect interpretation

- roses
- flowers
- flowers and roses
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- roses and other flowers
Experiment results (with 95% CIs)

\[ M(\text{roses and flowers}) = M(\text{flowers and roses}) \]
Conjoining **flowers** onto **roses** massively changes interpretation ($p \ll 0.001$)

$$M(\text{roses and flowers}) = M(\text{flowers and roses})$$
Conjoining *flowers* onto *roses* massively changes interpretation ($p \ll 0.001$)

$M(\text{roses and flowers}) = M(\text{flowers and roses})$

$M(\text{roses and flowers}) \neq M(\text{roses})$
Experiment results (with 95% CIs)

Conjoining *flowers* onto *roses* massively changes interpretation ($p \ll 0.001$)

$M(\text{roses and flowers}) = M(\text{flowers and roses})$

Conjoining *roses* onto *flowers* changes interpretation too! ($p < 0.025$)

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Experiment results (with 95% CIs)

Conjoining *flowers* onto *roses* massively changes interpretation \((p \ll 0.001)\)

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M(\text{roses and flowers}) = M(\text{flowers and roses})
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Experiment results (with 95% CIs)

Conjoining flowers onto roses massively changes interpretation ($p \ll 0.001$)

Conjoining roses onto flowers changes interpretation too! ($p < 0.025$)

Adding other has no discernible effect

$$M(\text{roses and flowers}) = M(\text{flowers and roses})$$

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Conjoining flowers onto roses massively changes interpretation ($p \ll 0.001$)

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M(roses and flowers) = M(flowers and roses)
M(roses and flowers) ≠ M(roses)
M(roses and flowers) ≠ M(flowers)
M(roses and flowers) = M(roses and other flowers)
The semantic puzzle

We sell roses and flowers for Mother's Day.

We sell roses and other flowers for Mother's Day.

We sell roses for Mother's Day.
The semantic puzzle

*We sell roses and flowers for Mother's Day.*

*We sell roses and other flowers for Mother's Day.*

*We sell roses for Mother's Day.*
The semantic puzzle

*We sell roses and flowers for Mother's Day.*

- What does this mean?

*We sell roses and other flowers for Mother's Day.*

*We sell roses for Mother's Day.*
The semantic puzzle

*We sell roses and flowers for Mother's Day.*

- What does this mean?
- Empirically, we saw that it means

  *We sell roses and other flowers for Mother's Day.*

  *We sell roses for Mother's Day.*
The semantic puzzle

*We sell roses and flowers for Mother's Day.*

- What does this mean?
- Empirically, we saw that it means
  
  *We sell roses and other flowers for Mother's Day.*
- But I will show that it should literally mean
  
  *We sell roses for Mother's Day.*
Consider the sum semilattice of flower subtypes (Link, 1983):

\[ \text{roses} \sqcup f_2 \sqcup f_3 \]

Its nodes induce a partition over possible worlds:

The sum that \textit{we sell}:

\[
\begin{array}{|c|}
\hline
f_1 \sqcup f_2 \sqcup f_3 \\
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f_1 \sqcup f_2 \\
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\[ \text{roses} \sqcup f_2 \sqcup f_3 \]

\[ \text{roses} \sqcup f_2 \quad \text{roses} \sqcup f_3 \quad f_2 \sqcup f_3 \]

\[ \text{roses}(f_1) \quad f_2 \quad f_3 \]

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roses ⊔ f_2 ⊔ f_3
roses ⊔ f_2    roses ⊔ f_3   f_2 ⊔ f_3
|    |   |   |
---  ---  ---
roses(f_1) f_2 f_3
```

Its nodes induce a partition over possible worlds:

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The sum that we sell:

We sell *roses*.
We sell *flowers*.
We sell *roses and flowers*.
Consider the sum semilattice of flower subtypes (Link, 1983):

Its nodes induce a partition over possible worlds:

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\[
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\ f_3 \\
\ f_2 \\
\ f_1 \\
\ f_1 \sqcup f_2 \\
\ f_1 \sqcup f_3 \\
\ f_2 \sqcup f_3 \\
\ f_1 \sqcup f_2 \sqcup f_3 \\
\end{array}
\]
Consider the sum semilattice of flower subtypes (Link, 1983):

We sell roses. We sell flowers. We sell roses and flowers.

The literal semantics of roses and flowers should be the same as that of roses!
The semantic puzzle

\[ \text{roses} \sqcup f_2 \sqcup f_3 \]

\[ \text{roses} \sqcup f_2 \quad \text{roses} \sqcup f_3 \quad f_2 \sqcup f_3 \]

\[ \text{roses}(f_1) \quad f_2 \quad f_3 \]
The semantic puzzle

roses ⊔ f_2 ⊔ f_3

roses ⊔ f_2  roses ⊔ f_3  f_2 ⊔ f_3

roses(f_1)  f_2  f_3

roses and flowers (literally)
The semantic puzzle

roses ⊔ f_2 ⊔ f_3

roses ⊔ f_2

roses ⊔ f_3

f_2 ⊔ f_3

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roses and flowers (literally)
The semantic puzzle

- *roses and flowers* is interpreted to commit the speaker to *more* than its literal meaning.
The semantic puzzle

- **roses and flowers** is interpreted to commit the speaker to *more* than its literal meaning.

- Where does this interpretation come from?

---

roses and other flowers

**roses $\sqsubseteq f_2 \sqcup f_3$**

**roses $\sqsubseteq f_2$**

**roses $\sqsubseteq f_3$**

**$f_2 \sqcup f_3$**

**roses($f_1$)**

**$f_2$**

**$f_3$**

**roses and flowers (literally)**
The semantic puzzle

• **roses and flowers** is interpreted to commit the speaker to *more* than its literal meaning

• **Where does this interpretation come from?**

• **Approach pursued here:** it is a conversational implicature
Conversational implicature

- Inference in context by which an utterance communicates more than what is literally said
- Driven by world knowledge and by alternative utterances—what could have been said
- Two major cases:
  - Quantity (Q-)implicature: the negation of an alternative utterance with a stronger meaning is inferred
    
    \[(I \text{ ate all of the apples})\]
  - Informativity (I-)implicature: reasoning to the typical case
    
    (Levinson 2000)
Conversational implicature

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• Two major cases:
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    \[ I \text{ ate some of the apples} \rightarrow I \text{ didn’t eat all of the apples} \]
    
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Conversational implicature

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  - Informativity (I-)implicature: reasoning to the typical case (Levinson 2000)
    
    \(The\text{ cup is on the table} \rightarrow The\text{ cup is in contact with the table}\)
The theoretical challenge and intuition

*roses and other flowers*

*roses and flowers* \textasciitilde \textit{flowers} \textasciitilde *roses*

\textbf{What provides the division of these alternatives’ pragmatic labor (Horn, 1984)?}
The theoretical challenge and intuition

**R:** the *roses* flower type  **OF:** any other flower type

*roses and other flowers*

*roses and flowers*  **flowers**

**What provides the division of these alternatives’ pragmatic labor (Horn, 1984)?**

*roses*
The theoretical challenge and intuition

**R:** the *roses* flower type  **OF:** any other flower type

- Alternative utterance set, and challenges:

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  roses

• Intuition:

  • If you had meant just R, you’d clearly have said *roses.*
The theoretical challenge and intuition

**R**: the *roses* flower type  **OF**: any other flower type

- Alternative utterance set, and challenges:

  *roses and other flowers*

  \[ \text{roses and flowers} \quad \text{flowers} \]

  \[ \text{What provides the division of these alternatives’ pragmatic labor (Horn, 1984)?} \]

  \[ \text{roses} \]

- Intuition:
  - If you had meant just **R**, you’d clearly have said *roses*.
  - But if you had meant **R \sqcup OF** it might have been too effortful to say *roses and other flowers*
The theoretical challenge and intuition

R: the *roses* flower type      OF: any other flower type

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  *roses*

• Intuition:

  • If you had meant just \( R \), you’d clearly have said *roses*.
  • But if you had meant \( R \sqcup \text{OF} \) it might have been too effortful to say *roses and other flowers*
  • So I’ll interpret *roses and flowers* as a shortened form that means \( R \sqcup \text{OF} \).
The theoretical challenge and intuition

\( \text{R: the } \textit{roses} \text{ flower type} \quad \text{OF: any other flower type} \)

- Alternative utterance set, and challenges:

  \( \textit{roses and other flowers} \)

  \( \text{Why no quantity implicature?} \)

  \( \textit{roses and flowers} \quad \textit{flowers} \)

  \( \text{What provides the division of these alternatives’ pragmatic labor (Horn, 1984)?} \)

  \( \textit{roses} \)

- Intuition:
  - If you had meant just \( \text{R} \), you’d clearly have said \( \text{roses} \).
  - But if you had meant \( \text{R} \sqcup \text{OF} \) it might have been too effortful to say \( \text{roses and other flowers} \).
  - So I’ll interpret \( \text{roses and flowers} \) as a shortened form that means \( \text{R} \sqcup \text{OF} \).
Rational Speech Act Theory

Assumptions:

- Speaker and listener beliefs represented as probability distributions over world states
- Joint communicative goal:
  - align the listener’s beliefs with those of the speaker
  - but maintain brevity while doing so!
- Grammar and the literal meanings of words are common knowledge between speaker and listener
- Speaker and listener can recursively reason (probabilistically) about each other

(Frank & Goodman, 2012; Goodman & Stühlmuller, 2013; see also Jäger, 2012)
Q-implicature in rational speech-act theory

I ate some of the apples → I didn’t eat all of the apples

\[ P^{(0)}_{\text{Listener}}(m|u, \mathcal{L}) \propto \mathcal{L}(m, u)P(m) \]

\[ P^{(n)}_{\text{Speaker}}(u|m) \propto \left[ P^{(n-1)}_{\text{Listener}}(m|u)e^{-c(u)} \right]^\lambda \]

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I ate some of the apples → I didn’t eat all of the apples

“Literal” listener

(Jäger, 2012; Frank & Goodman, 2012; Goodman & Stühlmuller, 2013)
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I ate some of the apples $\rightarrow$ I didn’t eat all of the apples

“Literal” listener

(Jäger, 2012; Frank & Goodman, 2012; Goodman & Stühlmuller, 2013)
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Q-implicature in rational speech-act theory

*I ate some of the apples* → *I didn’t eat all of the apples*

(Jäger, 2012; Frank & Goodman, 2012; Goodman & Stühlmuller, 2013)
Q-implicature in rational speech-act theory

I ate **some** of the apples → I didn’t eat **all** of the apples

(Thier, 2012; Frank & Goodman, 2012; Goodman & Stuhlmueller, 2013)
Q-implicature in rational speech-act theory

*I ate some of the apples* → *I didn’t eat all of the apples*

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"Literal" lexicon

World state

Utterance

"Literal" lexicon

0/1 filter function

Prior expectations about world state

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(Jäger, 2012; Frank & Goodman, 2012; Goodman & Stühlmuller, 2013)
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\[ P(\forall) = P(\exists \neg \forall) = \frac{1}{2} \]

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*I ate some of the apples* → *I didn’t eat all of the apples*

\[
P(\forall) = P(\exists \neg \forall) = \frac{1}{2}
\]

(Jäger, 2012; Frank & Goodman, 2012; Goodman & Stühlmuller, 2013)
Speaking in RSA

\[ P^{(1)}_{Speaker}(u|m) \propto \left[ P^{(0)}_{Listener}(m|u)e^{-c(u)} \right]^\lambda \]

\[ \lambda = 1 \]

\[ c(\text{some}) = c(\text{all}) = 0 \]
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Speaking in RSA

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P_{Speaker}^{(1)}(u|m) \propto \left[ P_{Listener}^{(0)}(m|u)e^{-c(u)} \right]^\lambda
\]

\[
c(some) = c(all) = 0
\]

Utterance cost

\[
\lambda = 1
\]
Speaking in RSA

\[ P_{Speaker}^{(1)}(u|m) \propto \left[ P_{Listener}^{(0)}(m|u)e^{-c(u)} \right]^\lambda \]

\( c(\text{some}) = c(\text{all}) = 0 \)

“Greedy optimality” parameter

\( \lambda = 1 \)
The pragmatic listener

\[ P^{(1)}_{\text{Listener}}(m|u) \propto P^{(1)}_{\text{Speaker}}(u|m)P(m) \]
The pragmatic listener

\[ P^{(1)}_{\text{Listener}}(m|u) \propto P^{(1)}_{\text{Speaker}}(u|m)P(m) \]
Speaker—listener recursion

- The process of recursion strengthens the implicature
Speaker—listener recursion

- The process of recursion strengthens the implicature

![Diagram showing some and all with corresponding labels A and E~A]
Other successes of RSA theory

- Basic Rational Speech Act theory’s virtues:
  - Quantitative fit to human interpretations in simple communication games (Frank & Goodman, 2012)
  - Accounts for effect of speaker knowledgeability of world state on implicature (Goodman & Stühlmuller, 2013)

- More advanced variants can account for:
  - Simple cases of Horn’s division of pragmatic labor (Bergen, Goodman, & Levy, 2012)
  - Vagueness and context-sensitivity of relative adjectives (Lassiter & Goodman, 2013)
  - Disjunctive expressions (Bergen, Levy, & Goodman, unpublished*)

*Draft now available online!
Basic RSA for *roses and flowers*

- We’ll simplify to two flower “types”:

\[
R \sqcap OF
\]

- The corresponding lexicon:

\[
\text{Partition over possible worlds}
\]

- \text{R} \quad \text{OF} \quad \text{R} \sqcap \text{OF}

- \text{roses and other flowers}
- \text{roses and flowers}
- \text{flowers}
- \text{roses}
Basic RSA for *roses and flowers*

- Basic RSA is unable to break the symmetry between *roses* and *roses and flowers* in the lexicon.

\[
P(R) = \frac{1}{3} \\
P(OF) = \frac{1}{3} \\
P(R \sqcup OF) = \frac{1}{3}
\]

\[c(\text{roses}) = c(\text{flowers}) = 0\]
\[c(\text{roses and flowers}) = 0.1\]
\[c(\text{roses and other flowers}) = 0.15\]
Basic RSA for *roses and flowers*

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\[
c(\text{roses}) = c(\text{flowers}) = 0 \\
c(\text{roses and flowers}) = 0.1 \\
c(\text{roses and other flowers}) = 0.15
\]
Refined word meanings and compositionality

• But we can extend the formalism in two respects:
  • Allow a distinction between a word’s literal meaning from its context-specific refined meaning
  • Require that a word’s context-specific refined meaning is preserved through semantic composition

• Bergen, Levy, and Goodman (unpublished) call this COMPOSITIONAL LEXICAL UNCERTAINTY
RSA with lexical uncertainty

\[ P_{\text{Listener}}^{(0)}(m|u, \mathcal{L}) \propto \mathcal{L}_u(m)P(m) \]

\[ P_{\text{Speaker}}^{(1)}(u|m, \mathcal{L}) \propto \left[ P_{\text{Listener}}^{(0)}(m|u, \mathcal{L})e^{-c(u)} \right]^\lambda \]

\[ P_{\text{Listener}}^{(1)}(m|u) \propto P(m) \sum_{\mathcal{L}} P(\mathcal{L})P_{\text{Speaker}}^{(1)}(u|m, \mathcal{L}) \]

\[ P_{\text{Speaker}}^{(n)}(m|u) \propto \left[ P_{\text{Listener}}^{(n-1)}(m|u)e^{-c(u)} \right]^\lambda \quad n > 1 \]

\[ P_{\text{Listener}}^{(n)}(m|u) \propto P(m)P_{\text{Speaker}}^{(1)}(u|m) \quad n > 1 \]

(Bergen, Goodman, and Levy 2012)
RSA with lexical uncertainty

Speaker considers literal listener behavior for each set of possible lexical refinements

\[
P^{(0)}_{\text{Listener}}(m|u, \mathcal{L}) \propto \mathcal{L}_u(m)P(m)
\]

\[
P^{(1)}_{\text{Speaker}}(u|m, \mathcal{L}) \propto \left[ P^{(0)}_{\text{Listener}}(m|u, \mathcal{L})e^{-c(u)} \right]^\lambda
\]

\[
P^{(1)}_{\text{Listener}}(m|u) \propto P(m) \sum_{\mathcal{L}} P(\mathcal{L})P^{(1)}_{\text{Speaker}}(u|m, \mathcal{L})
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\]

(Bergen, Goodman, and Levy 2012)
RSA with lexical uncertainty

Speaker considers literal listener behavior for each set of possible lexical refinements.

Pragmatic listener marginalizes over possible lexical refinements.

\[
P^{(0)}_{\text{Listener}}(m|u, \mathcal{L}) \propto \mathcal{L}_u(m) P(m) \\
P^{(1)}_{\text{Speaker}}(u|m, \mathcal{L}) \propto P^{(0)}_{\text{Listener}}(m|u, \mathcal{L}) e^{-c(u)} \lambda^{\lambda} \\
P^{(1)}_{\text{Listener}}(m|u) \propto P(m) \sum_{\mathcal{L}} P(\mathcal{L}) P^{(1)}_{\text{Speaker}}(u|m, \mathcal{L}) \\
P^{(n)}_{\text{Speaker}}(m|u) \propto P^{(n-1)}_{\text{Listener}}(m|u) e^{-c(u)} \lambda^{\lambda} \quad n > 1 \\
P^{(n)}_{\text{ Listener}}(m|u) \propto P(m) P^{(1)}_{\text{Speaker}}(u|m) \quad n > 1
\]

(Bergen, Goodman, and Levy 2012)
Compositional lexical uncertainty

\[
\begin{array}{c}
R \square OF \\
R & & OF
\end{array}
\]
Compositional lexical uncertainty

• Let *roses*, *flowers*, and *other flowers* each be refinable to any upward-closed set on the lattice
Compositional lexical uncertainty

• Let roses, flowers, and other flowers each be refinable to any upward-closed set on the lattice

\[
\text{roses} \quad \Box \quad \text{OF}
\]

\[
\text{R} \quad \Box \quad \text{OF}
\]

\[
\text{R} \quad \Box \quad \text{OF}
\]
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```
R □ OF

R

OF
```
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```
R △ OF
  △
 / \
R OF
```
Compositional lexical uncertainty

- Let *roses*, *flowers*, and *other flowers* each be refinable to any upward-closed set on the lattice

\[
R \sqcap OF
\]

\[
R \quad OF
\]

- Semantic composition for *and*:

\[
M(X \text{ and } Y) = M(X) \cap M(Y)
\]
Compositional lexical uncertainty

• Let *roses*, *flowers*, and *other flowers* each be refinable to any upward-closed set on the lattice

\[ R \sqcup \text{OF} \]

Roses

• Semantic composition for *and*:

\[ M(X \text{ and } Y) = M(X) \cap M(Y) \]
Compositional lexical uncertainty

- Let *roses*, *flowers*, and *other flowers* each be refinable to any upward-closed set on the lattice

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- Semantic composition for *and*:

  \[ M(X \text{ and } Y) = M(X) \cap M(Y) \]

- Final constraints: every utterance in the alternative set must have a meaning, and every meaning must be expressible by some utterance
<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>OF</th>
<th>R+OF</th>
</tr>
</thead>
<tbody>
<tr>
<td>roses and other flowers</td>
<td></td>
<td></td>
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<tr>
<td>roses and flowers</td>
<td></td>
<td></td>
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<tr>
<td>flowers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>roses</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Pragmatic listening after lexical uncertainty

roses and other flowers
roses and flowers
flowers
roses

R  OF  R+OF
Why is this informativeness implicature?
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- There are many possible context-specific refinements available for *flowers*
Why is this informativeness implicature?

• There are many possible context-specific refinements available for *flowers*

• Not all of them include $R$
Why is this informativeness implicature?

- There are many possible context-specific refinements available for *flowers*
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Why is this informativeness implicature?

- There are many possible context-specific refinements available for *flowers*
- Not all of them include $R$
- This breaks the overall symmetry between *roses* and *roses and flowers*
Why is this informativeness implicature?

- There are many possible context-specific refinements available for *flowers*
- Not all of them include \( R \)
- This breaks the overall symmetry between *roses* and *roses and flowers*
- It also makes \( R \& OF \) the “typical case” for *roses and flowers*
Why is this informativeness implicature?

- There are many possible context-specific refinements available for flowers
- Not all of them include R
- This breaks the overall symmetry between roses and roses and flowers
- It also makes R&OF the “typical case” for roses and flowers
- This and considerations of brevity overwhelm the pressure for Q-implicature from roses and other flowers
Conclusion
Conclusion

- Discovered the *roses and flowers* construction
Conclusion

- Discovered the *roses and flowers* construction
- Found out that it’s been around for a while
Conclusion

- Discovered the *roses and flowers* construction
- Found out that it’s been around for a while
- Found out that it is interpreted as *roses and other flowers*
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• Showed why its literal semantics shouldn’t mean that
Conclusion

• Discovered the *roses and flowers* construction
• Found out that it’s been around for a while
• Found out that it is interpreted as *roses and other flowers*
• Showed why its literal semantics shouldn’t mean that
• Showed how its interpretation can nevertheless be accounted for under a rational speech-act theory
Many thanks to...

- Funders:
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  - Alfred P. Sloan Foundation
  - Center for Advanced Study in the Behavioral Sciences

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  - Dan Lassiter
  - Beth Levin
  - Stanley Peters
  - Chris Potts
  - Judith Tonhauser

- SALT organizers and reviewers

- All of you for listening!
Meet lattice for events
Meet lattice for events
Meet lattice for events

\[ \text{roses} \land f_2 \land f_3 \]

\[ \text{roses} \land f_2 \]

\[ \text{roses} \land f_3 \]

\[ f_2 \land f_3 \]

\[ \emptyset \]
Meet lattice for events

\[
\begin{align*}
\text{roses} & \quad \text{roses} \land f_2 \land f_3 \\
\text{flowers} & \quad f_2 \land f_3 \\
\emptyset & \quad \text{roses} \land f_2 \\
\end{align*}
\]
Meet lattice for events

roses and flowers

roses

roses ∧ \( f_2 \) ∧ \( f_3 \)

flowers

\( f_2 \) ∧ \( f_3 \)

\( f_2 \)

\( f_3 \)

\( \emptyset \)