

Ling 566
Dec 3, 2015
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
- Reading questions

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 ____.

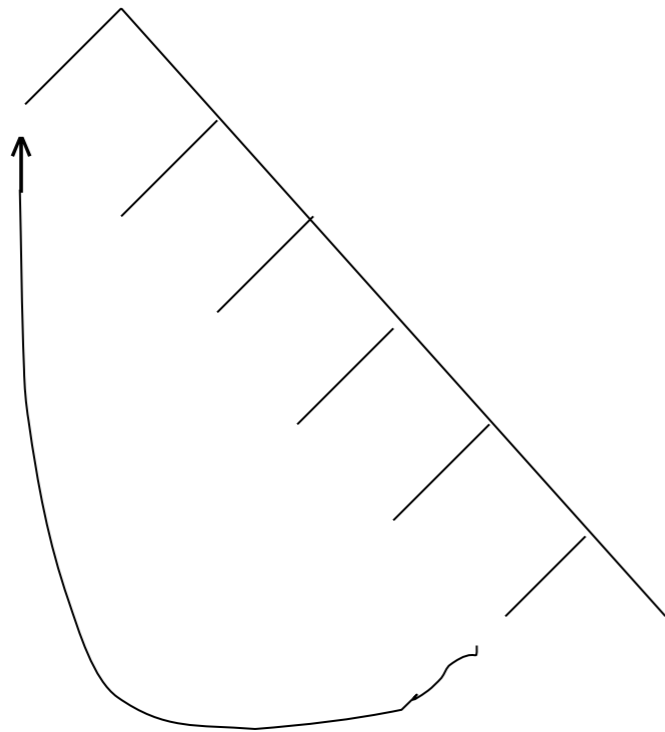
**To Pat, you can rely ____.*

LDDs in TG

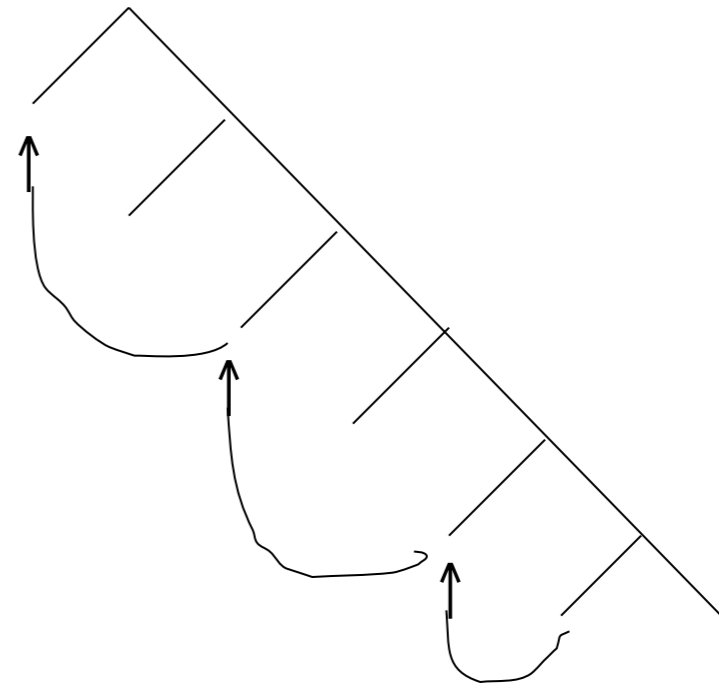
- These were long thought to constitute the strongest evidence for transformations.
- They were handled in TG by moving the filler from the gap position.
- Case, agreement, preposition selection could apply before movement.

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

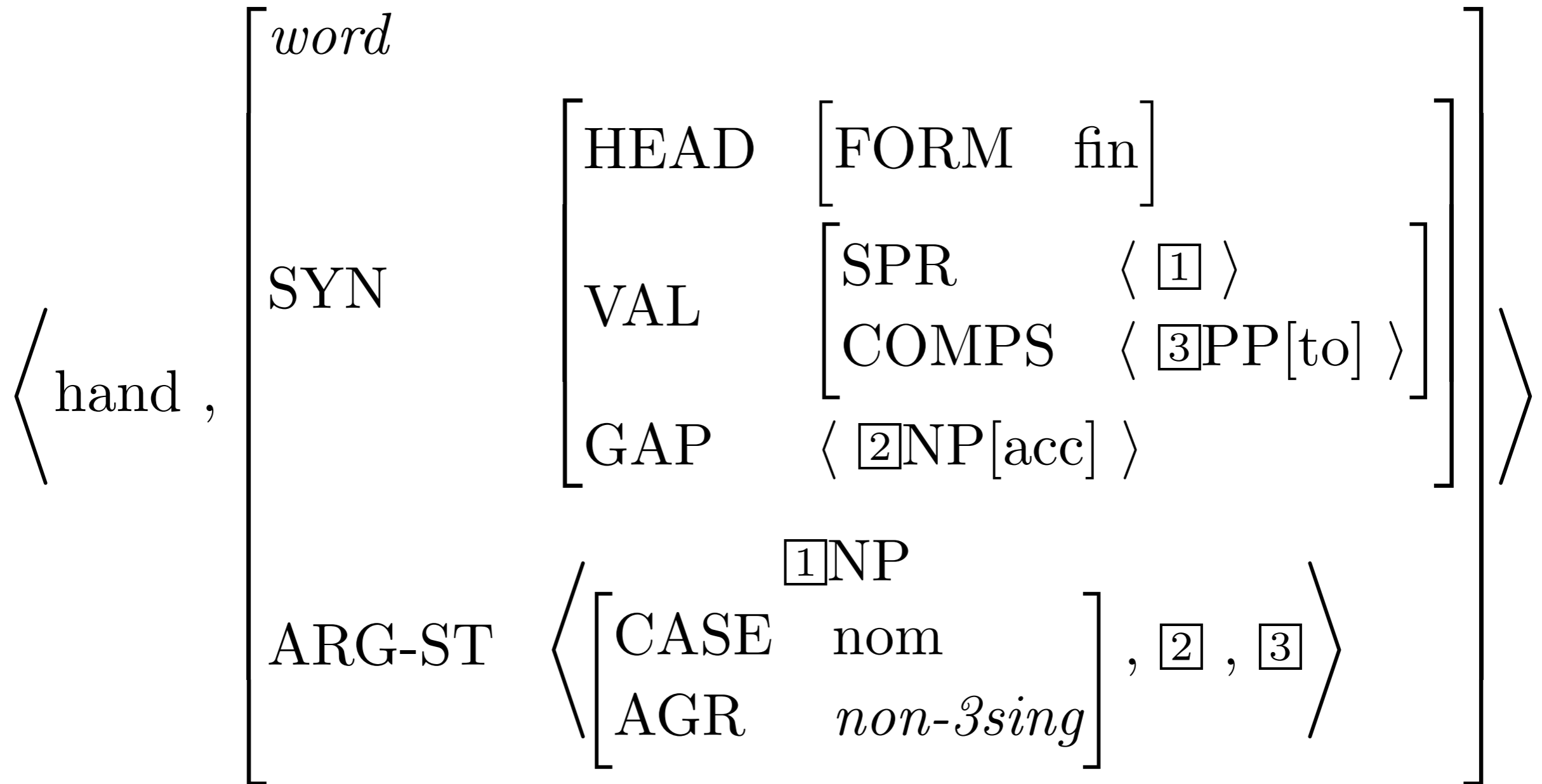
- Like valence features and ARG-ST, GAP's value is a list of feature structures (often empty).
- Subject gaps are introduced by a lexical rule.
- Non-subject gaps are introduced by revising the Argument Realization Principle.

The Revised ARP

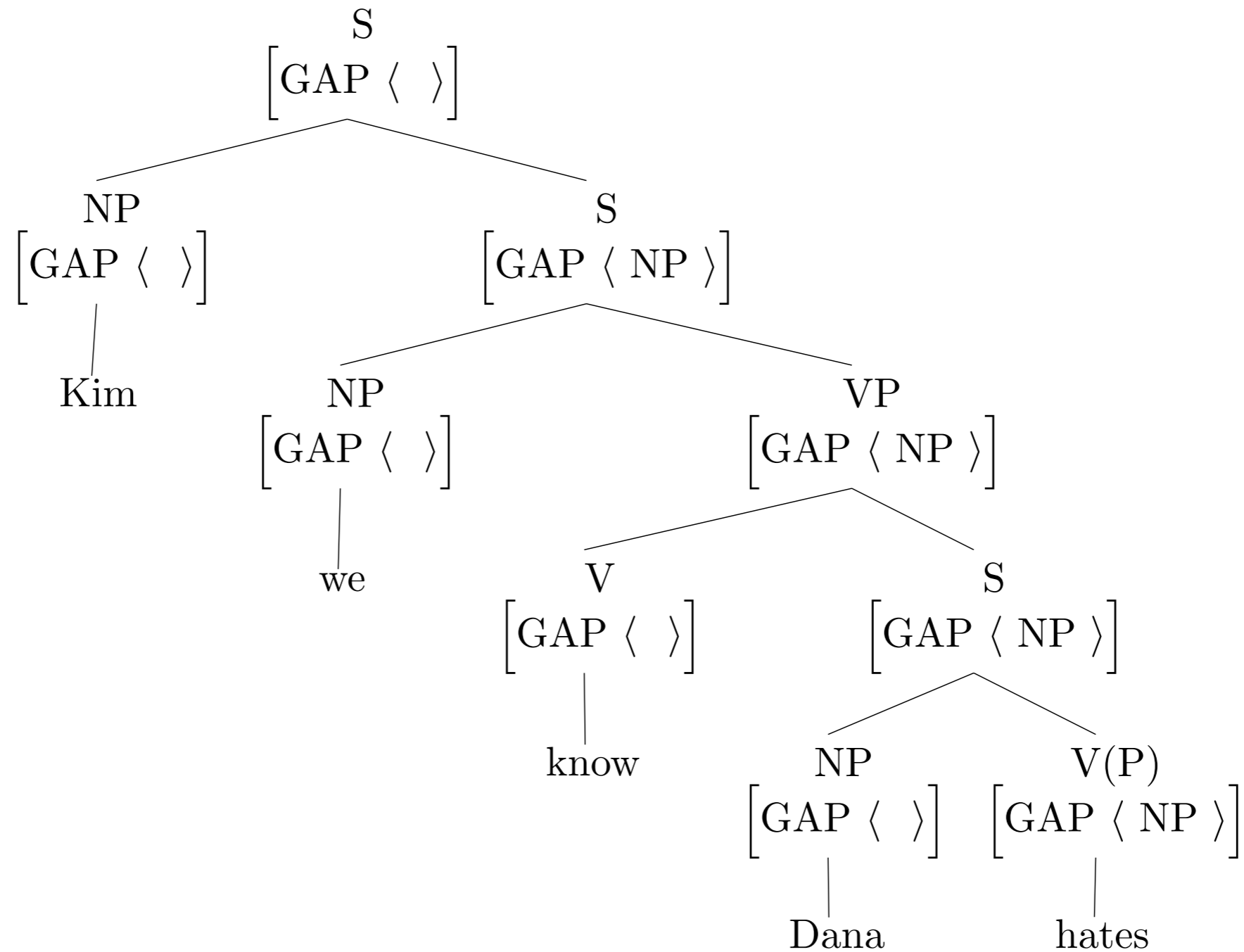
$$\text{word:} \left[\begin{array}{l} \text{SYN} \\ \text{ARG-ST} \end{array} \left[\begin{array}{l} \text{VAL} \\ \text{GAP} \end{array} \left[\begin{array}{l} \text{SPR} \\ \text{COMPS} \end{array} \left[\begin{array}{l} \boxed{A} \\ \boxed{B} \end{array} \ominus \boxed{C} \right] \right] \oplus \boxed{B}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

- \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

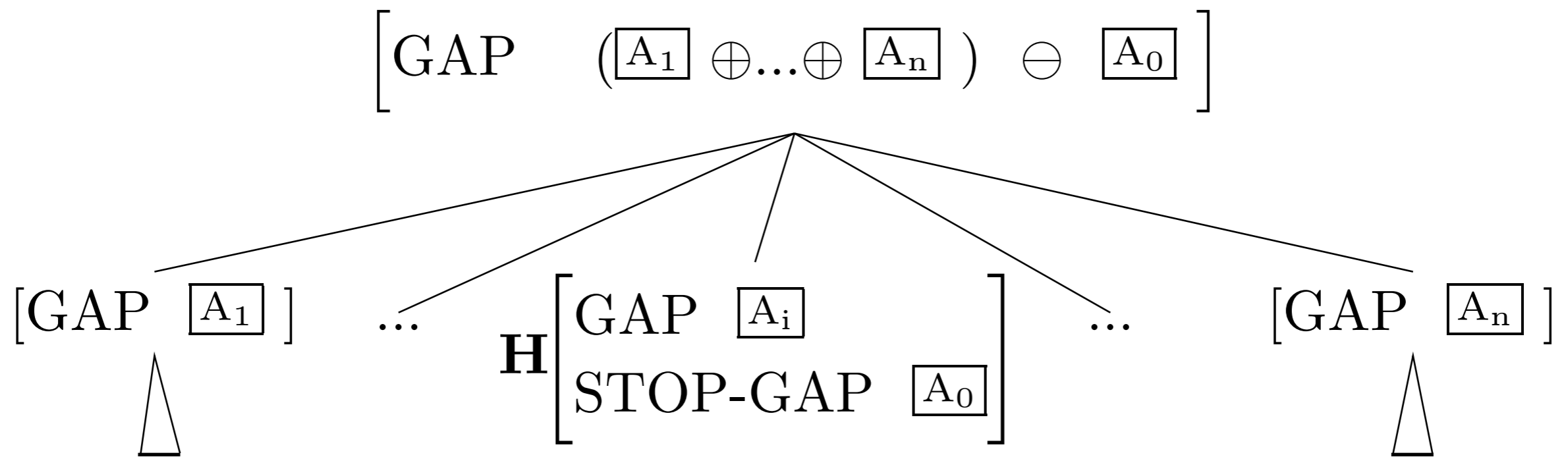
- Pass any GAP values from daughters up to their mothers,
- **except** when the filler is found.
- For topicalization, we can write the exception into the grammar rule, but
- For *easy*-adjectives, the NP that corresponds to the gap is the subject, which is introduced by the Head-Specifier Rule.
- Since 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?

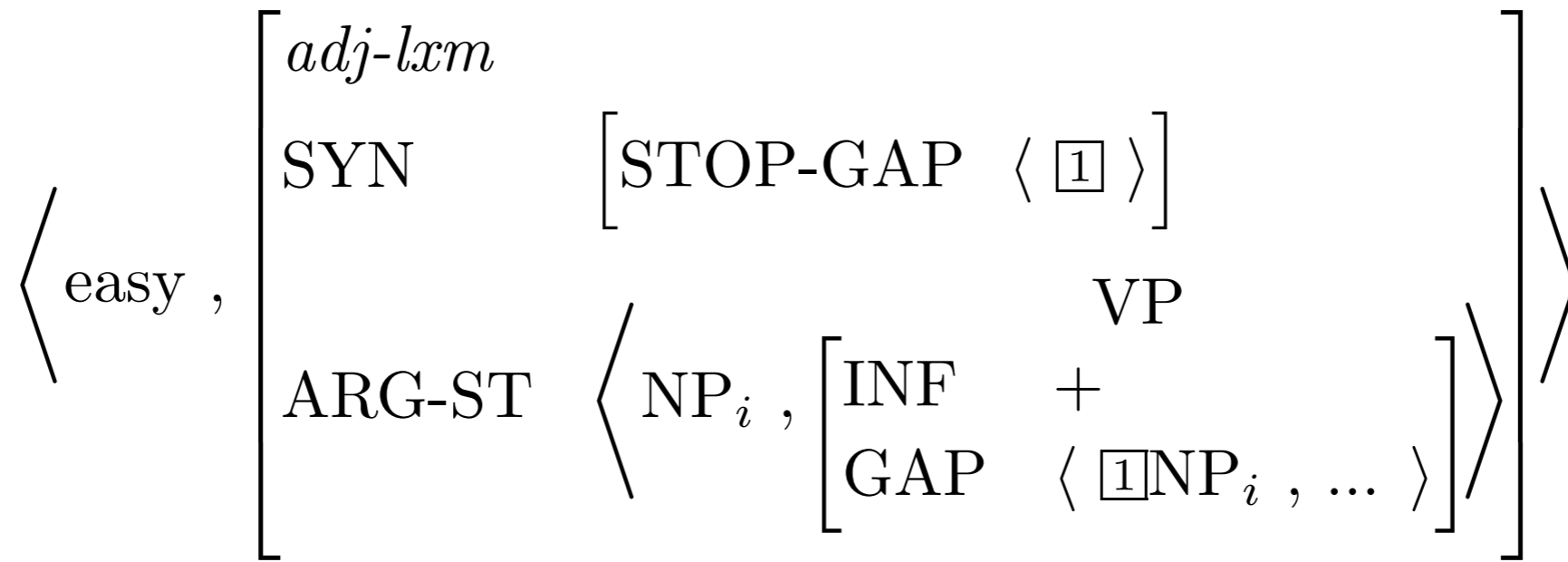
- STOP-GAP is empty almost everywhere
- When a gap is filled, STOP-GAP is nonempty, and its value is the same as the gap being filled.
- This blocks propagation of that GAP value, so gaps are only filled once.
- The nonempty STOP-GAP values come from two sources:
 - a stipulation in the Head-Filler Rule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

The Head-Filler Rule

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

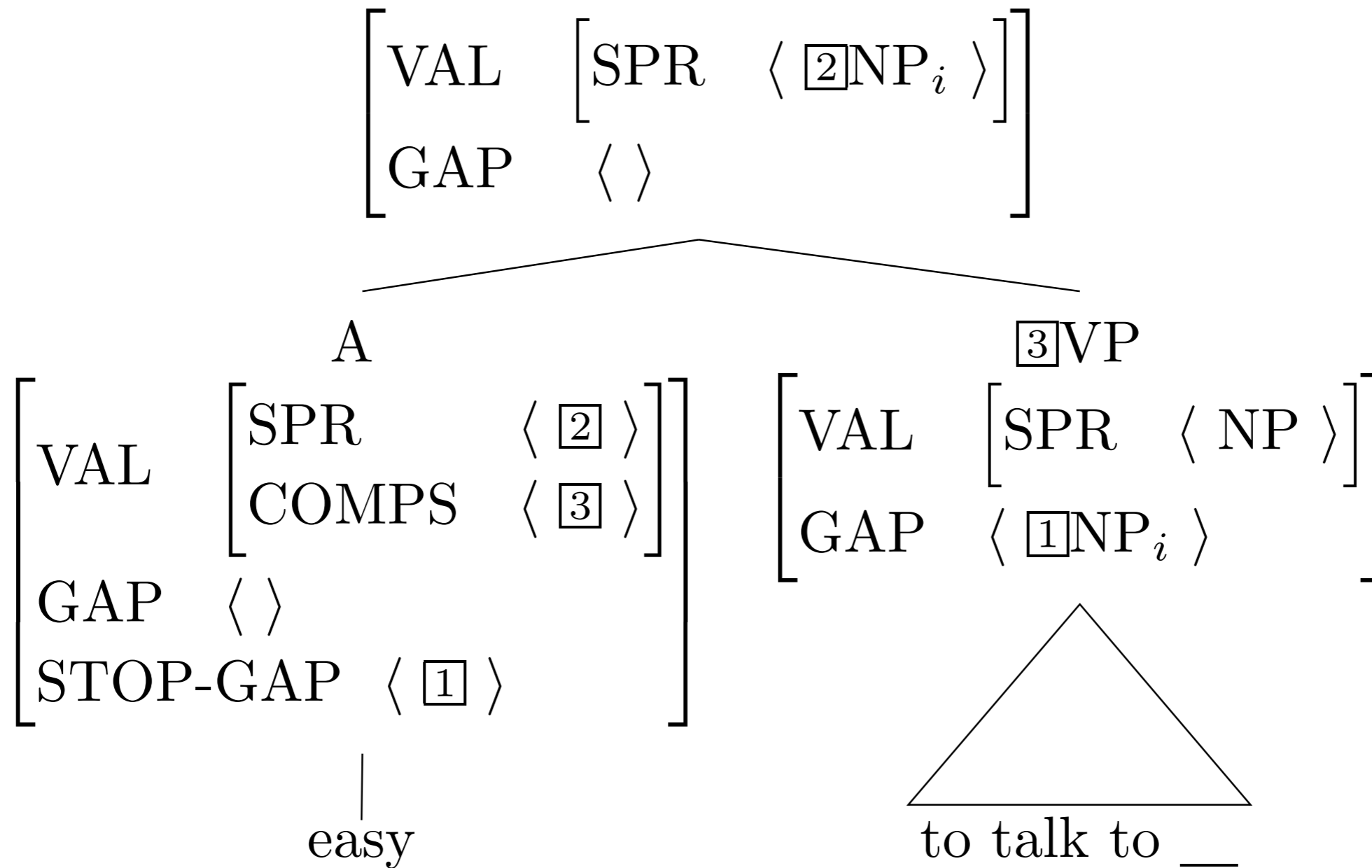
- This only covers gap filling in finite Ss
- The filler has to be identical to the GAP value
- The STOP-GAP value is also identical
- The GAP Principle ensures that the mother's GAP value is the empty list

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

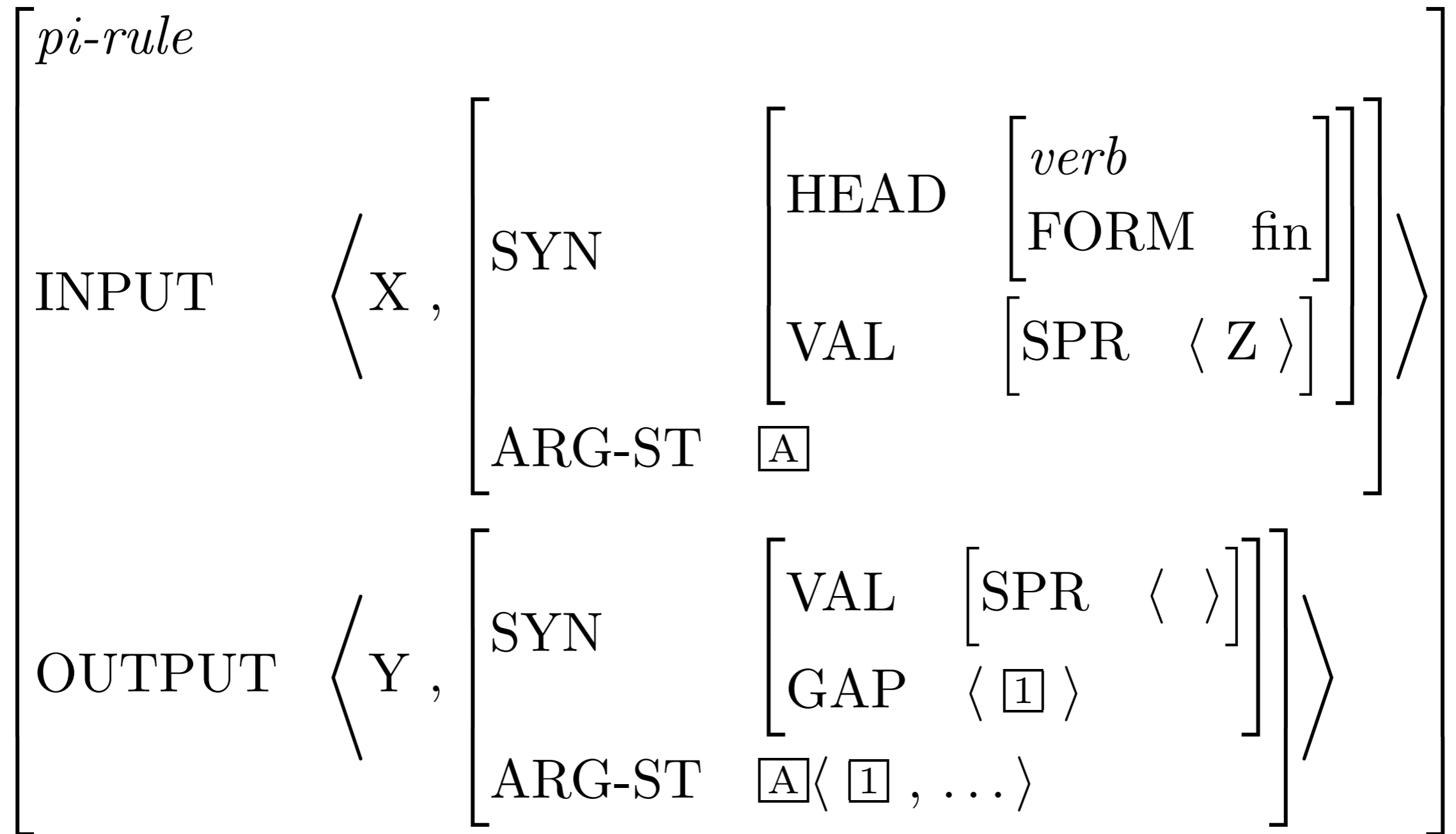
On to New Material....

- Sentences with subject gaps
- Gaps in coordinate constructions

Subject Gaps

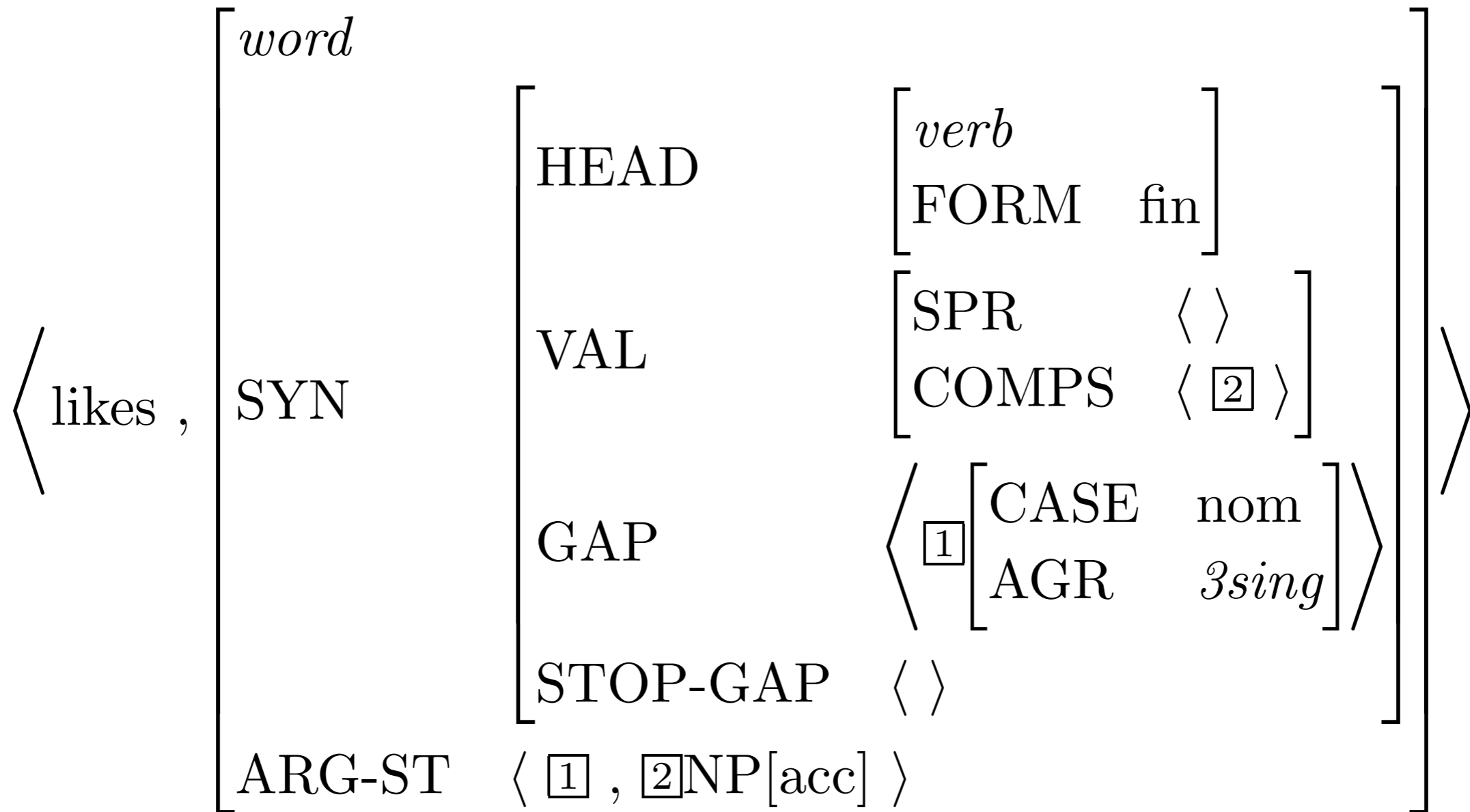
- The ARP revision only allowed missing complements.
- But gaps occur in subject position, too:
This problem, everyone thought ____ was too easy.
- We handle these via a lexical rule that, in effect, moves the contents of the SPR list into the GAP list

The Subject Extraction Lexical Rule



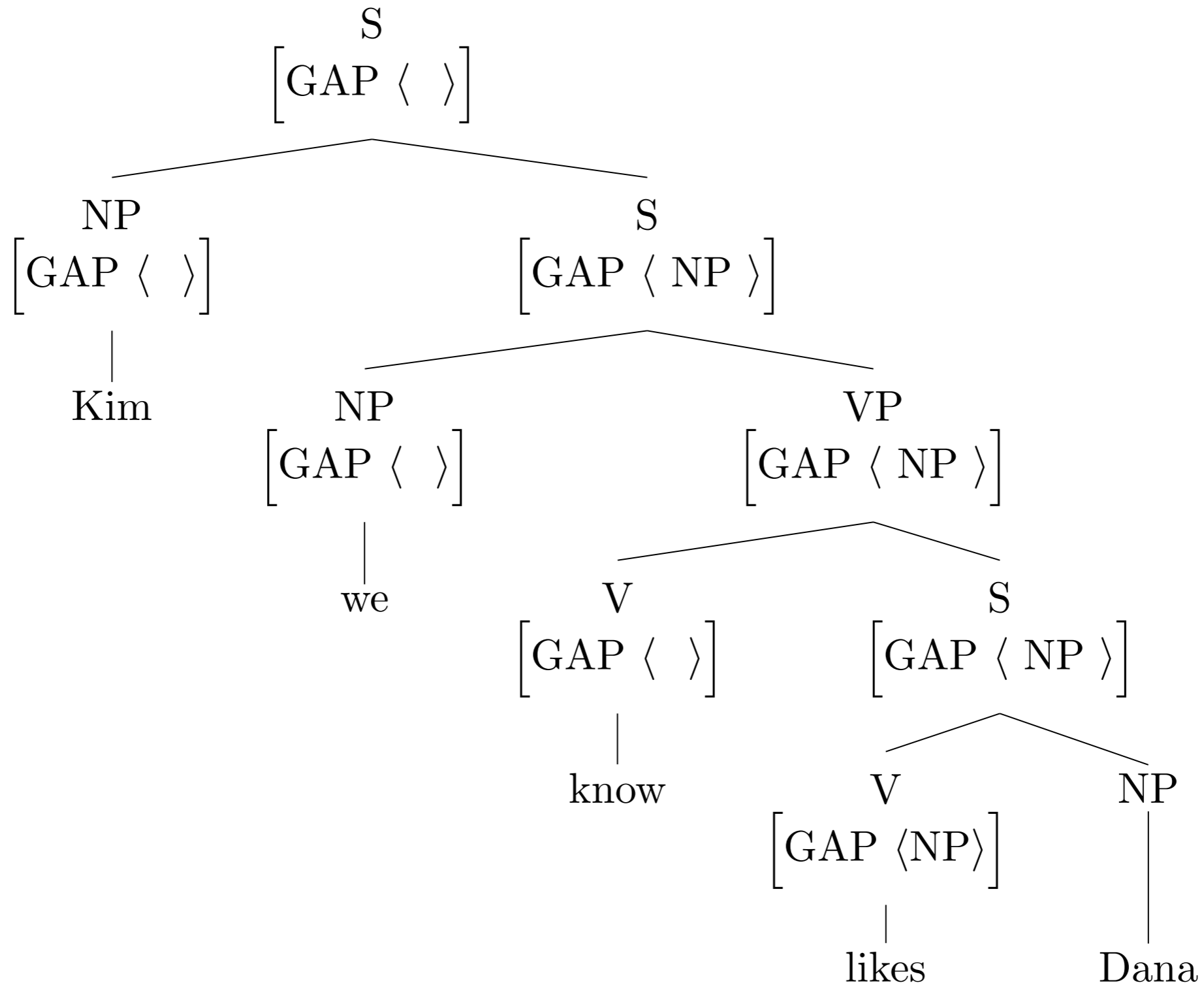
- NB: This says nothing about the phonology, because the default for *pi-rules* is to leave the phonology unchanged.

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

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

- 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

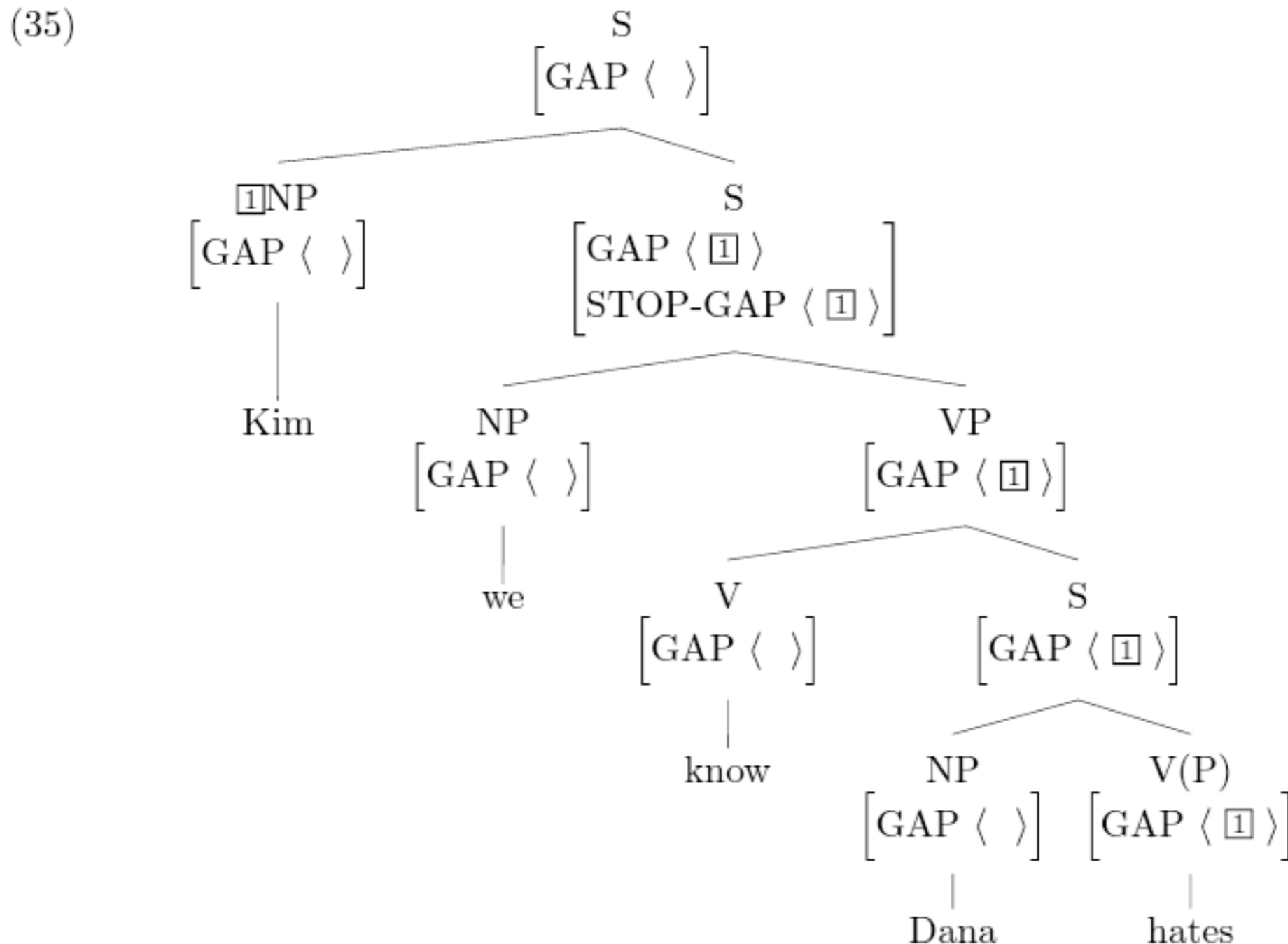
- Some examples of the phenomenon
- What is new and different about it
- Brief sketch of the TG approach
- Broad outlines of our approach
- Details of our approach
- Subject extraction
- Coordinate Structure Constraint

Reading Questions

- Would there be any effects of introducing these GAPS and FILLERS on the semantic features?
- It wasn't immediately clear why the GAP principle places the STOP-GAP on and only on the head daughter. Is that just an empirically-driven decision or does it follow from other principles?

Reading Questions

- Where does the STOP-GAP value come from in tree (35)?



Reading Questions

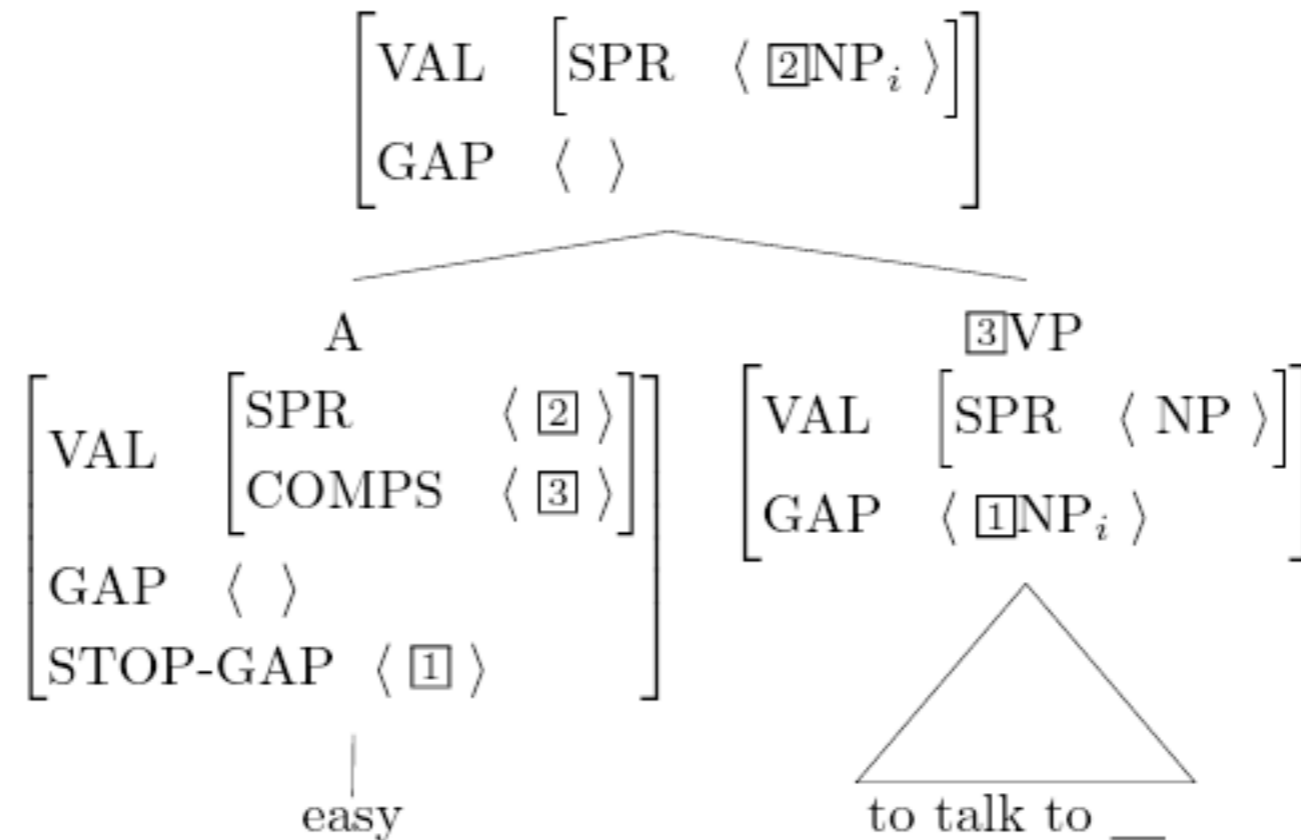
- Why can't we deal with subject gaps with the ARP?
- Why don't we use a lexical rule for the complement gaps?

Reading Questions

- In (38) it is confusing that *easy to talk to* and *to talk to* are missing the same NP, but that at the level of the AP, the missing NP is fully determined as the subject of it. I was wondering what stops us from labeling all its occurrences with the same tag, instead of two different ones. If we insist in two different tags, what does guarantee the equality of them? Just the index? What rule/principle is that derived from?

Reading Questions

(38)



Reading Questions

- I was quite confused by the treatment of APs with words like easy and hard. Why are these not gappy? Is it because the complement that is missing is also functioning as an argument elsewhere in the phrase?
- Easy/hard are adjectives noted in the text for their ability to fill gaps. Is this due exclusively to the fact that their lexical entries override the default entry for STOP-GAP $\langle \rangle$? Also, is there a formal rule that links the referent of the missing NP to the subject of the AP?

Reading Questions

(37)

$$\left\langle \text{easy} , \left[\begin{array}{l} \text{adj-lxm} \\ \text{SYN} \quad \left[\text{STOP-GAP} \langle \boxed{1} \rangle \right] \\ \text{ARG-ST} \quad \left\langle \text{NP}_i , \left[\begin{array}{l} \text{VP} \\ \text{INF} \quad + \\ \text{GAP} \quad \langle \boxed{1} \text{NP}_i , \dots \rangle \end{array} \right] \right\rangle \end{array} \right] \right\rangle$$

Reading Questions

- Are there exactly 2 easy-adjectives (easy and hard) in English? Do other languages tend to have more?
- From the ERG: *difficult, easy, hard, impossible, good, tough, available, fine, feasible, safe, sensible, simple, interesting, dangerous, important, handy, all right, ...*

Reading Questions

- "But our analysis correctly rules out any sentences in which a gap constitutes a full conjunct." I'm not sure why the grammar's Coordinate Structure Constraint correctly fails to license the sentence: *Which rock legend would it be ridiculous to compare [____] and [____]? What exactly is a full conjunct? Why did the other analyses fail?

Reading Questions

- It seems to me that the Coordinate Structure Constraint posited on page 444 doesn't hold for all possible sentences, as it rules out examples such as 51a, which seems to be a perfectly valid sentence (doesn't it?). I'm sure an argument could be made for even the more awkward examples such as 53a. Is there indeed an insufficiency with this constraint or am I understanding this incorrectly?

Reading Questions

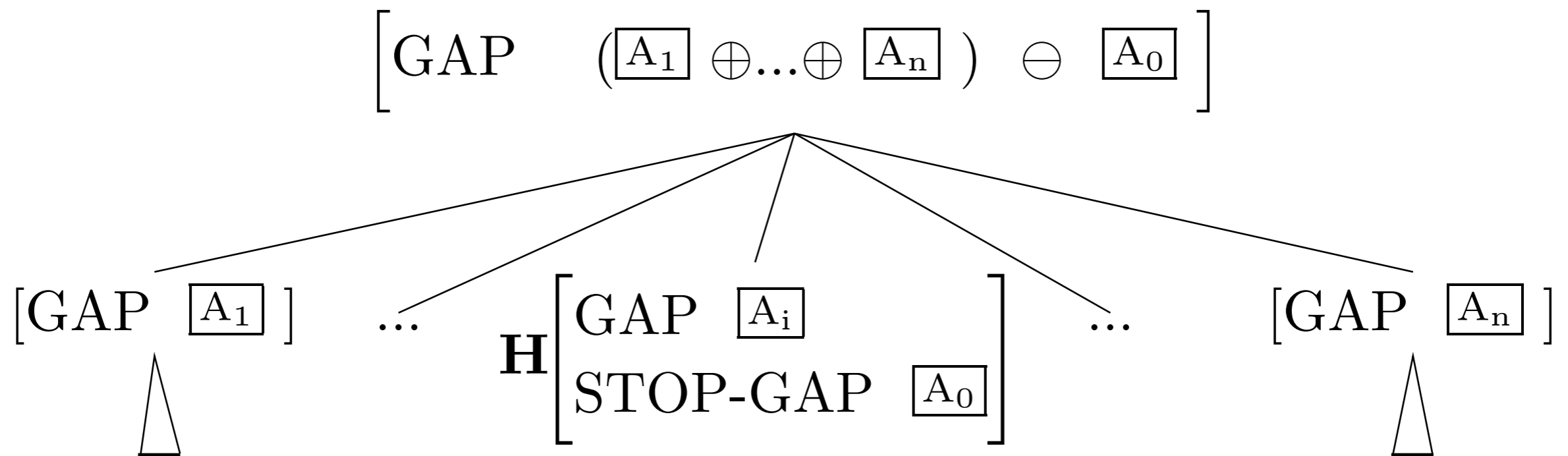
- (51a) *Here is the student that [the principal suspended [__ and Sandy]].
- (53a) *Apple bagels, I can assure you that [[Leslie likes __] and [Sandy hates lox]].

Reading Questions

- Let's say our ARG-ST has two GAP values and one STOP-GAP. How can we determine which of the GAP values to take away?
- I notice that our example GAP/STOP-GAP's have indices (as in (35)), but where do these come from? Are they all from lexical rules, as in (37)?

The GAP Principle

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



Reading Questions

(37)

$$\left\langle \text{easy} , \left[\begin{array}{l} \text{adj-lxm} \\ \text{SYN} \quad \left[\text{STOP-GAP} \langle \boxed{1} \rangle \right] \\ \text{ARG-ST} \quad \left\langle \text{NP}_i , \left[\begin{array}{l} \text{VP} \\ \text{INF} \quad + \\ \text{GAP} \quad \langle \boxed{1} \text{NP}_i , \dots \rangle \end{array} \right] \right\rangle \end{array} \right] \right\rangle$$

Reading Questions

- The GAP principle appears to allow for phrases with multiple GAPS. How does this interact with the Head-Filler Rule, which looks like it only accounts for one GAP and one STOP-GAP in the HEAD element of a given phrase?
- How would the STOP-GAP(s) look like in a tree for sentences such as “Problems this involved, my friends on the East Coast are hard to talk to_ about_” ?
- Can there be multiple references to the same GAP filler in a tree or will the first branch be binary in a string with GAP + components?

Reading Questions

- Do we have any tests to see whether or not a given sentence contains a gap? For example, consider:
(1) There are many people to meet.
- It seems as though there is something gappy going on, but it is certainly not completely grammatically analagous to:
(2) That song is hard to sing.
- How to do test whether or not there is a gap, other than bare intuition?

Reading Questions

- I'm curious how we might handle languages that use "redundant" pronouns in sentences with topicalization. Particularly how we might get 5 while still disallowing 6, and how we might capture the link between the topicalized object and the pronoun (which shows up not just semantically but also in agreement properties as shown in 7).

Reading Questions

- (1) El lápiz te lo dí (a ti)
The pencil to-you it I-gave (to you)
- (2) *Te lo dí el lápiz
To-you it I-gave the pencil
- (3) Te dí (a ti) el lápiz
To-you I-gave (to you) the pencil
- (4) Te dí el lápiz (a ti)
To-you I-gave the pencil (to you)
- (5) El lápiz que te dí
The pencil that to-you I-gave
- (6) *El lápiz te dí (a ti)
The pencil to-you I-gave
- (7) *La manzana te lo dí
The apple-fem to-you it-masc I-gave

Reading Questions

- This chapter discussed the restrictions on gaps related to coordinate conjunctions, but it seems there are many other constraints on gaps. Does our Chapter 14 grammar license these examples?

Did you know if Erin called Joe?

**Who did you know if Erin called?*

Reading Questions

- Gapping and Islands seem like common phenomena cross-linguistically. What kind of variation is there? When applying this gapping theory to other languages, what kinds of problems like the one in (61) can arise?