

# The Mapping from Form to Meaning

Prof. Dr. Maribel Romero

Antrittsvorlesung

June 9, 2008

# Roadmap

1. The semantic enterprise
2. A case study: Korean plural *-tul*
3. The bigger picture

# The Semantic Enterprise

- The semantic enterprise aims to map linguistic form to meaning.

## LINGUISTIC FORM

simple/complex word  
sentence  
discourse



## MEANING

mental representations  
or  
model-theoretic objects  
in the world

- Consider a complex linguistic expression, e.g. a sentence. What aspects of its form need to be taken into account to derive its meaning?

# Atomic units matter

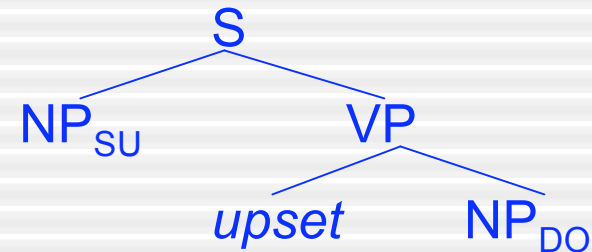
- Obviously, it matters what atomic units are used.
  - (1) The captain admires **Mary**.
  - (2) The captain admires **Sue**.
- Lexical ambiguity: (B. Santorini's webpage)
  - (3) Notice in a field: The farmer allows walkers to cross the field for free, but the bull **charges**.
  - (4) Sign at a car dealership:  
The best way to **get back on your feet**—miss a car payment.

# Syntactic Form matters

- The syntactic structure (syntactic relation among the units) clearly matters.

(1) John upset Mary.

(2) Mary upset John.



- Syntactic ambiguity:

(3) I most enthusiastically recommend this candidate [with no qualifications whatsoever].  
(B. Santorini's webpage)

# Phonological Form matters

- The intonation (focal stress) matters.

(1) If John had married BERtha, he would have inherited \$1M.

↳ The will had a clause concerning Bertha.

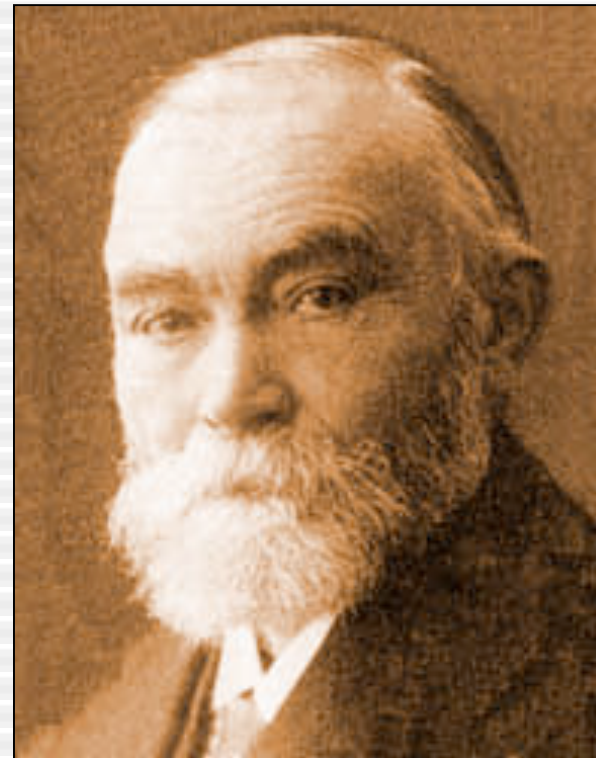
(2) If John had MARried Bertha, he would have inherited \$1M.

↳ The will had a clause requiring that John be married.

# Principle of Compositionality

Frege's Principle  
of Compositionality:

The meaning of a  
complex expression  
is a function of the  
meaning of its parts  
and the way they are combined.



# Unconscious knowledge

- Lexical example: *weil* vs. *denn*

(1) Die Straße ist sehr naß, **denn** es hat viel geregnet.

(2) Die Straße ist sehr naß, **weil** es viel geregnet hat.

(3) Es hat viel geregnet, **denn** die Straße ist sehr naß.

(4) #Es hat viel geregnet, **weil** die Straße sehr naß ist.

(Scheffler 2008)



# Unconscious knowledge

- Syntactic example: high vs. low negation

(1) Did John **not** see Lucía or Martin?

- As alternative question: Lucía / Martin.
- As polar question: Yes / No.

(2) Did**n't** John see Lucía or Martin?

- ~~As alternative question: Lucía / Martin.~~
- As polar question: Yes / No.

(Han and Romero 2004)

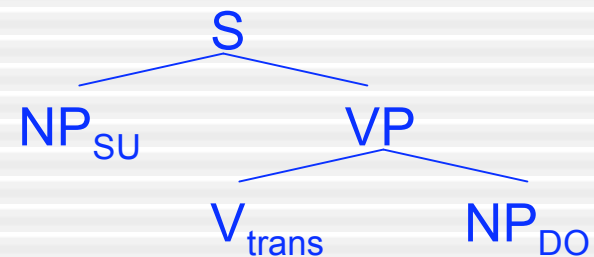
# Systematic knowledge

- Whoever understands (1) understands (2):  
(1) Holland defeated Italy.  
(2) Italy defeated Holland.

The meaning  
of the units:

Holland          Italy  
defeat

The meaning of the  
way of combination:



# The Semantic Enterprise

The goal is to uncover our systematic, largely unconscious knowledge of linguistic meaning and characterize it using formal tools; more concretely:

- To define the meaning of the units and explain their similarities and differences, and
- To build an algorithmic procedure that combines those meaning units in a systematic way.

# Roadmap

1. The semantic enterprise
- 2. A case study: Korean plural *-tul*
3. The bigger picture

# Plurality in Nouns

- Plurality in NOUNS:

Singular

(1) Boy

$\lambda x. \text{BOY}(x)$

$\{a, b, c\}$

Plural

(2) Boys

$*\lambda x. \text{BOY}(x)$

$\{a+b+c, a+b, b+c, a+c, a, b, c\}$

(3) Al and Bob are boys.

$a+b \in \{a+b+c, a+b, b+c, a+c, a, b, c\}$

# Plurality in Verbs

- Plurality in VERBS: Iterative pluractionality

Singular

(1) slap  
 $\lambda e.SLAP(e)$   
 $\{e_1, e_2, e_3\}$

Plural

(2) slap + **Pluractional marker**  
 $*\lambda e.SLAP(e)$   
 $\{e_1+e_2+e_3, e_1+e_2, e_2+e_3, e_1+e_3, e_1, e_2, e_3\}$

(3) Su=nana u=**bi**-pi-ma-tatsi. [Oregon N. Paiute]

SUBJ=man 3=red-butt-hand-slap

‘The man is spanking him/her.’ (Thornes 2003)

$\exists e [ e \in * \lambda e.SLAP(e) \ \& \ Ag(e)=the.man \ \& \ Pat(e)=him/her ]$

# Korean EPM *-tul*

- Korean marker *-tul* has, in descriptive terms, two syntactico-semantic functions:
- Intrinsic Plural Marker (IPM) function: on nominals
- Extrinsic Plural Marker (EPM) function: on non-nominals

(Data from Joh (2008))

# Korean EPM *-tul*

- IPM *-tul* in nominals:

= plurality

(1) Ilhaknyen haksayng-**tul**-i

First-year student-**IPM**-Nom

‘The / Some first-year students’



# Korean EPM *-tul*

- EPM *-tul* in non-nominals: ≠iterative pluractionality

(1) Ku haksaeng-tul-i lak'etpol-ul  
The student-IPM-nom racquetball-acc  
yolsimhi-**tul** ch'y-ot-ta  
intensely-**EPM** hit-Pst-Dec  
'The students played racquetball intensely.'

(2) \* Han haksaeng-i lak'etpol-ul yolsimhi-**tul** ch'y-ot-ta  
One student-nom racq.-acc intensely-**EPM** hit-Pst-Dec  
'One student played racquetball intensely.'

# Korean EPM *-tul*

- EPM *-tul* in non-nominals:

(1) Ilhaknyen haksayng-tul-i kongweneuse

First-year student-IPM-Nom park-Loc

sikkurupkke-**tul** ttamok-ul ci-ess-ta.

loudly-**EPM** raft-Acc build-Pst-Dec.

‘The first-year students built a raft in the park (possibly as a collective action), **each** loudly / being loud.’

# Korean EPM *-tul*

- EPM *-tul* in non-nominals: = distributivity of the modified non-nominal

(2) Ilhaknyen haksayng-i                      kongweneuse-tul

First-year student-IPM-Nom park-Loc-EPM

sikkurupkke ttamok-ul ci-ess-ta.

loudly                      raft-Acc build-Pst-Dec.

‘The first-year students built a raft loudly (possibly as a collective action), **each** in the park.’

# Korean EPM *-tul*

- Conclusion 1:

The same form --namely *-tul*-- is used to express plurality and distributivity.

- Morphological support for Landman's (1996) idea that Plurality = Distributivity = \*-operator

↪ If there is only one *-tul* marker in Korean (as opposed to two homophonous units), how do we derive the difference between the two uses? 20

# Korean EPM *-tul*

- IPM vs EPM *-tul*: a minimal pair

(1) Ai-tul-i                    kikyey-**tul**-ey    tongcen-ul neh-ess-ta.  
Child-IPM-Nom Machine-**IPM**-Loc coin-Acc put-Pst-Dec  
'The children put a coin into machines.'

(Simple) plurality

(2) Ai-tul-i                    kikyey-ey-**tul**    tongcen-ul neh-ess-ta.  
Child-IPM-Nom Machine-Loc-**EPM** coin-Acc put-Pst-Dec  
'The children put a coin [each into a machine].'

Distributivity

# Korean EPM - *tul*

- Conclusion 2:

The difference between IPM and EPM *-tul* strives on:

- whether *-tul* applies internal to the Noun Phrase and, thus, the \*-operator applies to the  $\lambda$ -slot of the noun:

(1)  $*\lambda x. \text{MACHINE}(x)$

- or *-tul* applies external to the NP and, thus, the \*-operator applies to a  $\lambda$ -slot of the entire Postpositional Phrase.

(2)  $\lambda P. * \lambda x. \exists e [ P(x)(e) \ \& \ \exists z [ \text{MACHINE}(z) \ \& \ \text{LOC}(e+z) ] ]$

↪ Different syntactic form derives different meaning.

# The Semantic Enterprise

The goal is to uncover our systematic, largely unconscious knowledge of linguistic meaning and characterize it using formal tools; more concretely:

- To define the meaning of the units and explain their similarities and differences, and
  - To build an algorithmic procedure that
- combines those meaning units in a systematic way.

# Roadmap

1. The semantic enterprise
2. A case study: Korean plural *-tul*
- 3. The bigger picture



# The vast research space of meaning

- **Formal semantics**  
questions, focus, ellipsis, indefinites, scope, negation, disjunction, conditionals, intensionality, individual concepts, adjectives, situations, events, free choice items, ...
- **The syntax-semantics interface**  
reconstruction, binding theory, copular sentences, adverbial quantification over individuals, ...
- **The semantics-pragmatics interface**  
ellipsis and discourse, epistemic bias, decision-theoretical pragmatics, ...
- **Computational semantics**  
Tree Adjoining Grammars, underspecified representations, ...

# Beyond semantics, beyond linguistics

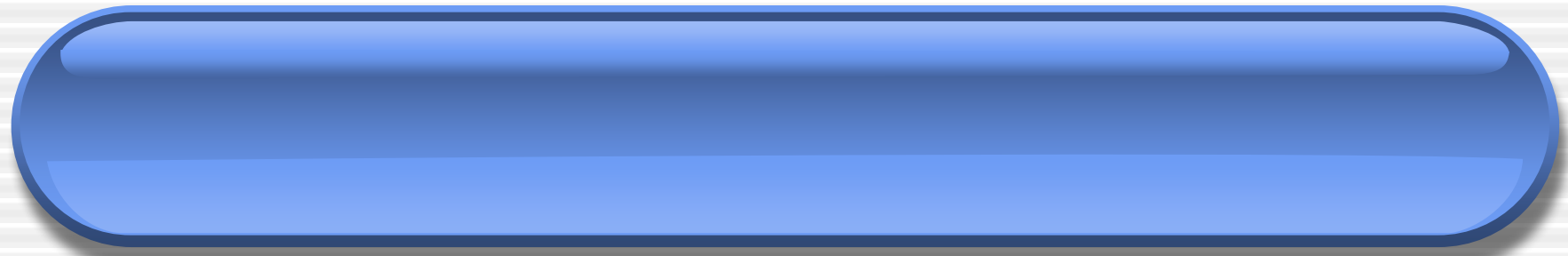
- What are the main contributions that we can expect semantics --and, more generally, linguistics-- to make to science and society in the foreseeable future?
- In other words, why should we care about semantics and linguistics?

# A long-term pay-off

- Linguistics is the study not of a language, but of the language faculty:
  - What patterns recur crosslinguistically and what patterns are unattested?
  - What are the building blocks of meaning on which languages build their lexical units and composition rules?
- In the long term, I believe that linguistics will help us understand the (small) percentage of the human genome that differentiates us from other species.

# A mid-term pay-off

- Computer applications have exploited lexical and syntactic resources of language. Now semantic information is being added.
- Semantic representations are useful for several applications:
  - search engines
  - model checkers
  - inference
  - machine translation
  - human-bot communication, etc.



Thank you!