Issues in polarity sensitivity

1. Negative Polarity Items

Negative polarity items (NPIs) are expressions that can only appear in negative contexts. NPIs are found in many, possible all, natural languages. Here are some examples:

English *ever*, *any*, *lift a finger*.

(1) a. * Theodore ever attended.
    b. Theodore didn’t ever attend.
(2) a. * We saw anyone.
    b. We didn’t see anyone.
(3) a. * Theodore lifted a finger.
    b. Theodore did not lift a finger.

French idioms (from Krifka 1992).

(4) a. Je n’ai compris un traître mot.
    I havn’t understood a treacherous word
    ‘I didn’t understand a single word.’
    b. Il y avait pas un chat.
    it of had not a cat
    ‘There was no soul there.’

Korean *amwu* and *pakkey* (from Sells 2001).

(5) a. Swuni-ka amwu tey-to ka-ci anh-ass-ta
    Swuni-NOM any where go-COMP NEG-PAST-DECL
    ‘Swuni didn’t go anywhere.’
    b. Swuni-ka ku chayk-pakkey ilk-ci anh-ass-ta
    Swuni-NOM that book-except read-COMP NEG-PAST-DECL
    ‘Swuni read only that book.’

Who the hell! (from Giannakidou and den Dikken 2002)

(6) a. *I know who the hell would buy that book.
    b. I don’t know who the hell would buy that book.

What are the structural condition on NPI licensing? What are the possible licensers for NPIs? Why do NPIs have to be licensed and what makes their licensers license them?

2. The role of surface syntax

In English, there are certain requirements as to the position of an NPI relative to its licensing negation. As the examples given below demonstrate, there is no simple generalization on the structural relation between the two items.

(7) a. * He has met any student [who doesn’t speak French].
b. * He has ever been to Schenectady [when I wasn’t there].
c. * She lifted a finger [to not help him].

(8) a. * The instructor [who doesn’t speak French] has offended any student.
b. * [Although I haven’t], he has ever been to Pflugerville.
c. * [Because I didn’t move], she lifted a finger to help him.

(9) a. * Anyone [wasn’t arrested].
b. * Anybody [didn’t call].

(10) [A doctor who knew anything about acupuncture] [wasn’t available].
(Linebarger 1980, 1987, Uribe-Etxebarria 1995)

(11) a. I don’t [think any rain fell].
b. I didn’t [sign up [because I heard [that any friend of yours did]]].

(12) a. * Theodore didn’t [read any book and this magazine].
b. * Theodore didn’t [read the book that anyone recommended].
(Linebarger 1980, 1987, Krifka 1995, Chierchia to appear)

Similar issues arise in NPI licensing in other languages (see e.g. Sells 2001 on Korean and Yamashita 2002 on Japanese).

3. Other negative polarity licensers

While some negative polarity items, like Korean *amwu* and *pakkey*, need to be licensed by sentence negation, others, like English *ever*, are much more widely distributed.

(13) a. Theodore passed without [ever attending].
b. No student [ever attended].
c. At most ten students [ever attended].
d. No [student who ever attended] failed.
e. Every [student who ever attended] passed.

(14)a. * Theodore passed after [ever attending].
b. * Every student [ever attended].
c. * Some students [ever attended].
d. * Some [students who ever attended] failed.
e. * At least ten [students who ever attended] passed.

(15)

Licensers	**Non-licensers**
not	
without	*after*
no student	*every student*
few students	*many students*
no	*some*
every	*at least ten*
…	…

4. The monotonicity generalization

Ladusaw (1979) proposed that NPI licensers differ from non-licensers in that they reverse entailments among their arguments.

(16)a. [write a long paper] >>
[write a paper]

b. [student who wrote a long paper] >>
[student who wrote a paper]

Licensers reverse entailments:

(17) not [write a long paper] << >/>
not [write a paper]

(18) without [writing a long paper] << >/>
without [writing a paper]

(19) No student [wrote a long paper] << >/>
No student [wrote a paper]

(20) At most ten students [wrote a long paper] << >/>
At most ten students [wrote a paper]

(21) No [student who wrote a long paper] << >/>
No [student who wrote a paper]

(22) Every [student who wrote a long paper] << >/>
Every [student who wrote a paper]

Entailment reversing expressions are also called *downward monotone, downward entailing, or monotone decreasing*.

Non-licensers don't reverse entailments:

(23) after [writing a long paper] </< >>
after [writing a paper]

(24) Every student [wrote a long paper] </< >>
Every student [wrote a paper]

(25) Some students [wrote a long paper] </< >>
Some students [wrote a paper]

(26) Some [students who wrote a long paper] </< >>
Some [students who wrote a paper]

(27) At least ten [students who wrote a long paper] </< >>
At least ten [students who wrote a paper]

All the non-licensers shown here preserve entailments among their arguments. Such entailment preserving expressions are also called *upward monotone*, *upward entailing*, or *monotone increasing*.

(28) Upward monotonicity

A function f of type $\langle\sigma,\tau\rangle$ is upward monotone iff
for all x, y of type σ such that $x \Rightarrow y$: $f(x) \Rightarrow f(y)$

(29) Downward monotonicity

A function f of type $\langle\sigma,\tau\rangle$ is downward monotone iff
for all x, y of type σ such that $x \Rightarrow y$: $f(y) \Rightarrow f(x)$

(30) Generalized entailment $\Rightarrow$ (e.g. Krifka 1992, 1995, von Fintel 1999)

If p and q have type t, then
$p \Rightarrow q$ iff $p = 0$ or $q = 1$

If f and g have type $\langle\sigma,\tau\rangle$, then
$f \Rightarrow g$ iff for all x of type σ: $f(x) \Rightarrow g(x)$

If an expression denotes a function that is upward (downward) monotone according to this definition, we will call this expression itself *upward* (*downward*) *monotone*.

Exercise 1 Prove that under the lexical entries given below, *not*, *every*, *no (student)*, and *at most ten (students)* are downward monotone, whereas *some*, *some (student)*, *at least ten (students)*, and *every student* are upward monotone.

$[[\textit{not}]] = \lambda f_{<e,t>}.\lambda x_e.f(x)=0$
$[[\textit{no}]] = \lambda f_{<e,t>}.[\lambda g_{<e,t>}.\ \{x: f(x)=1\} \cap \{x: g(x)=1\} = \varnothing\ ]$
$[[\textit{every}]] = \lambda f_{<e,t>}.[\lambda g_{<e,t>}.\ \{x: f(x)=1\} \subseteq \{x: g(x)=1\}\ ]$
$[[\textit{some}]] = \lambda f_{<e,t>}.[\lambda g_{<e,t>}.\ \{x: f(x)=1\} \cap \{x: g(x)=1\} \neq \varnothing\ ]$
$[[\textit{at most ten}]] = \lambda f_{<e,t>}.[\lambda g_{<e,t>}.\ |\{x: f(x)=1\} \cap \{x: g(x)=1\}| \leq 10\ ]$
$[[\textit{at least ten}]] = \lambda f_{<e,t>}.[\lambda g_{<e,t>}.\ |\{x: f(x)=1\} \cap \{x: g(x)=1\}| \geq 10\ ]$

Exercise 2 Prove that the denotation of *exactly ten* given below is neither upward nor downward monotone.

$[[\textit{exactly ten}]] = \lambda f_{<e,t>}.[\lambda g_{<e,t>}.\ |\{x: f(x)=1\} \cap \{x: g(x)=1\}| = 10\ ]$

Exercise 3 Discuss whether the proper name *Theodore* is upward or downward monotone.

5. The modified monotonicity generalization

Only-noun phrases are known to be a counterexample to Ladusaw's original monotonicity generalization (Atlas 1996).

(31) Only Theodore [ever attended].

(32) Only Theodore [wrote a long paper] </<
Only Theodore [wrote a paper]

Certain lexical items are said to trigger presuppositions. Horn (1969) proposed that *only* is a presupposition trigger as well.

(33) *The* cocktail bar in Calhoun Hall is closed.
<Calhoun Hall has exactly one cocktail bar>

(34) Theodore is late *again*.
<Theodore was late before>

(35) Theodore has *stopped* smoking.
<Theodore used to smoke>

(36) *Only* Theodore attended.
<Theodore attended>

Von Fintel (1999) argues for a slight modification of Ladusaw's monotonicity generalization, proposing that in checking the relevant entailments, any presupposition of the conclusion (which is not already a presupposition of the premise) must be added as an additional premise.

(37) Only Theodore [wrote a long paper] <<
Only Theodore [wrote a paper], <Theodore wrote a long paper>

Von Fintel calls expressions that pass this test *Strawson downward monotone*. Note that any expression that is downward monotone in the original sense is also Strawson downward monotone.

(38) Strawson downward monotonicity (von Fintel 1999)

A function f of type $<\sigma,\tau>$ is Strawson downward monotone iff
for all x, y of type σ such that $x \Rightarrow y$ and x is in the domain of f: $f(y) \Rightarrow f(x)$

If an expression denotes a function that is Strawson downward monotone in this sense, we will call this expression itself *Strawson downward monotone*.

Exercise Prove that under the lexical entry for *only* given below, *only Theodore* is Strawson downward monotone.

$[[\textit{only}]] = \lambda x_e.[\lambda f_{<e,t>}: f(x)=1. \text{ for all } y \in D_e-\{x\}: f(y) = 0\ ]$

6. Local and global licensing

Local licensing (Ladusaw 1979, Chierchia to appear)

A NPI must be in the scope of a (Strawson) downward monotone expression.

Global licensing (Krifka 1992)

A NPI must be in a (Strawson) downward monotone sentence frame.

(39) Theodore did not [lift a finger].

(40)a. not [write a long paper] << (local)
not [write a paper]

b. Theodore did not [write a long paper] << (global)
Theodore did not [write a paper]

(41) Theodore passed without [lifting a finger]

(42)a. without [writing a long paper] << (local)
without [writing a paper]

b. Theodore passed without [writing a long paper] << (global)
Theodore passed without [writing a paper]

(43) No student [lifted a finger].

(44) No student [wrote a long paper] << (local, global)
No student [wrote a paper]

For the cases above, local and global licensing make the same predictions. But the two views come apart in certain cases. The following example seems to favor local licensing.

(45) Every student who did not [lift a finger] failed.

(46)a. not [write a long paper] << (local)
not [write a paper]

b. Every [student who did not [write a long paper]] failed. </< (global)
Every [student who did not [write a paper]] failed.

7. Types of polarity items and licensers

Zwarts (1998) draws attention to the fact that not all NPIs are equal, suggesting that they can be grouped into three types.

Weak: *ever, …*

(47)a. Theodore didn't [ever attend].
b. No student [ever attended].
c. At most ten students [ever attended].

Strong: *lift a finger*, …

(48)a. Theodore didn't [lift a finger].
b. No student [lifted a finger].
c. * At most ten students [lifted a finger].

Superstrong: *pakkey*, *one bit*, …

(49) a. Theodore wasn’t [happy one bit about this regulation].
b. * No student [was happy one bit about this regulation].
c. * At most ten students [were happy one bit about this regulation].

Zwarts suggests that licensers of strong NPIs are characterized by validating the entailment pattern illustrated below. In his terms, these licensers denote *anti-additive* functions.

(50) didn’t [sing *or* dance] << >>
[didn’t sing] *and* [didn’t dance]

(51) No student [sang *or* danced]. << >>
[No student sang] *and* [no student danced].

(52) At most ten students [sang *or* danced]. </< >>
[At most ten students sang] *and* [at most ten students danced].

(53) Anti-additivity (Zwarts 1998)

A function f of type $<\sigma,\tau>$ is anti-additive iff
for all x, y of type σ: $f(x \vee y) = f(x) \wedge f(y)$

(54) Generalized conjunction (Gazdar 1980, Partee and Rooth 1983)

If p and q have type t, then
(i) $p \wedge q = 1$ iff $p = 1$ and $q = 1$
(ii) $p \vee q = 1$ iff $p = 1$ or $q = 1$

If f and g have type $<\sigma,\tau>$, then
(i) $f \wedge g = \lambda x_\sigma . f(x) \wedge g(x)$
(ii) $f \vee g = \lambda x_\sigma . f(x) \vee g(x)$

An expression that denotes an anti-additive function will itself be called *anti-additive*.

Exercise 1 Assuming the lexical entries given above, prove that *not* and *no student* are anti-additive, whereas *at most ten students* is not.

Exercise 2 Prove that every anti-additive function is also downward monotone.