Ling 320 Semantics. Current Class Grammar. 11 Oct 2007.

1. The system so far. Again, our aim in building a grammar of English is to model a native speaker's ability to *produce* and *interpret* sentences.

Our grammar has three components:

(i) A **lexicon**, which states the category (N, V, etc.) and denotation of each word.

(ii) A set of **syntactic rules**, which specify how words are assembled into sentences. We now have two types of syntactic rules: **phrase structure rules** and **transformations**. Phrase structure rules combine words into phrases, the largest phrase being S. The output of the phrase structure rules is called the **Deep Structure** (or DS) representation of a sentence. The DS representation of a sentence serves as input to transformations. Transformations alter (or *transform*) tree structures. We only have one transformation so far: *V-to-T Movement*. The output of the transformations is called the **Surface Structure** (or SS) representation of a sentence. This SS serves as input to the semantic rules of composition.

(iii) A set of **semantic rules of composition**, which assign an interpretation to every node of an SS representation (with the exception of certain specified nodes that are deemed semantically vacuous, and thus invisible to the semantic component).

(i) Lexicon

N: $\llbracket \textit{Laure} \rrbracket^s$ = Laure, $\llbracket \textit{Alec} \rrbracket^s$ = Alec, etc.

V_i: $\llbracket \textit{laugh} \rrbracket^s = \{x \mid x \text{ laughs in } s\}$, … etc.

V_t: $\llbracket \textit{save} \rrbracket^s = \{<x, y> \mid x \text{ saves } y \text{ in } s\}$, … etc.

A_i: $\llbracket \textit{brave} \rrbracket^s = \{x \mid x \text{ is brave in } s\}$, … etc.

A_t: $\llbracket \textit{afraid} \rrbracket^s = \{<x, y> \mid x \text{ is afraid of y in } s\}$, … etc.

P_i: $\llbracket \textit{out} \rrbracket^s = \{<x, y> \mid x \text{ is out in } s\}$, … etc.

P_t: $\llbracket \textit{behind} \rrbracket^s = \{<x, y> \mid x \text{ is behind } y \text{ in } s\}$, … etc.

Conj: $\llbracket \textit{and} \rrbracket^s = \cap$, $\llbracket \textit{or} \rrbracket^s = \cup$ Neg: $\llbracket \textit{not} \rrbracket^s = '$

T: *be*

Note: We neglect for now the semantic contribution of the T node.
Semantically vacuous items: Main verb *be*; the P *of*.

(ii) Syntactic rules

(a) *Phrase Structure rules*:

S → NP (T) VP
VP → Neg VP
VP → V_c, AP
VP → V_i
PP → P_i
AP → A_i
N → *Laure*, *Carla*, *Alec*, …
V_i → *laugh*, *smoke*, *disappear*…
A_i → *brave*, …
P_i → *around*, *out*, …
V_c → *be*

NP → N
VP → VP Conj VP
VP → V_c PP
VP → V_t NP
PP → P_t NP
AP → A_t PP
Neg → *not*
V_t → *save*, *like*, …
A_t → *afraid*, …
P_i → *behind*, …
T → *be*

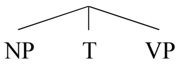
(b) *Transformations*:

V-to-*T Movement*: Raise main verb *be* to T, if T is empty.

(iii) Semantic rules of composition

For any situation *s*,

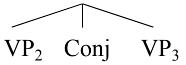
(a) If α has the form S, $\llbracket \alpha \rrbracket^s = 1$ iff $\llbracket \text{NP} \rrbracket^s \in \llbracket \text{VP} \rrbracket^s$.



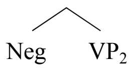
(b) If α is a non-branching node whose daughter node is β, $\llbracket \alpha \rrbracket^s = \llbracket \beta \rrbracket^s$.

(c) If α is a terminal node, $\llbracket \alpha \rrbracket^s$ is specified in the lexicon.

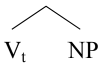
(d) If α has the form VP_1, $\llbracket \alpha \rrbracket^s = \llbracket \text{VP}_2 \rrbracket^s \llbracket \text{Conj} \rrbracket^s \llbracket \text{VP}_3 \rrbracket^s$.



(e) If α has the form VP$_1$, $\llbracket\alpha\rrbracket^s = (\llbracket \mathrm{VP}_2\rrbracket^s)\ \llbracket\mathrm{Neg}\rrbracket^s$.

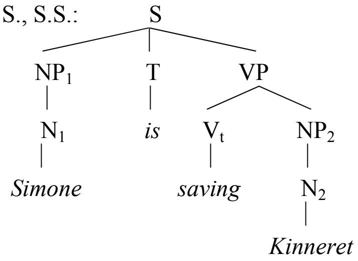


(f) If α has the form VP, $\llbracket\alpha\rrbracket^s = \{x \mid \langle x, \llbracket\mathrm{NP}\rrbracket^s\rangle \in \llbracket \mathrm{V_t}\rrbracket^s\}$.



2. Example derivations

(1) D.S., S.S.:

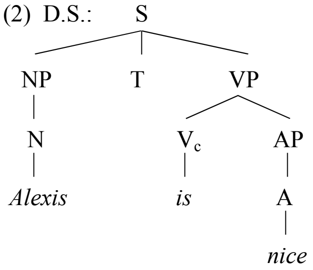


For any s, $\llbracket \mathrm{S}\rrbracket^s = 1$ iff

$\llbracket \mathrm{NP_1}\rrbracket^s \in \llbracket \mathrm{VP}\rrbracket^s$	by (a)
$\llbracket \mathrm{N_1}\rrbracket^s \in \llbracket \mathrm{VP}\rrbracket^s$	by (b)
$\llbracket \textit{Simone}\rrbracket^s \in \llbracket \mathrm{VP}\rrbracket^s$	by (b)
Simone $\in \llbracket \mathrm{VP}\rrbracket^s$	by (c)
Simone $\in \{x \mid \langle x, \llbracket \mathrm{NP_2}\rrbracket^s\rangle \in \llbracket \mathrm{V_t}\rrbracket^s\}$	by (f)
Simone $\in \{x \mid \langle x, \llbracket \mathrm{N_2}\rrbracket^s\rangle \in \llbracket \mathrm{V_t}\rrbracket^s\}$	by (b)
Simone $\in \{x \mid \langle x, \llbracket \textit{Kinneret}\rrbracket^s\rangle \in \llbracket \mathrm{V_t}\rrbracket^s\}$	by (b)
Simone $\in \{x \mid \langle x, \mathrm{Kinneret}\rangle \in \llbracket \mathrm{V_t}\rrbracket^s\}$	by (c)
Simone $\in \{x \mid \langle x, \mathrm{Kinneret}\rangle \in \llbracket \textit{saving}\rrbracket^s\}$	by (b)
Simone $\in \{x \mid \langle x, \mathrm{Kinneret}\rangle \in \{\langle y, z\rangle \mid y \text{ is saving } z \text{ in } s\}\}$	by (c)
Simone $\in \{x \mid x \text{ is saving Kinneret in } s\}$	by def. $\in$

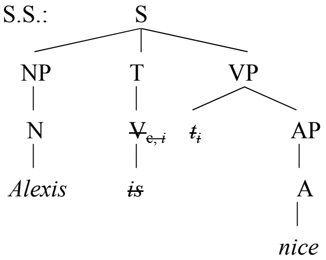
Note: The strikethrough font designates semantically vacuous nodes (nodes that are invisible to the semantic component).

(2) D.S.:



V-to-T Movement
→

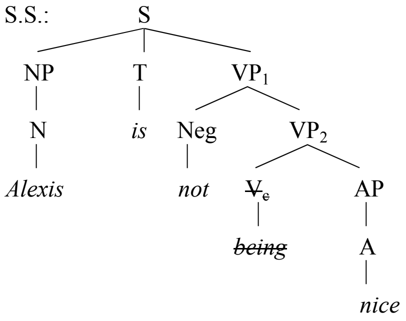
S.S.:



For any s, $\llbracket \mathrm{S}\rrbracket^s = 1$ iff

$\llbracket \mathrm{NP_1}\rrbracket^s \in \llbracket \mathrm{VP}\rrbracket^s$	by (a)
$\llbracket \mathrm{N_1}\rrbracket^s \in \llbracket \mathrm{VP}\rrbracket^s$	by (b)
$\llbracket \textit{Alexis}\rrbracket^s \in \llbracket \mathrm{VP}\rrbracket^s$	by (b)
Alexis $\in \llbracket \mathrm{VP}\rrbracket^s$	by (c)
Alexis $\in \llbracket \mathrm{AP}\rrbracket^s$	by (b)
Alexis $\in \llbracket \mathrm{A}\rrbracket^s$	by (b)
Alexis $\in \llbracket \textit{nice}\rrbracket^s$	by (b)
Alexis $\in \{x \mid x \text{ is nice in } s\}$	by (c)
Alexis is nice in s	by def. $\in$

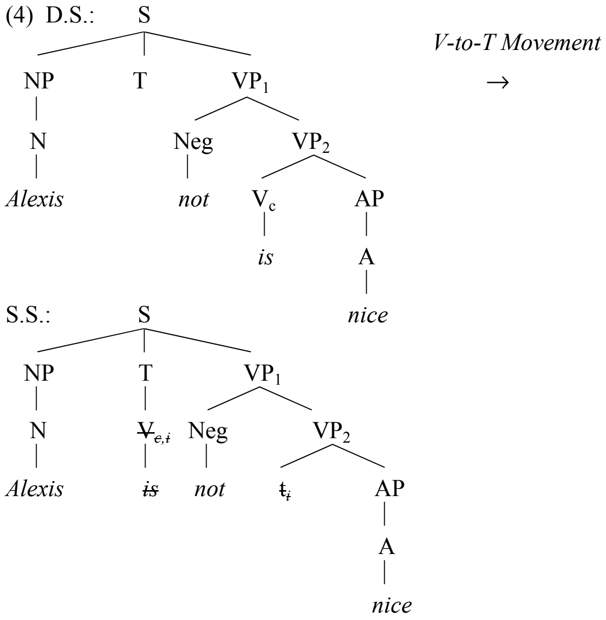
(3) D.S., S.S.:



For any s, $[\![\text{S}]\!]^s = 1$ iff

$[\![\text{NP}_1]\!]^s \in [\![\text{VP}_1]\!]^s$	by (a)
$[\![\text{N}_1]\!]^s \in [\![\text{VP}_1]\!]^s$	by (b)
$[\![\textit{Alexis}]\!]^s \in [\![\text{VP}_1]\!]^s$	by (b)
Alexis $\in [\![\text{VP}_1]\!]^s$	by (c)
Alexis $\in ([\![\text{VP}_2]\!]^s) [\![\text{Neg}]\!]^s$	by (e)
Alexis $\in ([\![\text{AP}]\!]^s) [\![\text{Neg}]\!]^s$	by (c)
Alexis $\in ([\![\text{A}]\!]^s) [\![\text{Neg}]\!]^s$	by (b)
Alexis $\in ([\![\textit{nice}]\!]^s) [\![\text{Neg}]\!]^s$	by (b)
Alexis $\in (\{x \mid x \text{ is nice in } s\}) [\![\text{Neg}]\!]^s$	by (c)
Alexis $\in (\{x \mid x \text{ is nice in } s\})'$	by (c)
Alexis $\notin \{x \mid x \text{ is nice in } s\}$	by def '

(4) D.S.:



For any s, $[\![\text{S}]\!]^s = 1$ iff

$[\![\text{NP}_1]\!]^s \in [\![\text{VP}_1]\!]^s$	by (a)
$[\![\text{N}_1]\!]^s \in [\![\text{VP}_1]\!]^s$	by (b)
$[\![\textit{Alexis}]\!]^s \in [\![\text{VP}_1]\!]^s$	by (b)
Alexis $\in [\![\text{VP}_1]\!]^s$	by (c)
Alexis $\in ([\![\text{VP}_2]\!]^s) [\![\text{Neg}]\!]^s$	by (e)
Alexis $\in ([\![\text{AP}]\!]^s) [\![\text{Neg}]\!]^s$	by (c)
Alexis $\in ([\![\text{A}]\!]^s) [\![\text{Neg}]\!]^s$	by (b)
Alexis $\in ([\![\textit{nice}]\!]^s) [\![\text{Neg}]\!]^s$	by (b)
Alexis $\in (\{x \mid x \text{ is nice in } s\}) [\![\text{Neg}]\!]^s$	by (c)
Alexis $\in (\{x \mid x \text{ is nice in } s\})'$	by (c)
Alexis $\notin \{x \mid x \text{ is nice in } s\}$	by def '