Chapter 14 (especially 14.4-14.5)

Long Distance Dependencies,

continued

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
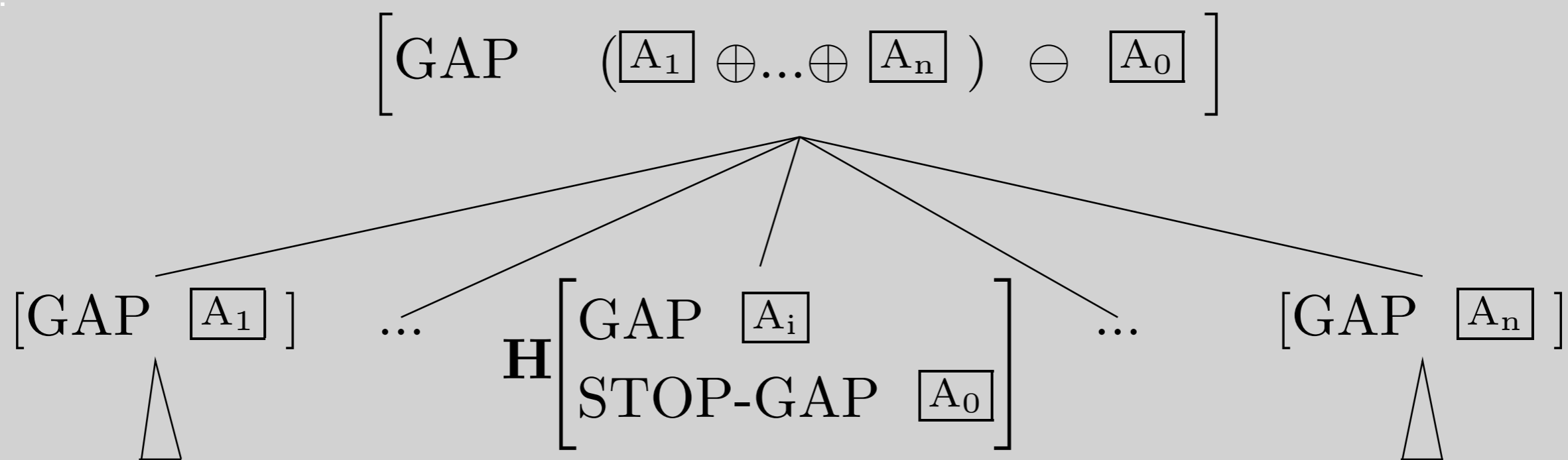
The Revised ARP

$$
word: \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{VAL} & \begin{bmatrix} \text{SPR} & \boxed{A} \\ \text{COMPS} & \boxed{B} \ominus \boxed{C} \end{bmatrix} \\ \text{GAP} & \boxed{C} \end{bmatrix} \\ \text{ARG-ST} & \boxed{A} \oplus \boxed{B} \end{bmatrix}
$$

- $\ominus$ 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.

The GAP Principle

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

$$\left[\text{GAP} \quad (\boxed{A_1} \oplus ... \oplus \boxed{A_n}) \ominus \boxed{A_0} \right]$$

$$[\text{GAP} \ \boxed{A_1}] \quad ... \quad \mathbf{H}\begin{bmatrix} \text{GAP} & \boxed{A_i} \\ \text{STOP-GAP} & \boxed{A_0} \end{bmatrix} \quad ... \quad [\text{GAP} \ \boxed{A_n}]$$

The Head-Filler Rule

$$[phrase] \rightarrow \boxed{1}\begin{bmatrix} \text{GAP} & \langle\,\rangle \end{bmatrix} \quad \mathbf{H}\begin{bmatrix} \text{HEAD} & \begin{bmatrix} verb \\ \text{FORM} & \text{fin} \end{bmatrix} \\ \text{VAL} & \begin{bmatrix} \text{SPR} & \langle\,\rangle \\ \text{COMPS} & \langle\,\rangle \end{bmatrix} \\ \text{STOP-GAP} & \langle\,\boxed{1}\,\rangle \\ \text{GAP} & \langle\,\boxed{1}\,\rangle \end{bmatrix}$$

The Lexical Entry for *easy*

$$
\left\langle \text{easy} \;,\;
\begin{bmatrix}
\textit{adj-lxm} \\[4pt]
\text{SYN} \quad \begin{bmatrix} \text{STOP-GAP} \;\; \langle\, \boxed{1} \,\rangle \end{bmatrix} \\[16pt]
\text{ARG-ST} \;\; \left\langle \text{NP}_i \;,\;
\begin{bmatrix}
\quad\quad\quad\quad \text{VP} \\
\text{INF} \quad + \\
\text{GAP} \quad \langle\, \boxed{1}\text{NP}_i \;,\; ... \,\rangle
\end{bmatrix}
\right\rangle
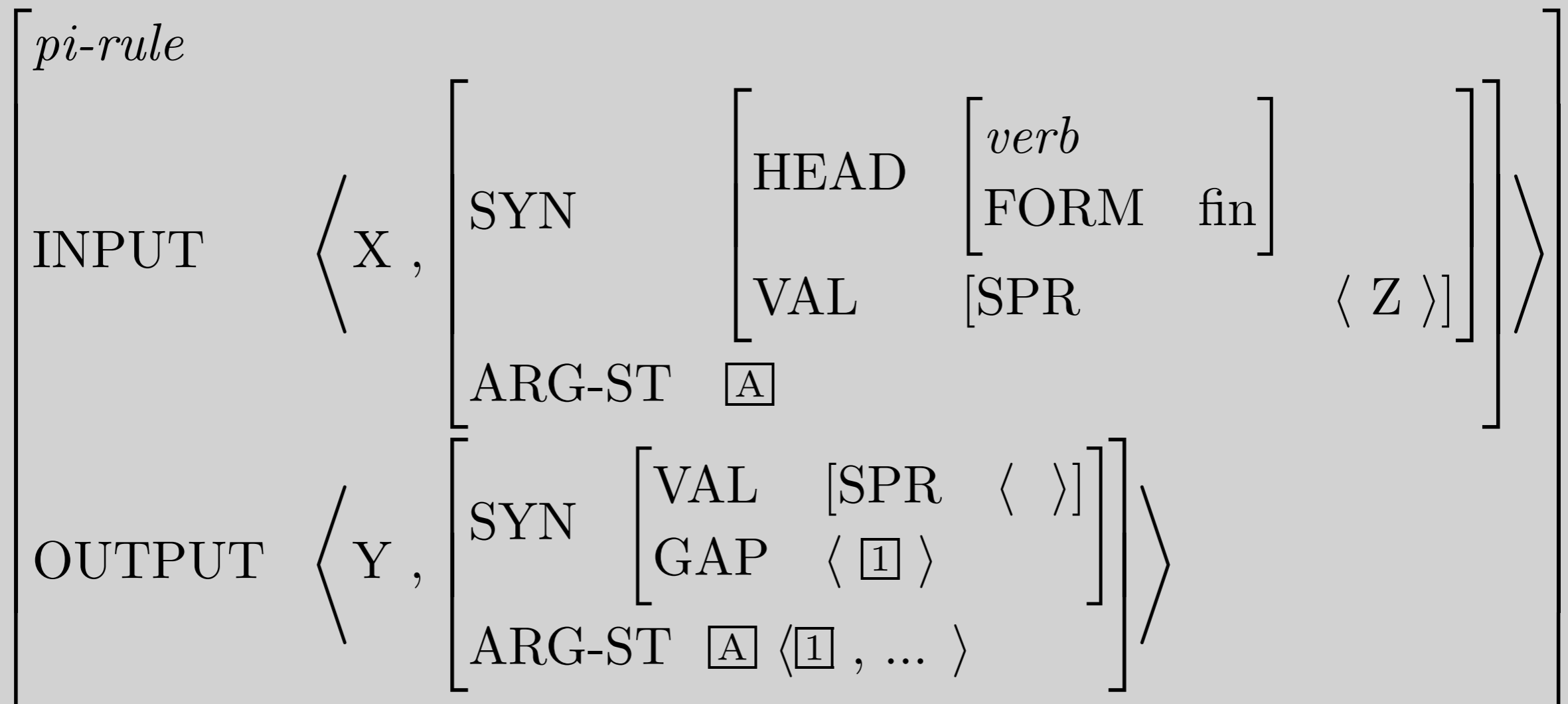\end{bmatrix}
\right\rangle
$$
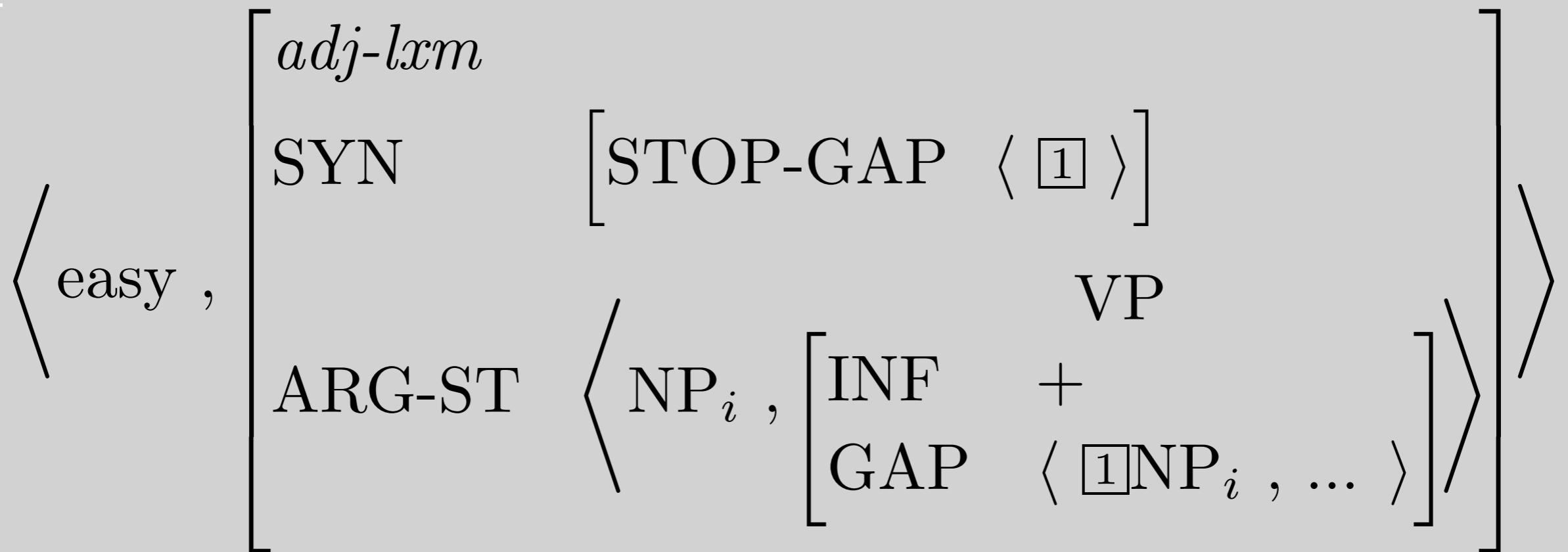
On to New Material….

- Sentences with subject gaps

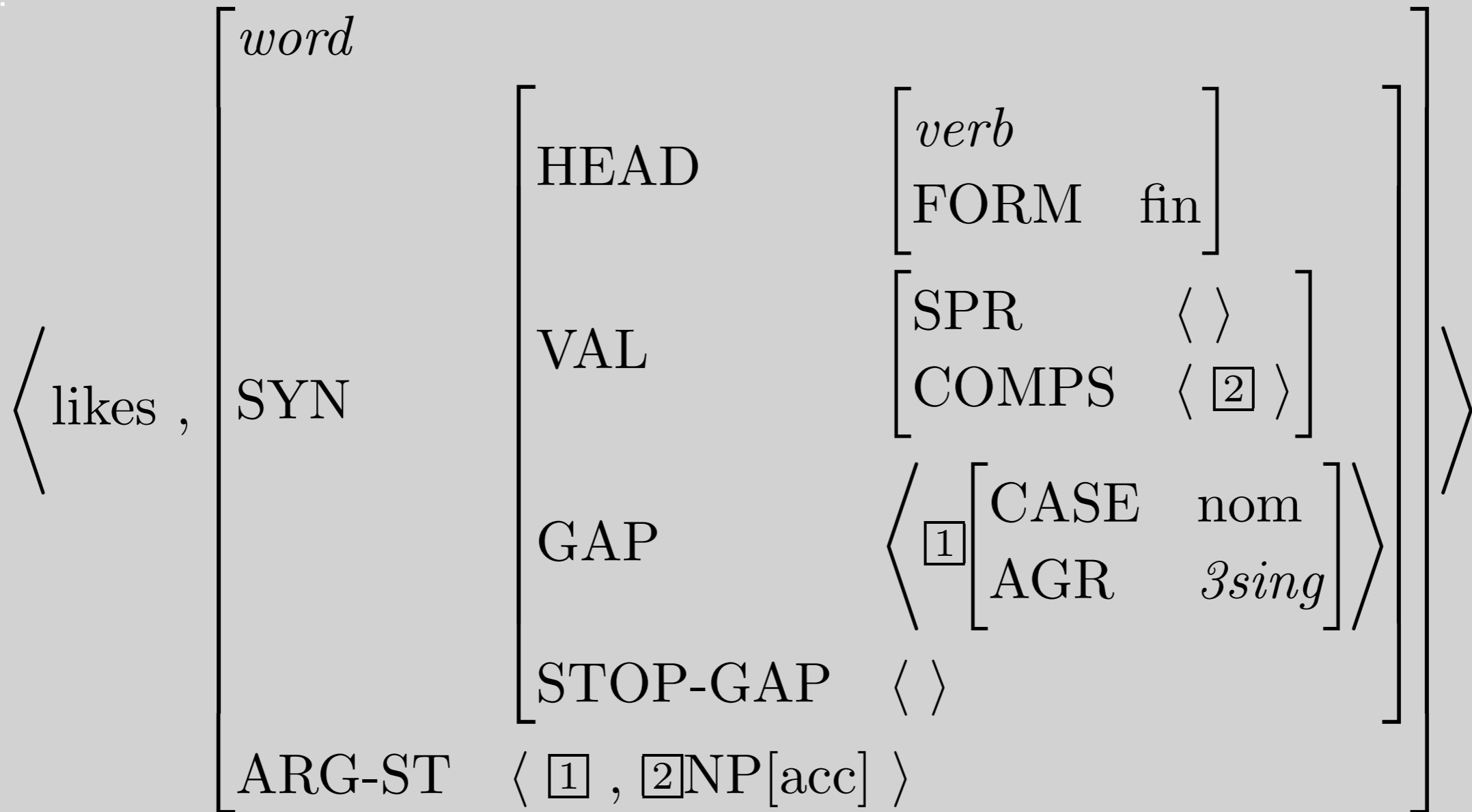- Gaps in coordinate constructions

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

$$
\begin{bmatrix}
\textit{pi-rule} \\[4pt]
\text{INPUT} \quad \left\langle \text{X} \;,\; \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{verb} \\ \text{FORM} \quad \text{fin} \end{bmatrix} \\ \text{VAL} & [\text{SPR} \qquad \langle\,\text{Z}\,\rangle] \end{bmatrix} \\ \text{ARG-ST} & \boxed{\text{A}} \end{bmatrix} \right\rangle \\[20pt]
\text{OUTPUT} \quad \left\langle \text{Y} \;,\; \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{VAL} & [\text{SPR} \quad \langle\;\rangle] \\ \text{GAP} & \langle\,\boxed{1}\,\rangle \end{bmatrix} \\ \text{ARG-ST} & \boxed{\text{A}}\,\langle\,\boxed{1}\,,\,...\,\rangle \end{bmatrix} \right\rangle
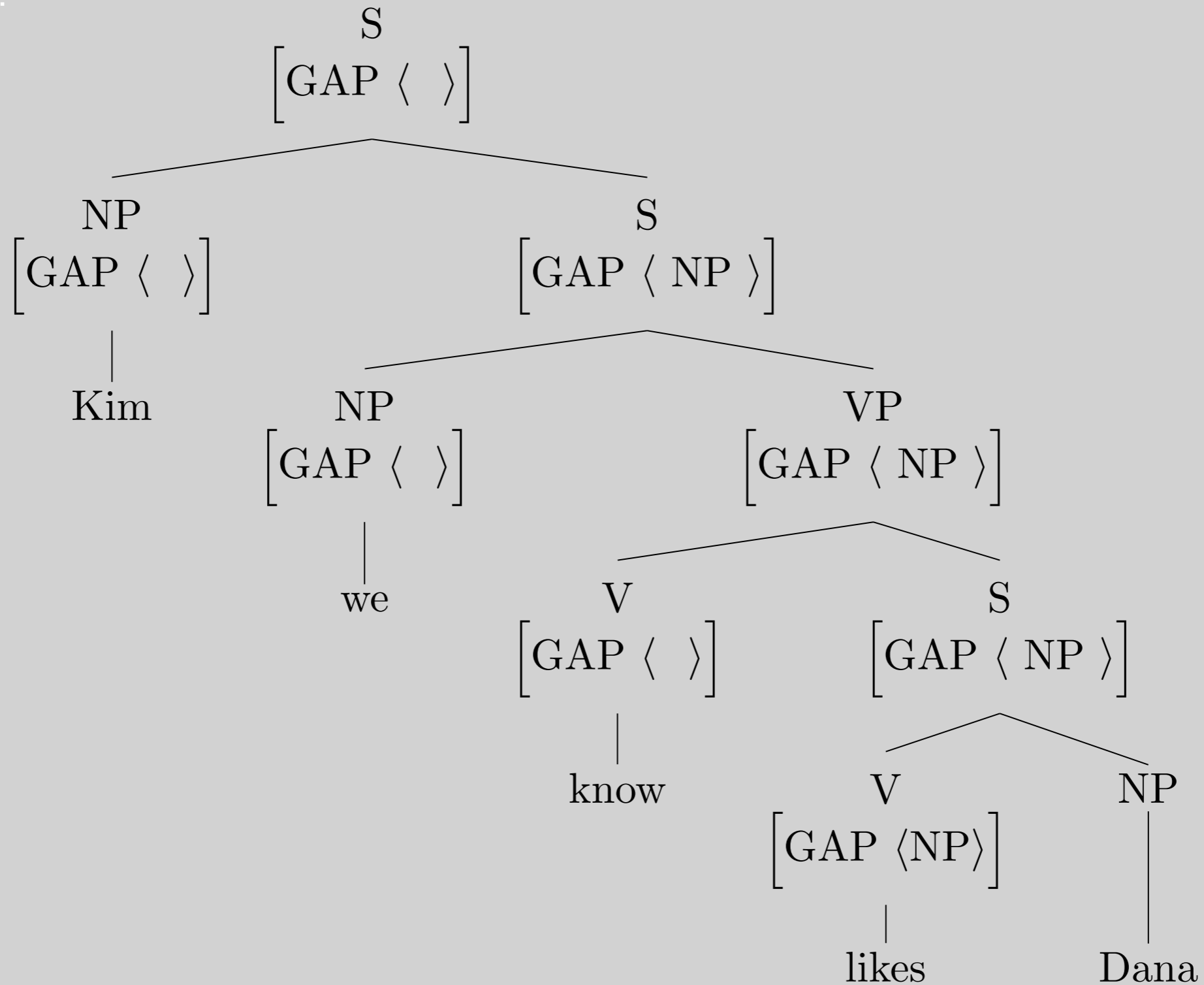\end{bmatrix}
$$

- Note: This nothing about the phonology, because the default for *pi-rule*s is to leave the phonology unchanged.

A Lexical Sequence This Licenses

$$
\left\langle \text{likes} \;,\; \begin{bmatrix} \textit{word} \\[4pt] \text{SYN} \quad \begin{bmatrix} \text{HEAD} \quad \begin{bmatrix} \textit{verb} \\ \text{FORM} \quad \text{fin} \end{bmatrix} \\[10pt] \text{VAL} \quad \begin{bmatrix} \text{SPR} \quad \langle\;\rangle \\ \text{COMPS} \quad \langle\;\boxed{2}\;\rangle \end{bmatrix} \\[14pt] \text{GAP} \quad \left\langle \boxed{1} \begin{bmatrix} \text{CASE} \quad \text{nom} \\ \text{AGR} \quad \textit{3sing} \end{bmatrix} \right\rangle \\[12pt] \text{STOP-GAP} \quad \langle\;\rangle \end{bmatrix} \\[10pt] \text{ARG-ST} \quad \langle\; \boxed{1}\;,\; \boxed{2}\text{NP}[\text{acc}]\;\rangle \end{bmatrix} \right\rangle
$$

- Note that the ARP is satisfied

A Tree with a Subject Gap

```
                              S
                         [ GAP ⟨ ⟩ ]
              _____/_____
             /                                  \
           NP                                    S
       [ GAP ⟨ ⟩ ]                         [ GAP ⟨ NP ⟩ ]
           |                       _____/_____
          Kim                     /                            \
                                 NP                            VP
                            [ GAP ⟨ ⟩ ]                   [ GAP ⟨ NP ⟩ ]
                                 |                   _____/_____
                                 we                 /                     \
                                                    V                      S
                                               [ GAP ⟨ ⟩ ]          [ GAP ⟨ NP ⟩ ]
                                                    |                  _____/\_____
                                                  know               /            \
                                                                     V            NP
                                                                [ GAP ⟨NP⟩ ]        |
                                                                     |            Dana
                                                                   likes
```

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

$$
\begin{bmatrix} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{IND} & s_0 \end{bmatrix} \rightarrow
$$

$$
\begin{bmatrix} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{IND} & s_1 \end{bmatrix} .... \begin{bmatrix} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{IND} & s_{n-1} \end{bmatrix} \begin{bmatrix} \text{HEAD} & conj \\ \text{IND} & s_0 \\ \text{RESTR} & \langle \begin{bmatrix} \text{ARGS} & \langle s_1....s_n \rangle \end{bmatrix} \rangle \end{bmatrix} \begin{bmatrix} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{IND} & s_n \end{bmatrix}
$$

- 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

$$
\begin{bmatrix} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_0 \end{bmatrix} \rightarrow
$$

$$
\begin{bmatrix} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_1 \end{bmatrix} \dots \begin{bmatrix} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_{n-1} \end{bmatrix} \begin{bmatrix} \text{HEAD} & conj \\ \text{IND} & s_0 \\ \text{RESTR} & \langle \begin{bmatrix} \text{ARGS} & \langle s_1 \dots s_n \rangle \end{bmatrix} \rangle \end{bmatrix} \begin{bmatrix} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_n \end{bmatrix}
$$

- 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.