



Ling 566
Nov 16, 2017
Auxiliaries

Overview

- What are auxiliaries?
- General properties of auxiliaries
- Lexical type/lexical entries for auxiliaries
- Reading questions
- Next time: NICE properties (lexical rules)

What Auxiliaries Are

- Sometimes called “helping verbs,” (English) auxiliaries are little words that come before the main verb of a sentence, including forms of *be*, *have*, *do*, *can*, *could*, *may*, *might*, *must*, *shall*, *should*, *will*, and *would*
- Cross-linguistically, they tend to be involved in the expression of time, necessity, possibility, permission, and obligation, as well as such things as negation, affirmation, and questioning

Some Basic Facts about Eng. Auxiliaries

- They are optional
Pat tapdanced. Pat can tapdance. Pat is tapdancing.
- They precede any non-auxiliary verbs
**Pat tapdance can. *Pat tapdancing is.*
- They determine the form of the following verb
**Pat can tapdancing. *Pat is tapdance.*
- When they co-occur, their order is fixed
*Pat must be tapdancing. *Pat is musting tapdance.*
- Auxiliaries of any given type cannot iterate
**Pat could should tapdance.*

A Little History

- Chomsky's first book, *Syntactic Structures* (1957), contained a detailed analysis of the English system of auxiliary verbs
- It showed how formal analysis could reveal subtle generalizations
- The power of Chomsky's analysis of auxiliaries was one of the early selling points for transformational grammar
 - Especially, his unified treatment of auxiliary *do*
- So it's a challenge to any theory of grammar to deal with the same phenomena

Two Approaches to Analyzing Auxiliaries

- Treat auxiliaries as a special category, and formulate specialized transformations sensitive to their presence
- Assimilate their properties to existing types as much as possible, and elaborate the lexicon to handle what is special about them
- We adopt the latter, treating auxiliaries as a subtype of *srv-lxm*

Consequences of Making *auxv-lxm* a Subtype of *srv-lxm*

- Auxiliaries should express one-place predicates
- Auxiliaries should allow non-referential subjects (dummy *there*, *it*, and idiom chunks)
- Passivization of the main verb (the auxiliary's complement) should preserve truth conditions
- Are these borne out?

Why call auxiliaries verbs?

- *be*, *have*, and *do* exhibit verbal inflections (tense, agreement)
- *be*, *have*, and *do* can all appear as main verbs (that is, as the only verb in a sentence)
 - Their inflections are the same in main and auxiliary uses
 - *be* exhibits auxiliary behavior, even in its main verb uses
- Modals (*can*, *might*, *will*, etc.) don't inflect, but they occur in environments requiring a finite verb with no (other) finite verb around.

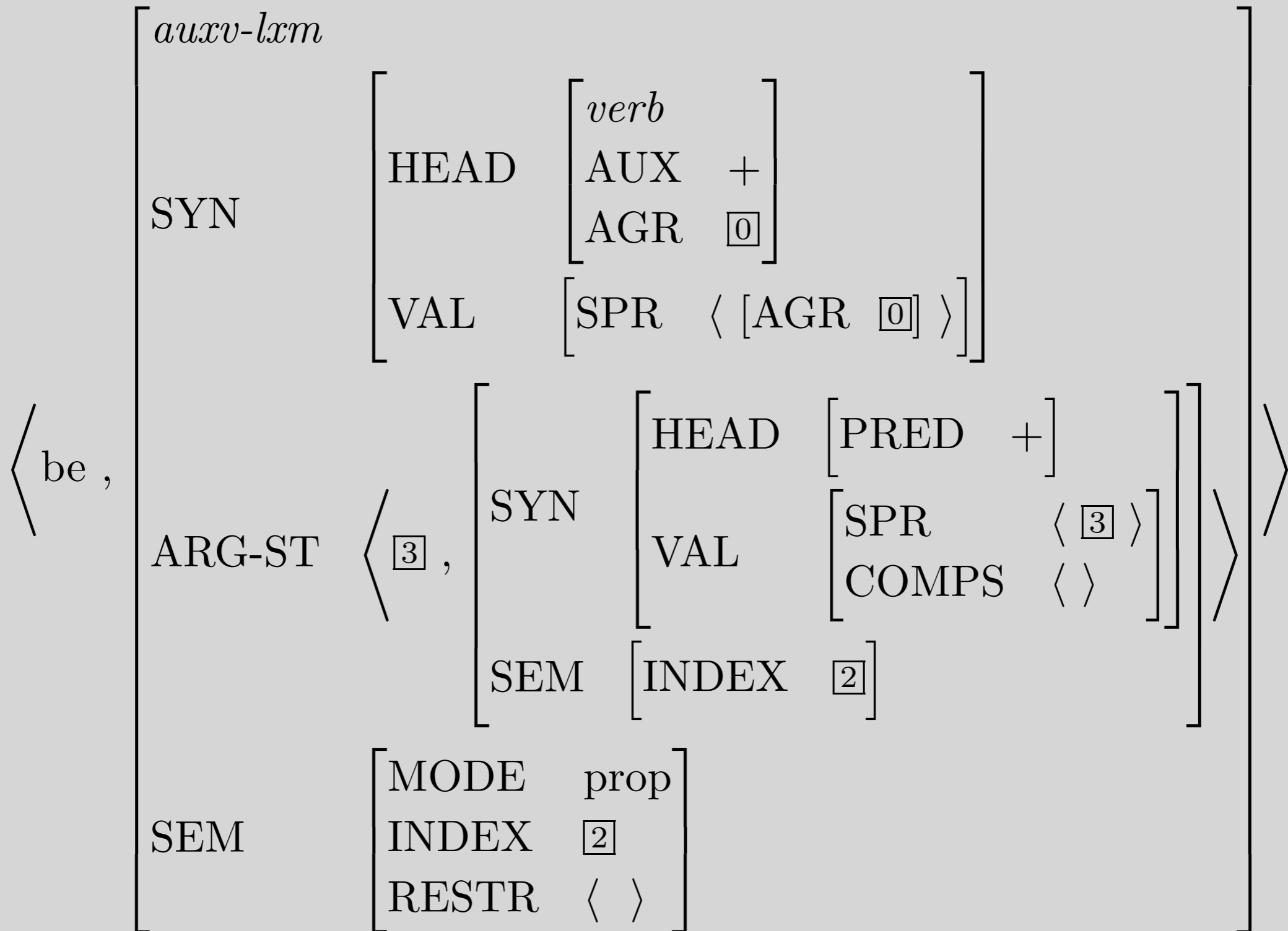
What's special about auxiliaries?

- Unlike other subject-raising verbs we have looked at, their complements aren't introduced by *to*
- The modals and *do* have defective paradigms
- There are restrictions on the ordering and iterability of auxiliaries
- They have a set of special characteristics known as the NICE properties.

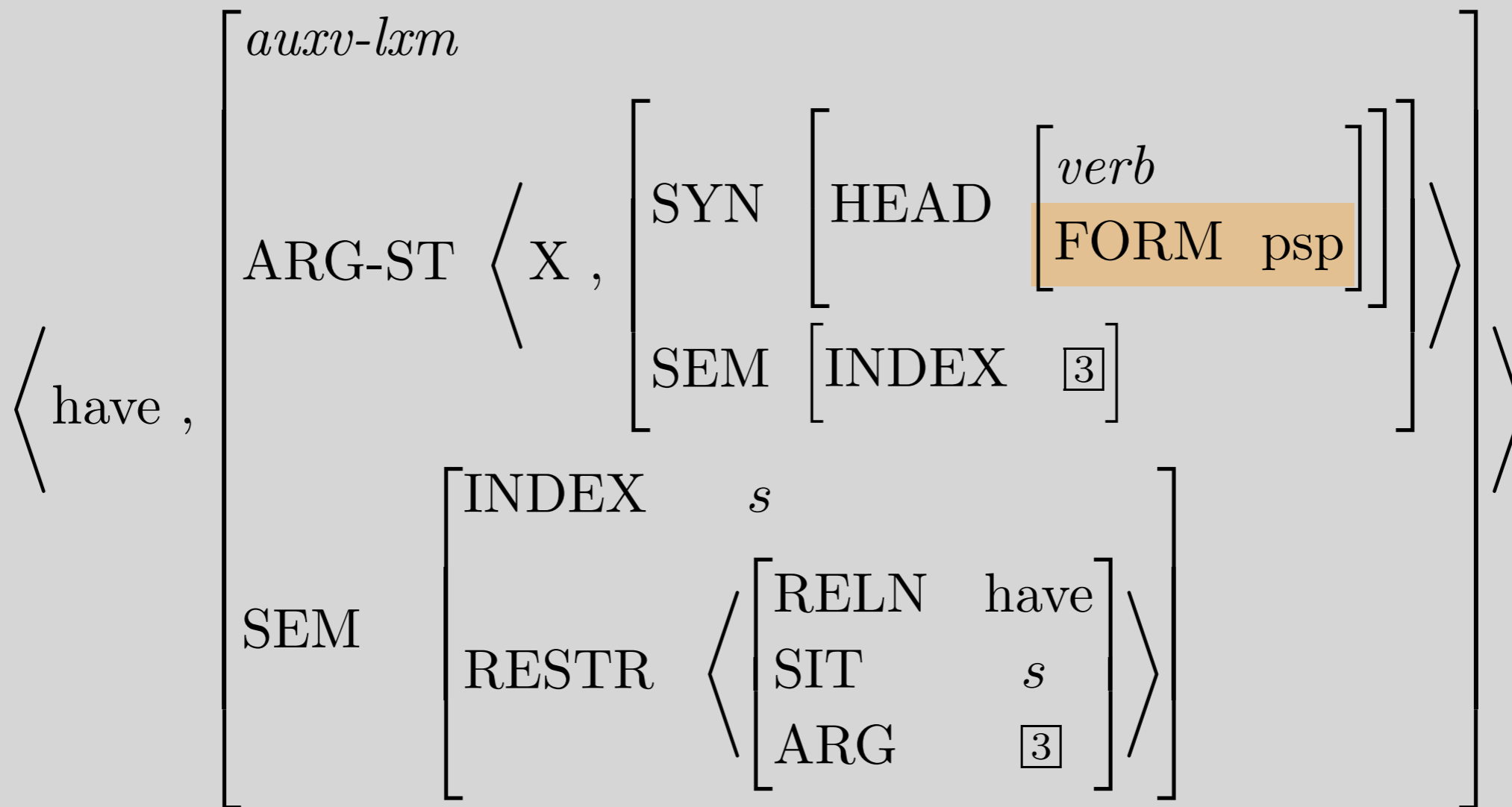
Some Type Constraints

TYPE	FEATURES/CONSTRAINTS	IST
<i>verb-lxm</i>	$\left[\begin{array}{l} \text{SYN} \quad \left[\text{HEAD} \quad \left[\begin{array}{l} \textit{verb} \\ \text{AUX} \quad / \quad - \end{array} \right] \right] \\ \text{ARG-ST} \quad \langle [\text{HEAD} \textit{nominal}], \dots \rangle \\ \text{SEM} \quad \left[\text{MODE} \quad \textit{prop} \right] \end{array} \right]$	<i>infl-lxm</i>
<i>srv-lxm</i>	$\left[\text{ARG-ST} \quad \left\langle \boxed{1}, \left[\begin{array}{l} \text{SPR} \quad \langle \boxed{1} \rangle \\ \text{COMPS} \quad \langle \rangle \end{array} \right] \right\rangle \right]$	<i>verb-lxm</i>
<i>ic-srv-lxm</i>	$\left[\begin{array}{l} \text{ARG-ST} \quad \left\langle \text{X}, \left[\begin{array}{l} \text{VP} \\ \text{INF} \quad + \\ \text{INDEX} \quad s \end{array} \right] \right\rangle \\ \text{SEM} \quad \left[\text{RESTR} \quad \left\langle [\text{ARG} \quad s] \right\rangle \right] \end{array} \right]$	<i>srv-lxm</i>
<i>auxv-lxm</i>	$\left[\text{SYN} \quad \left[\text{HEAD} \quad \left[\text{AUX} \quad + \right] \right] \right]$	<i>srv-lxm</i>

The Entry for *be*, with Inherited Information

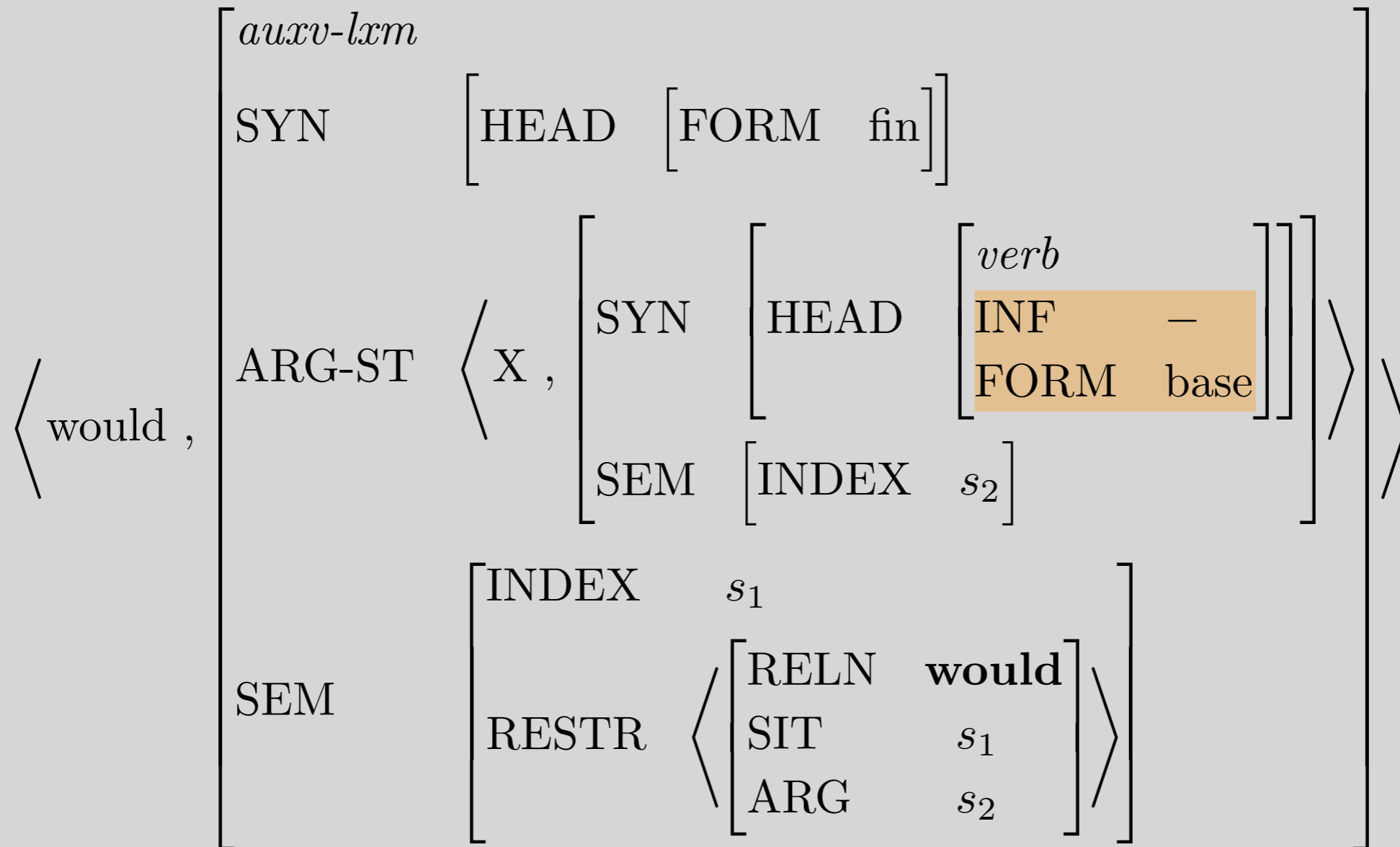


Entry for *have*



- Note the FORM restriction on the complement VP
- What accounts for the analogous FORM restriction on verbs following *be*?

Lexical Entry for a Modal



- Note the restriction on the form of the complement VP
- What inflectional lexical rules apply to this lexeme?

Accounting for the Basic Facts Cited Earlier

- **Optionality of auxiliaries:**
As raising verbs, their subjects and complements go together.
- **Auxiliaries precede non-auxiliary verbs:**
Auxiliaries are heads, and complements follow heads in English.
- **Auxiliaries determine the form of the following verb:**
This is built into their lexical entries.
- **When auxiliaries co-occur, their order is fixed:**
Different explanations for different combinations; see next slide.
- **Non-iterability of auxiliaries:**
Ditto.

Accounting for Restrictions on Order and Iterability

- **Order**

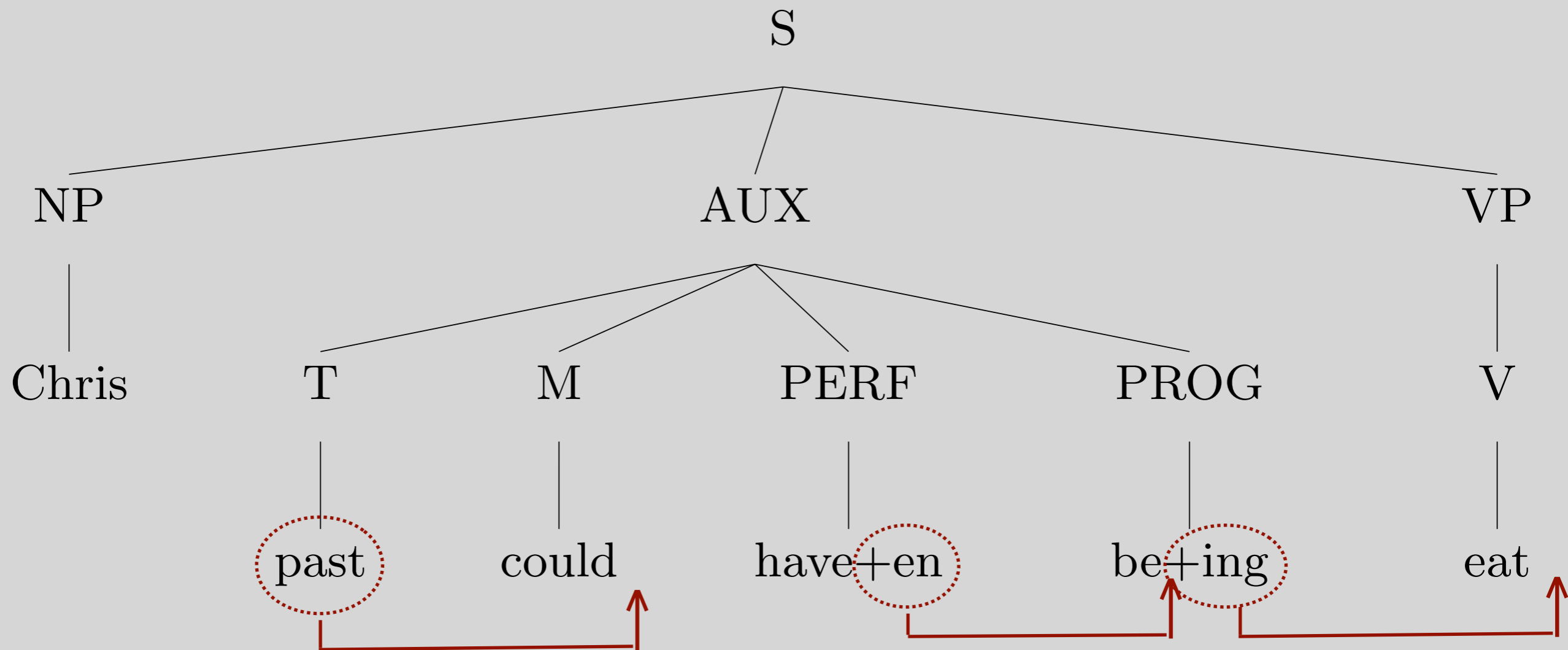
- Modals are finite, and all auxiliaries take non-finite complements. Hence, modals must come first.
- Stative verbs (like *own*) don't have present participles, and auxiliary *have* is stative. Hence, **Pat is having tapdanced*.

- **Iterability**

- Auxiliary *be* is also stative, so **Pat is being tapdancing*.
- Modals must be finite, and their complements must be base, so **Pat can should tapdance*.
- **Pat has had tapdanced* can be ruled out in various ways, e.g. stipulating that auxiliary *have* has no past participle.

Sketch of Chomsky's Old Analysis

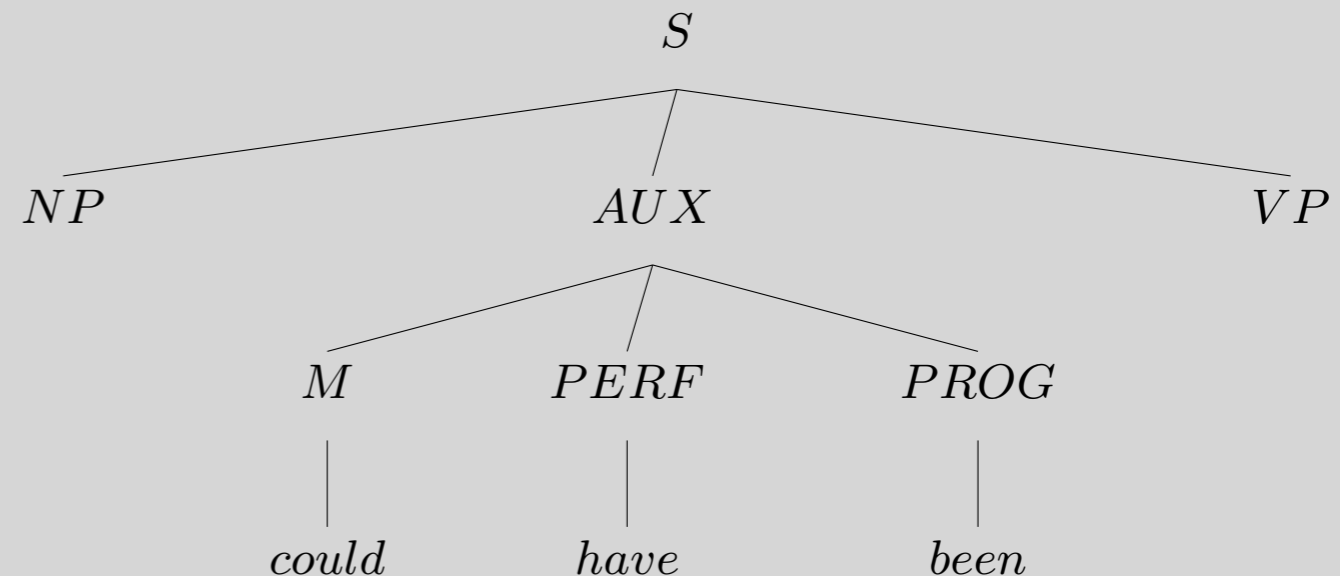
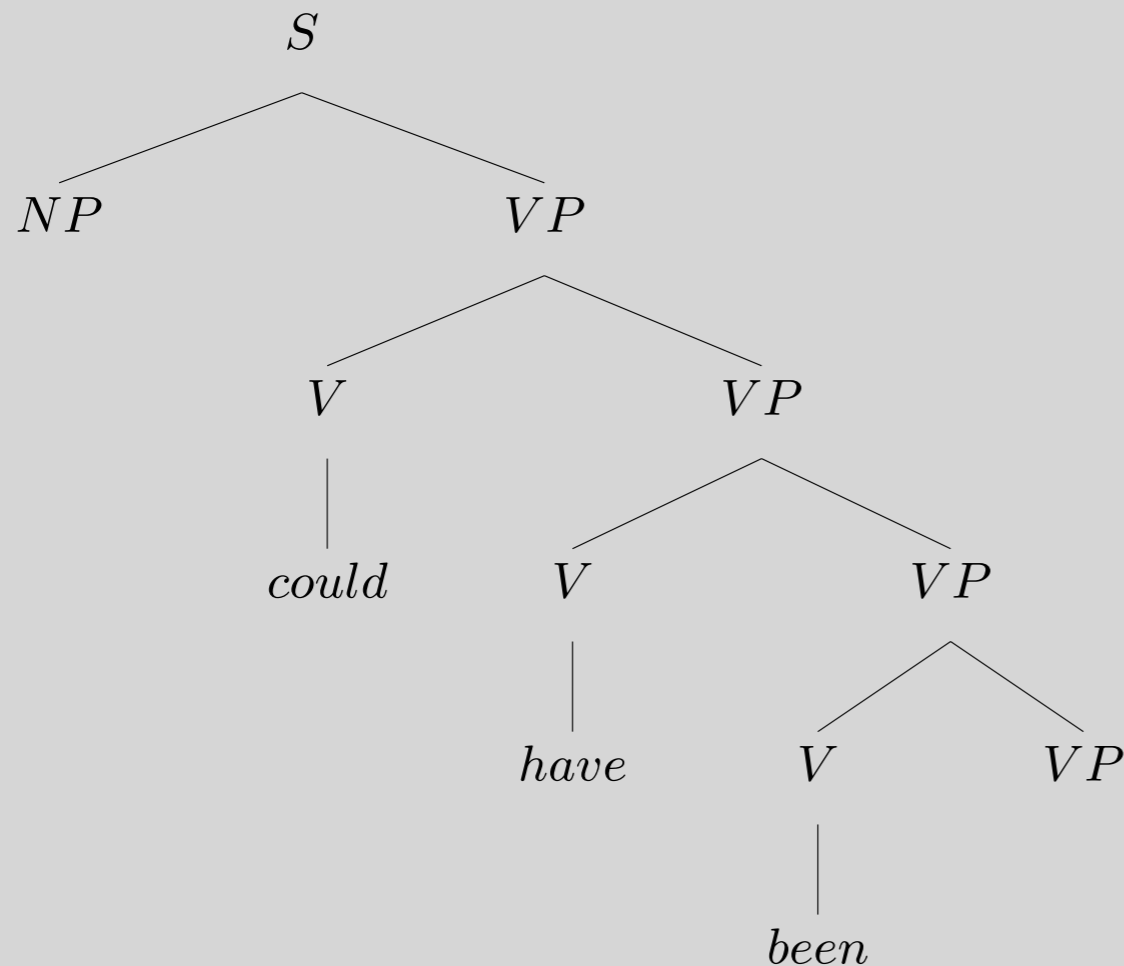
$S \rightarrow NP \text{ AUX } VP$
 $AUX \rightarrow T(M)(PERF)(PROG)$



How this Analysis Handles the Basic Facts

- **Optionality of auxiliaries:**
Stipulated in the phrase structure rule (with parentheses)
- **Auxiliaries precede non-auxiliary verbs:**
Built into the phrase structure rule, with AUX before VP
- **Auxiliaries determine the form of the following verb:**
Inflections are inserted with the auxiliaries and moved onto the following verb transformationally.
- **When auxiliaries co-occur, their order is fixed:**
Stipulated in the phrase structure rule for AUX
- **Non-iterability of auxiliaries:**
Ditto.

The two analyses assign very different trees



- *could have been* *VP*, *have been* *VP*, and *been* *VP* are all constituents
- *could have been* is not a constituent

- *could have been* *VP*, *have been* *VP*, and *been* *VP* are not constituents
- *could have been* is a constituent

Ellipsis and Constituency

- Consider:

Pat couldn't have been eating garlic, but Chris could have been

Pat couldn't have been eating garlic, but Chris could have

Pat couldn't have been eating garlic, but Chris could

- On the nested analysis, the missing material is a (VP) constituent in each case
- On the flat analysis, the missing material is never a constituent
- This argues for our analysis over the old transformational one.

Our Analysis of Auxiliaries So Far

- Auxiliaries are subject-raising verbs
- Most basic distributional facts about them can be handled through selectional restrictions between auxiliaries and their complements (that is, as ARG-ST constraints)
- Auxiliaries are identified via a HEAD feature AUX, which we have not yet put to use

Overview

- What are auxiliaries?
- General properties of auxiliaries
- Lexical type/lexical entries for auxiliaries
- Reading questions
- Next time: NICE properties (lexical rules)

Reading Questions

- Does our grammar account for the sentence **Pat do take logic* (as opposed to *Pat can take logic*)?
- Does *'ve* have the same feature structure as the *have* that we've been using in the examples of this section?

Reading Questions

- Why is the function F_{PAST} undefined for modals, while the morphological function F_{3SG} is defined and simply results in forms that are lacking the regular 3sing -s affix?
- What does it mean on p.99 that we can simply assume that the function F_{past} is undefined for certain words? Is this fact or being "undefined" something we can see in or build into our grammar?

Reading Questions

- I'm having a hard time setting aside the idea that the presence of a modal is in complementary distribution with presence of tense, and I find the text's answer to this (that modals do inflect for tense, but systematically don't show it) very unsatisfying. Is there a more concrete solution to this phenomenon in the bigger grammar(s), and if so, would you be able to at least share an intuition for it?

Reading Questions

- How do we handle phrases such as *is able to* (synonym of *can*) and *ought to* (synonym of *should*)? Using *is able to* as an example, do we simply treat *is* as an aux that must have *able* and *to* as the 2nd and 3rd element on its ARG-ST list respectively?

Reading Questions

- Did the specification [PRED +] in the lexical entry for be from ch. 11 in (10) restrict its co-occurrence to passive and progressive VP complements? Is this why FORM is not specified in the ch. 13 version of the lexical rule for be ? Why not specify FORM explicitly for the sake of clarity (even if it would be redundant)?

Reading Questions

- What does HPSG do with aspect?
- I still cannot understand why some *auxv-lxms* have a predicate in RESTR list while others don't. How can we determine whether an auxiliary verb lexeme has something in its RESTR list?

Reading Questions

- Why does "have" have a semantic role when it's a helper verb? Consider the following examples:

Paul has studied.

Paul studied.

I had done it!

I did it!

- These sentences seem to be have the truth conditions regardless of whether the auxiliary verb "have" is used. Shouldn't "have" have no semantic role?

Reading Questions

- How does the semantics differentiate between these sentences? - *He can have a bike* - *He will have a bike* - *He did have a bike*
- For 'have' does it have different semantics when it is a verb compared to aux-verb ?
- For ambiguously deontic modals, do we just make separate lexical entries for them to distinguish them from their non-deontic counterparts? Or will there be some test to tell them apart?

Reading Questions

- Are languages in which auxiliaries can co-occur in a non-fixed order or languages where auxiliaries can iterate?
- Is it better to introduce three subtypes of *auxv-lxm*: *modal-lxm* w/ [FORM fin], *have-lxm* w/ [ARG-ST <X, [FORM psp]>], and *be-lxm* w/ [ARG-ST <X, [PRED +]>], so that we can better explain the order of auxiliary sequence. A *have-lxm* word can't precede a *modal-lxm* word, because the FORM value of the complement VP headed by the *modal-lxm* word can't be psp. And a *be-lxm* word can't precede a *modal-lxm* word or a *have-lxm* word, because the PRED value of the complement VP headed by the *modal-lxm* word or the *have-lxm* word can't be +.

Reading Questions

- It seems like there are a number of phenomena which need a more complex semantic analysis to accurately account for them (such as in this chapter on p.401, have not iterating). How are these complexities handled in industry? Are there very complex semantic analyses used (that we're just not covering because it's an intro class), or is it all big data/neural-network work where you simply train your model until it works well enough without bothering to account for all that semantic complexity explicitly?

Reading Questions

- Reading this chapter also made me curious about how you developed the grammar, and I was wondering if the development corresponds to the linear way it is laid out in the textbook. I ask this because it seems that some decisions made early on presuppose the aspects of the grammar we see handled later.

Reading Questions

- Chomsky obviously was very influential in the 60s, but it also seems like a lot of the work he did was "armchair" linguistics that wasn't backed up by data/experiments. Does this book focus so heavily on relating everything to Chomsky's ideas because they are just the foundation of modern linguistics and therefore the topics to address, or are Chomsky's ideas still the main line of thought in linguistics? As we get better ways of testing language knowledge/production and more insight into the brain, are we moving past Chomsky, or is he really still this relevant? What about in CompLing versus Ling in general?