Chapter 7, Sections 7.1-7.5

Binding Theory

Some Examples from Chapter 1

- *She likes herself*
- *$*$She$_i$ likes her$_i$.*
- *We gave presents to ourselves.*
- *$*$We gave presents to us.*
- *We gave ourselves presents*
- *$*$We gave us presents.*

- *$*$Leslie told us about us.*
- *Leslie told us about ourselves.*
- *$*$Leslie told ourselves about us.*
- *$*$Leslie told ourselves about ourselves.*

Some Terminology

- <u>Binding</u>: The association between a pronoun and an antecedent.

- <u>Anaphoric</u>: A term to describe an element (e.g. a pronoun) that derives its interpretation from some other expression in the discourse.

- <u>Antecedent</u>: The expression an anaphoric expression derives its interpretation from.

- <u>Anaphora</u>: The relationship between an anaphoric expression and its antecedent.

The Chapter 1 Binding Theory Reformulated

- Old Formulation:
  - A reflexive pronoun must be an argument of a verb that has another preceding argument with the same reference.
  - A nonreflexive pronoun cannot appear as an argument of a verb that has a preceding coreferential argument.
- New Formulation:
  - Principle A (version I): A reflexive pronoun must be bound by a preceding argument of the same verb.
  - Principle B (version I): A nonreflexive pronoun may not be bound by a preceding argument of the same verb.

Some Challenges

- Replace notions of "bound" and "preceding argument of the same verb" by notions definable in our theory.

- Generalize the Binding Principles to get better coverage.

A Question

- What would be a natural way to formalize the notion of "bound" in our theory?

- Answer: Two expressions are bound if they have the same INDEX value ("are coindexed").

Two More Questions

- Where in our theory do we have information about a verb's arguments?

- Answer: In the verb's VALENCE features.

- What determines the linear ordering of a verb's arguments in a sentence?

- Answer: The interaction of the grammar rules and the ordering of elements in the COMPS list.

The Argument Realization Principle

- For Binding Theory, we need a single list with both subject and complements.

- We introduce a feature ARG-ST, with the following property (to be revised later):

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

- This is a constraint on the type *word*

Notes on ARG-ST

- It's neither in SYN nor SEM.

- It only appears on lexical heads (not appropriate for type *phrase*)

- No principle stipulates identity between ARG-STs.

Two Bits of Technical Machinery

- <u>Definition</u>: If *A* precedes *B* on some ARG-ST list, then *A* **outranks** *B*.

- Elements that must be anaphoric -- that is, that require an antecedent -- are lexically marked **[MODE ana]**. These include reflexive pronouns and reciprocals.

The Binding Principles

- <u>Principle A</u>:   A [MODE ana] element must be outranked by a coindexed element.

- <u>Principle B</u>: A [MODE ref] element must not be outranked by a coindexed element.

Pronoun-Antecedent Agreement

- The Binding Principles by themselves don't block:
  - * *I amused yourself.*
  - * *He amused themselves.*
  - * *She amused himself.*
- Coindexed NPs refer to the same entity, and AGR features generally correlate with properties of the referent.
- The Anaphoric Agreement Principle (AAP): Coindexed NPs agree.
  - *

Binding in PPs

- What do the Binding Principles predict about the following?

   I brought a book with me.

   *I brought a book with myself.

   *I mailed a book to me.

   I mailed a book to myself.

- Answer: With the current formulation, only the non-reflexive pronouns should be good.

Two Types of Prepositions: the Intuition

- "Argument-marking": Function like case-markers in other languages, indicating the roles of NP referents in the situation denoted by the verb.

- "Predicative": Introduce their own predication.

Two Types of Prepositions: a Formalization

- Argument-marking prepositions share their objects' MODE and INDEX values.
  - This is done with tagging in the lexical entries of such prepositions.
  - These features are also shared with the PP node, by the Semantic Inheritance Principle.
- Predicative prepositions introduce their own MODE and INDEX values.

Redefining Rank

- If there is an ARG-ST list on which *A* precedes *B*, then *A* outranks *B*.

- If a node is coindexed with its daughter, they are of equal rank -- that is, they outrank the same nodes and are outranked by the same nodes.

An Example
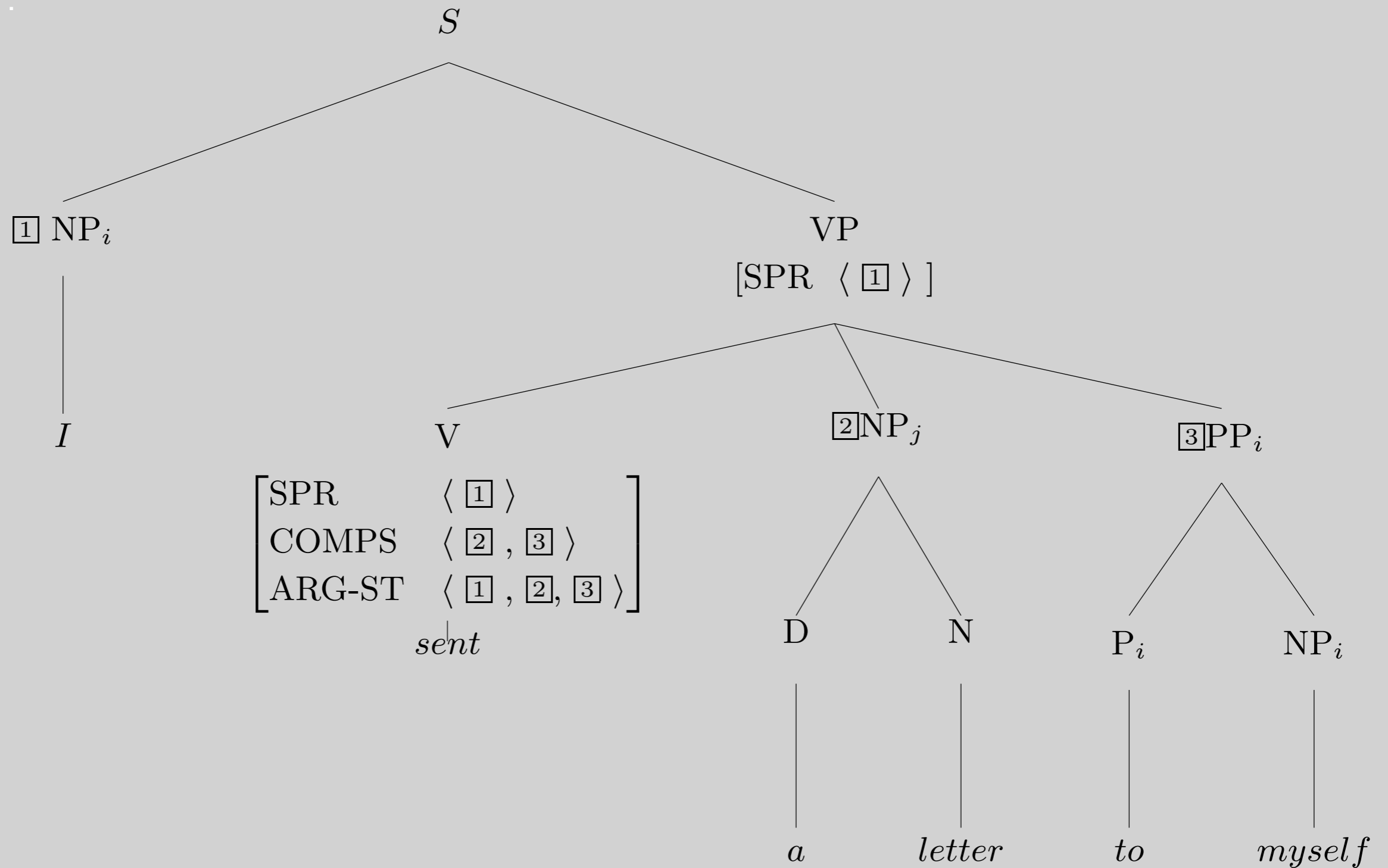
S

$\boxed{1}\,\text{NP}_i$

I

VP
$[\text{SPR}\ \langle\ \boxed{1}\ \rangle\ ]$

V

$$\begin{bmatrix} \text{SPR} & \langle\ \boxed{1}\ \rangle \\ \text{COMPS} & \langle\ \boxed{2}\ ,\ \boxed{3}\ \rangle \\ \text{ARG-ST} & \langle\ \boxed{1}\ ,\ \boxed{2},\ \boxed{3}\ \rangle \end{bmatrix}$$

$sent$

$\boxed{2}\text{NP}_j$

D

N

a

$letter$

$\boxed{3}\text{PP}_i$

P_i

NP_i

to

$myself$

The ARG-ST

$$\left[\text{ARG-ST} \left\langle \begin{bmatrix} \text{NP}_i \\ \text{MODE ref} \end{bmatrix}, \begin{bmatrix} \text{NP}_j \\ \text{MODE ref} \end{bmatrix}, \begin{bmatrix} \text{PP}_i \\ \text{MODE ana} \end{bmatrix} \right\rangle \right]$$

- The PP is outranked by the first NP. (Why?)
- *myself* has the same rank as the PP. (Why?)
- So, *myself* is outranked by the first NP. (Why?)
- Therefore, Principle A is satisfied.

Replacing *myself* with *me*
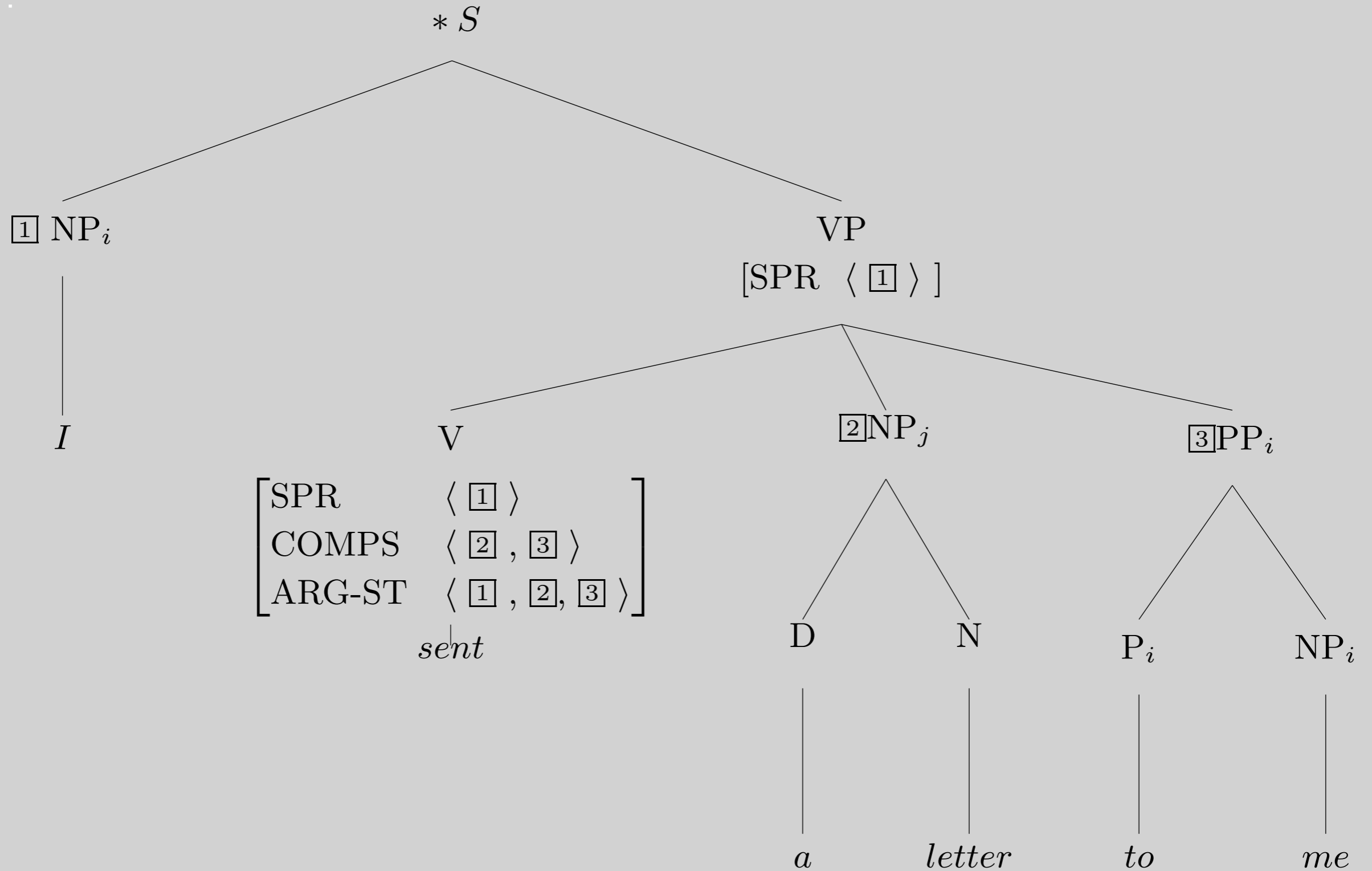
$*\,S$

$\boxed{1}\ \text{NP}_i$ VP
$[\text{SPR} \ \langle \ \boxed{1} \ \rangle \ ]$

I V $\boxed{2}\text{NP}_j$ $\boxed{3}\text{PP}_i$

$$\begin{bmatrix} \text{SPR} & \langle \ \boxed{1} \ \rangle \\ \text{COMPS} & \langle \ \boxed{2} \ , \ \boxed{3} \ \rangle \\ \text{ARG-ST} & \langle \ \boxed{1} \ , \ \boxed{2}, \ \boxed{3} \ \rangle \end{bmatrix}$$

sent

D   N P_i NP_i

a   *letter*   *to*   *me*

The ARG-ST

$$\left[\text{ARG-ST} \left\langle \begin{bmatrix} \text{NP}_i \\ \text{MODE ref} \end{bmatrix}, \begin{bmatrix} \text{NP}_j \\ \text{MODE ref} \end{bmatrix}, \begin{bmatrix} \text{PP}_i \\ \text{MODE ref} \end{bmatrix} \right\rangle \right]$$

- The PP is outranked by the first NP.
- *me* has the same rank as the PP.
- So, *me* is outranked by the first NP.
- Therefore, Principle B is violated.

Another Example

$$S$$

①NP_i VP
[SPR ⟨ ① ⟩]

I

V

$$\begin{bmatrix} \text{SPR} & \langle\ ①\ \rangle \\ \text{COMPS} & \langle\ ②\ ,\ ③\ \rangle \\ \text{ARG-ST} & \langle\ ①\ ,\ ②,\ ③\ \rangle \end{bmatrix}$$

brought

②NP_j

③PP_k

D   N

P_k NP_i

a   *pencil*
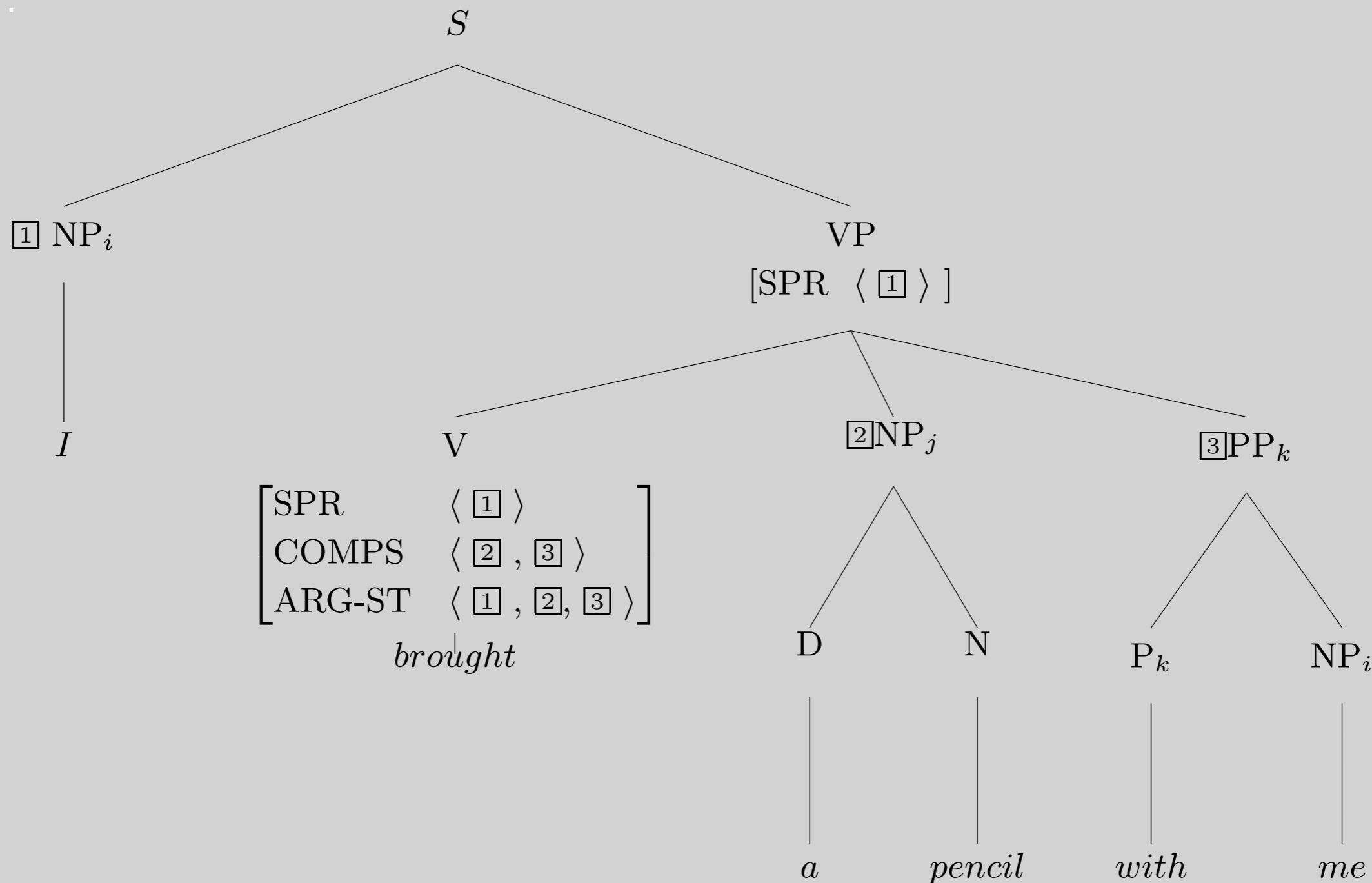
with   *me*

- Here *I* does not outrank *me*, so Principle B is satisfied.

Replacing *me* with *myself*

$* S$

$\boxed{1} \, \text{NP}_i$

VP
$[\text{SPR} \; \langle \, \boxed{1} \, \rangle \,]$

I

V

$\begin{bmatrix} \text{SPR} & \langle \, \boxed{1} \, \rangle \\ \text{COMPS} & \langle \, \boxed{2} \, , \boxed{3} \, \rangle \\ \text{ARG-ST} & \langle \, \boxed{1} \, , \boxed{2}, \boxed{3} \, \rangle \end{bmatrix}$

brought

$\boxed{2}\text{NP}_j$

$\boxed{3}\text{PP}_k$

D

N

P_k

NP_i

a

pencil

with
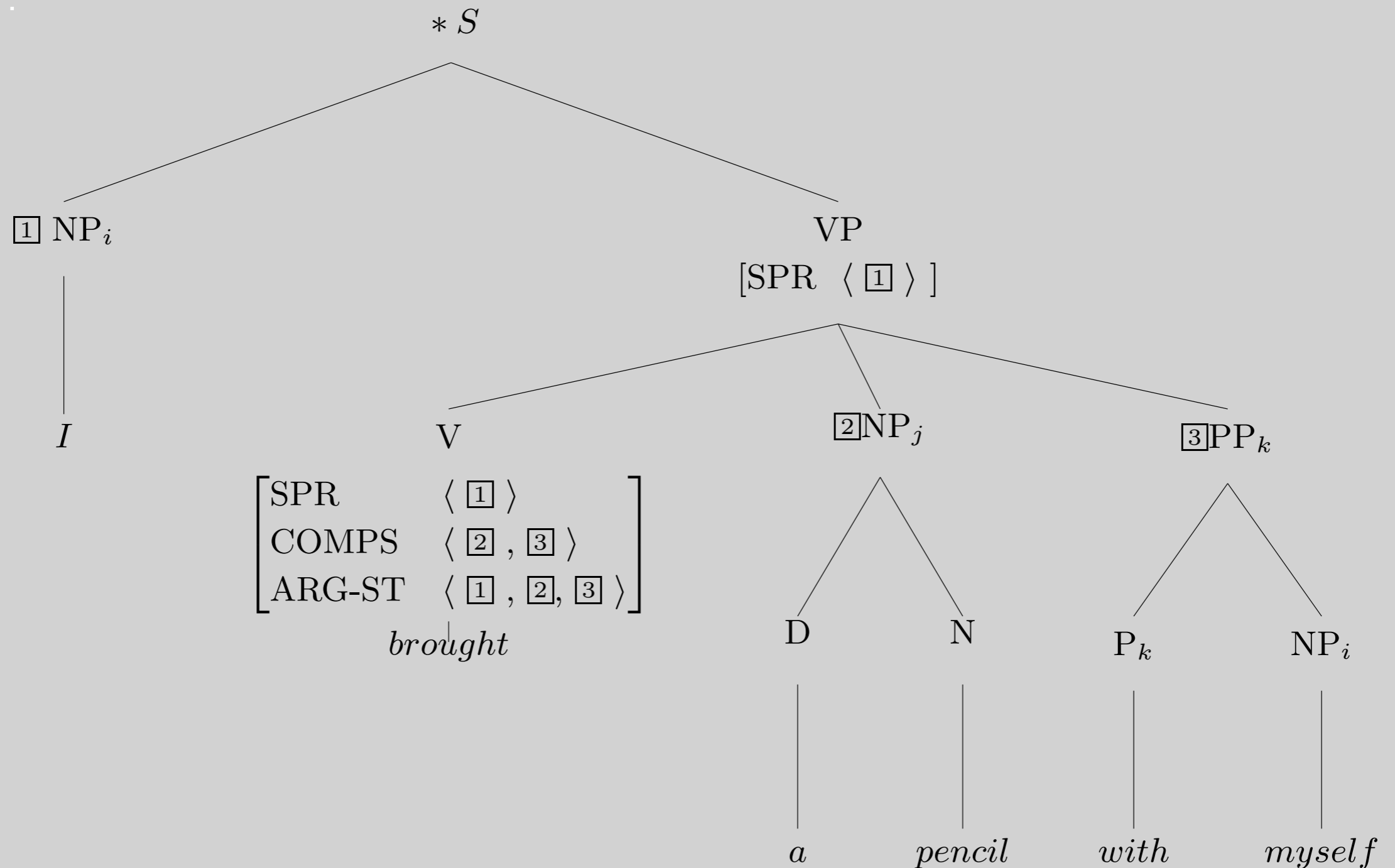
myself

- Here *I* does not outrank *myself*, so Principle A is violated.

Imperatives

- Have the internal structure of a VP
  Leave!
  Read a book!
  Give the dog a treat!
  Put the ice cream in the freezer!

- *Function as **directives***

- Have the verb in base form

  Be careful!   not   **Are careful!*

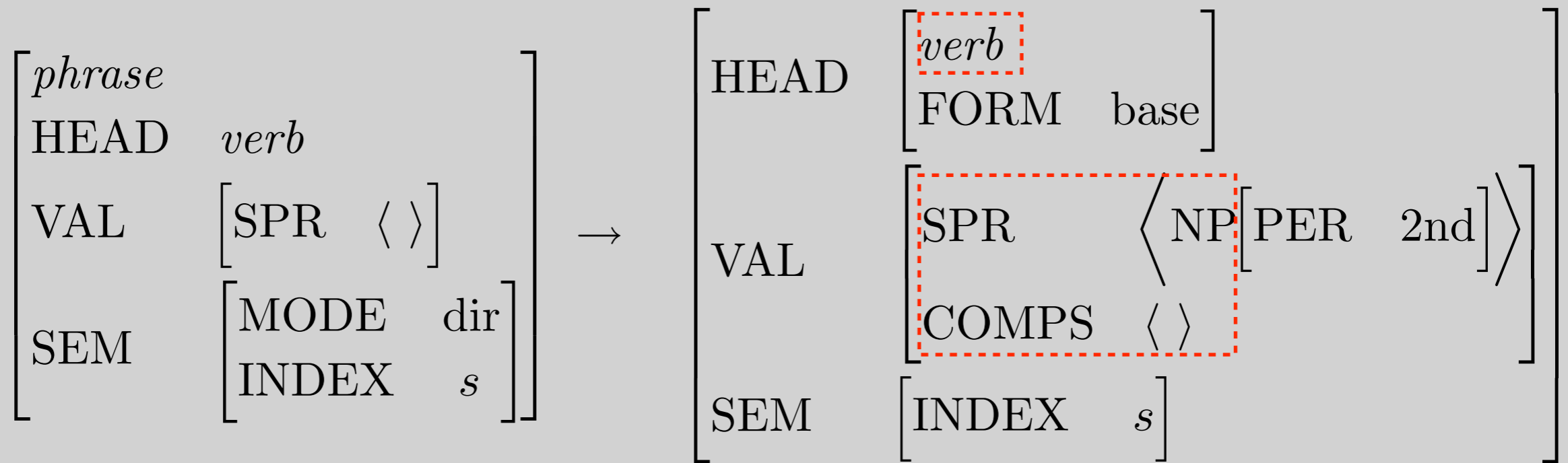- Allow 2nd person reflexives, and no others

  Defend yourself! vs. **Defend myself/himself!*

The Imperative Rule

$$
\begin{bmatrix}
phrase \\
\text{HEAD} \quad verb \\
\text{VAL} \quad \begin{bmatrix} \text{SPR} \quad \langle \ \rangle \end{bmatrix} \\
\text{SEM} \quad \begin{bmatrix} \text{MODE} \quad \text{dir} \\ \text{INDEX} \quad s \end{bmatrix}
\end{bmatrix}
\rightarrow
\begin{bmatrix}
\text{HEAD} \quad \begin{bmatrix} verb \\ \text{FORM} \quad \text{base} \end{bmatrix} \\
\text{VAL} \quad \begin{bmatrix} \text{SPR} \quad \langle \text{NP}\begin{bmatrix} \text{PER} \quad \text{2nd} \end{bmatrix}\rangle \\ \text{COMPS} \quad \langle \ \rangle \end{bmatrix} \\
\text{SEM} \quad \begin{bmatrix} \text{INDEX} \quad s \end{bmatrix}
\end{bmatrix}
$$

The Imperative Rule

$$
\begin{bmatrix}
phrase \\
\text{HEAD} & verb \\
\text{VAL} & \begin{bmatrix} \text{SPR} & \langle\,\rangle \end{bmatrix} \\
\text{SEM} & \begin{bmatrix} \text{MODE} & \text{dir} \\ \text{INDEX} & s \end{bmatrix}
\end{bmatrix}
\rightarrow
\begin{bmatrix}
\text{HEAD} & \begin{bmatrix} verb \\ \text{FORM} & \text{base} \end{bmatrix} \\
\text{VAL} & \begin{bmatrix} \text{SPR} & \langle \text{NP} \begin{bmatrix} \text{PER} & \text{2nd} \end{bmatrix} \rangle \\ \text{COMPS} & \langle\,\rangle \end{bmatrix} \\
\text{SEM} & \begin{bmatrix} \text{INDEX} & s \end{bmatrix}
\end{bmatrix}
$$

- Internal structure of a VP

The Imperative Rule

$$
\begin{bmatrix}
phrase \\
\text{HEAD} \quad verb \\
\text{VAL} \quad \begin{bmatrix} \text{SPR} \quad \langle\,\rangle \end{bmatrix} \\
\text{SEM} \quad \begin{bmatrix} \text{MODE} \quad dir \\ \text{INDEX} \quad s \end{bmatrix}
\end{bmatrix}
\rightarrow
\begin{bmatrix}
\text{HEAD} \quad \begin{bmatrix} verb \\ \text{FORM} \quad base \end{bmatrix} \\
\text{VAL} \quad \begin{bmatrix} \text{SPR} \quad \langle \text{NP}\begin{bmatrix} \text{PER} \quad 2\text{nd} \end{bmatrix} \rangle \\ \text{COMPS} \quad \langle\,\rangle \end{bmatrix} \\
\text{SEM} \quad \begin{bmatrix} \text{INDEX} \quad s \end{bmatrix}
\end{bmatrix}
$$
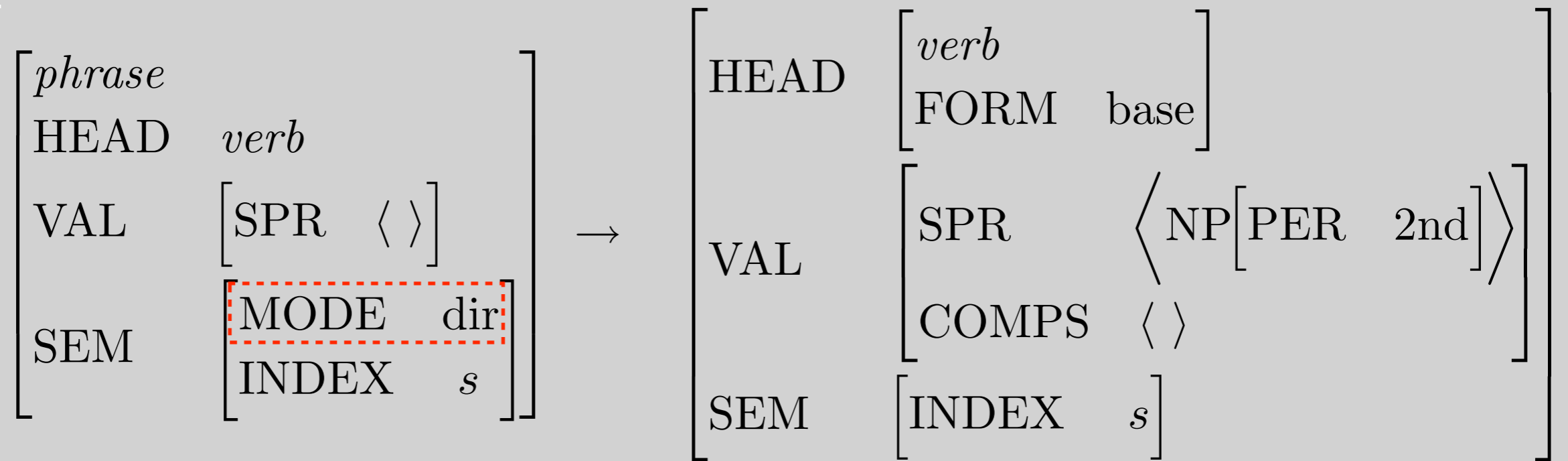
- Internal structure of a VP
- Directive function

The Imperative Rule

$$
\begin{bmatrix}
phrase \\
\text{HEAD} \quad verb \\
\text{VAL} \quad \begin{bmatrix} \text{SPR} & \langle\,\rangle \end{bmatrix} \\
\text{SEM} \quad \begin{bmatrix} \text{MODE} & dir \\ \text{INDEX} & s \end{bmatrix}
\end{bmatrix}
\rightarrow
\begin{bmatrix}
\text{HEAD} & \begin{bmatrix} verb \\ \text{FORM} \quad base \end{bmatrix} \\
\text{VAL} & \begin{bmatrix} \text{SPR} & \langle \text{NP}\begin{bmatrix}\text{PER} & \text{2nd}\end{bmatrix}\rangle \\ \text{COMPS} & \langle\,\rangle \end{bmatrix} \\
\text{SEM} & \begin{bmatrix} \text{INDEX} & s \end{bmatrix}
\end{bmatrix}
$$
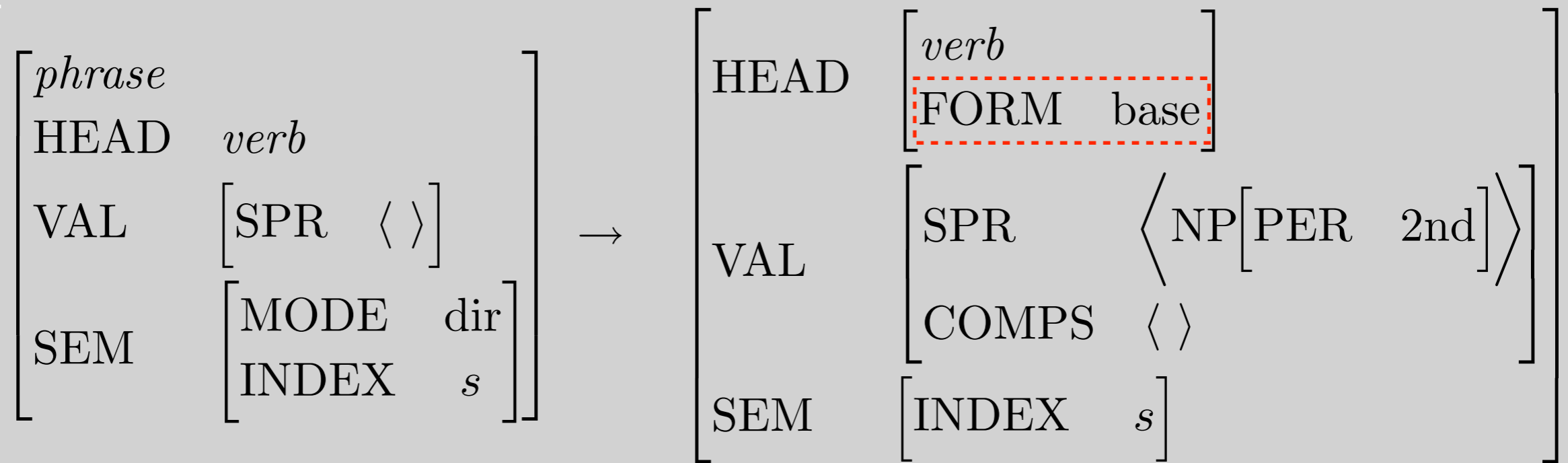
- Internal structure of a VP
- Directive function
- Base form

The Imperative Rule

$$
\begin{bmatrix}
phrase \\
\text{HEAD} \quad verb \\
\text{VAL} \quad \begin{bmatrix} \text{SPR} & \langle\,\rangle \end{bmatrix} \\
\text{SEM} \quad \begin{bmatrix} \text{MODE} & \text{dir} \\ \text{INDEX} & s \end{bmatrix}
\end{bmatrix}
\rightarrow
\begin{bmatrix}
\text{HEAD} & \begin{bmatrix} verb \\ \text{FORM} & \text{base} \end{bmatrix} \\
\text{VAL} & \begin{bmatrix} \text{SPR} & \langle \text{NP}\begin{bmatrix}\text{PER} & \text{2nd}\end{bmatrix}\rangle \\ \text{COMPS} & \langle\,\rangle \end{bmatrix} \\
\text{SEM} & \begin{bmatrix} \text{INDEX} & s \end{bmatrix}
\end{bmatrix}
$$
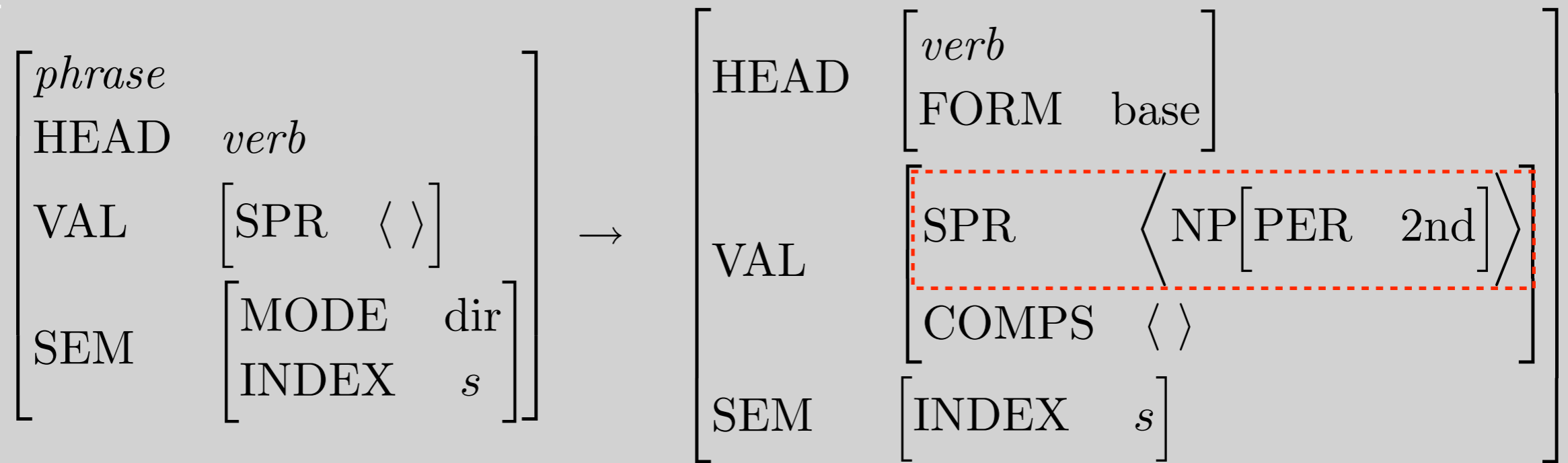
- Internal structure of a VP
- Directive function
- Base form
- Only 2nd person reflexives

The Imperative Rule

$$\begin{bmatrix} phrase \\ \text{HEAD} \quad verb \\ \text{VAL} \quad \begin{bmatrix} \text{SPR} \quad \langle \, \rangle \end{bmatrix} \\ \text{SEM} \quad \begin{bmatrix} \text{MODE} \quad \text{dir} \\ \text{INDEX} \quad s \end{bmatrix} \end{bmatrix} \rightarrow \begin{bmatrix} \text{HEAD} \quad \begin{bmatrix} verb \\ \text{FORM} \quad \text{base} \end{bmatrix} \\ \text{VAL} \quad \begin{bmatrix} \text{SPR} \quad \langle \text{NP} \begin{bmatrix} \text{PER} \quad \text{2nd} \end{bmatrix} \rangle \\ \text{COMPS} \quad \langle \, \rangle \end{bmatrix} \\ \text{SEM} \quad \begin{bmatrix} \text{INDEX} \quad s \end{bmatrix} \end{bmatrix}$$

- Internal structure of a VP
- Directive function
- Base form
- Only 2nd person reflexives

- Note that this is not a headed rule. Why?

The Imperative Rule

$$
\begin{bmatrix}
phrase \\
\text{HEAD} \quad verb \\
\text{VAL} \quad \begin{bmatrix} \text{SPR} \quad \langle\,\rangle \end{bmatrix} \\
\text{SEM} \quad \begin{bmatrix} \text{MODE} \quad \text{dir} \\ \text{INDEX} \quad s \end{bmatrix}
\end{bmatrix}
\rightarrow
\begin{bmatrix}
\text{HEAD} \quad \begin{bmatrix} verb \\ \text{FORM} \quad \text{base} \end{bmatrix} \\
\text{VAL} \quad \begin{bmatrix} \text{SPR} \quad \langle \text{NP}\begin{bmatrix}\text{PER} \quad \text{2nd}\end{bmatrix}\rangle \\ \text{COMPS} \quad \langle\,\rangle \end{bmatrix} \\
\text{SEM} \quad \begin{bmatrix} \text{INDEX} \quad s \end{bmatrix}
\end{bmatrix}
$$

- Internal structure of a VP
- Directive function
- Base form
- Only 2nd person reflexives

- Note that this is not a headed rule. Why?
- Answer: It would violate the HFP and the SIP.

Day 1 Revisited

- Recall

  F---- yourself!   *F---- you!*

  Go f---- yourself!   *Go f---- you!*

- *F--- NP!* has two analyses
  - As an imperative
  - As a truly subjectless fixed expression.

- *Go f---- NP!* can only be analyzed as an imperative.