Chierchia's Puzzle and Sauerland's account

1.1. Deriving Basic Implicatures (very rough outline)

Principles of communication (Maxim of Quantity) require a speaker to use the most informative (strongest) true proposition from a designated set.

Under run-of-the-mill circumstances, (1)' (but not its symmetric counterpart) is a member of the designated set for (1).

(1)   John did some of the homework.

(1)'   John did all of the homework.

These principles (together with the assumption of an opinionated speaker) allow the listener to infer (upon hearing (1)) that, unless the speaker believed that (1)' were false, the speaker would have uttered (1)'.

Since the speaker didn't make this alternative utterance, it fallows that the speaker believes that (1)' is false.

Derived Implicature: (S believes) it's not the case that John did all of the homework.

1.2. Chierchia's Problem

(2)   John did the reading or some of the homework.

Principles of communication (Maxim of Quantity) should allow the listener to infer (upon hearing (2)) that unless the speaker believed that (2)' were false, the speaker would have uttered (2)':

(2)'   John did the reading or all of the homework.

Since the speaker didn't make this alternative utterance, it should follow that the speaker believes that (2)' is false.

Derived Implicature: (S believes) it's not the case that John did the reading or all of the homework.

Chierchia's Problem: $\neg(p \lor q) \equiv \neg p \land \neg q$; although we get the correct implicature that John didn't do all of the homework, we also get the incorrect implicature that John didn't do the reading.

The problem generalizes to all disjunctions of the form $p \lor q$, where q has a stronger alternatives q'.

More neutrally, we can say that the problem indicates that our generalization which was stated as a desideratum for a theory of scalar implicatures was incorrect:

(3) **The Exhaustivity Generalization (EG)**: utterance of a sentence, S, as a default, licenses the inference that (the speaker believes that) all of the scalar alternatives of S that are logically stronger than S are false (Henceforth, the Exhaustivity Inference).

> The Scalar Alternatives of a sentence S, Alt(S), are the set of sentences that can be derived from S by replacing scalar items in S by their scale-mates.

When q' is stronger than q, p∨q' is stronger than p∨q. Furthermore, if q'∈Alt(q), p∨q'∈Alt(p∨q). Yet, contrary to EG an utterance of p∨q does not lead to the inference that p∨q' is false.

> **Chierchia's Generalization**: The (pragmatically) strengthened meaning of a disjunctive sentence, $\varphi \vee \psi$, is the following:
> $S(\varphi \vee \psi) = [S(\varphi) \wedge \neg \psi]$ or $[S(\psi) \wedge \neg\varphi]$

4.3. Sauerland's Proposal[1]

1. Enrich the set of alternatives for disjunction:

(4) Horn-Scale(*or*) = {*or*, *L*, *R*, *and*} (pLq = p; pRq = q)

(5) Alt(p∨q)= p∨q $\diagup\diagdown$ p∧q
        q
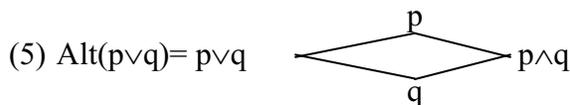
2. An algorithm for computing scalar implicatures:

A.   Form the set of Primary (weak) Implicatures:
              PI = {¬B$_s$(A'): A'∈ ALT(A) and A' is stronger than A}

B.   Form the set of Secondary (strong) Implicatures:
              SI = {B$_s$(¬A'): A'∈ ALT(A), A' is stronger than A, and
                        B$_s$(A) $\wedge$ ΛPI $\wedge$ B$_s$(¬A') is not contradictory}

Set A is the set of inferences that we derive directly from the (assumption that the speaker obeys the) Maxim of Quantity.

Set B is the set of inferences that stronger alternatives are false, which are introduced whenever it is possible to assume that the speaker is opinionated about stronger

---

[1] Benjamin Spector (2005, 2007) made the same proposal, in a somewhat different (more generalized) format. A related proposal can be found in Yae-Sheik Lee (1995).

alternative; whenever the assumption of an opinionated speaker is consistent with what has already been inferred from the maxim of quantity.

When a simple disjunctive sentence, $p \vee q$, is uttered, we derive the following:

$\quad$ PI $= \neg B_s(p), \ \neg B_s(q), \ \neg B_s(p \wedge q)$
$\quad$ SI $= B_s \neg (p \wedge q)$

The disjunction puzzle arises from embedding a non-maximal scalar item under disjunction (P $\vee$ Q where Q'$\in$Alt(Q) and Q' is stronger than Q). The challenge is:

1. To avoid the implicature $\neg$(P $\vee$ Q').
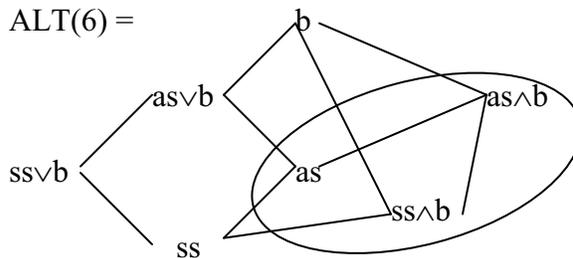2. To derive the implicature $\neg$ Q'

Challenge 1 is met in the following way: $\neg B_s(Q)$ is a primary implicatures and $B_s(P \vee Q) \wedge \neg B_s(Q) \wedge B_s(\neg(P \vee Q'))$ is contradictory.

Challenge 2 is met straightforwardly: given (4), Q'$\in$ Alt (P $\vee$ Q), and the Secondary Implicature $B_s(\neg$ Q') is consistent with the assertion and the primary implicatures.

In detail

(6) Kai ate some of the soup or the broccoli,

ALT(6) =

$B_s(ss \vee b)$
PI $= \neg B_s(as \vee b), \ \neg B_s(ss)$, $\qquad\qquad$ (the rest follow)
SI $= B_s(\neg as), \ B_s(\neg(ss \wedge b))$ $\qquad\qquad$ (the rest [$B_s(\neg(as \wedge b))$] follows)

4.4. Advantage of Sauerland's Proposal: embedding under universal quantifiers

(7) You're required to talk to Mary or Sue.
Implicatures:
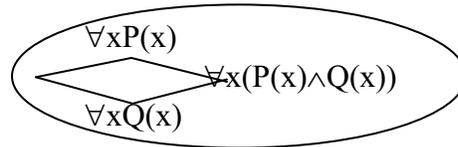   a. You're not required to talk to Mary.
   b. You're not required to talk to Sue.

(8) Every friend of mine has a boy friend or a girl friend.
   a. It's not true that every friend of mine has a boy friend.
   b. It's not true that every friend of mine has a girl friend.

These facts follow straightforwardly from the Sauerland scale:

(9) $Alt(\forall x(P(x) \vee Q(x))) = \forall x(P(x) \vee Q(x))$

$$\forall x P(x)$$
$$\forall x(P(x) \wedge Q(x))$$
$$\forall x Q(x)$$

$PI = \neg B_s(\forall x P(x)), \neg B_s(\forall x Q(x))$ (the rest follows)
$SI = B_s(\neg \forall x P(x)), B_s(\neg \forall x Q(x))$ (the rest follows)

4.5. The Predicted Generalization

(10) **The S-Exhaustivity Generalization (predicted by Sauerland's Theory)**: utterance of a sentence, S, as a default, licenses the inference that (the speaker believes that) every sentence is false if it is Sauerland-Excludable given S and Alt(S).

p is *Sauerland-Excludable* given S and C if $p \in C$, p is stronger than S and
$\neg \exists q \in C$ [(q is stronger than S) and $(S \wedge \neg p$ entails q)].
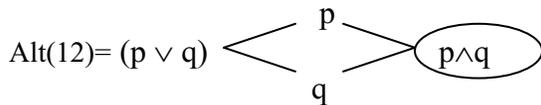
Homework:

1. Prove that the S-Exhaustivity Generalization is indeed predicted by Sauerland's theory.
2. Come up with a set of sentences C and a sentence S such that the set $\{\neg p: p$ is Sauerland-Excludable alternatives of S given C} is inconsistent with S.

Can you think of possible implications of this exercise?

Remaining Cracks in the neo-Gricean System

1. Hurford Disjunctions

(11)   John talked to Mary or Sue or both

Alt(12)= (p ∨ q)   〈 p / q 〉 → (p∧q)

Equivalences:
(p ∨ q) ∨ (p ∧ q) = (p ∨ q) L (p ∧ q) = …= **(p ∨ q)**
(p L q) ∨ (p ∧ q) = p ∨ (p ∧ q) = (p L q) L (p ∧/∨/L q) = …= **p**
(p R q) ∨ (p ∧ q) = q ∨ (p ∧ q) = (p R q) L (p ∧/∨/L q) = …= **q**
(p L/R/∧ q) ∧ (p ∧ q) = … = **p ∧ q**

Key point: we would get the right results if the first disjunct were interpreted
exclusively. Homework: to understand why.

2. Free Choice

(12)   You may eat the cake or the ice-cream.
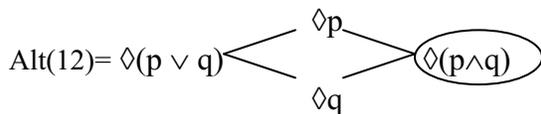   Inferences: a.   You may eat the cake.
                       b.   You may eat the ice-cream.
                       c.   Maybe: You're not allowed to eat the cake and the ice-cream.
                            Wide scope for allowed, i.e., there is no allowed world in which you do both.

We've seen good arguments that FC should be derived as an implicature. However, under
Sauerland's system we derive primary implicatures that contradict FC:

Alt(12)= ◊(p ∨ q)   〈 ◊p / ◊q 〉 → (◊(p∧q))

We incorrectly derive:

   PI = ¬**B$_s$(◊p)**, ¬**B$_s$(◊q)**, ¬B$_s$◊(p∧q)
   SI = B$_s$¬ ◊(p∧q)

Key point: we would get the right results if each of the alternative were interpreted with a strengthened meaning:

$\Diamond(p \lor q) \rightarrow \Diamond(p \lor q) \land \neg\Diamond(p \land q)$
$\Diamond(p) \rightarrow \Diamond(p) \land \neg\Diamond(q)$
$\Diamond(p) \rightarrow \Diamond(q) \land \neg\Diamond(p)$
$\Diamond(p \land q) \rightarrow \Diamond(p \land q)$

Homework: to understand why!

3. Comparatives and modified numerals

(13)　　a.　John has more than 3 children.
　　　　b.　John has 4 or more children.
　　　　c.　John has at least 4 children.

　　　　d.　John has 4 children.
　　　　　　　　　　　(Krifka 1999)
See Fox and Hackl (2006), Fox (2007), Geurts and Nouwen (2007), Nouwen (2008), Spector (2005).

4. Evidence for Embedded Implicatures

(14)　　The man who is talking to Mary or Sue is my brother.
　　　　The man who is talking to Mary and Sue is my brother in law.
　　　　　　　　　　　　　　　(Levison 2000)

(15)　　Some people met Mary or Sue.　　　　(Chierchia 2004)

(16)　　Some people who know linguistics or philosophy came to the party.
　　　　　　　　　　　　　　　(Eliza Block, 2007 handout)

And many more: Cohen 1971, Kempson 197x, Chierchia 2004, passim

5. Modularity

(17)　　#John has an even number of children. More specifically, he has 3 children.
　　　　　　　　　　　　　　　(Fox 2004, class notes)

See also Heim 1991, Magri 2007, Fox and Hackl 2006.

6. Cumulative Interpretation (Krifka 1998, Landman 2000)

(18)　　3 boys ate 7 apples.

Scha claims that the sentence is false if 4 boys ate 8 apples (cumulatively; henceforth 4 boys cum-ate 8 apples).

Krifka and Landman argue that this is an implicature:

(19)   3 boys ate 7 apples. And, it is even possible that 4 boys ate 8 apples.

But how could we derive the implicature. After all, *4 boys ate 8 apples* is not more informative than *3 boys ate 7 apples*.

7. Other Cracks

- **Implicature accounts of the DE constraint on NPIs:** accounts NPI licensing in terms of systematic contradictions derived by an implicature-generating device (Krifka, Chierchia).
- **Intervention Effects:** interactions between implicature and NPI licensing, intervention effects (Chierchia 2004, 2005)
- **Free Choice items** and their distribution (Chierchia 2006)

An alternative perspective (cf. G&S 1984; Krifka 1995)

Suppose we derived scalar implicatures within grammar. We might then expect embedded implicatures. We will see that it can also help us fill in the other cracks in the Gricean picture. But first some technical work.

1. Background: the semantics of *only* and association with focus

(20)   a.   Mary only introduced JOHN to Sue.
       b.   Mary only introduced John to SUE.
       b.   Mary only introduced JOHN to SUE.

       LFa: only [C][$_{VP}$ Mary introduced John$_F$ to Sue]
       LFb: only [C][$_{VP}$ Mary introduced John to Sue$_F$]
       LFc: only [C][$_{VP}$ Mary introduced John$_F$ to Sue$_F$]

What the sentences in (20)) say is that among the propositions in the set C, the only proposition that is true is the proposition that Mary introduced John to Sue. The sentences differ in the value of C something that needs to follow from the theory of focus (For discussion see Rooth (1995), Beaver and Clark (2003)).

(21)   a. $C_{(20)a)} = \{p_{st}: \exists x \in D_e$ and $p = \lambda w.$ Mary introduced x to Sue in w$\}$.
       b. $C_{(20)a)} = \{p_{st}: \exists x \in D_e$ and $p = \lambda w.$ Mary introduced John to x in w$\}$.
       c. $C_{(20)a)} = \{p_{st}: \exists x,y \in D_e$ and $p = \lambda w.$ Mary introduced x to y in w$\}$.

(22)   C is (a subset of) the focus value of VP (Foc(VP)).

(23)   Informally: Foc(VP) is the set of propositions that can be derived from the interpretations of various modifications of VP; modifications in which focused constituents are replaced by various alternatives.

(24)   [[only]] = $\lambda C_{<st,t>}.\lambda p_{st}.\lambda w: p(w) =1. \forall q \in C. (q(w) =1) \rightarrow (q = p)$

How do we insure that C is (a subset of) the focus value of VP?

(25)   Two general approaches:
       a.   C is directly constrained.
       b.   C is required to be a contextually relevant set and focus is correlated with the context in the required way.

2. A modification in the semantics of *only*

(26)   a.   John only talked to [Bill and Mary]$_F$.
       b.   #That's not true. Look, he talked to BILL.

       b.   John only read THREE books.

#That's not true. Look, he read two books.

(27) $[[only]] = \lambda C_{<st,t>}.\lambda p_{st}.\lambda w: p(w) =1. \forall q \in C. (q(w) =1) \rightarrow (p \Rightarrow q)$

(28)   **The alternatives of Scalar items are their scale-mates.**

Consequence of this observation: the focus value of a sentence, S, in which the set of focused constituents is the set of scalar items in S is Alt(S)

(29)   a.   John only read THREE books. He didn't read FOUR.
        b.   John only read SOME books. He didn't read ALL books.
        a.   John only talked to Mary OR Sue. He didn't talk to Mary AND Sue.

3. The Postulation of a null exhaustivity operator[2]

(30)   Speaker A: Look at these 10 boys. Which of them do you know?
        Speaker B: I know John and Bill.
        Inference: B doesn't know any of the other boys.

(31) $EXH(C)[I \text{ know } [John \text{ and } Bill]_F]$

(32) $[[EXH]] = \lambda C_{<st,t>}.\lambda p_{st}.\lambda w. p(w) =1 \text{ and } \forall q \in C. (q(w) =1) \rightarrow (p \Rightarrow q)$

4. The Exhaustivity Generalization (from class 1-3)

(33)   The Exhaustivity Generalization: utterance of a sentence, S, licenses, as a default, the inference that (the speaker believes that) all of the scalar alternatives of S that are logically stronger than S are false.

The Scalar Alternatives of a sentence S, Alt(S), are the set of sentences that can be derived from S by replacing scalar items in S by their scale-mates.

This generalization would seem to follow if, as-default, sentences are interpreted as answers to questions and the following stipulation holds:[3]

(34)   Stipulation:

        1. Scalar items are inherently focused.[4] Or alternatively

        2. Alt(S) is most times contextually given

---

[2] Groenendijk, J. and M. Stokhof (1984). Studies on the Semantics of Questions and the Pragmatics of Answers, University of Amsterdam. Our exhaustivity operator is taken from Krifka (1995) and is different from that of G&S. See also Fintel, K. v. (1997). "Bare Plurals, Bare Conditionals, and *Only*." Journal of Semantics **14**: 1-56. We will see that some more work is needed to replicate Sauerland's account.
[3] In the end, the generalization will turn out to be false. Instead the OIG will be true.
[4] See Krifka (1995) for a particular implementation of the stipulation.

(the latter is essentially the Gricean stipulation)

(35))   I have three children.

  default structure: EXH(C)[$_S$ I have three$_F$ children].

[[(35))]]   = 1 iff I have (at least) 3 children and every proposition in C that is true is entailed by the proposition that I have (at least) 3 children.

    iff I have (at least) 3 children and every proposition in Alt(S) that is true is entailed by the proposition that I have (at least) 3 children.

 Hope: We don't need a stipulation. The Exhaustivity Generalization holds only when the scalar item is focused which is often enough the case.

Welker (1994):

(36)   a. I need four chairs.
  b. JOHN has four chairs.

(37)   a. I need four chairs.
  b. John has TWO chairs.

Possible Conclusions:

1. If there is no focus on the scalar word, we don't get the implicature.

2. If the context makes a different set of propositions salient, we don't get the implicature (or rather we get a different implicature).

The New Ambiguity Hypothesis: All sentences are systematically ambiguous. The source of this ambiguity is an optional exhaustivity operator.

Chierchia's Pragmatic Principle (cf. Dalrymple et. al 1994, 1998): When a sentence is ambiguous the default interpretation is the strongest alternative.

Another possible alternative: *Exh* operator is totally optional. However, if it is not present, there will be an implicature that the speaker is ignorant about every stronger alternative. In most contexts the implicature is implausible, hence the *exh* is preferred. (Fox 2006)

5. Back to Stephenson's Objection

(38)   John has 2 children. Bill does, too. In fact, Bill has 3 children.

This is no longer predicted to be bad. The VP meaning of the first sentence in (38)) is the same whether or not there is an exhaustive operator above.

(39)   A: Who did you say John talked to?
        B: I only said that he talked to Mary$_F$.
        A: Do you think Bill did <talk to Mary>?
        B: I think he did <talk to Mary>. But I think that Bill talked to Sue as well.

6. Which is Simpler?

I think it's still hard to tell.

Assumptions of the neo-Gricean account:

a.   Alt(S) is the relevant set of alternatives.

b.   Hearer's assume that speakers are opinionated about the truth value of the members of Alt(S).

Assumptions of the syntactic alternative:

a.   Alt(S) is the relevant set of alternatives.

b.   Covert *Exh* is a lexical entry.

c.   Strongest meaning hypothesis, or one of the alternativs suggested.

7. Back to the "cracks in the Gricean picture"

24.954 Pragmatics in Linguistic Theory
Spring 2010