

Bar-Hillel and the Division of Labor in Language

On the interaction of grammar, logic, and pragmatics

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November 2, 2015

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In his book *Pragmatics of Natural Languages* (Humanities Press, New York, 1971), Yehoshua Bar-Hillel convincingly demonstrated that the meanings of words, phrases and sentences in natural language can be quite context-dependent.

Bar-Hillel, Yehoshua (1971). *Pragmatics of Natural Languages*.
Humanities Press, New York.

This context-dependence, and other points that Bar-Hillel made in that work, raise the question about the proper division of labor in (the study of) language and meaning:

**What are the proper domains of inquiry for
syntax, semantics, logic, and pragmatics?**

The importance of this issue is equally forcefully made in Bar-Hillel's 1971 *Linguistic Inquiry* paper (in which he comes up with the now ubiquitous term 'pragmatic wastebasket').

Bar-Hillel, Yehoshua. (1971). "Out of the pragmatic wastebasket."
Linguistic Inquiry 2(3): 401–407.

The moral I would recommend to draw from this quadruple experience is simple: Be more careful with forcing bits and pieces you find in the pragmatic wastebasket into your favorite syntactico-semantic theory. It would perhaps be preferable to first bring some order into the contents of this wastebasket as is, to clarify somewhat better the explicandum—to use Carnap's undeservedly neglected slogan—before embarking on the explication. My little exercise was certainly too short to force you to draw this moral. But, pending further arguments, keep reminding yourself of it!

(Bar-Hillel, "Out of the pragmatic wastebasket," p. 405)

Since then, there has been a lively debate about many phenomena in natural language with regards to whether their properties should be captured in **syntactic, semantic, or pragmatic theory, or by some combination of the three.**

These questions are still actively pursued also at the Hebrew University, for example, in the Language, Logic and Cognition Center, where Bar-Hillel's dictum and vision is adhered to in an interdisciplinary, formal study of natural language.

Today, I plan to discuss one phenomenon and explore what the abovementioned fields – logic, syntax, semantics, and pragmatics – may contribute to our understanding of it:

the interpretation of the logical word “or” in natural language.

Disjunction in logic: At least one of the disjuncts is True!

A	B	(A or B)		
T	T	T	T	T
T	F	T	T	F
F	T	F	T	T
F	F	F	F	F

Hypothesis no. 1

Disjunction in natural language = disjunction in logic!

Disjunction in natural language

- (1) John talked to Mary or Sue.
- (2) Conveys: John didn't talk to both Mary and Sue.

Disjunction in natural language: Exactly one of the disjuncts is True!

Disjunction in logic: At least one of the disjuncts is True!

A	B	(A or _{EXCL} B)	(A or _{LOGIC} B)
T	T	T F T	T T T
T	F	T T F	T T F
F	T	F T T	F T T
F	F	F F F	F F F

Hypothesis no. 2

Disjunction in natural language = exclusive disjunction!

Puzzle: Negated disjunction

- (3) John didn't talk to Mary or Sue.
- (4) Conveys: John didn't talk to Mary & John didn't talk to Sue

A	B	$\neg (A \text{ or}_{\text{EXCL}} B)$				$\neg (A \text{ or}_{\text{LOGIC}} B)$			
T	T	T	T	F	T	F	T	T	T
T	F	F	T	T	F	F	T	T	F
F	T	F	F	T	T	F	F	T	T
F	F	T	F	F	F	T	F	F	F

Hypothesis no. 3

Disjunction below negation = disjunction in logic!

Disjunction elsewhere = exclusive disjunction!

- (5) John must talk to Mary or Sue.
- (6) Conveys: John must talk to Mary or Sue
& John can talk to Mary & John can talk to Sue

But neither meaning that we provided for “or” yields the desired ‘free choice’ inference:

- (7) **Logical disjunction variant:**
John must talk to at least one of Mary and Sue.
- (8) **Exclusive disjunction variant:**
John must talk to exactly one of Mary and Sue.

In fact, it is not obvious at all that we can cook up some meaning for “or” that would yield the desired ‘free choice’ inference! So, we are at a dead end ...

Hypothesis no. 1

Disjunction in natural language = disjunction in logic!

But our comprehension of disjunction is mediated by pragmatics:

Maxim of Quantity (Grice 1975)

If the speaker believes that an alternative sentence to a disjunctive sentence is true, and if that sentence is more informative than the disjunctive sentence, then the speaker should use that sentence.

Disjunctive sentence

(9) John talked to Mary or Sue.

Alternative sentence

(10) John talked to Mary and Sue.

Hypothesis no. 1

Disjunction in natural language = disjunction in logic!

But our comprehension of disjunction is mediated by pragmatics:

Maxim of Quantity (Grice 1975)

If the speaker believes that an alternative sentence to a disjunctive sentence is true, and if that sentence is more informative than the disjunctive sentence, then the speaker should use that sentence.

Disjunctive sentence

(11) John talked to Mary or Sue.

Pragmatic inference

(12) \neg BELIEVE_{SP}(John talked to Mary and Sue)

We obtain the desired exclusive interpretation of “or”! ✓

Disjunctive sentence

- (13) John didn't talk to Mary or Sue.
(= John didn't talk to Mary & John didn't talk to Sue)

Alternative sentence

- (14) John didn't talk to Mary and Sue.

Fact about logic

- (15) 'J. didn't talk to M. or S.' is more informative than 'J. didn't talk to M. and S.'

Maxim of Quantity (Grice 1975)

If the speaker believes that an alternative sentence to a disjunctive sentence is true, and **if that sentence is more informative than the disjunctive sentence**, then the speaker should use that sentence.

Since the application of Maxim of Quantity is vacuous (the alternative is not more informative), we obtain the desired logical interpretation of "or" below negation! ✓

Disjunctive sentence

(16) John must talk to Mary or Sue.

Alternative sentences

(17) John must talk to Mary.

(18) John must talk to Sue.

(19) John must talk to Mary and Sue.

Pragmatic inferences

(20) \neg BELIEVE_{SP}(John must talk to Mary)

(21) \neg BELIEVE_{SP}(John must talk to Sue)

(22) \neg BELIEVE_{SP}(John must talk to Mary and Sue)

Disjunctive sentence

(23) John must talk to Mary or Sue.

Pragmatic inferences

(24) \neg BELIEVE_{SP}(John must talk to Mary)

(25) \neg BELIEVE_{SP}(John must talk to Sue)

(26) \neg BELIEVE_{SP}(John must talk to Mary and Sue)

Pragmatic inferences together with the disjunctive sentence entail

(27) John can talk to Mary.

(28) John can talk to Sue.

We obtain the desired 'free choice' inference induced by "or" below modals! ✓

- Contrary to initial appearances, a proper treatment of “or” in natural language does not require us to deviate from the standard logical analysis of “or”.
- In fact, a careful consideration of linguistic data suggests that it is impossible to come up with an empirically adequate syntactic-semantic characterization of “or” that would on its own yield correct inferences in simple, negated and modal sentences.
- We showed, with some simplifications, that adopting **an intuitive pragmatic principle** (Maxim of Quantity, Grice 1975) and **the standard logical analysis of “or”** delivers the desired results: we have derived the correct inferences induced by disjunction in simple sentences, in negated sentences, and below modals!
- *(However, it may still be the case that our intuitive pragmatic principle could (or should) be put “into a syntactico-semantic straitjacket” (Bar-Hillel, “Pragmatic wastebasket,” p. 401). In fact, there may be good reasons to do so ...)*

We have seen that disjunction below negation receives a logical interpretation:

A	B	$\neg (A \text{ or}_{\text{LOGIC}} B)$
T	T	F
T	F	F
F	T	F
F	F	T

But then the following discourse should not be felicitous:

(29) John didn't talk to Mary OR Sue. He talked to both!

In this case, "or" does appear to have an exclusive interpretation:

A	B	$\neg (A \text{ or}_{\text{EXCL}} B)$
T	T	T
T	F	F
F	T	F
F	F	T

So, "or" may have an exclusive meaning in addition to its logical meaning after all! Or, perhaps more attractively, a version of the mechanism that derives its exclusive meaning may also apply below negation and, thus, be part of grammar. **To be continued ...**