Chapter 6

How the Grammar Works

6.1 Lecture notes

Chapter 6, Lecture One

I. **Why formalize the grammar?**

- Because a grammar like ours is complicated enough that it's predictions aren't obvious. By using mathematical formalisms whose interpretation is precisely defined, we can survey the predictions of our grammar (= theory of English, at the moment) to make sure they are correct.
- Formalizing the grammar means specifying exactly how each part of the grammar contributes to determining which structures are well-formed, which in turn defines which sentences are well-formed.
- 'SD' has so far been a semiformal concept. An SD brings together constraints from grammar rules, lexical entries and general principles of the grammar.
- Semiformally, we start with lexical entries, which trivially determine lexical SDs.
- Semiformally, we think in terms of a bottom-up process, where lexical SDs (and phrasal SDs) get combined into phrasal SDs in accordance with grammar rules and general constraints of the theory. This is illustrated in considerable detail in Chapter 6 for the sentence *They sent us a letter.*

II. **Variations**

? How, exactly, are the following variants of *They sent us a letter* ruled out by our grammar? **[Slides:1]**

(1) a. *Them sent us a letter.
b. *They sent we a letter.
c. *They sent us two letter.
d. *They sends us a letter.
e. *They sent us a letters.

- (1a) is out because the subject is in accusative, instead of nominative case. But how does the grammar actually 'check' this? The SPR requirement of *sent* specifies [CASE nom] and *them* specifies that it is [CASE acc]. The Head-Specifier Rule requires that they unify, and they don't so the Head-Specifier Rule cannot be used to build a parse of this string. Since no other rules even come close, the string is out.
- etc.

- Consider the following grammatical variations on the sentence *They sent us a letter.* **[Slides:2]**

(2) a. Our friend sent us a letter
b. They sent us a letter on Tuesday.
c. They went to Rome and sent us a letter.
d. What did they send us?

? Which ones can our grammar generate? (Everything except (2d). We'll get to an analysis of sentences like this one in Chapter 15.)

- [Note: Some of the SDs in the following get too big to fit onto slides without too much abbreviation and too small of a font. It might be helpful to write them out on a blackboard.]
- Derivation of (2a):
  - **[Slides:3]** gives the subtree for *friend*.
  - **?** Which rule built this tree? (Head-Complement Rule)
  - **?** We'll need a lexical entry for *our*. What should the COMPS value be? (empty) The SPR value? (empty) The AGR value? ([PER 3rd]). **[Slides:4]** (**[Slides:5]** gives the lexical tree.)

? Which rule will combine *our* and *friend*? (Head-Specifier Rule) **[Slides:6]**

- This can now combine with the SD for *sent us a letter* given in Chapter 6. **[Slides:7]**

? Which rule will combine *our friend* and *sent us a letter*? (Head-Specifier Rule)

? The SD for *sent us a letter* was built to combine with a plural NP (*they*) in Chapter 6. Will the same structure combine with the singular NP *our friend*? (Yes — *sent us a letter* does not constrain the AGR value of its SPR.)

- Derivation of (2b):
  - The lexical entry for *on* contains at least the information in **[Slides:8]**, and *Tuesday* at least the information in **[Slides:9]**.
  - Lexical trees licensed by these lexical entries can be combined by the Head-Complement Rule. **[Slides:10]**

  ? What happened to the D in the SPR value of *Tuesday*? (It was optional, so the lexical entry actually licensed at least two different lexical trees. The tree in the slide is one where the empty SPR option was taken.)

  ? Why is there a triangle above *Tuesday* in this tree? (Because the step where the Head-Complement Rule applies to make a phrase out of the word *Tuesday* is abbreviated.)
  - This phrase can combine with the VP *sent us a letter* **[Slides:7]** via the Head-Modifier rule **[Slides:11]**.
  - The avm at the top of this tree is almost identical to the avm for *sent us a letter*. All that's changed is there are a couple more relations in the RESTR value. This subtree can thus combine with *they* in the same way as before.
- Derivation of (2c):
  - *Went to Rome* is built up via two instances of the Head-Complement Schema, one which combines *to* and *Rome* and one which combines *went* and *to Rome*. The result is a VP looking for an NP SPR whose index will be the value of the GOER attribute of the GO relation. **[Slides:12]**

- Since the SYN value of this phrase is the same as for *sent us a letter* they can combine with *and* via the Coordination Rule. **[Slides:13]**
- The SYN value of this phrase is the same as for *sent us a letter*, so it can combine with *they* in the same way via the Head Specifier Rule.

? How does the index of *they* get to be value of the GOER and SENDER features? (By a cascade of identities: the Head Specifier Rule identifies the feature structure dominating *they* with the SPR value of the coordinated VP. The Coordination Rule identifies the SYN values of the two lower VPs, including their SPR values. The Valence Principle insures that the SPR values of the VPs will be the same all they way down to the verbs. The verbs identify the index of their SPR with GOER and SENDER features, respectively.)

III. Formal Definitions

- Notice the structure of the definition of well-formed structure given in the Appendix. Like many formal definitions, this works by having a 'high level' clause **[Slides:14]** that makes reference to notions ('satisfies some lexical entry' and 'satisfies some grammar rule') that are defined in subsequent clauses **[Slides:15–16]**
- The definition of lexical satisfaction is pretty trivial, but important nonetheless.
- The definition of phrasal satisfaction talks about a local subtree (a mother and its daughters) in relation to some grammar rule and the constraints mentioned in clauses 1-5.
- Clause 1 is there just to make sure that the feature structures at each node satisfy the corresponding descriptions in the grammar rule.
- Clauses 2–5 make sure that each well-formed subtree also satisfies the general principles of our theory, which are spelled out in terms of SDs in **[Slides:17–20]**