

Eembedding Implicatures: global or local?

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Local and global theories of NL interpretation

◆ Local Theories

- The (grammatical) status of a (linguistic) expression S is decided exclusively considering properties of S , and the properties of other linguistic objects S' are completely irrelevant for this decision.
- The interpretation of S is independent of the existence of related linguistic expressions S' that share the interpretation

◆ Global Theories (competition-based)

- There are different linguistic expressions in competition. The winner of the competition suppresses the other competing candidates, ruling them out from the set of well-formed linguistic objects
- Interpretations of S can be blocked by the existence of competitive forms S' .

Examples

	Local	Global
Syntax	Traditional generative syntax	OT syntax connectionism
Semantics	Montague semantics Interpretive optimization (Hendriks & de Hoop)	Early structuralism & lexical field theories Bidirectional optimization
Presuppos.	Van der Sandt, Geurts	Zeevat (discourse particles)
Implicature	Relevance Theory Chierchia 2004	Neo-Gricean theories OT-Pragmatics

Questions

- ◆ Is there only one truth: Either local or global?
- ◆ If local and global theories can coexist: What is their proper place?
- ◆ What is the relation between both theories? How to transform global theories into local ones?

1 Embedded implicatures

- Explicature and implicature
- Embedded implicature hypothesis (EIH)
- R-based implicatures generally satisfy EIH
- Q-based implicatures can violate EIH

The relevance theoretic distinction between explicature and implicature

- ◆ *Explicatures* are assumptions constructed by developing the logical forms encoded by the utterance. *Implicatures* are assumptions constructed by “developing assumption schemes retrieved from encyclopaedic memory” (Sperber & Wilson 1986, p. 181)
- ◆ An *Explicature* is a pragmatically determined part of what is said (‘truth-conditional pragmatics’). *Implicatures proper* relate to the non-truth-conditional aspects of pragmatics (Carston 2002)
- ◆ **E:** John had a drink \rightsquigarrow John had an alcoholic drink
I: Some students wrote an essay \rightsquigarrow not all students wrote an essay

Embedding and Scope

- ◆ **Scope principle:** *A pragmatically determined aspect of meaning is part of what is said (and therefore, not a conversational implicature), if – and perhaps only if – it falls within the scope of logical operators such as negation and conditionals. (Carston 2002: 191)*
- ◆ Obviously, this principle is related to Green's 'Embedded Implicature Hypothesis' (EIH):
EIH: *If assertion of a sentence S conveys the implicatum that p with nearly universal regularity, then when S is embedded the content that is usually understood to be embedded for semantic purposes is the proposition $S \& p$. (Green, 1998: 77)*

Embedded implicature hypothesis (EIH)

EIH seems to hold for R-based implicatures (\approx *explicatures*) but not generally for Q-based implicatures

- (1') a. I believe that John had a drink \rightsquigarrow I believe that John had an AD
b. I doubt that John had a drink \rightsquigarrow I doubt that John had an AD
- (2') a. I believe that some students wait for me \rightsquigarrow I believe that some but not all students wait for me
b. I doubt that some students wait for me \rightsquigarrow I believe that no students wait for me
c. I doubt that some students wait for me \rightsquigarrow I doubt that some but not all students wait for me [too weak!]
d. ?Possibly all students are waiting for me. Hence, I doubt that some students are waiting for me.

R-based implicatures satisfy EIH

The intuitive truth-conditional content of an utterance may go well beyond the proposition obtained by decoding, disambiguation and reference assignment. The following examples illustrate **free enrichment** as a pragmatic processes that contribute to the recovery of the proposition expressed by an utterance. Neo-Griceans would classify them as R-based

- (3) a. I lost a contact lens in the accident (\rightsquigarrow contact lens of the Speaker)
b. I didn't lose a contact lens in the accident, but Mary did
c. Either Mary lost a contact lens in the accident or Bob did
- (4) a. Peter drank several beers and drove home (\rightsquigarrow temporal sequence)
b. If Peter drank several beers and drove home, then I will really be disappointed
b. If Peter drove home and drank several beers, then I will not be disappointed

More R-based implicatures

Domain restrictions

- (5) a. Everyone left early (\rightsquigarrow everyone at the party left early)
b. Either everyone left early or the ones who stayed on are in the garden

Meronomic restriction

- (6) a. This apple is red (\rightsquigarrow the outside of the apple is red)
b. I doubt that this apple is red



Reciprocals and plural predication

- (7) a. The girls saw each other (\rightsquigarrow every girl saw every other girl)
b. I doubt that the girls saw each other. No girl sees girl 5
- (8) a. The cats see the dogs (\rightsquigarrow every cat sees every dog)
b. I doubt that the cats see the dogs. No cat sees dog 3
- (9) a. The cats are sitting in the baskets (\rightsquigarrow every cat is sitting in one of the baskets)
b. # I doubt that the cats are sitting in the baskets. No cat is sitting in basket 3, all cats are sitting in baskets 1 and 2 (Winter 2001)

Q-based implicatures violate EIH

- (10) a. Mary lives somewhere in the south of France
b. Speaker does not know where in the south of France Mary resides.
c. If Mary lives somewhere in the south of France, then I do not know where
d. If (c) would satisfy EIH, then it should be a tautology, see Carstons p. 194)
- (11) a. $\varphi \rightsquigarrow \neg K \psi$, with ψ stronger than φ
b. $\exists x \varphi(x) \rightsquigarrow \neg K \varphi(a)$, for each individual place a
c. $\exists x \varphi(x) \rightarrow \neg K \varphi(a)$ [no stronger alternatives]
d. $(\exists x \varphi(x) \ \& \ \neg K \varphi(a)) \rightarrow \neg K \varphi(a)$ [tautology for local solution].

Scalar implicatures: or

- (12) a. If Paul or Bill come, Mary will be upset
b. #But if Paul and Bill both come, Mary won't be
c. If Paul comes, Mary or Sue will be upset

The local implicature (EIH) is not realized in the antecedent but in the conclusion

- (13) I wasn't shocked because I touched the red wire OR the blue wire. I was shocked because I touched both. (D. Fox)

The local implicature IS realized in the antecedent when the OR is marked

- (14) John doubts that Paul or Bill are in that room. (This sentence cannot be used if it is evident for John that both are in the room)

The local implicature is not realized in negative embedding predicates

- (15) Did John or Paul arrive?
a. # No; they both did
b. Yes, they both did

In questions, the local implicature does not appear

Scalar implicatures: count nouns

(16) a. John: “My colleague makes \$ 100 an hour”

b. John believes that his colleague makes \$ 100 an hour

c. If he makes \$ 100 an hour then he must be very rich.

Again the local implicature is realized in (b) but not in (c)

(17) a. If John has two cars, the third one parked outside must be somebody else’s.

b. If John has two cars *and no more*, the third one parked outside must be somebody else’s

Chierchia (p.24) describes this as an accommodation (what is different from a local implicature)

- ◆ Conclusion: The scalar implicatures connected with count nouns only appear in upward entailing contexts.

Conclusions of the empirical part

- ◆ R-based implicatures are Explicatures (satisfying EIH)
- ◆ Q-based implicatures do not generally satisfy EIH (roughly: they locally project in upward entailing contexts but not in downward entailing contexts)
- ◆ Apparent counterexamples do not destroy this picture:
 - I wasn't shocked because I touched the red wire OR the blue wire. I was shocked because I touched both.
 - Usually you may only take an apple. So, if you may take an apple OR take a pear, you should bloody well be pleased.

2 Global theories

- Neo-Gricean theories are global
- Can a global theory explain EIs?
 - Q-based (Sauerland and others)
 - R-based (notion of **Relevance**)

Conversational Implicatures

I-principle (termed **R** by Horn)

Quantity 2, Relation

- ◆ *Say no more than you must (given Q)* (Horn 1984)
- ◆ *Read as much into an utterance as is consistent with what you know about the world (bearing the Q-principle in mind).*

[Levinson 1983: 146f.]

Conditional perfection, *neg-raising*, bridging

- ◆ Seeks to select the most *harmonic* interpretation

Interpretive Optimization

Q-principle

Quantity 1

- ◆ *Say as much as you can (given I)* (Horn 1984).
- ◆ *Do not provide a statement that is informationally weaker than your knowledge of the world allows, unless providing a stronger statement would contravene the I-principle*

[Levinson 1987: 401]

Scalar implicatures

- ◆ Can be considered as a blocking mechanism

Expressive Optimization

Can a global theory explain EIs?

- ◆ I think it can explain the contrast between explicatures and implicatures proper, with three provisos:
 - reconsideration of the epistemic status of Q-based implicatures: $\varphi \rightsquigarrow \neg K\psi$ rather than $\varphi \rightsquigarrow K\neg\psi$
 - possibility of strengthening: $\neg K\psi \rightsquigarrow K\neg\psi$
 - proper definition of relevance for R-based implicatures
- ◆ R-based implicatures satisfy EIH
- ◆ Q-based implicatures project in a different way (roughly: they locally project in upward entailing contexts but not in downward entailing contexts)

In defense of a global theory (**Q**)

- ◆ Only a global theory can explain $\neg(\forall A)B \rightsquigarrow (\exists A)B$
[because the blocking clause $\neg K\neg(\exists A)B$ results in an embedding implicature $K((\exists A)B)$]
- ◆ A global theory accounts for the implicatures due to embedded scalar implicatures, e.g. $K(\exists A)B \rightsquigarrow K(\exists A)\neg B$
[because the blocking clause $\neg K(\forall A)B$ is strengthened to $K\neg(\forall A)B$, i.e. $K(\exists A)\neg B$]
- ◆ In downward entailing context no blocking term is available for *some*. Hence, the EIH is violated.

In defense of a global theory (**R**)

- ◆ For the proper treatment of R-based implicatures we need a proper measure of relevance
 - BE Strong (maximize informativity) fails for negative contexts
 - The same for the relevance-theoretic notion of relevance (maximize the contextual effect)
 - However, there are appropriate measures of the relevance of complex sentences.

Relevance (Merin 1997)

Three conditions of a local theory of relevance

- (1) $\text{Rel}(A \& B) = \text{Rel}(A) + \text{Rel}(B)$ if A and B are independent
- (2) **$\text{Rel}(A) = -\text{Rel}(\neg A)$**
- (3) $\text{Rel}(A \vee B) = \alpha \text{Rel}(A) + (1 - \alpha) \text{Rel}(\neg A)$ with $0 \leq \alpha \leq 1$

Relevance (following van Rooy 2004)

◆ Goal-directed relevance functions

- Standard statistical relevance: $\mathbf{r}(G, A) = P(G/A) - P(G)$
- Carnap's relevance: $\mathbf{c}(G, A) = P(G \cap A) - P(G) \times P(A)$
- Good's relevance: $\mathbf{g}(G, A) = \log P(A/G) - \log P(A/\neg G)$

◆ Other notions

- Merin, reconstructing RT's contextual effect
 $CE(A, C) = \text{inf}(A | C)$, with $\text{inf}(A | C) = -\log_2 \text{prob}(A | C)$
- Van Rooy: Relevance of an answer to a question
 $\square_Q(A) = E(Q) - E(Q | A)$

Optimal enrichments of underspecified logical forms LF

- ◆ Fact: If m is an *optimal* enrichment of LF then $\neg m$ is an optimal enrichment of $\neg LF$
- ◆ Proof:
 - Assume a local enrichment mechanism for logical forms, i.e. m is an enrichment of $LF \rightarrow \neg m$ is an enrichment of $\neg LF$
 - Assume $\text{Rel}(m) = \neg \text{Rel}(\neg m)$
 - Consequently, m is an *optimal* enrichment of $LF \rightarrow \neg m$ is an optimal enrichment of $\neg LF$
- ◆ It can be concluded that EIH is inherited by negation, i.e. if a structure \mathcal{S} satisfies EIH, then also $\neg \mathcal{S}$ satisfies it.

3 Local theories

- Local projection mechanism
- In defense of a local theory
- Blocking cannot be an online phenomenon

Local projection mechanism

- ◆ Local theories use a compositional mechanism in order to calculate the implicatures of complex sentences.
 - Basic implicatures are connected to particular lexical items
 - They project in an obvious way in case EIH is satisfied
 - If EIH is not generally satisfied a more refined projection mechanism is required (e.g. Chierchia's)

In defense of a local theory

- ◆ Only local theories can account for an incremental interpretation mechanism.
- ◆ Experimental pragmatics has stressed the automaticity of processing conversational implicatures (Tanenhaus, Noveck, Breheny, etc.). The emergence of local theories conforms to automatization.

Blocking cannot be an online phenomenon

- ◆ A problem for *Neo-Gricean* theories: There is no direct way to analyse blocking as an online, incremental mechanism
- ◆ This holds both for simple and complex sentences
- ◆ Therefore, the blocking of certain interpretations has to be treated as an offline phenomenon. For instance, it can be seen as a consequence of (bidirectional) learning
- ◆ Hence, the effect of blocking is a *fossilization phenomenon*

4 Global and local theories as two different perspectives

- Different time scales
- Toward a unified theory: Fossilization
- Example 1: *some* and *all*
- Example 2: *Pronouns* and *reflexives*

Different time scales

- ◆ A global theory such as bidirectional OT pragmatics should be seen as describing *diachronic* forces that explains conversational implicatures as the product of rational behaviour between cooperative conversants on a diachronic time scale
- ◆ This does not conflict with local theories (Chierchia 2001, ...) which take a *synchronic perspective* and assume that scalar implicatures are computed automatically in the grammar by means of special semantic composition rules.

Towards a unified theory: Fossilization

- ◆ The idea of Fossilization provides an explanation of how local theories of interpretation emerge from global ones
- ◆ In the framework of OT, local theories of interpretation conform to unidirectional, interpretive optimization
- ◆ Global theories of interpretation conform to bidirectional optimization
- ◆ Hence, the mechanism of *fossilization* can be understood as a transformation that turns a bidirectional OT system into a (nearly equivalent) unidirectional one. The latter conforms with incremental interpretation whereas the former does not.

Some roots of the idea

- ◆ ‘Invited Inferences’ (Geis & Zwicky 1971). Mechanism of conventionalization for implicatures
- ◆ Traugott (2005 and earlier) applied the idea to explain language change (lexicalization and language change)
- ◆ Levinson (2000) und Mattausch (2004) used the idea for explaining the development of binding principles.

Applications

- ◆ Deriving a local theory of embedded implicatures from a global (neo-Gricean) theory
- ◆ Fossilization of simple scalar implicatures
- ◆ The idea of fossilization as a starting point for resolving puzzles in experimental pragmatics
 - *Some elephants have a trunck*: why children sometimes think more logical than adults (Noveck)
 - The acquisition of binding principles: why children sometimes misinterpret pronouns while correctly producing them (Hendriks & Spender)

Example 1: *Some and all*

◆ Experimental Pragmatics: Noveck u.a.

		10-11	Adults
– Some elephants live in the zoo (appropriate)	yes	90%	99%
– All elephants live in the zoo (inappropriate)	no	99%	99%
– Some elephants have trunks (inappropriate)	yes	85%	41%
– All elephants have trunks (appropriate)	yes	99%	96%
– Some elephants have wings (absurd)	no	99%	98%
– All elephants have wings (absurd)	no	99%	99%

◆ Why children sometimes think more logical than adults?

◆ Two possible answers

- metalinguistic ability for perspective changing (bidirektional reasoning) not yet developed
- Fossilization not yet progressed

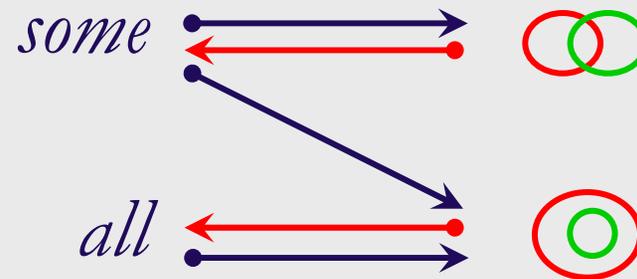
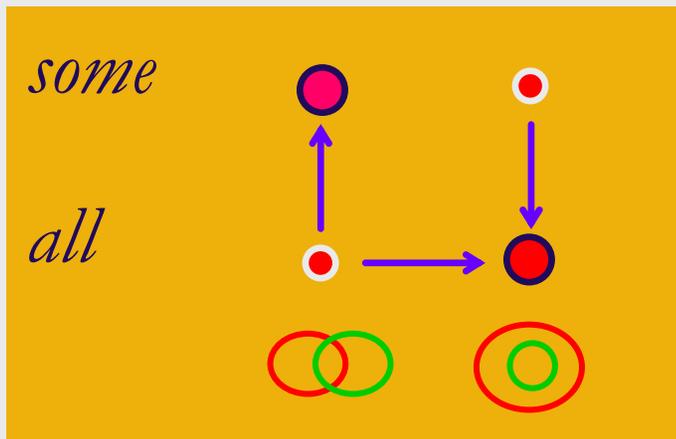
Two possible answers

- ◆ Metalinguistic abilities for perspective changing (bidirektional reasoning) not yet developed
- ◆ Fossilization not yet proceeded

	<i>Functional</i>	<i>Formal</i>
<i>Genetic evolution</i>	Evolutionary Psychology (<i>Pinker</i>)	Minimalist program (<i>Chomsky</i>)
<i>Cultural evolution</i>	Recruitment theory (<i>Steels</i>)	Iterated learning (<i>Kirby, Hurford, Zuidema</i>)

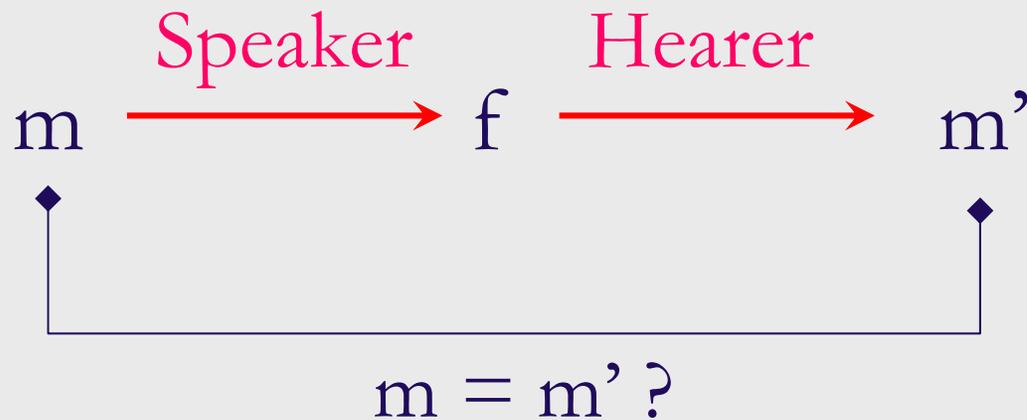
The implementation of the first answer

- ◆ Lexical Constraint A : *all* \rightarrow Set-inclusion
- ◆ Referential Economy: prefers *all* \gg *some*



- ◆ Bidirectional Solutions

The implementation of the second answer: (Iterated) Learning



If yes, nothing happens

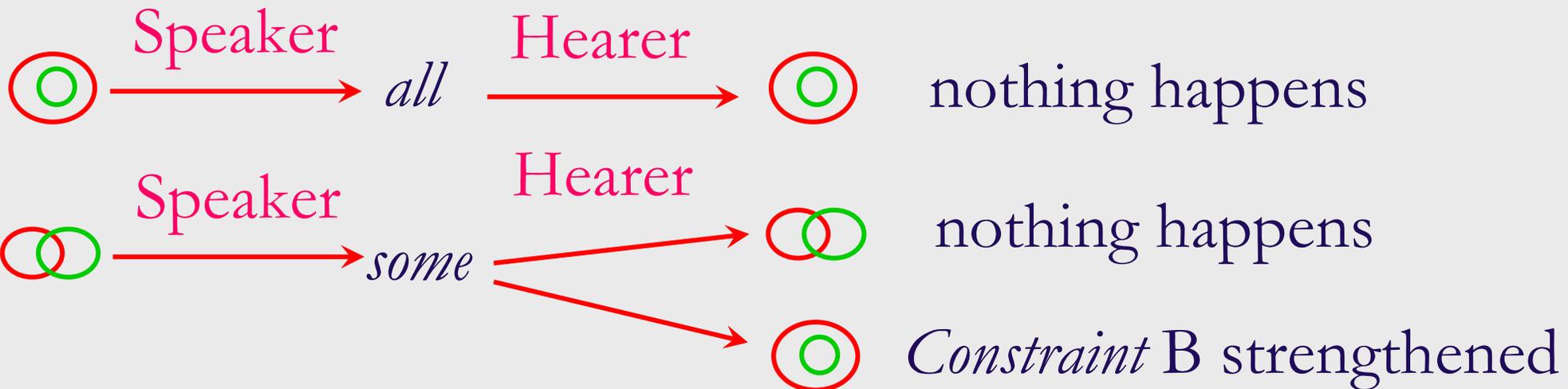
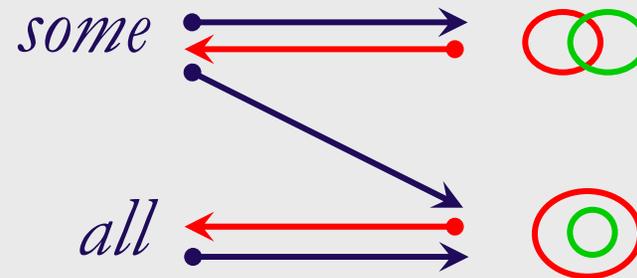
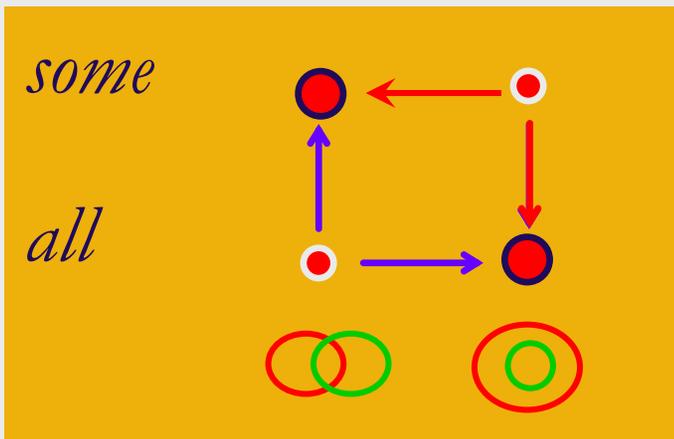
If no, adjustment:

All constraints that favour (f, m) over (f, m') are promoted

All constraints that favour (f, m') over (f, m) are demoted

The second answer: Fossilization

- ◆ Lexical *Constraint A*: *all* \rightarrow Set-inclusion
- ◆ Referential Economy: *all* \gg *some*
- ◆ Potential lexical *Constraint B*: *some* \rightarrow Set-intersection;



Can we empirically distinguish between the two possible answers?

- ◆ Look for similar examples of blocking within other lexical domains
- ◆ According to the solution of *evolutionary psychology* the crucial developmental stages should appear synchronously for the different domains
- ◆ According to the solution of *(iterated) learning* the time course of the development is not necessarily synchronized but may crucially depend on factors of frequency and other use factors.

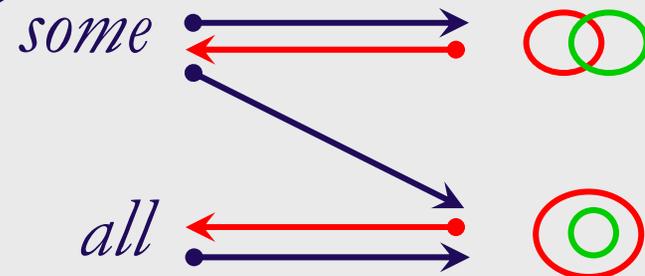
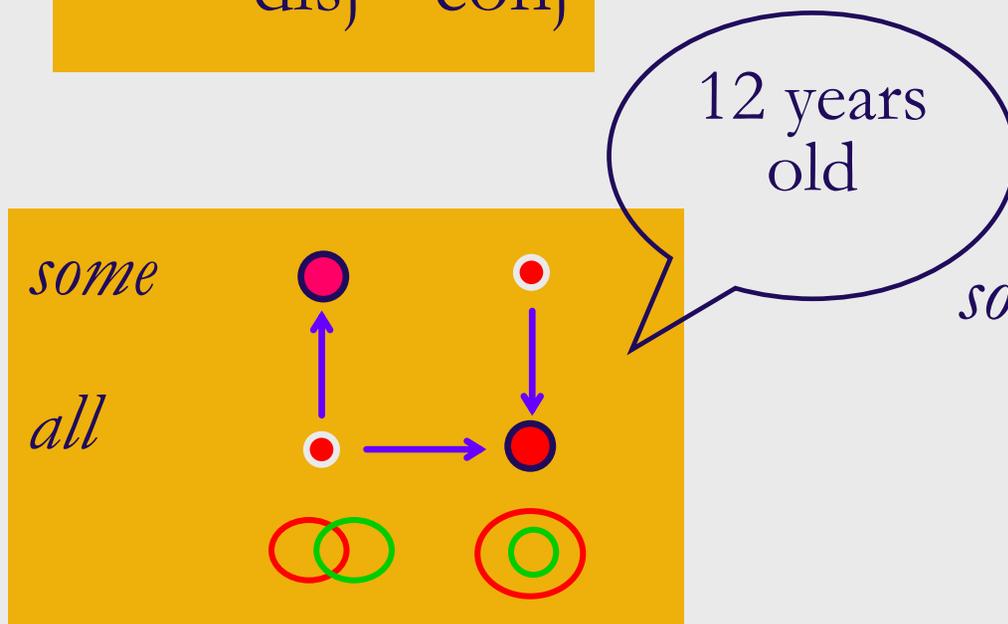
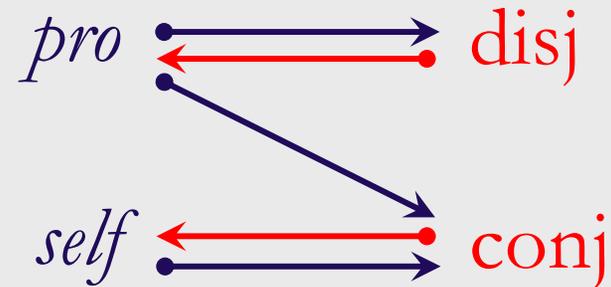
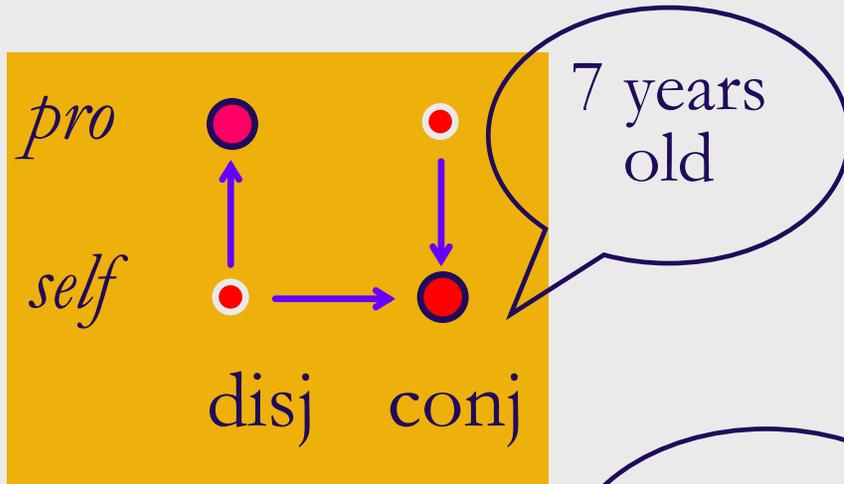
Children's *interpretation* and *production* of pronouns and reflexives

(1) Bert saw himself

(2) Bert saw him

- ◆ Sentences like (1) are correctly understood from the age of 3;0
- ◆ The *him* in (2) is misinterpreted as coreferring with the subject about half the time. Children continue to perform poorly on the interpretation of pronouns even up to the age of 6;6.
- ◆ Production: Even very young children (ranging from 2;3 to 3;10), consistently used the pronoun to express a disjoint meaning while they used the reflexive to express a coreferential interpretation (more than 95% correct)

Comparing two cases of blocking



5 Conclusions

- Local and global approaches can coexist. Local approaches conform to a synchronic view, global approaches conform to a diachronic view.
- Hence, we can see the synchronic account as informed by a diachronic account. Conforms to the classical view of ‘Grammaticalization’ = the harnessing of pragmatics by a grammar (Haiman 1985)
- In OT, the mechanism of **fossilization** can be understood as a transformation that turns a bidirectional OT system into a (nearly equivalent) unidirectional one. The latter conforms with incremental interpretation whereas the former does not.