

Ling 566
Nov 27, 2012
Long Distance Dependencies

Overview

- Some examples of the phenomenon
- What is new and different about it
- Brief sketch of the TG approach
- Broad outlines of our approach
- Details of our approach
- Subject extraction
- Coordinate Structure Constraint

Examples

- *wh*-questions:

What did you find?

Tell me who you talked to

- relative clauses:

the item that I found

the guy who(m) I talked to

- topicalization:

The manual, I can't find

Chris, you should talk to.

- *easy*-adjectives:

My house is easy to find.

Pat is hard to talk to.

What these have in common

- There is a ‘gap’: nothing following *find* and *to*, even though both normally require objects.
- Something that fills the role of the element missing from the gap occurs at the beginning of the clause.
- We use topicalization and *easy*-adjectives to illustrate:

The manual, *I can't find* _____

Chris *is easy to talk to* _____

Gaps and their fillers can be far apart:

- *The solution to this problem, Pat said that someone claimed you thought I would never find_____.*
 - *Chris is easy to consider it impossible for anyone but a genius to try to talk to_____.*
- ☞ That's why we call them “long distance dependencies”

Fillers often have syntactic properties associated with their gaps

Him, I haven't met ____.

**He, I haven't met ____.*

The scissors, Pat told us _____ were missing.

**The scissors, Pat told us _____ was missing.*

On Pat, you can rely ____.

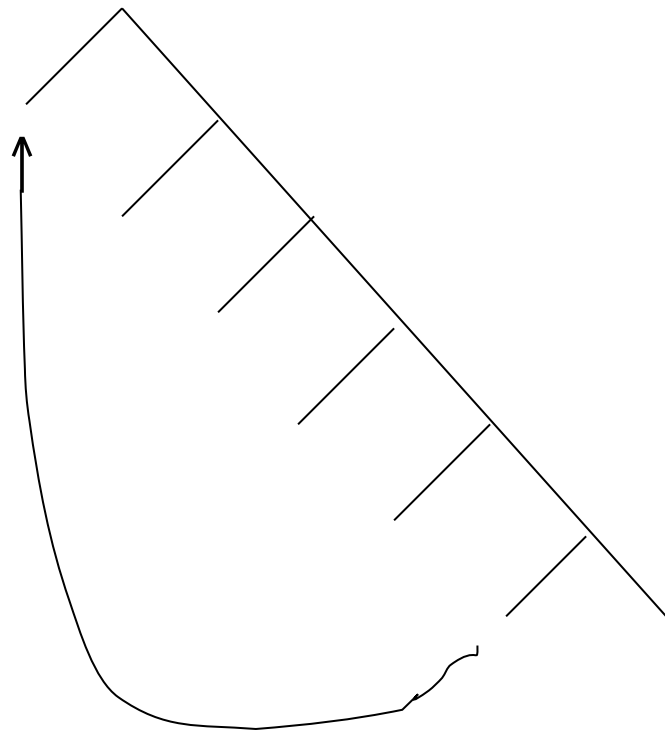
**To Pat, you can rely ____.*

LDDs in TG

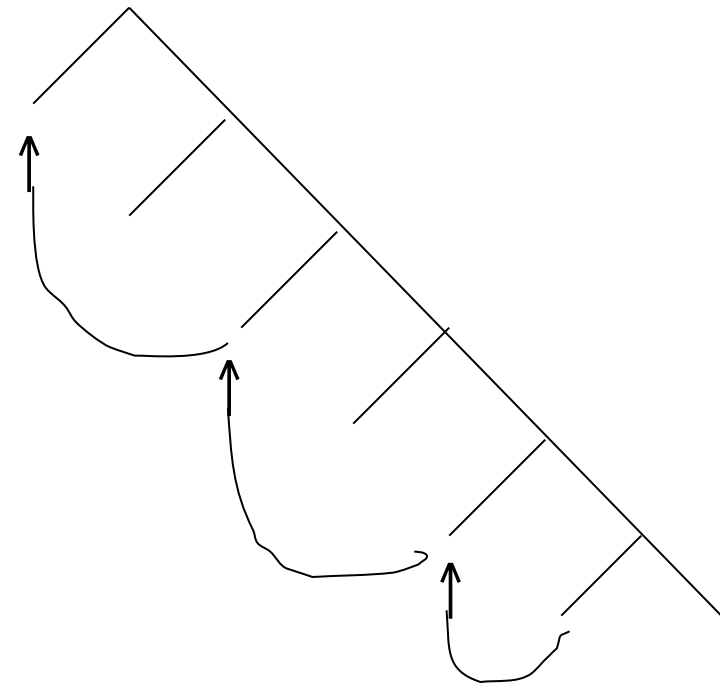
- These were long thought to constitute the strongest evidence for transformations.
- They were handled in TG by moving the filler from the gap position.
- Case, agreement, preposition selection could apply before movement.

A big debate about LDDs in TG

- Does long-distance movement take place in one fell swoop or in lots of little steps?



Swooping



Looping

Looping is now generally accepted in TG

- Various languages show morphological marking on the verbs or complementizers of clauses between the filler and the gap.
- Psycholinguistic evidence indicates increased processing load in the region between filler and gap.
- This opens the door to non-transformational analyses, in which the filler-gap dependency is mediated by local information passing.

Very Rough Sketch of Our Approach

- A feature GAP records information about a missing constituent.
- The GAP value is passed up the tree by a new principle.
- A new grammar rule expands S as a filler followed by another S whose GAP value matches the filler.
- Caveat: Making the details of this general idea work involves several complications.

The Feature GAP

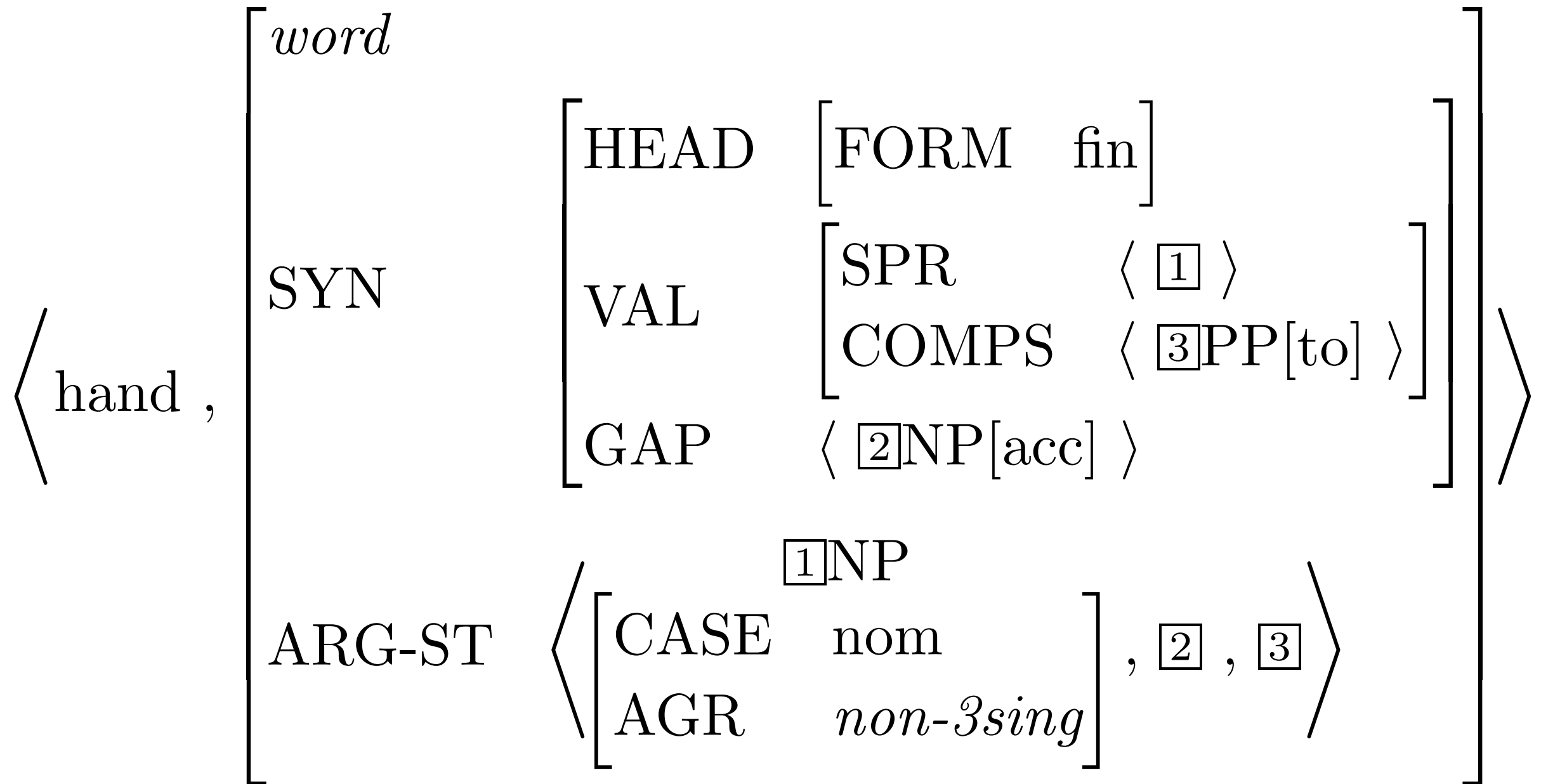
- Like valence features and ARG-ST, GAP's value is a list of feature structures (often empty).
- Subject gaps are introduced by a lexical rule.
- Non-subject gaps are introduced by revising the Argument Realization Principle.

The Revised ARP

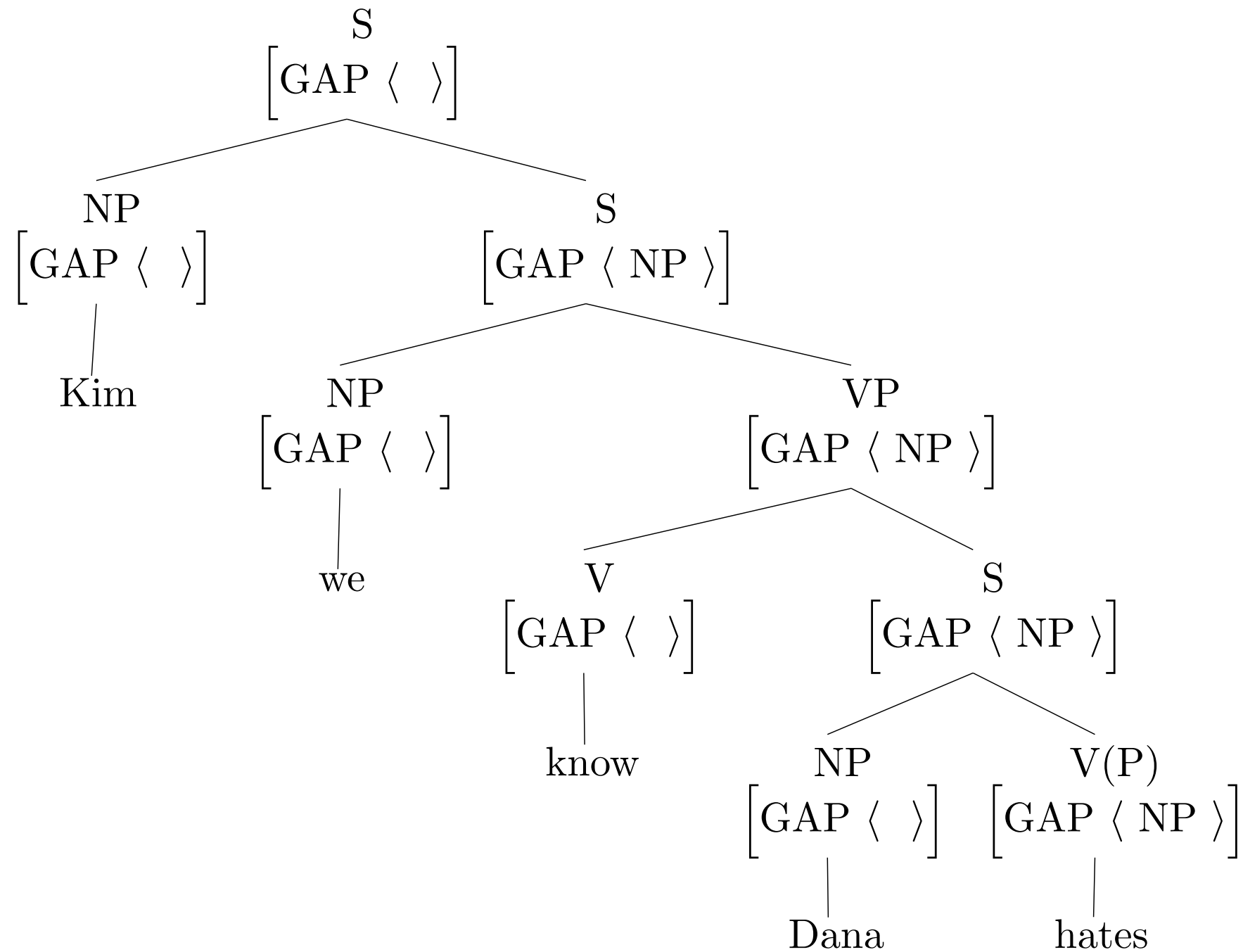
$$\text{word:} \left[\begin{array}{l} \text{SYN} \\ \text{ARG-ST} \end{array} \left[\begin{array}{l} \text{VAL} \\ \text{GAP} \end{array} \left[\begin{array}{l} \text{SPR} \\ \text{COMPS} \end{array} \left[\begin{array}{l} \boxed{A} \\ \boxed{B} \ominus \boxed{C} \end{array} \right] \right] \right] \oplus \boxed{B} \right]$$

- \ominus is a kind of list subtraction, but:
 - it's not always defined, and
 - when defined, it's not always unique
- The ARP now says the non-SPR arguments are distributed between COMPS and GAP.

A Word with a Non-Empty GAP Value



How We Want GAP to Propagate



What We Want the GAP Propagation Mechanism to Do

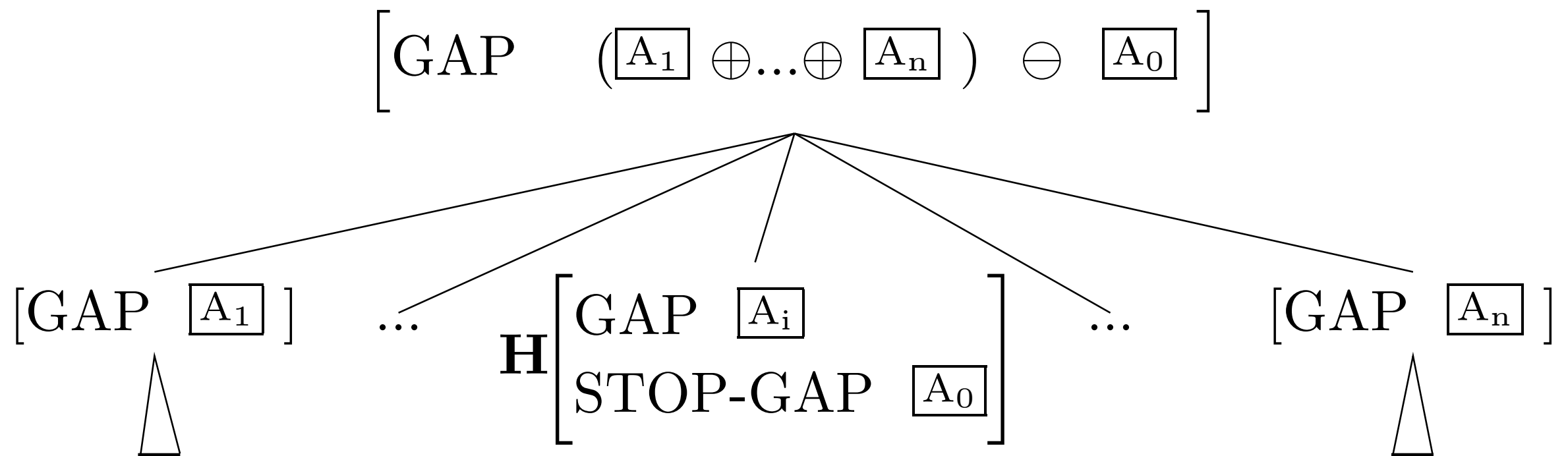
- Pass any GAP values from daughters up to their mothers,
- **except** when the filler is found.
- For topicalization, we can write the exception into the grammar rule, but
- For *easy*-adjectives, the NP that corresponds to the gap is the subject, which is introduced by the Head-Specifier Rule.
- Since specifiers are not generally gap fillers, we can't write the gap-filling into the HSR.

Our Solution to this Problem

- For *easy*-adjectives, we treat the adjective formally as the filler, marking its SPR value as coindexed with its GAP value.
- We use a feature STOP-GAP to trigger the emptying of the GAP list.
 - STOP-GAP stops gap propagation
 - *easy*-adjectives mark STOP-GAP lexically
 - a new grammar rule, the Head-Filler Rule mentions STOP-GAP

The GAP Principle

A local subtree Φ satisfies the GAP Principle with respect to a headed rule ρ if and only if Φ satisfies:



How does STOP-GAP work?

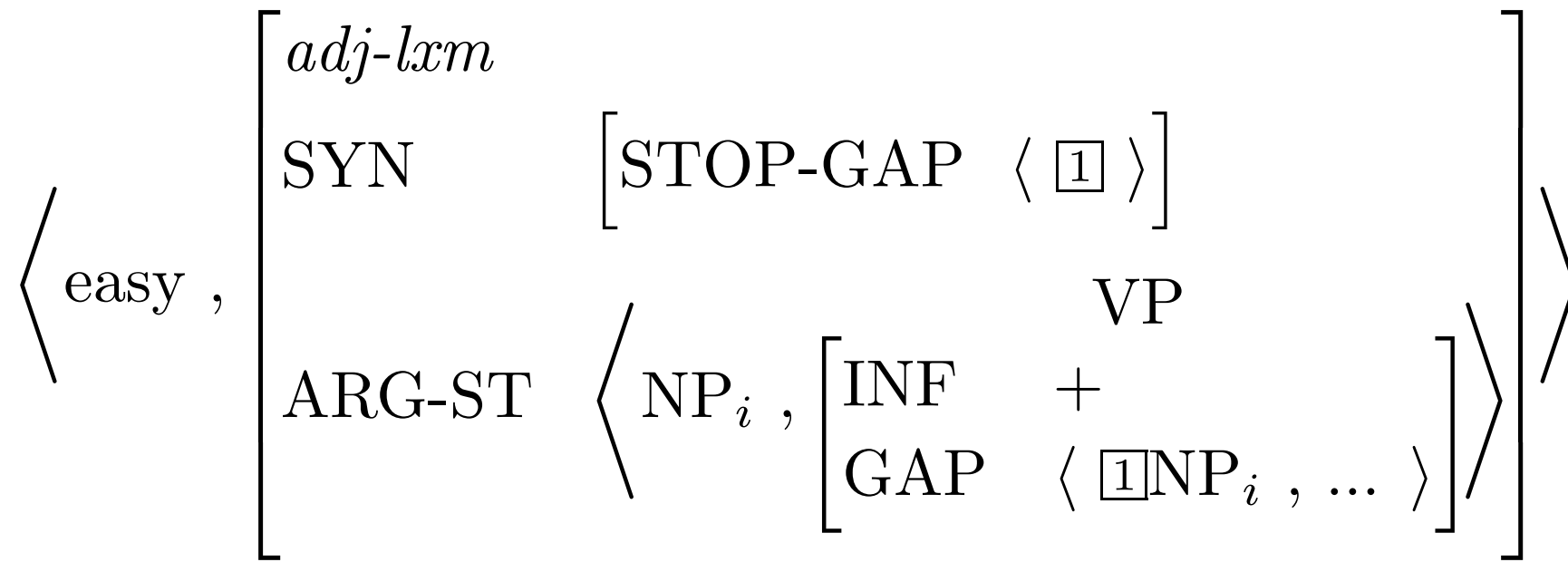
- STOP-GAP is empty almost everywhere
- When a gap is filled, STOP-GAP is nonempty, and its value is the same as the gap being filled.
- This blocks propagation of that GAP value, so gaps are only filled once.
- The nonempty STOP-GAP values come from two sources:
 - a stipulation in the Head-Filler Rule
 - lexical entries for *easy*-adjectives
- No principle propagates STOP-GAP

The Head-Filler Rule

$$[phrase] \rightarrow \boxed{1} \left[\text{GAP} \quad \langle \rangle \right] \mathbf{H} \left[\begin{array}{l} \text{HEAD} \quad \left[\begin{array}{l} \textit{verb} \\ \text{FORM} \quad \textit{fin} \end{array} \right] \\ \text{VAL} \quad \left[\begin{array}{l} \text{SPR} \quad \langle \rangle \\ \text{COMPS} \quad \langle \rangle \end{array} \right] \\ \text{STOP-GAP} \quad \langle \boxed{1} \rangle \\ \text{GAP} \quad \langle \boxed{1} \rangle \end{array} \right]$$

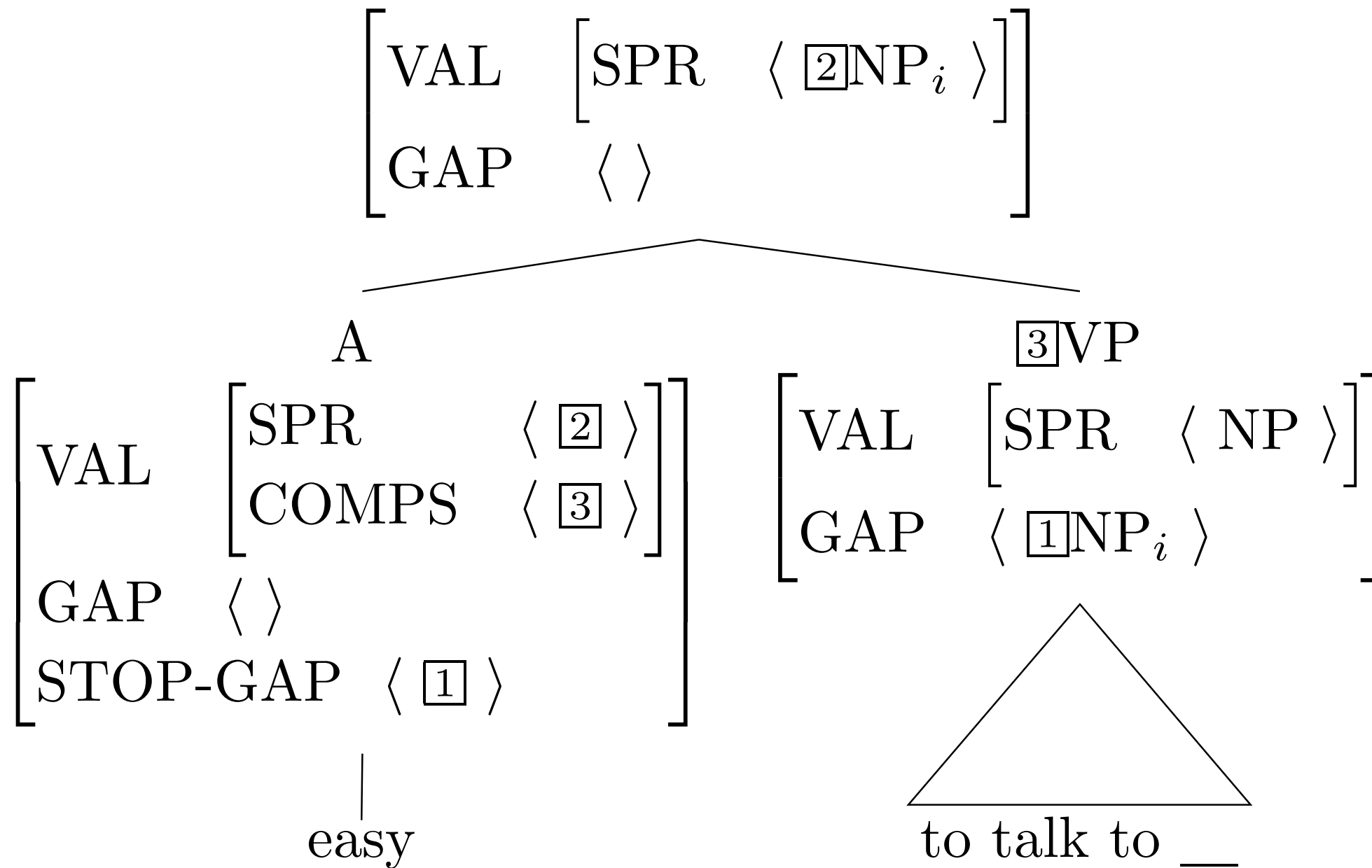
- This only covers gap filling in finite Ss
- The filler has to be identical to the GAP value
- The STOP-GAP value is also identical
- The GAP Principle ensures that the mother's GAP value is the empty list

Gap Filling with *easy*-Adjectives



- Because STOP-GAP and GAP have the same value, that value will be subtracted from the mother's GAP value.
- The first argument is coindexed with the GAP value, accounting for the interpretation of the subject as the filler.

A Tree for *easy to talk to*_____



STOP-GAP Housekeeping

- Lexical entries with nonempty STOP-GAP values (like *easy*) are rare, so STOP-GAP is by default empty in the lexicon.
- Head-Specifier and Head-Modifier rules need to say [STOP-GAP < >]
- Lexical rules preserve STOP-GAP values.

GAP Housekeeping

- The initial symbol must say [GAP < >]. Why?
 - To block **Pat found* and **Chris talked to* as stand-alone sentences.
- The Imperative Rule must propagate GAP values. Why?
 - It's not a headed rule, so the effect of the GAP Principle must be replicated
 - Imperatives can have gaps:
This book, put on the top shelf!

Sentences with Multiple Gaps

- Famous examples:

This violin, sonatas are easy to play___ on___.

**Sonatas, this violin is easy to play___ on___.*

- Our analysis gets this:
 - The subject of *easy* is coindexed with the **first** element of the GAP list.
 - The Head-Filler rule only allows one GAP remaining.
- There are languages that allow multiple gaps more generally.

Where We Are

- filler-gap structures:

The solution to this problem, nobody understood_____

That problem is easy to understand_____

- The feature GAP encodes information about missing constituents
- Modified ARP allows arguments that should be on the COMPS list to show up in the GAP list
- GAP values are passed up the tree by the GAP Principle

Where We Are (continued)

- The feature STOP-GAP signals where GAP passing should stop
- The Head-Filler Rule matches a filler to a GAP and (via STOP-GAP) empties GAP
- Lexical entries for *easy*-adjectives require a gap in the complement, coindex the subject with the gap, and (via STOP-GAP) empty GAP on the mother

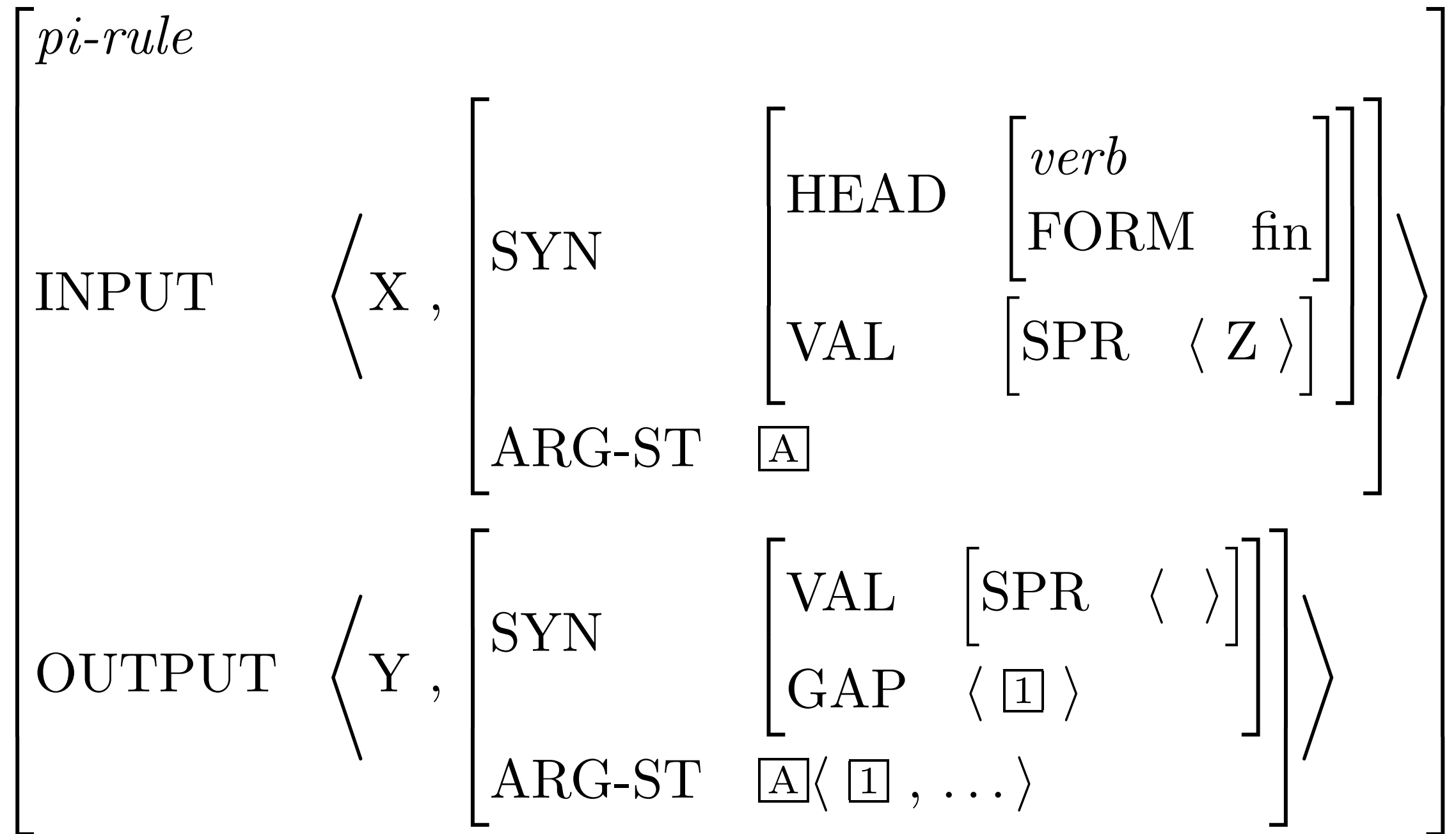
On to New Material....

- Sentences with subject gaps
- Gaps in coordinate constructions

Subject Gaps

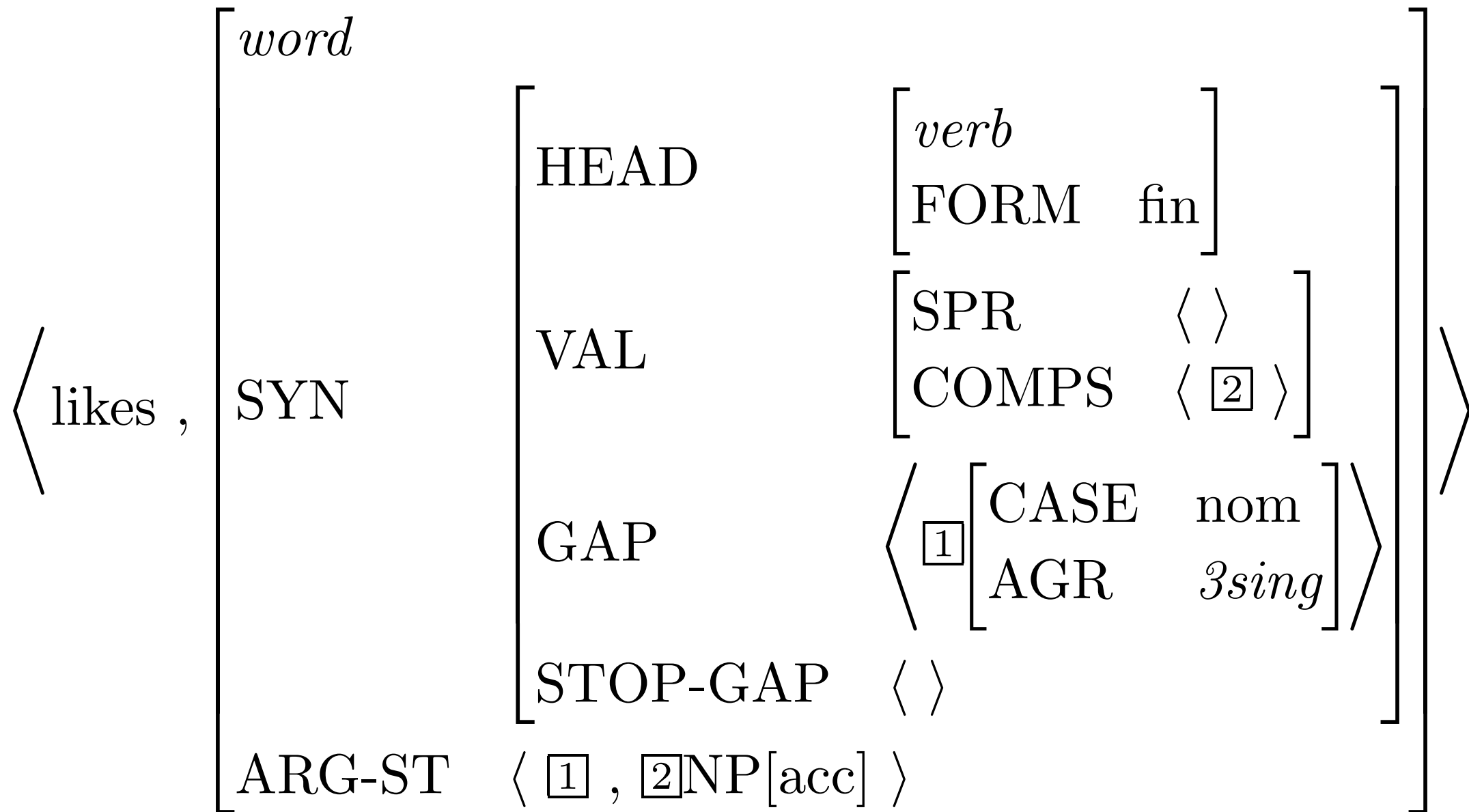
- The ARP revision only allowed missing complements.
- But gaps occur in subject position, too:
This problem, everyone thought ____ was too easy.
- We handle these via a lexical rule that, in effect, moves the contents of the SPR list into the GAP list

The Subject Extraction Lexical Rule



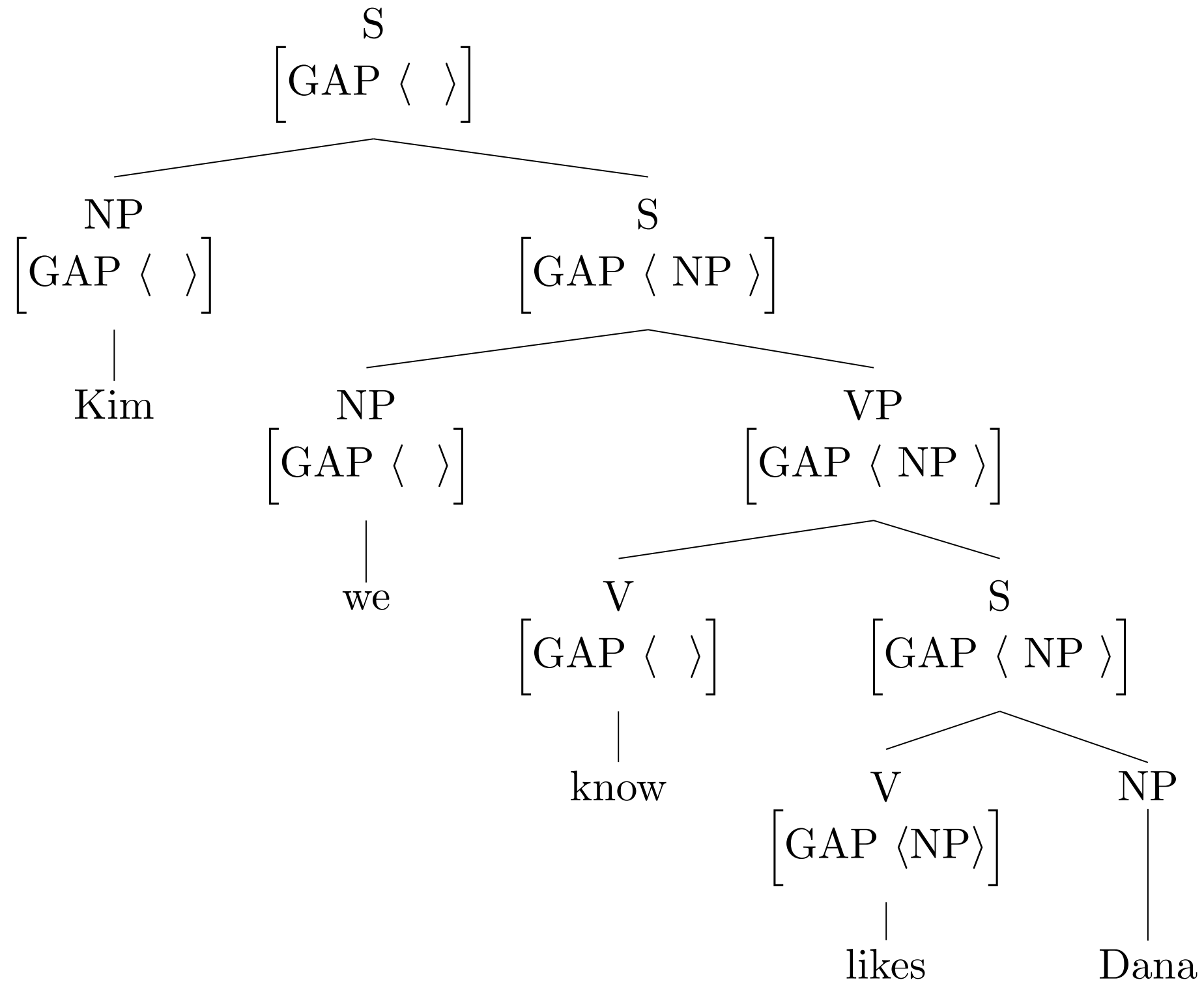
- NB: This says nothing about the phonology, because the default for *pi-rules* is to leave the phonology unchanged.

A Lexical Sequence This Licenses



- Note that the ARP is satisfied

A Tree with a Subject Gap



Island Constraints

- There are configurations that block filler-gap dependencies, sometimes called “islands”
- Trying to explain them has been a central topic of syntactic research since the mid 1960s
- We’ll look at just one, Ross’s so-called “Coordinate Structure Constraint”
- Loose statement of the constraint: a constituent outside a coordinate structure cannot be the filler for a gap inside the coordinate structure.

Coordinate Structure Constraint Examples

*This problem, nobody finished the extra credit and _____

*This problem, nobody finished _____ and the extra credit.

*This problem, nobody finished _____ and started the extra credit.

*This problem, nobody started the extra credit and finished _____

- But notice:

This problem, everybody started _____ and nobody finished _____

The Coordinate Structure Constraint

- In a coordinate structure,
 - no conjunct can be a gap (conjunct constraint),
and
 - no gap can be contained in a conjunct if its filler is outside of that conjunct (element constraint)
-unless each conjunct has a gap that is paired with the same filler (across-the-board exception)

These observations cry out for explanation

- In our analysis, the conjunct constraint is an immediate consequence: individual conjuncts are not on the ARG-ST list of any word, so they can't be put on the GAP list
- The element constraint and ATB exception suggest that GAP is one of those features (along with VAL and FORM) that must agree across conjuncts.
- Note: There is no ATB exception to the conjunct constraint.
**This problem, you can compare only _____ and _____.*

Our Coordination Rule, so far

$$\begin{array}{l} \left[\begin{array}{ll} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{IND} & s_0 \end{array} \right] \end{array} \rightarrow \begin{array}{l} \left[\begin{array}{ll} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{IND} & s_1 \end{array} \right] \dots \left[\begin{array}{ll} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{IND} & s_{n-1} \end{array} \right] \left[\begin{array}{ll} \text{HEAD} & conj \\ \text{IND} & s_0 \\ \text{RESTR} & \langle \left[\text{ARGS } \langle s_1 \dots s_n \rangle \right] \rangle \end{array} \right] \left[\begin{array}{ll} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{IND} & s_n \end{array} \right] \end{array}$$

- Recall that we have tinkered with what must agree across conjuncts at various times.
- Now we'll add GAP to the things that conjuncts must share

Our Final Coordination Rule

$$\begin{array}{l} \left[\begin{array}{ll} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_0 \end{array} \right] \end{array} \rightarrow \begin{array}{l} \left[\begin{array}{ll} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_1 \end{array} \right] \dots \left[\begin{array}{ll} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_{n-1} \end{array} \right] \left[\begin{array}{ll} \text{HEAD} & conj \\ \text{IND} & s_0 \\ \text{RESTR} & \langle \left[\text{ARGS} \langle s_1 \dots s_n \rangle \right] \rangle \end{array} \right] \left[\begin{array}{ll} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_n \end{array} \right] \end{array}$$

- We've just added GAP to all the conjuncts and the mother.
- This makes the conjuncts all have the same gap (if any)
- Why do we need it on the mother?

Closing Remarks on LDDs

- This is a huge topic; we've only scratched the surface
 - There are many more kinds of LDDs, which would require additional grammar rules
 - There are also more island constraints, which also need to be explained
- Our account of the coordinate structure constraint (based on ideas of Gazdar) is a step in the right direction, but it would be nice to explain why certain features must agree across conjuncts.

Overview

- Some examples of the phenomenon
- What is new and different about it
- Brief sketch of the TG approach
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- Subject extraction
- Coordinate Structure Constraint

Reading Questions

- If an ARG-ST element is mapped to GAP instead of SPR or COMPS, does the corresponding semantic argument go unlinked?
- What is a topicalized sentence?
- If we redefine S to be GAP $\langle \rangle$, then what symbol do we use for just SPR $\langle \rangle$, COMPS $\langle \rangle$?

Reading Questions

- How does the new initial symbol ensure that all GAPS are eventually filled?

$$(40) \left[\begin{array}{l} \textit{phrase} \\ \\ \text{SYN} \end{array} \left[\begin{array}{l} \text{HEAD} \left[\begin{array}{l} \textit{verb} \\ \text{FORM} \quad \textit{fin} \end{array} \right] \\ \text{VAL} \left[\begin{array}{l} \text{SPR} \quad \langle \rangle \\ \text{COMPS} \quad \langle \rangle \end{array} \right] \\ \text{GAP} \quad \langle \rangle \end{array} \right] \right]$$

- Are *easy* and *hard* the only adjectives of that type?

easy adjectives in the ERG

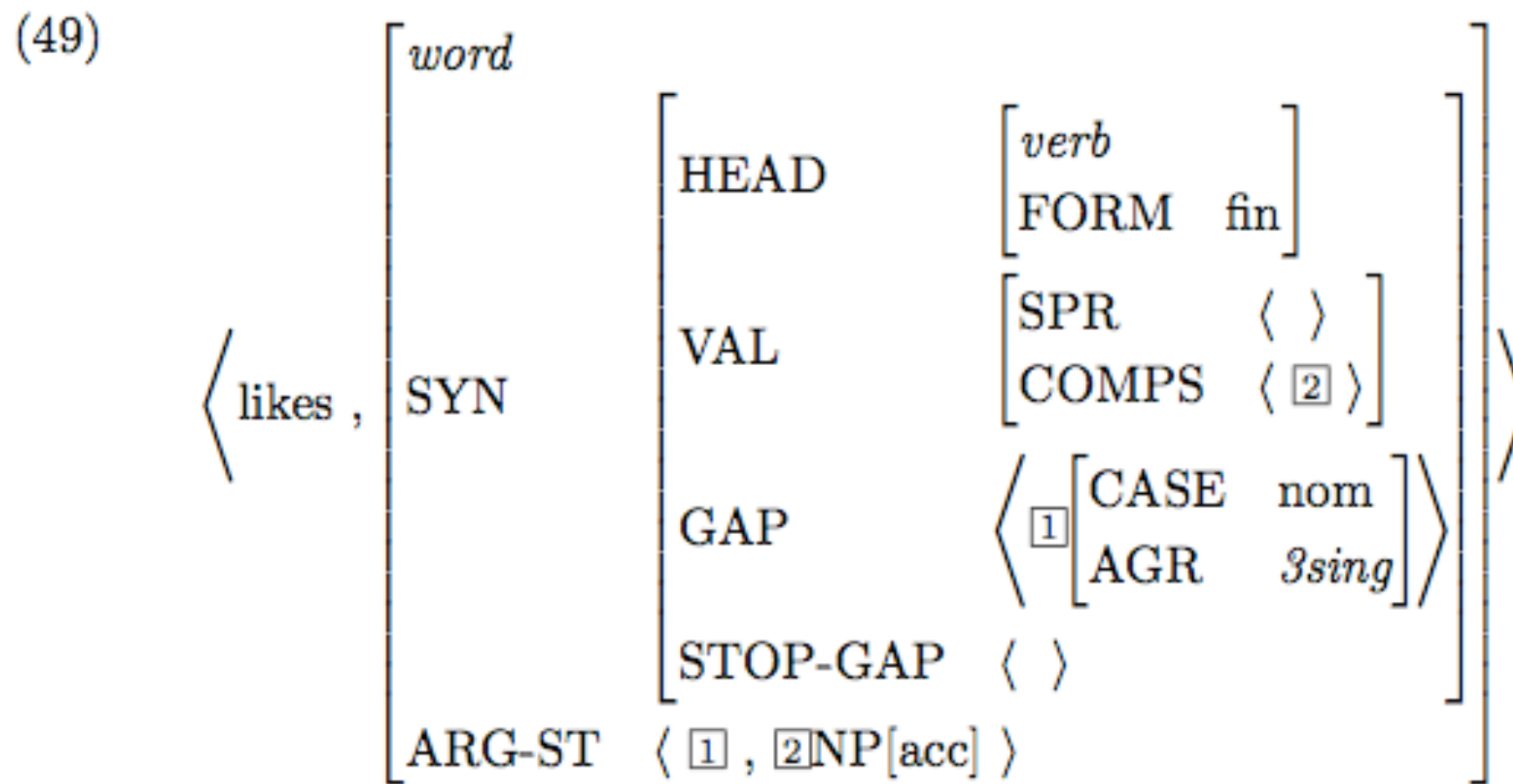
all right, available, dangerous, difficult, enjoyable,
entertaining, feasible, fine, good, handy, hard, hazardous,
important, impossible, interesting, left, liberating, safe,
sensible, simple, tedious, tough, wonderful,

Reading Questions

- Why do the *easy*-adjectives only coindex their SPR with their complement's GAP, rather than identifying the whole feature structure?
- How does agreement work with *easy*-adjectives? Is it just because they share only an index?
 - (1) She is easy to follow.
 - (2) It is easy to follow her.

Reading Questions

- What kind of sentences is the following lexical sequence involved in licensing?



Reading Questions

- Does the order of elements on the GAP list matter?
- Where do values for STOP-GAP come from?
- Why isn't GAP under VAL?

Reading Questions

- Why does the Imperative Rule identify the GAP values of mother and daughter?
- Why not just say that they are both empty?
- Are there any semantics restrictions or "tendencies" concerning what can go in a gap?

Reading Questions

- How is (61) not licensed?

(61) *Which rock legend would it be ridiculous to compare [[__] and [__]]?

- How is (62) grammatical? I'm having a hard time believing it is.

(62) Which rock legend would it be ridiculous to compare __ with himself?

Reading Questions

- Why do we need STOP-GAP? Can't we just cancel the GAP value when we fill it?
- Why doesn't the modification of the Coordination Rule also include the guarantee that conjuncts cannot differ in their STOP-GAP value? Does the grammar license fillers as conjuncts without that modification?
 - (1) This table and those chairs Kim bought at the store yesterday.
 - (2) Over the river and through the woods to Grandmother's house we go.

Reading Questions

- In the HFR, how can the GAP value be identified with STOP-GAP and with the non-head daughter?

$$[phrase] \rightarrow \boxed{1} [GAP \langle \rangle] \mathbf{H} \left[\begin{array}{l} \text{HEAD} \left[\begin{array}{l} \textit{verb} \\ \text{FORM} \quad \textit{fin} \end{array} \right] \\ \text{VAL} \left[\begin{array}{l} \text{SPR} \quad \langle \rangle \\ \text{COMPS} \quad \langle \rangle \end{array} \right] \\ \text{STOP-GAP} \quad \langle \boxed{1} \rangle \\ \text{GAP} \quad \langle \boxed{1} \rangle \end{array} \right]$$

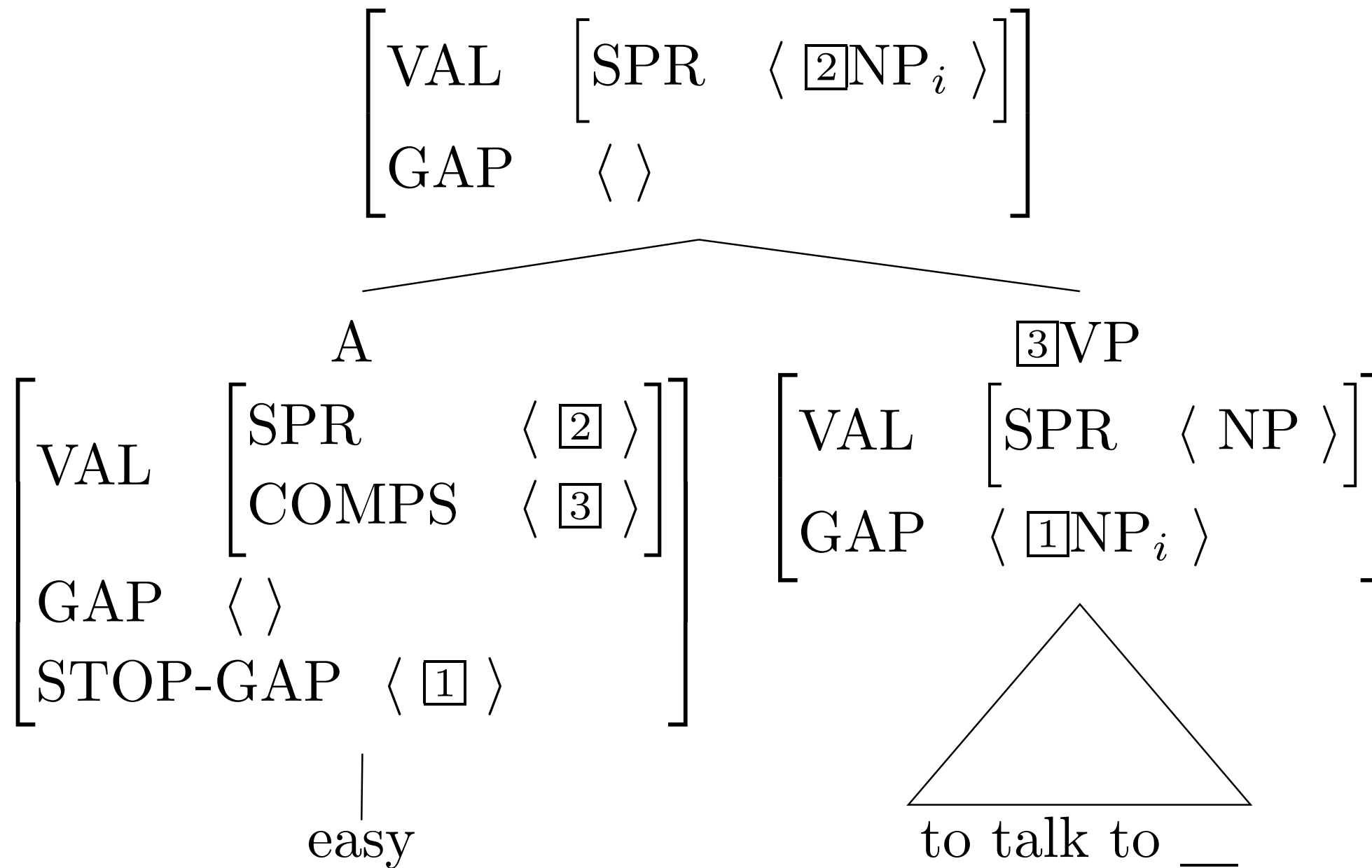
Reading Questions

- In order for the Head-Filler Rule to fire, the head daughter needs to have a value in its stop-gap feature. But in the (35), for example, it just seems to appear - unlike easy where it is specified in the lexical entry. What gives?

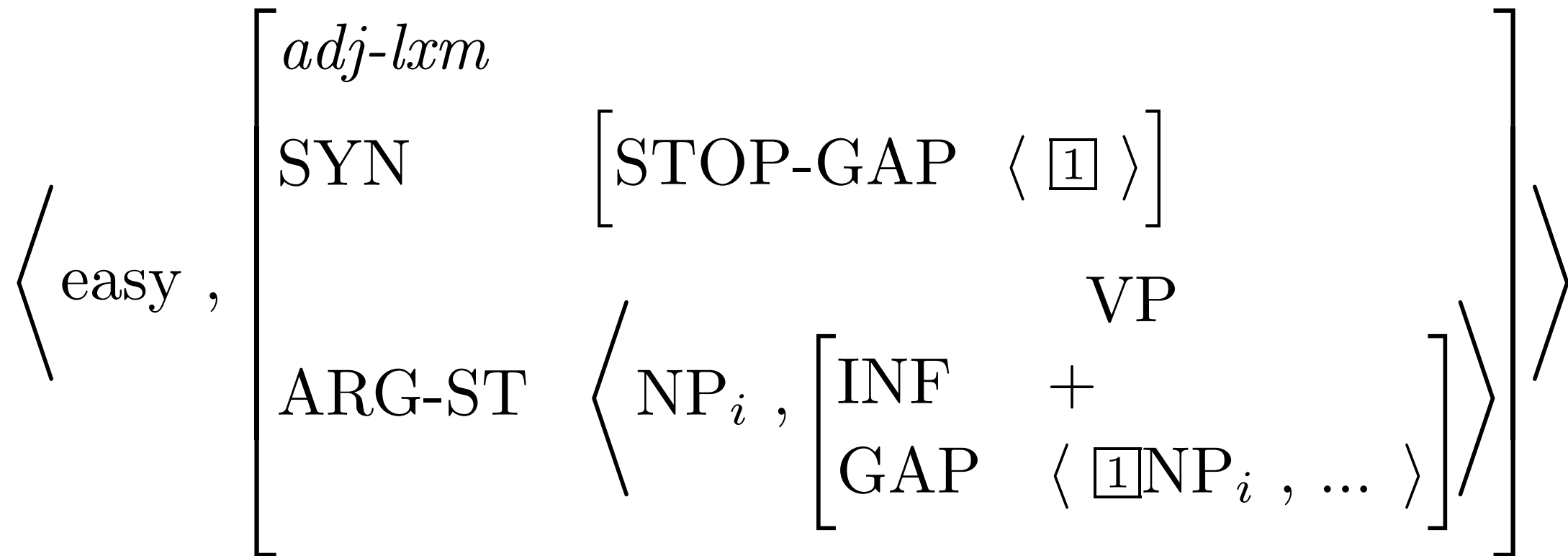
Reading Questions

- Why is the GAP value on *easy* < >?
- What keeps the second ARG-ST element from showing up on GAP?
- What constrains the STOP-GAP value on the mother?

A Tree for *easy to talk to*_____



Lexical entry for *easy*



Reading Questions

- In a tree, will the number of nodes with non-empty STOP-GAP values equal the number of gaps?

Reading Questions

- How would our grammar handle sentences like (2) where the conjoined, topicalized NPs are interpreted to be individual complements of the verbs?
 - (1) An apple and a banana, Tim bought and Eric ate.
 - (2) An apple and a banana, Tim bought and Eric ate, respectively.
- The interpretation in (1) is that Tim bought both an apple and a banana and Eric ate both an apple and a banana, and in (2) that Tim bought an apple and Eric ate a banana.

Reading Questions

- In example (2) on page 428 you write:
 - b. To whom did they hand the toy?
 - c. Who(m) should you have talked to?
- Why does c. seem to be receiving a potential hall pass on not agreeing with its ACC case preposition?

Reading Questions

- Intuitively, I was wondering whether this chapter was going to address sentences with this kind of aside thing going on:

The story, which we all know and love ____(?), will be told for ages.

- Are those the "relative clauses" which are "beyond the scope of our text" as mentioned in 14.5? If not, do we have the tools to describe them?

Reading Questions

- How does our current grammar handle this sentence:

I like the student we met yesterday.

- I feel that there is a *which* hidden in between *student* and *we*, but how do we specify a gap filler in the tree that is not found in the sentence?

Reading Questions

- I don't understand what would license the *wh*- pronoun, or the verb *do* for that matter, in present simple questions. It seems that something specific about the nature of a question would license *wh*, so that it wouldn't be licensed in normal sentences.

Reading Questions

- Also, there's mention that these topical sentences are rather rare in English, but common in some other languages. They sound pretty old-timey to me. From a historical perspective, would something like the topical formation be considered an artifact from an ancestor language?

Reading Questions

- How do we license (2) without allowing (1)?

(1) *You can rely on that the textbook includes answer keys.

(2) That the textbook includes answer keys, you can rely on.

Reading Questions

- True or false: the maximum possible list size of GAP would be 2. That's because the max size of a comps list would be 2, for a ditransitive verb, so in a "worse case scenario," GAP would have 2 phrases.

Reading Questions

To the baby, that toy would be easy to hand ____ ____.
That toy, which baby did you hand to ____ ____?

- Does the order of elements in GAP list matters?
- How do we keep track of filler/gap pairs in the sentence contains multiple GAPs?
- The Head-Filler Rule only identifies one filler/gap pair at a time. Are we going to extend this rule so that it can handle multiple GAPs?
- Do we ever get sentences with >2 nested gaps?