

Project

Negative Polarity Items: Language meets Logic, subjectively

Chemla, Homer, Rothschild
LSCP, IJN, ENS-DEC, Oxford

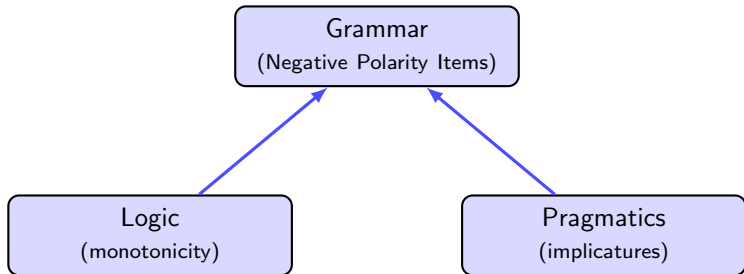
June 11, 2010

The project

- The distribution of Negative Polarity Items (NPI)

- (1) Jean n'a pas le moindre talent pour la musique.
Jean doesn't have any talent for music.
- (2) * Jean a le moindre talent pour la musique.

- A key role



- Today's main conclusion

The grammaticality of NPIs relies on *subjective* logic

The distribution of NPIs

(3) Jean n'a pas le moindre talent pour la musique.

(4) * Jean a le moindre talent pour la musique.

- **Hypothesis 1:** NPIs are felicitous **under negation**

(5) Chaque alien qui a le moindre talent pour la musique est obèse.
Each alien who has any talent for music is obese.

(6) * Chaque alien a le moindre talent pour la musique.
*Each alien has any talent for music.

[Chaque $\underbrace{[\text{NP } [\text{RELC } \text{qui } \dots]]}_{\text{restrictor}}$ $\underbrace{[\text{VP}]}_{\text{nuclear scope}}$]

restrictor nuclear scope

- **Hypothesis 2:** NPIs are felicitous in **negative environments**

→ A generalized notion of negativity: **Downward Entailingness**

NPI = Negative Polarity Item

Monotonicity (from examples)

- (7) saumon ('salmon') ↑
saumon fumé ('smoked salmon')
- (8) Jean a du saumon. ↑
Jean a du saumon fumé.
- (9) Jean n'a pas de saumon. ↓
Jean n'a pas de saumon fumé.
- (10) Chaque alien a goûté du saumon. ↑
Chaque alien a goûté du saumon fumé.
- (11) Chaque alien qui a goûté du saumon est poilu. ↓
Chaque alien qui a goûté du saumon fumé est poilu.






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Monotonicity: abstract, general definition

- **Definitions**

$X^+ \Rightarrow X$

– $\varphi(\dots)$ is **Downward-Entailing (DE)** if $\varphi(X^+) \Leftarrow \varphi(X)$

– $\varphi(\dots)$ is **Upward-Entailing (UE)** if $\varphi(X^+) \Rightarrow \varphi(X)$

Generalization [NPI]

$\varphi(\text{NPI})$ is felicitous when $\varphi(\dots)$ is **downward**-entailing

Fauconnier, Ladusaw (1970's)

- **What's surprising**

- Judgments for NPIs: easy
- Monotonicity judgments: hard (Geurts & van der Slik 2005)
- Judgments for NPIs are graded
- A logical property is not graded
- How does grammar access this logical, abstract property?

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- **Task 1:** Collect judgments about **NPI grammaticality**

The top sentence is always a control without the NPI

Chaque alien qui a du talent pour la musique est obèse.

Bizarre Naturel

Chaque alien qui a le moindre talent pour la musique est obèse.

Bizarre Naturel

Submit

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- **Task 1:** Collect judgments about **NPI grammaticality**
- **Task 2:** Collect judgments about **monotonicity inferences**
 - Downward monotonicity:

“Chaque alien qui a goûté du saumon est poilu.”

→ Chaque alien qui a goûté du saumon fumé est poilu.

Faible

Fort

- Upward monotonicity: same sentences in the other order

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Monotonicity also plays a role for Scalar Implicatures (SIs)

- Direct scalar implicatures

- (12) John visited **several** Parisian museums.
→ NOT[John visited all the Parisian museums]

Generalization [dSI] *(purely Gricean version)*
 $\varphi(\textit{several})$ implicates not- $\varphi(\textit{all})$
whenever $\varphi(\textit{all}) \Rightarrow \varphi(\textit{several})$
i.e. when $\varphi(\dots)$ is **upward**-entailing

- Indirect scalar implicatures

- (13) John didn't visit **all** the Parisian museums.
→ NOT[John didn't visit any Parisian museums]
= John visited some Parisian museums.

Generalization [iSI] *(purely Gricean version)*
 $\varphi(\textit{all})$ implicates not- $\varphi(\textit{some})$
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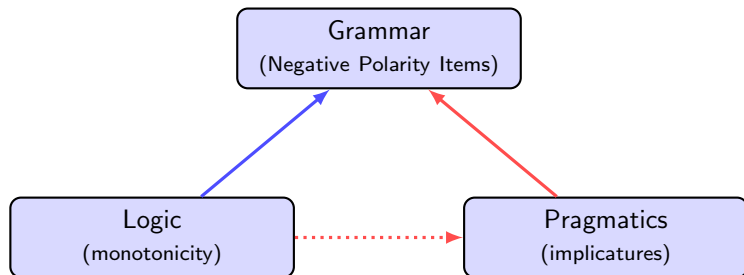
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Theoretical situation



- **Implicature approaches to NPI**

The same linguistic operator: 1. licenses NPIs

2. gives rise to implicatures

Kadmon and Landman, Krifka, Chierchia...

- **Task 1:** Collect judgments about **NPI grammaticality**
- **Task 2:** Collect judgments about **monotonicity inferences**
- **Task 3:** Collect judgments about **scalar implicatures**

- Direct scalar implicatures

[$\varphi(\textit{several}) \rightarrow \textit{not-}\varphi(\textit{all})$]

“Chaque alien qui a visité plusieurs musées parisiens est rouge.”
 → Certains ont visité tous les musées p. et ne sont pas rouges.



- Indirect scalar implicatures

[$\varphi(\textit{all}) \rightarrow \textit{not-}\varphi(\textit{some})$]

“Chaque alien qui a visité tous les musées parisiens est rouge.”
 → Certains ont visité des m.p. (un ou plus) et ne sont pas rouges.



- **Task 1:** Collect judgments about **NPI grammaticality**
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Project

- Collect:
 - Grammar: judgments for NPIs
 - Logical competence: downward monotonicity
upward monotonicity
 - Pragmatic competence: direct scalar implicatures
indirect scalar implicatures
- Investigate the correlations

Experiment

- **Cover story**

Aliens arrived on Earth! This is obviously what everyone talks about and we ask you to imagine that the sentences you are going to see are uttered in a conversation about these aliens...

- **2 sets of 7 or 8 environments:**

- Comparing Scopes and Restrictors systematically
- Comparing Scopes of similar quantifiers (e.g., Less than vs. At most)

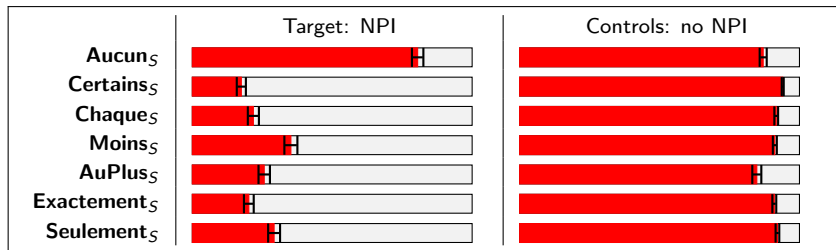
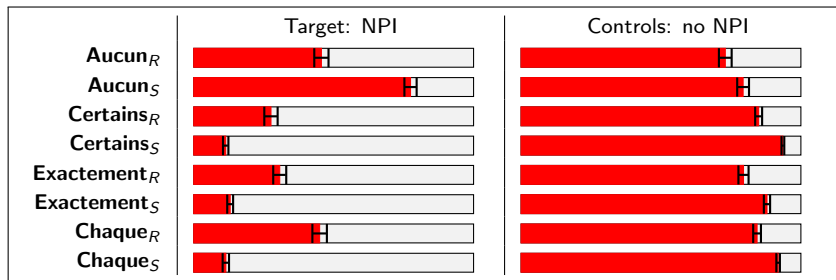
- **3 blocks:** NPI, Monotonicity, Scalar Implicatures

- **2×24 participants:** 6 for each order of presentation of the 3 blocks

(the NPI block was never last)

- **Number of items ≈ 250 :** $7/8$ (env.) $\times 6$ (judgments) $\times 6$ (repetitions)

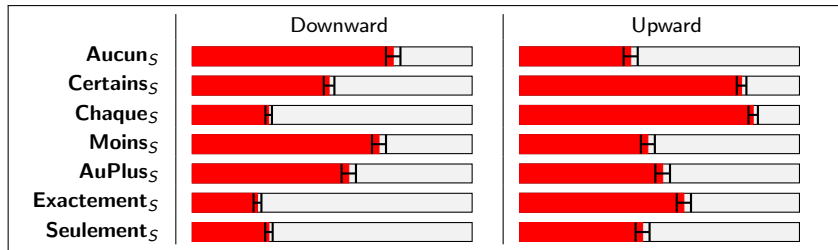
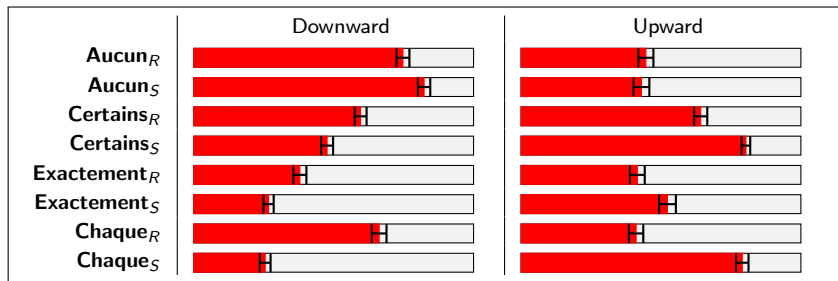
Bare results: NPI



- Controls are good
- Intuitively reasonable judgments
- Subtle differences arise

→ Good methodology

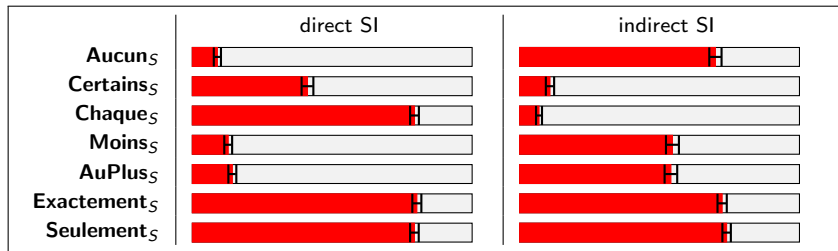
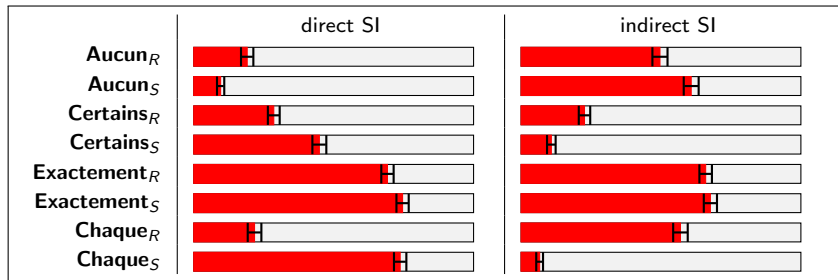
Bare results: Monotonicity



Not clear cut (as one may expect):

→ participants do not have direct access to monotonicity judgments

Bare results: scalar implicatures



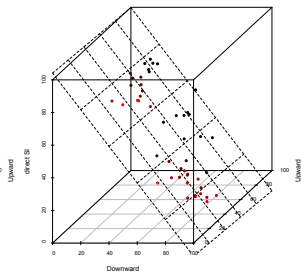
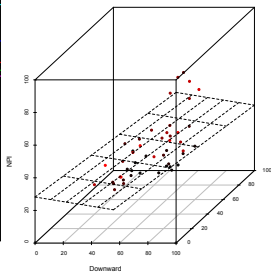
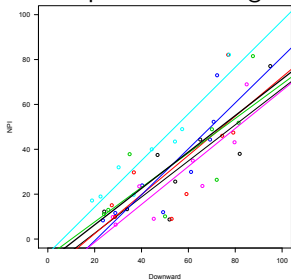
Correlations

1. For each subject and each environment, plot mean NPI judgments against downward-monotonicity judgments.
2. For each subject, compute the linear regression:

$$\text{NPI} = \alpha_D \times \text{D-MON} + \beta \quad (r^2)$$

$$\text{NPI} = \alpha_D \times \text{D-MON} + \alpha_U \times \text{U-MON} + \beta \quad (r^2)$$

3. Compute the average α and r^2 across subjects



nb: Standardized α and adjusted r^2

nb: per item analyses yield similar results

Results: implicatures and monotonicity

scopes

	Down (r^2)	Up (r^2)
dSI	-0.72 (.84)	.32 (.61)
iSI	.02 (.67)	-0.53 (.81)

	Down	Up	(r^2)
dSI	-0.72	.056	(.83)
iSI	-.23	-0.64	(.80)

restrictors

	Down (r^2)	Up (r^2)
dSI	-0.73 (.85)	.28 (.67)
iSI	.10 (.63)	-0.48 (.80)

	Down	Up	(r^2)
dSI	-0.69	.057	(.85)
iSI	-.15	-0.60	(.79)

- Negative correlations!

- Interpretation

Generalization [dSI]

(purely Gricean version)

$\varphi(\textit{some})$ implicates $\textit{not-}\varphi(\textit{all})$

when $\varphi(\dots)$ is **upward-entailing**

Generalization [dSI] (Update)

(neo-Gricean version)

$\varphi(\textit{some})$ implicates $\textit{not-}\varphi(\textit{all})$

when $\varphi(\dots)$ is **not downward-entailing**

Similarly for indirect scalar implicatures

- In words

- Old version: alternatives are negated whenever they are stronger
- New version: alternatives are negated **whenever it is possible**

Results: Explaining judgments about NPI

- For NPIs: no clear asymmetry between Up and Down

→ NPIs are different from scalar implicatures

scopes

	Down (r^2)	Up (r^2)
NPI	.39 (.73)	-.41 (.73)

	Down	Up	(r^2)
NPI	.27	-.33	(.79)

restrictors

	Down (r^2)	Up (r^2)
NPI	.59 (.76)	-.39 (.71)

	Down	Up	(r^2)
NPI	.41	-.32	(.79)

- Weaker correlation with SIs? (adjusted r^2)

Probably true at least when only direct or only indirect SIs are included.

scopes

	dSI (r^2)	iSI (r^2)
NPI	-.43 (.71)	.28 (.64)

	dSI	iSI	(r^2)
NPI	-.40	.20	(.70)

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	dSI (r^2)	iSI (r^2)
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Interpretation

- Refinement of the logic thesis

Generalization [NPI]

$\varphi(\text{NPI})$ is felicitous when $\varphi(\dots)$ is **downward**-entailing

Generalization [NPI] (New!)

$\varphi(\text{NPI})$ is felicitous when $\varphi(\dots)$ is

1. **perceived** as **downward**-entailing **and**
2. **perceived** as not-**upward**-entailing

- Against the SI approach

- Monotonicity correlates differently with NPI (symmetrical) and SI (asymmetrical)
- No single operator for NPIs and dSIs, or for NPIs and iSIs

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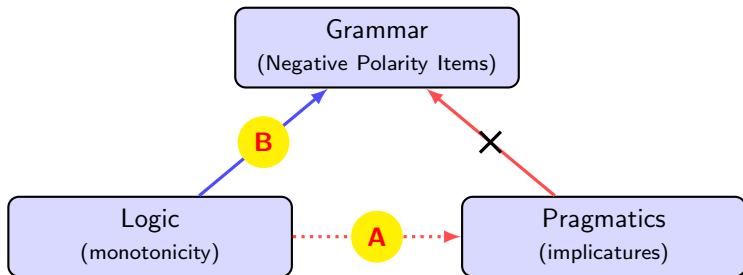
Conclusions

A. Logic in Pragmatics

Results support **modern** approaches to scalar implicatures

B. Logic in Grammar

Results are in favor of an **enriched** and **subjective** logic approach



- **Unified methodology:** inferences and grammaticality

Perspectives

- Different NPIs, different scalar items
- Cross-linguistic, cross-cultural differences
- Other phenomena:
 - **Positive Polarity Item (PPI)**
 - Other linguistics/logic generalizations (e.g., about quantifiers)

