Scalar Implicatures #1

1. Inferences that don't follow automatically from logical analysis.

1.1. Letter of recommendation

(1) s(peaker): Mr. X's command of English is excellent, and his attendance at tutorials has been regular.
Inference: (s believes that) Mr. X is a bad philosopher.

Is this a logical inference? At first sight doesn't seem very plausible.

Goal: To see if there is a pragmatic explanation – if whatever effects language use (the "conditions governing conversation") determines that the best explanation of s's utterance attributes to s a belief that X is a bad philosopher.

My opinion: Yes, plausible that there is a pragmatic explanation (though not at all trivial).

1.2. Ignorance Inferences

(2)s: John spoke to Mary or Sue.
Ignorance Inferences:
s has no opinion as to whether or not John spoke to Mary.
s has no opinion as to whether or not John spoke to Sue.

Is this a logical inference? At first sight doesn't seem very plausible (though we might present considerations that go the other way).

Goal: To see if there is a pragmatic explanation.

My opinion: Yes, plausible principles of language use provide an explanation. However, there is some empirical evidence for deriving the inferences as logical entailments (Meyer 2013, 2014). Furthermore, it turns out that one can provide evidence for a pragmatic principle that would require a derivation of the sort Meyer has argued for (Buccola and Haida 2019, Fox 2016).

1.3. Exclusive Disjunction

(3)s: John spoke to Mary or Sue.
Inference:
John didn't speak to both Mary and Sue.

Is this logical entailment? Hard to tell, perhaps, but there are some well-known arguments that it isn't (which we will review and discuss at length).

Goal: To see if there is a pragmatic explanation.

My opinion: No. Arguably the simplest principles of language use are incompatible with the existence of a pragmatic explanation. Moreover there is empirical evidence that the inference is a logical entailment (despite what initially looks like compelling counter-evidence).

1.4. Conjunctive Interpretation of Disjunction (Free Choice)

(4) Parent to child: You are allowed to have cake or ice creak.
Inference:
Child is allowed to have cake.

Is this logical entailment? Feels like it is, but:

(5)a. You are allowed to have cake or ice creak.
Inference: You are allowed to have cake.
b. Speaker to child: You are not allowed to have cake or ice creak.
Inference: You are not allowed to have cake.

Impossible to treat both inferences as logical entailments, unless the sentences are ambiguous and there is an appropriate principle of disambiguation. (Simple logical reason: if $p \Rightarrow q$ and $\neg p \Rightarrow \neg q$, then $p \Leftrightarrow q$.)

My opinion: the principles that derive the exclusive meaning of disjunction can also yield the inference in (4).

2. Grice's Research Program and his empirical conjecture

(6)**Grice's Research Program**:
To develop a body of knowledge pertaining to communicative interactions ("the conditions governing conversation", or Pragmatics, P) and to see how this could inform grammatical/logical analysis (G).

(7)**Grice's Empirical Conjecture**:[1] Logicians (of his time) got things right about G.
"I wish…to maintain that the common assumption…that the divergences [between…some of what I shall call the formal devices $\neg$, $\wedge$, $\vee$, $\rightarrow$, $(\forall x)$, $(\exists x)$, (ι) …and…what are taken to be their analogs or counterparts in natural language] do exist is a common mistake **and that the mistake arises from inadequate attention to the conditions governing conversation."**

(8)**Grice's Goal**: To show that pursuing (6) will corroborate (7). In particular, to show that P can bridge the gap between what logicians had delivered (a while back) for G and what is empirically needed.

[1] This is often taken to be the conclusion of Grice's inquiry but, for reasons that will be clear shortly, I don't think it is warranted.

My opinion: The Research Program is surely required, but the Empirical Conjecture is too vague to evaluate as a general claim, and is probably wrong (under one construal, in the areas where it can be evaluated).

Plan

To look closely at Grice's Project in the domain of Scalar Implicatures (SIs).

What I hope to do

I. Discuss a dilemma (which I like to call Grice's Predicament): If truisms pertaining to the conditions governing conversation are correct (of the type that Grice envisioned), the empirical conjecture is most likely wrong.

II. Present the Standard Neo-Gricean Response (involving a denial of basic truisms)

III. Present Evidence that the conjecture is wrong (at least under one construal); that there is a formal device in Grammar, *Exh*, which accounts for systematic divergences (the grammatical theory of Scalar Implicatures)

IV. Present an alternative to NG that I think is at the heart of recent *Iterated Rationality Models*.

3. Letter of Recommendation – Outline of a Program

(9) s(peaker): Mr. X's command of English is excellent, and his attendance at tutorials has been regular.

Goal:

i. To spell out reasonable principles of language use from which it would follow that s could utter this sentence (write such a letter) only if s believed that X is a bad philosopher.
ii. To study more general consequences of the principles: how they generalize and the consequences for Grice's thesis re-Natural Logic.

Standard (Gricean) approach – Addressee reasons as follows:

a. If s believed that X was a good philosopher, s would have said so.
Hence, it's not the case that s believes that X is a good philosopher.
b. There is reason to believe that s has clear opinions about how good a philosopher X is. Hence, s believes that X is not a good philosopher.

Question:

Where do (a) and (b) come from? In particular, what are the principles of language use (general or otherwise) that derive (a) and (b) and what are their consequences?

For (b) the answer might seem mundane and not particularly general: just happens to follow from shared assumptions about the relationship between s and X (in the type

of context we are imagining). But (a) is likely to follow from something more general.

Can we articulate and justify a set of principles [e.g. principles of cooperative communication] that would derive (a) in the relevant context of utterance?

(10) **Normative Principles of Communication**
i. **Maxim of Quality:** Say *only* things you believe to be true.
ii. **Maxim of Quantity:** Say *everything* you believe to be true that is relevant for the topic of conversation.[2]

Can we justify these principles? Of course!

These are virtual truisms, reflected, e.g., in the oath we take in a court of law:
I swear/promise/… that I will tell [what I believe to be]
i. the truth (redundant given (ii and iii))
ii. the whole truth [given what's relevant] (**Quantity**)
iii. and nothing but the truth. (**Quality**)

So we might think we are in good shape: (a) is a consequence of virtual truisms – follows from (the assumption that s is obeying) Quantity.

But, why doesn't addressee reason as follows ("problem of symmetry"):

a*. If s believed that X was a bad philosopher, s would have said so.
Hence, it's not the case that s believes that X is a bad philosopher.
Hence (given b), s believes that X is not a bad philosopher.

After all (a*) follows from the virtual truisms (in exactly the same way as (a)).

Plausible answer: There is a known convention for letter writing. Write only good things.

(11) **Normative Principles of Communication (Revised)**
i. **Maxim of Quality:** Say *only* things you believe to be true.
ii. **Maxim of Conventionality:** Obey conventions of language use (in our particular case, don't write negative things about candidates in your support letter)
iii. **Maxim of Quantity:** Say *everything* that is relevant as long as it obeys (i) and (ii).

[2] In the recent IRM literature there is an alternative that dismisses Quantity, and has some conceptual appeal. Specifically, the idea (at least the way I would characterize it) is that (a) should follow from mutual belief in rationality together with mutual belief: (i) that the speaker is opinionated – (b) above and (ii) that the speakers goal is to eventually obey the maxim of quantity in its non-stipulative format. This idea will also depend, as we will see, in mutual belief that only specific alternatives ("messages") can be used by the speaker (An assumption that we can call *Formal Alternatives, FA*). We will also see empirical challenges to the resulting models, which require an explanation given the conceptual appeal. One obvious explanation is that FA needs to be rejected.

Questions:

a. What would be predicted without (ii)?
b. Why would we draw different conclusions from the following?

(12) s(peaker):
Mr. X is either a bad philosopher or a good philosopher (or somewhere in between).

Perhaps: By the utterance in (12), s conveys that s/he is not obeying the relevant convention. But how is that?

4. Ignorance Inferences

(13)s: John spoke to Mary or Sue.
Ignorance Inferences:
s has no opinion as to whether or not John spoke to Mary.
s has no opinion as to whether or not John spoke to Sue.

Addressee:

a. **Quantity**: If s believed that John spoke to Mary, s would have said so.
Hence, it's not the case that s believes that John spoke to Mary.
b. **Quantity**: If s believed that John spoke to Sue, s would have said so.
Hence, it's not the case that s believes that John spoke to Sue.
c. If s believed that John didn't speak to Mary, s would have believed that John spoke to Sue (given that s believes the disjunction – Quality). But we've shown that conclusion to be false in b.
d. If s believed that John didn't speak to Sue, s would have believed that John spoke to Mary (given that s believes the disjunction – Quality). But we've shown that conclusion to be false in a.

Look ahead: It would seem crazy to challenge this explanation, but if Meyer (2013, 2014) is right this has to be done, in which case we would need to ask what's wrong with this explanation (See Fox 2016, Buccola and Haida 2019).

5. Scalar Implicatures

(14) Some of the students got an A.
Standard logical rendition:
$\exists x(\text{student}(x) \wedge \text{got-an-A}(x))$

Problematic Inference:
Not true that all of the students got an A.

(15) 3 students got on A.
Standard logical rendition:
$\exists X[(|X|=3) \wedge \forall y \in X(\text{student}(y) \wedge \text{got-an-A}(y))]$

Problematic Inference:

Not true that 4 students got an A.

(16) John talked to Mary or Sue.
Standard logical rendition:
(John talked to Mary) $\vee$ (John talked to Sue)

Problematic Inference:
John didn't talk to both Mary and Sue.

5.1. Option 1, strengthen the meaning of the relevant lexical items

(17) Some of the students got an A.
Alternative logical rendition:
$\exists x(\text{student}(x) \wedge \text{got-an-A}(x)) \wedge$
$\neg\forall x(\text{student}(x) \rightarrow \text{got-an-A}(x))$

(18) 3 students got on A.
Alternative logical rendition:
$\exists X[(|X|=3) \wedge \forall y \in X(\text{student}(y) \wedge \text{got-an-A}(y))] \wedge$
$\neg\exists X[(|X|>3) \wedge \forall y \in X(\text{student}(y) \wedge \text{got-an-A}(y))]$

(19) John talked to Mary or Sue.
Alternative logical rendition:
(John talked to Mary) $\vee$ (John talked to Sue) $\wedge$
$\neg$[(John talked to Mary) $\wedge$ (John talked to Sue)]

(20) **Standard Lexical Entries:**
a. $[[\text{some}]] = \lambda A.\lambda B.\ A \cap B \neq \varnothing$
b. $[[3]] = \lambda A.\lambda B.\ |A \cap B| \geq 3$
c. $[[\text{or}]] = \lambda p.\lambda q.\ p = 1 \text{ or } q = 1.$

(21) **Alternative Lexical Entries:**
a. $[[\text{some}]] = \lambda A.\lambda B.\ A \cap B \neq \varnothing$ and $\neg(A \subset B)$ (=[[some but not all]])
b. $[[3]] = \lambda A.\lambda B.\ |A \cap B| = 3$ (=[[exactly 3]])
c. $[[\text{or}]] = \lambda p.\lambda q.\ p + q = 1$ (=[[ExOR]])

5.2. Evidence for Standard Lexical Entries

(22) Mary did some of the homework. For all I know she might have done all of it.

(23) If 20 students get an A this year, they will make the test harder next year. Did 20 students get an A? Yes. 20 students definitely got an A. The secretary posted grades for half the students. All of the grades will be posted by 2 PM tomorrow night.

(24) John talked to Mary or Bill. I hope he didn't talk to both of them.

5.3. Option 2: Ambiguity

(25) 2 Lexical Entries:

a. $[[some_{weak}]] = \lambda A.\lambda B.\ A \cap B \neq \emptyset$
$[[some_{strong}]] = \lambda A.\lambda B.\ A \cap B \neq \emptyset$ and $\neg(A \subset B)$ (=[[some but not all]])

b. $[[3_{weak}]] = \lambda A.\lambda B.\ |A \cap B| \geq 3$
$[[3_{strong}]] = \lambda A.\lambda B.\ |A \cap B| = 3$ (=[[exactly 3]])

c. $[[or_{weak}]] = \lambda p.\lambda q.\ p = 1$ or $q = 1$.
$[[or_{strong}]] = \lambda p.\lambda q.\ p + q = 1$ (=[[ExOR]])

5.4. Arguments against lexical ambiguity

Empirical:

a. Over and under predicts available readings
b. It doesn't pass a famous ambiguity test (VP ellipsis)

…

Conceptual:

It misses a generalization, it's not an explanation, wrong cross-linguistic prediction (as far as we know),…

5.4.1 Wrong Predictions about available readings

A. In some contexts (downward entailing?) we need to block stronger meanings:

(26) John didn't talk to Mary or Sue.
Seems false if John talked to Mary and Sue. [though this might be challenged…]

B. In downward entailing (perhaps all non upward entailing) contexts there are new inferences to account for:

(27) Mary didn't do all of the homework.

Inference:
Mary did some of the homework.

(28) a. Mary did much of the homework.
Inference: Mary didn't do all of the homework.
b. Mary didn't do much of the homework.
Inference: Mary did some of the homework.

C. The problem of multiple disjunctions (Reichenbach, generalized in Chierchia/Schwarz as discussed in Sauerland):

(29) John talked to Mary or Sue or Jane.
What is predicted by lexical ambiguity: calculate…

5.4.2. Ellipsis as an ambiguity test (pointed out to me years ago by T. Stephenson)

(30) Mary did some of the homework. The people who didn't failed the test.

(31) Father: How many pieces of candy did you eat?
Child: I ate 4 pieces of candy.
Father: But I told you that you shouldn't <eat 4 pieces of candy>.

(32) A: How many of the problems did John solve?
B: He solved 4 of them.
A: I wonder if Mary did, as well.
B: Of course she did. Mary always solves all of the problems.

Look ahead: Eventually, we will consider a more sophisticated ambiguity theory. We will want to understand how it would deal with this argument from ellipsis.

5.4.3. There has to be a generalization that we are missing here

The problem we are trying to deal with seems pretty general, and multiplying meanings feels like the wrong way to address it. In particular, it feels that there is a generalization that we'd be missing.

(33) a. Question: Who came to the party?
Answer: John did.
(Inference: no one else did)
b. Question: Who came to the party?
Answer: If John did, then I am quite confident that Mary did as well.

(34) a. Mary is as tall as John is. (Likely inference: Mary is not taller than John is.)
b. Mary is surely as tall as John is. For all I know, she might be taller

(35) a. It's possible that there is a sneak in the box.
(Likely inference: It's not necessary…)
b. Is it possible that there is a sneak in the box? Yes. In fact, I know that there is.

(36) a. John started working on his experiment.
(Likely inference: he didn't finish)
b. I am sure that John started working on his experiment. In fact, he might have finished.

Of course to convince ourselves that a generalization is being missed, we should be able to state the generalization. This is difficult to do for important reasons that will become apparent. Figuring out what the true generalization is will (as usual) turn out to be important in distinguishing competing theories.

6. The (neo)-Gricean Account (Horn, Gamut, Sauerland,…)

Standard Logical Renditions are correct.

The inferences we've looked at, therefore, do not follow just from the semantics of the sentences. Instead they are derived by the logic we entertained in thinking about the letter of recommendation. This, if true, would of course support Grice's conjecture about Natural Logic – (7) above.

Specifically, there is predictable thought process that is triggered in the mind of conversation participants given a set of shared beliefs – in particular, the common understanding that they are obliged to obey the rules governing conversation (Maxims). And from the assumption that the speaker obeys the relevant rules, we can infer things about his/her belief state…

6.1. We might have been convinced in the past that this is very simple

(37) s: John bought 3 houses.

(38) Addressee's reasoning:
If John bought 4 houses, I would have liked to know this. s did not provide me with this information. It is therefore reasonable to conclude that s thinks that John did not buy 4 houses.

6.2. But it's not[3]

We derive ignorance rather than a Scalar Implicature

Why not the following:

(39) *Addressee's reasoning:
If John bought exactly 3 houses, I would have liked to know this. s did not provide me with this information. It is therefore reasonable to conclude that s thinks that John did not buy exactly 3 houses.

After all: *John bought 3 houses* is equivalent to *John bought exactly 3 houses or more than 3 houses.*

[3] From Fintel and Heim class notes since at least (1997). Basic idea is rooted in Kroch (1972).

What we actually should conclude is that s is *ignorant* about which of the disjuncts is true.

a. **Quantity**: If s believed that John bought more than 3 houses, s would have said so. Hence, it's not the case that s believes that John bought more than 3 houses.
b. **Quantity**: If s believed that John bought exactly 3 houses, s would have said so. Hence, it's not the case that s believes that John bought exactly 3 houses.
c. If s believed that John didn't buy more than 3 houses, s would have believed that John bought exactly 3 houses (given that s believes the disjunction – Quality). But we've shown that conclusion to be false in b.
d. If s believed that John didn't buy exactly 3 houses, s would have believed that John bought more than 3 houses (given that s believes the disjunction – Quantity). But we've shown that conclusion to be false in a.

6.3. The Neo-Gricean Maxim of Quantity

(40)**Normative Principles of language use (restated)**

i. **Maxim of Quality:** s shouldn't utter φ if $\neg B_s(\varphi)$
ii. **Maxim of Conventionality:** s shouldn't utter φ if uttering φ violates conventions of language use.
iii. **Maxim of Relevance:** s shouldn't utter φ if φ is not relevant for the topic of conversation.
iv. **Maxim of Quantity (MQ):** s shouldn't utter φ if, $\exists\varphi'[B_s(\varphi')$ and $\neg(\varphi \Rightarrow_c \varphi')$ and uttering φ' obeys (i-iii)].

(*where $\Rightarrow_c$ stands for *contextual entailment*:

$$\varphi \Rightarrow_c \varphi' \text{ iff } (C \cap [\![\varphi]\!]) \subseteq [\![\varphi']\!] \text{ *)}$$

Question: What assumptions were we implicitly making about relevance above?

(41) **Normative Principles of language use (revised)**

i. **Maxim of Quality:** s shouldn't utter φ if $\neg B_s(\varphi)$
ii. **Maxim of Conventionality:** s shouldn't utter φ if uttering φ violates conventions of language use.
v. **Maxim of Relevance:** s shouldn't utter φ if φ is not relevant for the topic of conversation.
vi. **Neo-Gricean Maxim of Quantity (NGMQ):** s shouldn't utter φ if, $\exists\varphi'[B_s(\varphi')$ and $\neg(\varphi \Rightarrow_c \varphi')]$ and uttering φ obeys (i-iii) **and φ' ∈ALT(φ)**].

(42) Alt(φ) = {φ': φ' can be derived from φ by successive replacement of lexical items with their lexically specified alternatives.}

(43) **Lexically Specified Alternatives**: Alt(*four*) = {*one*, *two*, *three*, *four*, *five*,… }
Alt(*some*) = {*some*, (*many*), *all*}
Alt(*or*) = {*or*, *and*}
…

Obvious Questions:

-Doesn't the revision involve a rejection of the basic truism we spelled out in (10) or (11)?

-Do we still account for the inference addressee draws from the letter in (9)? After all, *X is a good philosopher* is not an alternative to the speaker's utterance.

-Can we come up with an intensional definition of ALT?

6.4. Opinionated Speakers (Soames 1982:455-456; Groenendijk and Stokhof 1984)

(44) Context: A speaker s utters the sentence, φ:= *John bought 3 houses*.
1. Given NG-MQ, h can infer $\neg B_s(\varphi')$ for all φ' such that
   a. $\varphi' \in ALT(\varphi)$
   b. $\neg(\varphi \Rightarrow_c \varphi')]$,
   c. $Rel_c(\varphi')$
   d. uttering φ' does not violate conventions of language use.
2. By 1, h can infer $\neg B_s$(*John bought 4 houses*), to the extent that it's relevant.

But we want h to infer $B_s(\neg$*John bought 4 houses*).

Useful Assumption (though perhaps not necessary):

Opinionated Speaker (OS): When φ is uttered by a speaker, s, the hearer's default assumption is that for every relevant member of Alt(φ), ψ, s has an opinion as to whether or not ψ is true.

Question: Do we need this to be the default?

Alternatively, one might suggest that we get implicatures only when there are reasons to assume that the speaker is opinionated.

7. The Predicted Generalization

(45) **The set of potential SIs**: Let φ be a sentence uttered by s in a context C and Let $ALT(\varphi, C) := \{\varphi' : \varphi' \in ALT(\varphi)$ & $Rel_c(\varphi')$ & uttering φ' does not violate conventions of language use$\}$.[4]
If $\varphi' \in ALT(\varphi, C)$ and φ' is not *contextually entailed* by φ, then $B_s(\neg\varphi')$ is a potential Scalar Implicature, SI.

A potential SI will become an actual SI if it is reasonable (at least possible) to assume that the speaker is opinionated about it (to make the *OS assumption*).

[4] From this point onwards, we're going to assume that there are no relevant conventions of language use. There's enough to keep track of as is…

(46) **More Specifically:** Let φ be a sentence uttered by s in a context C.
i. Form the set of Primary Implicatures
$PI(\varphi, C) = \{\neg B_s(\varphi'): \varphi' \in ALT(\varphi, C)$ & φ' is not contextually entailed by φ$\}$
ii. Form the set of Secondary Implicatures
$SI(\varphi, C) = \{B_s(\neg\varphi'): \neg B_s(\varphi') \in PI(\varphi, C)$ and it is reasonable to assume that s is opinionated about φ'$\}$

(47) **Necessary condition for OS:** One can assume that s is opinionated about φ' only if this assumption is consistent with the assumption that s obeys the maxims.

Sauerland takes OS to be a default assumption. He thus suggests the following procedure:

(48) **Sauerland's Algorithm:** Let φ be a sentence uttered by s in a context C.
i. Form the set of Primary Implicatures
$PI(\varphi, C) = \{\neg B_s(\varphi'): \varphi' \in ALT(\varphi, C)$ & φ' is not contextually entailed by φ$\}$
ii. Form the set of Secondary Implicatures
$SI(\varphi, C) = \{B_s(\neg\varphi'): \neg B_s(\varphi') \in PI(\varphi, C)$ and $B_s(\neg\varphi')$ is consistent with the set of sentences $\{B_s(\varphi)\} \cup PI(\varphi, C)\}$

Note: If we get rid of OS as default, we can think of Sauerland's algorithm as providing the maximal set of SIs (those you would get if you thought the speaker is as opinionated as he could possibly be).

Homework #1:
i. Come up with a sentence φ and a set of alternatives A such that if s uttered φ and A=ALT(φ, C), Sauerland's algorithm would attribute a contradictory set of beliefs to s. [A doesn't have to be constrained by our formal definition of alternatives in (42)).]
ii. What does your answer in (a) teach you about the relationship between (46) and (48).
Please work together.

8. Questions:
i. By revising the maxim of Quantity, have we lost our account for the letter of recommendation?
ii. Have we lost our account of ignorance inferences?
iii. NGMQ is a departure from what seems self evident, namely MQ (in fact it involves a *denial of what we called a virtual truism*). What could we do if we insisted that MQ is correct?
iv. Is there a real generalization here? In particular, can we provide an intensional definition of ALT, which will allow us to say what is predicted independently of lexical stipulations?
v. We've defined PI(φ, C) with reference to contextual entailment and this followed from the maxim of quantity. Can we check if this is the relevant

notion? What would we do if we discovered that the relevant notion is one of logical entailment?

vi. Can we create contexts where the relevant maxims are not active and how would that affect the resulting SIs?

vii. Are there embedded/intrusive SIs?

viii. Are there other areas of language (Grammar or Pragmatics) where similar generalizations to the one we stated here are observed, and what can we learn from the relevant generalizations.

9. An alternative Perspective on MQ (Iterated Rationality Models)

The non-modified maxims appear to follow from basic truism. A conceptual challenge for the neo-Gricean theory of SIs is that it requires the rejection of a truism.

Is there a way to derive SIs in the pragmatics, which does not face this conceptual challenge? Maybe.

9.1. Basic idea – the conversational setup (game)

The imperative, I_1, "say the whole truth" should be rejected in favor of, I_2, "convey the whole truth (in whatever way you can)".

If I_2 is the imperative, it is perhaps plausible to assume that it does not enter directly into the computation of SIs. Instead, it applies to the output of the computation (just as in the grammatical theory we will develop).

Basic setup: Conversation involves a rich common ground. What specifically is common ground is that the speaker is trying to convey the relevant aspect of her epistemic state (I.e., it is common ground that the speaker is obeying I_2.) and that the speaker will use a strategy that would meet this goal (and that everyone is rational and can calculate whatever needs to be calculated)

If we can add to that an assumption about *formal alternatives*, namely that it is common ground the speaker can only use certain alternatives (FA), then SIs could follow.

Specifically, they would follow in a situation where it is also common ground that the speaker is opinionated about everything that is relevant (OS).

9.2. Simple Scalar Implicature

(49) John did some of the homework.

Q: Did John do none of the homework, some of the homework, or all of the homework?

Assumptions about CG:

s's epistemic state entails a cell in the partition induced by Q, Partition(Q) (OS)

s can only use messages that are formal alternatives of (49). (FA)

Partition(Q) has three cells: {¬∃, ∃∧¬∀, ∀}

So this is a relatively simple situation:

- there are two possible messages: *some*, *all*
- there are three cell in Partition(Q): ¬∃, ∃∧¬∀, ∀
- OS guarantees that there is a p∈Partition(Q) such that the the speaker's epistemic state entails p. We can call this p the *speaker's-cell*.

If speaker's cell is ∀, speaker has a simple way of satisfying I_2 by uttering the message *all*.

If speaker's cell is ∃∧¬∀, speaker doesn't have a simple way of satisfying I_2.

But any move by the speaker other than uttering the message *all* will indicate to the hearer that speaker's cell is not ∀. So based on this observation, the speaker can utter the message *some* and be sure that the hearer will infer that speaker's cell has to be ∃∧¬∀.

(2) CELL IDENTIFICATION (first version; further versions to be stated in (4) and (8)): Message m *identifies* a cell t given a set of cells Π if m is true in t and there is no distinct $t' \in \Pi$ such that m is true in t'

(3) PEELING STRATEGY: Given a set of messages M, a partition Π, and a criterion C for cell identification, we build a set X of message-cell pairings as follows:

a. Initialize $X = \emptyset$, as well as $M' = M$ and $\Pi' = \Pi$

b. Collect all message-cell pairs where the message identifies the cell according to C into a temporary set U. That is, $U = \{< m, t > \in M' \times \Pi' :$ m identifies t according to $C\}$

c. If $U = \emptyset$, break and return X

d. Otherwise:

i. Update X with U. That is, $X = X \cup U$

ii. Remove from M' every message m that appears in the left-hand side of some pair in U

iii. Remove from Π' every cell t that appears in the right-hand side of some pair in U

iv. Go to step (3b)

(50) John bought 3 houses.

Homework: What needs to be assumed for an SI to be computed here?

Questions:

i. Is it reasonable to take it to be CG that the speaker can only use a specific set of messages? .

ii. What would happen if we remove FA from CG?
iii. What is predicted for situations where it is not CG that speaker is opinionated?
iv. What is the way (within this setup) to develop a theory of how we decide when to derive SIs and when to derive ignorance inferences?
v. The basic setup turns out to make different predictions from the Neo-Gricean or the grammatical theory of Sis (to which we will return)

What should we conclude on the basis of this (slides from Asherov, Fox and Katzir)?

A reference game: Scenario A (based on Stiller et al. 2011)

"Pick the crate with a **banana.**"

Which crate did the speaker have in mind?

I II III

Forced-Choice experiments:

Stiller et al. 2015 **96% chose objec**

Vogel et al. 2014 **76% chose objec**

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A reference game: Scenario B (based on Vogel et al. 2014)

"Pick the crate with a **banana.**"

Which crate did the speaker have in mind?

I II III

Forced-Choice experiment:

Vogel et al. 2014: **52% chose objec**