

Ling 566

Jan. 12, 2005

Valence, Agreement

# Overview

- A problem with the Chapter 3 grammar
- Generalize COMPS and SPR
- The Valence Principle
- Agreement
- The SHAC
- Work through problems 3.1, 4.5, 4.6

# Pizza addendum

- Unification is an operation for combining constraints from different sources.
- What are those sources in the pizza example?
- Why do we need to combine information from different sources in our grammars?

# Reminder: Where We Are

- Attempting to model English with CFG led to problems with the granularity of categories, e.g.
  - Need to distinguish various subtypes of verbs
  - Need to identify properties common to all verbs
- So we broke categories down into feature structures and began constructing a hierarchy of types of feature structures.
- This allows us to schematize rules and state cross-categorial generalizations, while still making fine distinctions.

# But it's still not quite right...

- There's still too much redundancy in the rules.
- The rules and features encode the same information in different ways.

Head-Complement Rule 1:

$$\left[ \begin{array}{c} \textit{phrase} \\ \text{VAL} \end{array} \left[ \begin{array}{cc} \text{COMPS} & \text{itr} \\ \text{SPR} & - \end{array} \right] \right] \rightarrow \mathbf{H} \left[ \begin{array}{c} \textit{word} \\ \text{VAL} \end{array} \left[ \begin{array}{cc} \text{COMPS} & \text{itr} \\ \text{SPR} & - \end{array} \right] \right]$$

Head Complement Rule 2:

$$\left[ \begin{array}{c} \textit{phrase} \\ \text{VAL} \end{array} \left[ \begin{array}{cc} \text{COMPS} & \text{itr} \\ \text{SPR} & - \end{array} \right] \right] \rightarrow \mathbf{H} \left[ \begin{array}{c} \textit{word} \\ \text{VAL} \end{array} \left[ \begin{array}{cc} \text{COMPS} & \text{str} \\ \text{SPR} & - \end{array} \right] \right] \text{ NP}$$

Head Complement Rule 3:

$$\left[ \begin{array}{c} \textit{phrase} \\ \text{VAL} \end{array} \left[ \begin{array}{cc} \text{COMPS} & \text{itr} \\ \text{SPR} & - \end{array} \right] \right] \rightarrow \mathbf{H} \left[ \begin{array}{c} \textit{word} \\ \text{VAL} \end{array} \left[ \begin{array}{cc} \text{COMPS} & \text{dtr} \\ \text{SPR} & - \end{array} \right] \right] \text{ NP NP}$$

# Solution:

## More Elaborate Valence Feature Values

- The rules just say that heads combine with whatever their lexical entries say they can (or must) combine with.
- The information about what a word can or must combine with is encoded in list-valued valence features.
  - The elements of the lists are themselves feature structures
  - The elements are “cancelled” off the lists once heads combine with their complements and specifiers.

# Complements

## Head-Complement Rule:

$$\left[ \begin{array}{c} \textit{phrase} \\ \text{VAL} \quad \left[ \text{COMPS} \quad \langle \rangle \right] \end{array} \right] \rightarrow \mathbf{H} \left[ \begin{array}{c} \textit{word} \\ \text{VAL} \quad \left[ \text{COMPS} \quad \langle \boxed{1}, \dots, \boxed{n} \rangle \right] \end{array} \right] \boxed{1}, \dots, \boxed{n}$$

- This allows for arbitrary numbers of complements, but only applies when there is at least one.
  - Heads in English probably never have more than 3 or 4 complements
  - This doesn't apply where Head-Complement Rule 1 would.  
(Why?)
- This covers lots of cases not covered by the old Head-Complement Rules 1-3. (Examples?)

**Question:** How would the grammar change if English had **post**positions, instead of **pre**positions?

## Head-Complement Rule

$$\left[ \begin{array}{c} \textit{phrase} \\ \text{VAL} \left[ \text{COMPS} \langle \rangle \right] \end{array} \right] \rightarrow \mathbf{H} \left[ \begin{array}{c} \textit{word} \\ \text{HEAD} \textit{verb} \mid \textit{adj} \mid \textit{noun} \\ \text{VAL} \left[ \text{COMPS} \langle \boxed{1}, \dots, \boxed{n} \rangle \right] \end{array} \right] \boxed{1}, \dots, \boxed{n}$$

## PP Rule

$$\left[ \begin{array}{c} \textit{phrase} \\ \text{VAL} \left[ \text{COMPS} \langle \rangle \right] \end{array} \right] \rightarrow \boxed{1}, \dots, \boxed{n} \mathbf{H} \left[ \begin{array}{c} \textit{word} \\ \text{HEAD} \textit{prep} \\ \text{VAL} \left[ \text{COMPS} \langle \boxed{1}, \dots, \boxed{n} \rangle \right] \end{array} \right]$$



# Specifiers

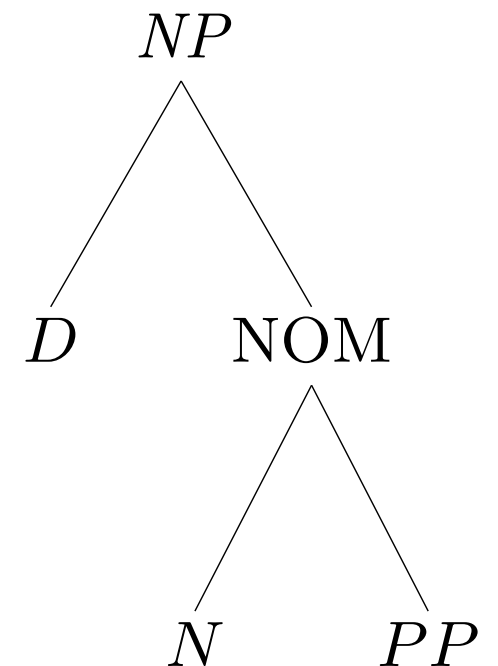
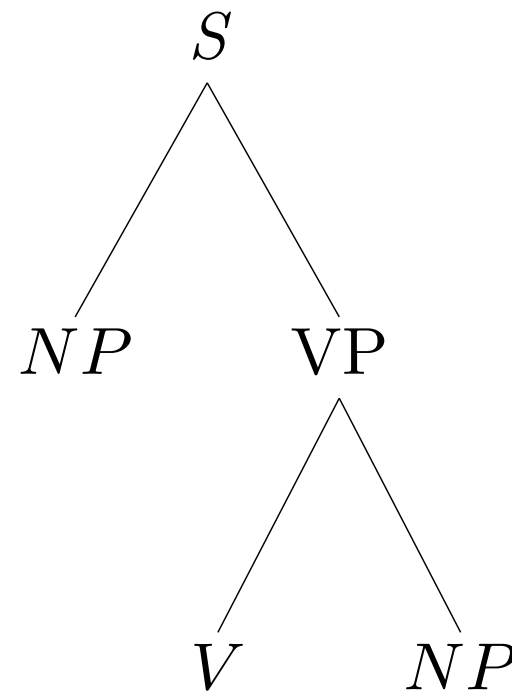
## Head-Specifier Rule (Version I)

$$\left[ \begin{array}{c} \textit{phrase} \\ \text{VAL} \end{array} \left[ \begin{array}{cc} \text{COMPS} & \langle \rangle \\ \text{SPR} & \langle \rangle \end{array} \right] \right] \rightarrow \boxed{2} \text{ H} \left[ \begin{array}{c} \text{VAL} \end{array} \left[ \begin{array}{cc} \text{COMPS} & \langle \rangle \\ \text{SPR} & \langle \boxed{2} \rangle \end{array} \right] \right]$$

- Combines the rules expanding S and NP.
- In principle also generalizes to other categories.
- Question: Why is SPR list-valued?

# Question:

Why are these right-branching? That is, what formal property of our grammar forces the COMPS to be lower in the tree than the SPR?



# Another Question...

What determines the VAL value of phrasal nodes?

ANSWER: The Valence Principle

Unless the rule says otherwise, the mother's values for the VAL features (SPR and COMPS) are identical to those of the head daughter.

# More on the Valence Principle

- Intuitively, the VAL features list the contextual requirements that haven't yet been found.
- This way of thinking about it (like talk of “cancellation”) is bottom-up and procedural.
- But formally, the Valence Principle (like most of the rest of our grammar) is just a well-formedness constraint on trees, without inherent directionality.

# So far, we have:

- Replaced atomic-valued VAL features with list-valued ones.
- Generalized Head-Complement and Head-Specifier rules, to say that heads combine with whatever their lexical entries say they should combine with.
- Introduced the Valence Principle to “cancel” things off the COMPS and SPR lists.

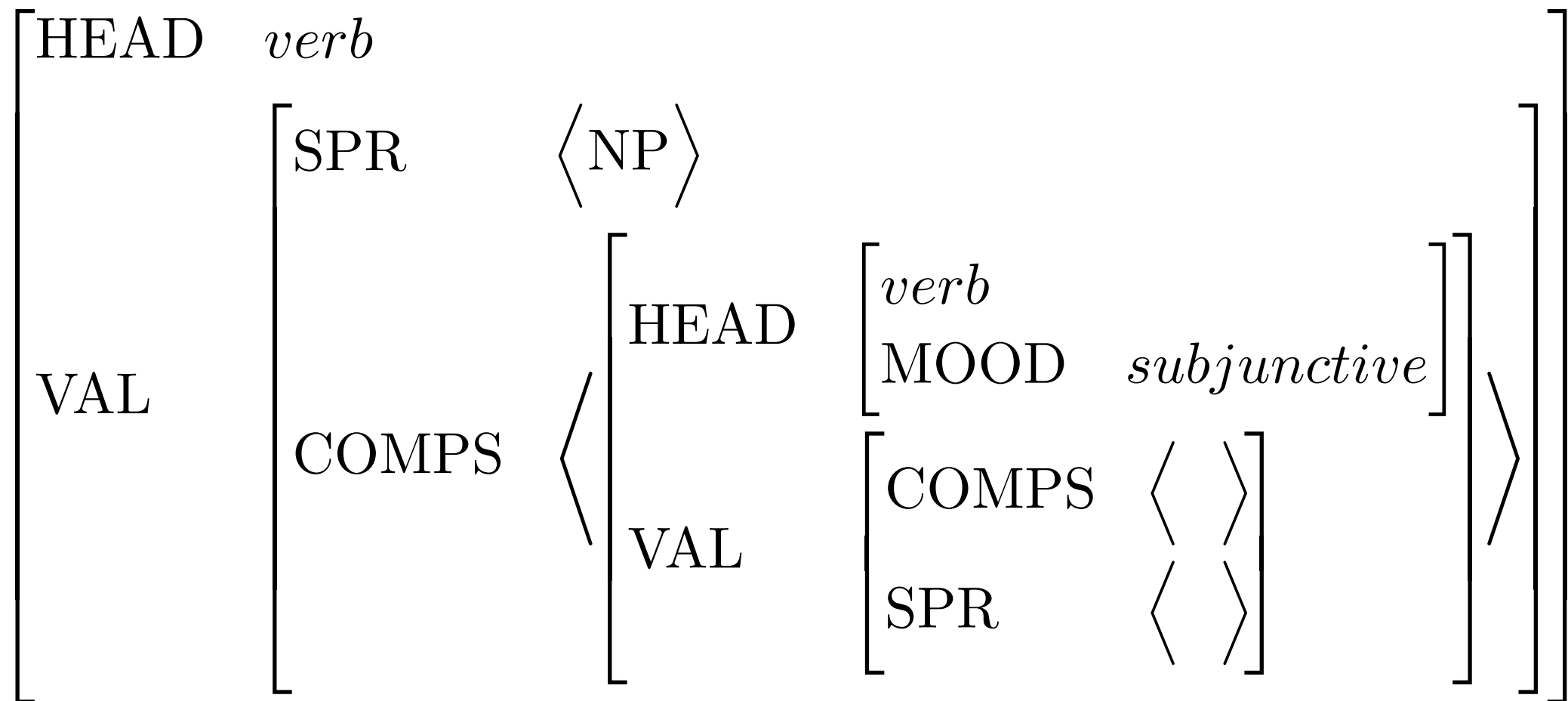
# The Parallelism between S and NP

- Motivation:
  - pairs like *Chris lectured about syntax* and *Chris's lecture about syntax*.
  - both S and NP exhibit agreement  
*The bird sings/\*sing* vs. *The birds sing/\*sings*  
*this/\*these bird* vs. *these/\*this birds*
- So we treat NP as the saturated category of type *noun* and S as the saturated category of type *verb*.

# Question: Is there any other reason to treat V as the head of S?

- In standard English, sentences must have verbs.  
(How about non-standard English or other languages?)
- Verbs taking S complements can influence the form of the verb in the complement:  
*I insist/\*recall (that) you be here on time.*
- Making V the head of S helps us state such restrictions formally

# A possible formalization of the restriction on *insist*



Note that this requires that the verb be the head of the complement. We don't have access to the features of the other constituents of the complement.



# An Overlooked Topic: Complements *vs.* Modifiers

- Intuitive idea: Complements introduce essential participants in the situation denoted; modifiers refine the description.
- Generally accepted distinction, but disputes over individual cases.
- Linguists rely on heuristics to decide how to analyze questionable cases (usually PPs).

# Heuristics for Complements vs. Modifiers

- Obligatory PPs are usually complements.
- Temporal & locative PPs are usually modifiers.
- An entailment test: If **X Ved (NP) PP** does not entail **X did something PP**, then the PP is a complement.

## Examples

- *Pat relied on Chris* **does not entail** *Pat did something on Chris*
- *Pat put nuts in a cup* **does not entail** *Pat did something in a cup*
- *Pat slept until noon* **does entail** *Pat did something until noon*
- *Pat ate lunch at Bytes* **does entail** *Pat did something at Bytes*

# Agreement

- Two kinds so far (namely?)
- Both initially handled via stipulation in the Head-Specifier Rule
- But if we want to use this rule for categories that don't have the AGR feature (such as PPs and APs, in English), we can't build it into the rule.

# The Specifier-Head Agreement Constraint (SHAC)

Verbs and nouns must be specified as:

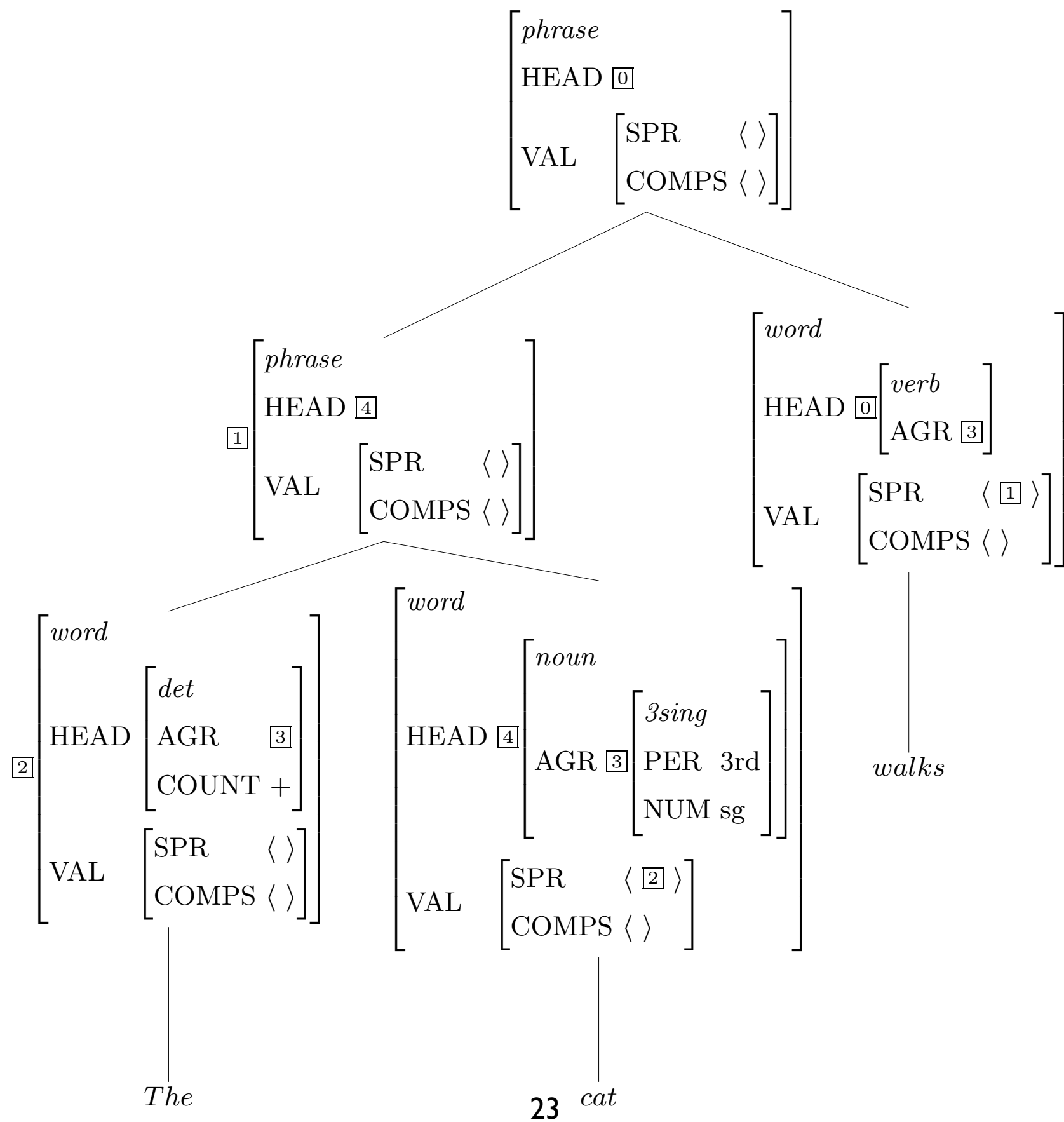
$$\left[ \begin{array}{l} \text{HEAD} \\ \text{VAL} \end{array} \left[ \begin{array}{l} \text{AGR} \quad \boxed{1} \\ \text{SPR} \quad \left\langle \left[ \text{AGR} \quad \boxed{1} \right] \right\rangle \end{array} \right] \right]$$

# The Count/Mass Distinction

- Partially semantically motivated
  - mass terms tend to refer to undifferentiated substances (*air, butter, courtesy, information*)
  - count nouns tend to refer to individuatable entities (*bird, cookie, insult, fact*)
- But there are exceptions:
  - *succotash* (mass) denotes a mix of corn & lima beans, so it's not undifferentiated.
  - *furniture, footwear, cutlery*, etc. refer to individuatable artifacts with mass terms
  - *cabbage* can be either count or mass, but many speakers get *lettuce* only as mass.
  - borderline case: *data*

# Our Formalization of the Count/Mass Distinction

- Determiners are:
  - [COUNT –] (*much* and, in some dialects, *less*),
  - [COUNT +] (*a*, *six*, *many*, etc.), or
  - lexically underspecified (*the*, *all*, *some*, *no*, etc.)
- Nouns select appropriate determiners
  - “count nouns” say SPR <[COUNT +]>
  - “mass nouns” say SPR <[COUNT –]>
- Nouns themselves aren’t marked for the feature COUNT
- So the SHAC plays no role in count/mass marking.



# Overview

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- Work through problems 3.1, 4.5, 4.6
- Next time: Semantics