Ling 566
Dec 8, 2016

Sign-Based Construction Grammar

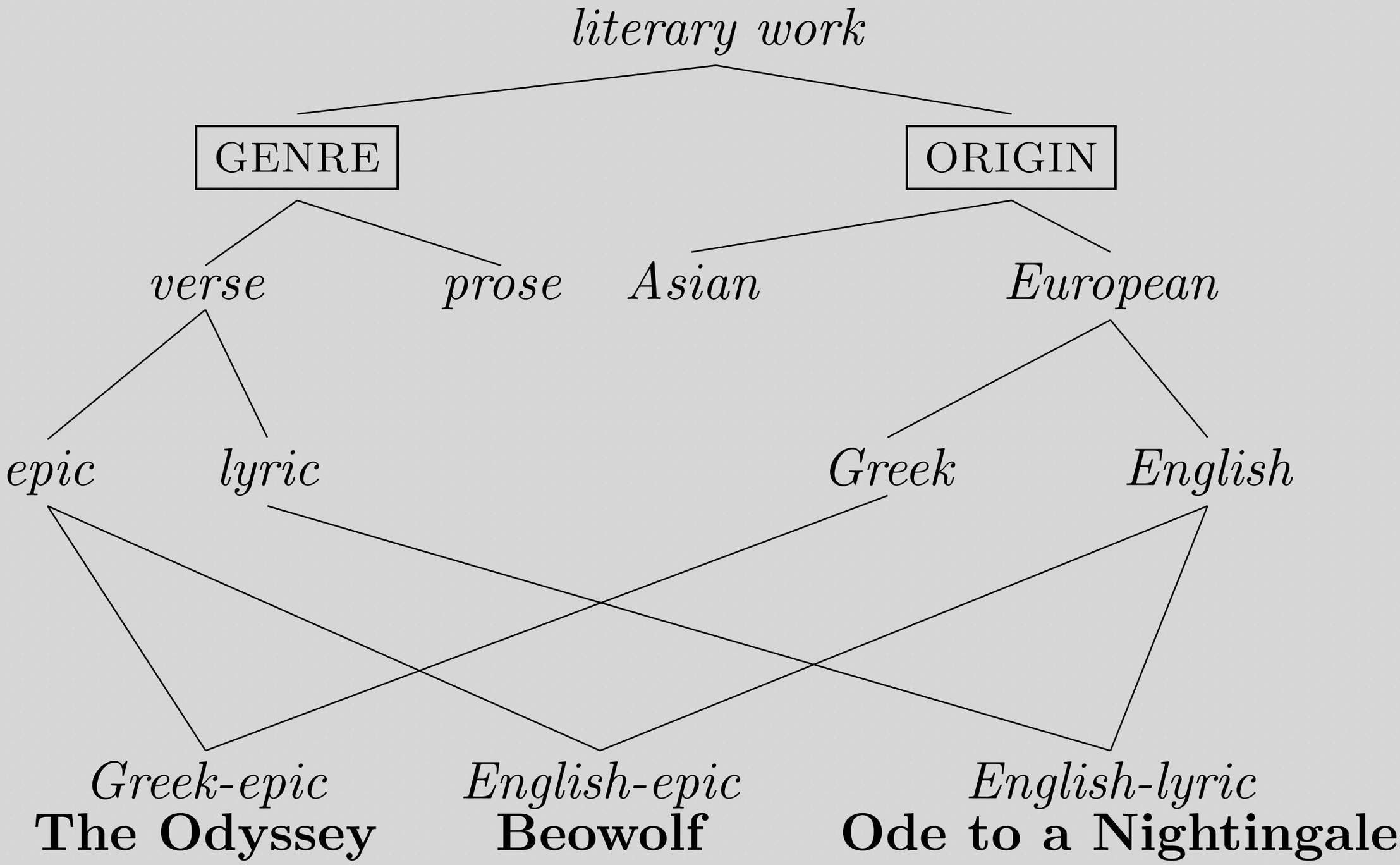
Overview

- Chapter 16 framework (same analyses, different underlying system)
- Reading questions
- Final preview
- Untangle this
- General wrap up

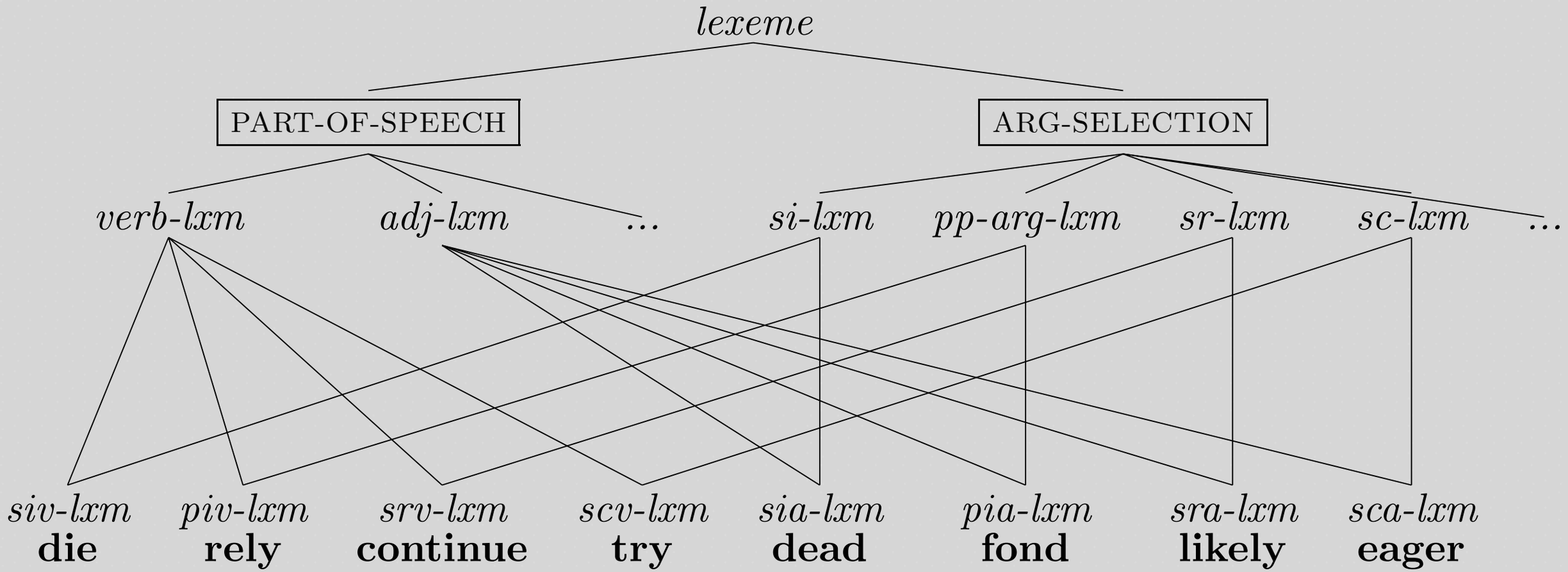
Overview of Differences

- Multiple Inheritance
- Signs
- Grammar rules form a hierarchy
- Every tree node has its own phonology
- Many principles become constraints on grammar rules
- The definition of well-formedness is simplified

Multiple Inheritance Hierarchies



Lexeme Hierarchy



Lexeme Abbreviations

- *si-lxm* : *strict-intransitive-lexeme*
- *pp-arg-lxm* : *PP-argument-lexeme*
- *sr-lxm* : *subject-raising-lexeme*
- *sc-lxm* : *subject-control-lexeme*
- *siv-lxm* : *strict-intransitive-verb-lexeme*
- *piv-lxm* : *PP-intransitive-verb-lexeme*
- *srv-lxm* : *subject-raising-verb-lexeme*
- *scv-lxm* : *subject-control-verb-lexeme*
- *sia-lxm* : *strict-intransitive-adjective-lexeme*
- *pia-lxm* : *PP-intransitive-adjective-lexeme*
- *sra-lxm* : *subject-raising-adjective-lexeme*
- *sca-lxm* : *subject-control-adjective-lexeme*

Lexeme Constraints

- $si\text{-}lxm : \left[\text{ARG-ST} \quad \langle\ \text{X}\ \rangle\right]$
- $pp\text{-}arg\text{-}lxm : \left[\text{ARG-ST} \quad \langle\ \text{X}\ ,\ \text{PP}\ \rangle\right]$
- $sr\text{-}lxm : \left[\text{ARG-ST} \quad \left\langle \boxed{1}\ , \left[\text{SPR} \quad \langle\ \boxed{1}\ \rangle\right]\right\rangle\right]$
- $sc\text{-}lxm : \left[\text{ARG-ST} \quad \left\langle \text{NP}_i\ , \left[\text{SPR} \quad \langle\ \text{NP}_i\ \rangle\right]\right\rangle\right]$

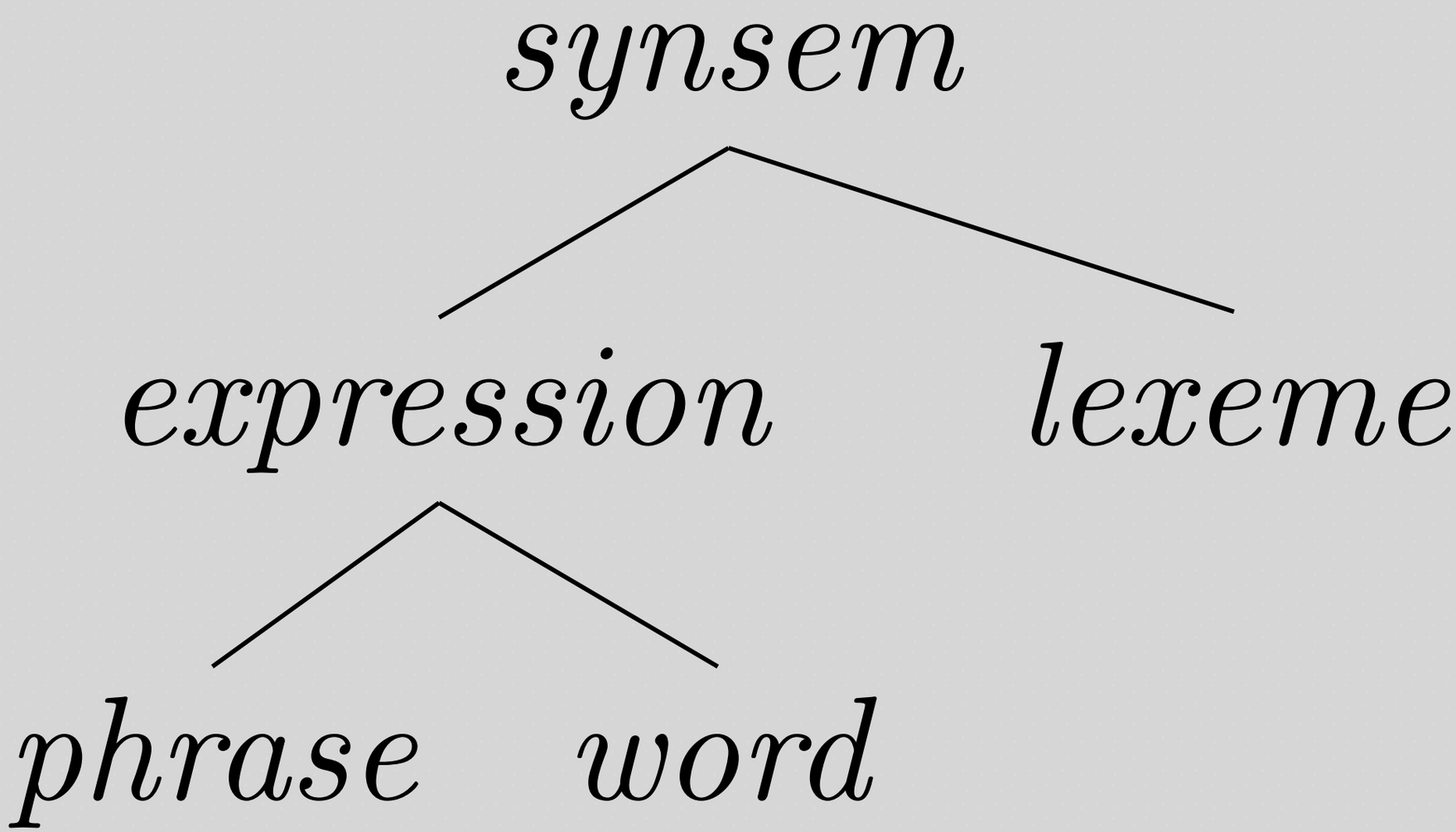
Another Lexeme Constraint

$$
\textit{verb-lxm}: \left[\begin{array}{ll}
\text{SYN} & \left[\begin{array}{ll}
\text{HEAD} & \left[\begin{array}{ll} \textit{verb} & \\ \text{PRED} & - \\ \text{INF} & / - \\ \text{AUX} & / - \\ \text{POL} & - \end{array}\right] \\
\text{ARG-ST} & \left\langle \left[\begin{array}{ll} \text{HEAD} & \textit{nominal} \\ \text{VAL} & \left[\begin{array}{ll} \text{SPR} & \langle\,\rangle \\ \text{COMPS} & \langle\,\rangle \end{array}\right] \end{array}\right], \ldots \right\rangle
\end{array}\right] \\
\text{SEM} & \left[\text{MODE} \quad \text{prop}\right]
\end{array}\right]
$$

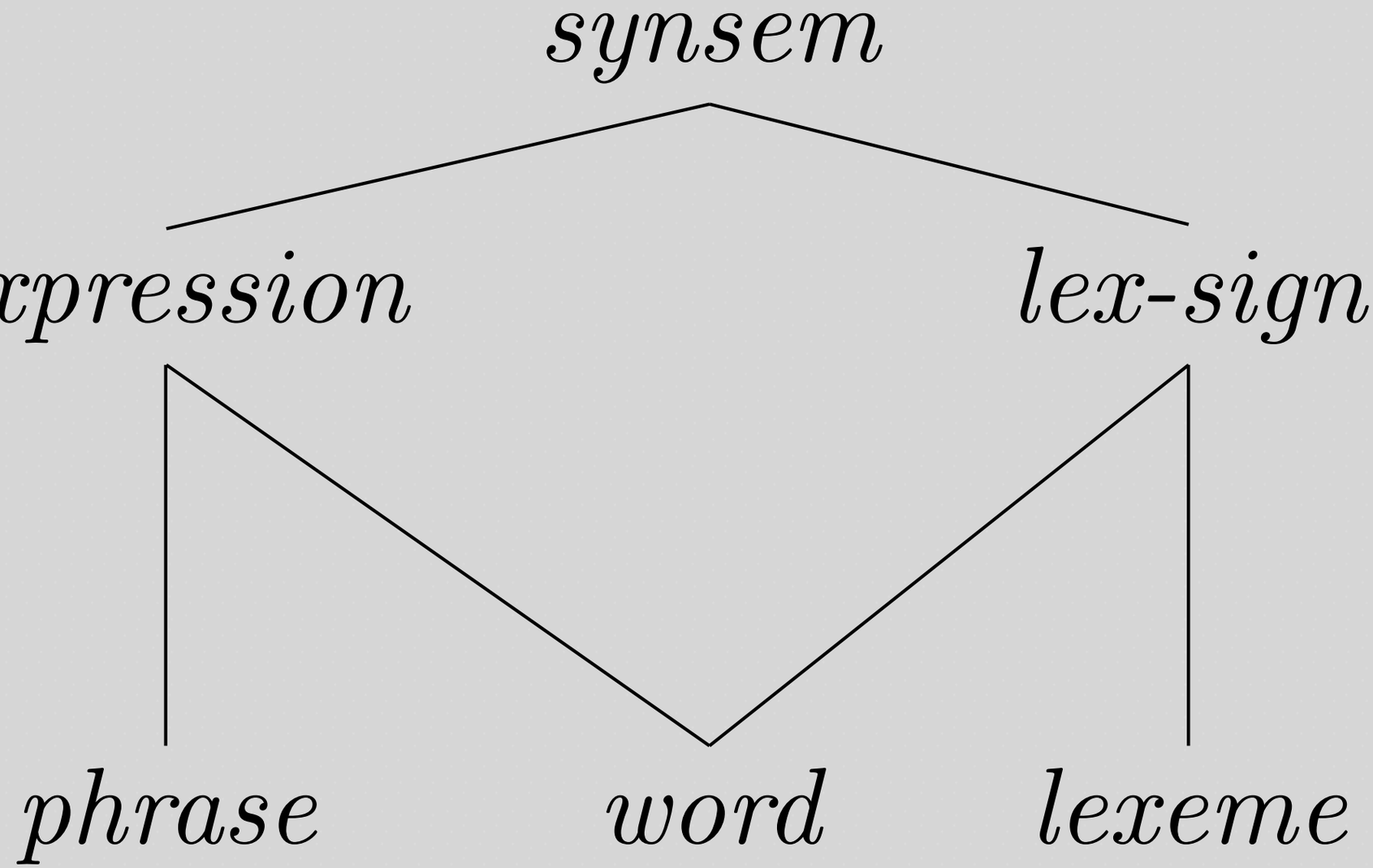
And Another

$$
\textit{adj-lxm}: \left[\begin{array}{ll}
\text{SYN} & \left[\begin{array}{ll}
\text{HEAD} & \textit{adj} \\
\text{VAL} & \left[\begin{array}{ll}
\text{SPR} & \langle\ \text{X}\ \rangle \\
\text{MOD} & \langle\ [\text{HEAD}\ \ \textit{noun}]\ \rangle
\end{array}\right]
\end{array}\right] \\
\text{ARG-ST} & \left\langle \left[\begin{array}{ll}
\text{HEAD} & \textit{nominal} \\
\text{VAL} & \left[\begin{array}{ll}
\text{SPR} & \langle\ \rangle \\
\text{COMPS} & \langle\ \rangle
\end{array}\right]
\end{array}\right], \ldots \right\rangle \\
\text{SEM} & \left[\text{MODE}\ \ \text{prop}\right]
\end{array}\right]
$$

Synsem Types



Give ARG-ST a Unique Home



Words and Phrases as Saussurean Signs

$$
\left[\begin{array}{ll}
\textit{word} & \\
\text{PHON} & \langle\ \text{Kim}\ \rangle \\
\text{SEM} & \left[\begin{array}{ll}
\text{MODE} & \text{ref} \\
\text{INDEX} & i \\
\text{RESTR} & \left\langle \left[\begin{array}{ll}
\text{RELN} & \textbf{name} \\
\text{SIT} & s \\
\text{NAME} & \text{Kim} \\
\text{NAMED} & i
\end{array}\right] \right\rangle
\end{array}\right]
\end{array}\right]
$$

Augmented Signs

$$\begin{bmatrix} \textit{word} & & \\ \text{PHON} & \langle\ \text{Kim}\ \rangle & \\ \text{SYN} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{noun} & \\ \text{AGR} & \textit{3sing} \end{bmatrix} \end{bmatrix} & \\ \text{ARG-ST} & \langle\ \ \rangle & \\ \text{SEM} & \begin{bmatrix} \text{MODE} & \text{ref} & \\ \text{INDEX} & i & \\ \text{RESTR} & \left\langle \begin{bmatrix} \text{RELN} & \textbf{name} \\ \text{SIT} & s \\ \text{NAME} & \text{Kim} \\ \text{NAMED} & i \end{bmatrix} \right\rangle & \end{bmatrix} & \end{bmatrix}$$

Phrases as Signs

$$\left[\begin{array}{ll} \textit{phrase} & \\ \text{PHON} & \langle\ \text{Kim}\ ,\ \text{walks}\ \rangle \\ \text{SYN} & \left[\begin{array}{ll} \text{HEAD} & \left[\begin{array}{ll} \textit{verb} & \\ \text{FORM} & \text{fin} \end{array}\right] \\ \text{SPR} & \langle\ \rangle \\ \text{COMPS} & \langle\ \rangle \end{array}\right] \\ \text{SEM} & \left[\begin{array}{ll} \text{MODE} & \text{prop} \\ \text{INDEX} & s \\ \text{RESTR} & \left\langle \left[\begin{array}{ll} \text{RELN} & \textbf{name} \\ \text{NAME} & \text{Kim} \\ \text{NAMED} & i \end{array}\right], \left[\begin{array}{ll} \text{RELN} & \textbf{walk} \\ \text{SIT} & s \\ \text{WALKER} & i \end{array}\right], \ldots \right\rangle \end{array}\right] \end{array}\right]$$

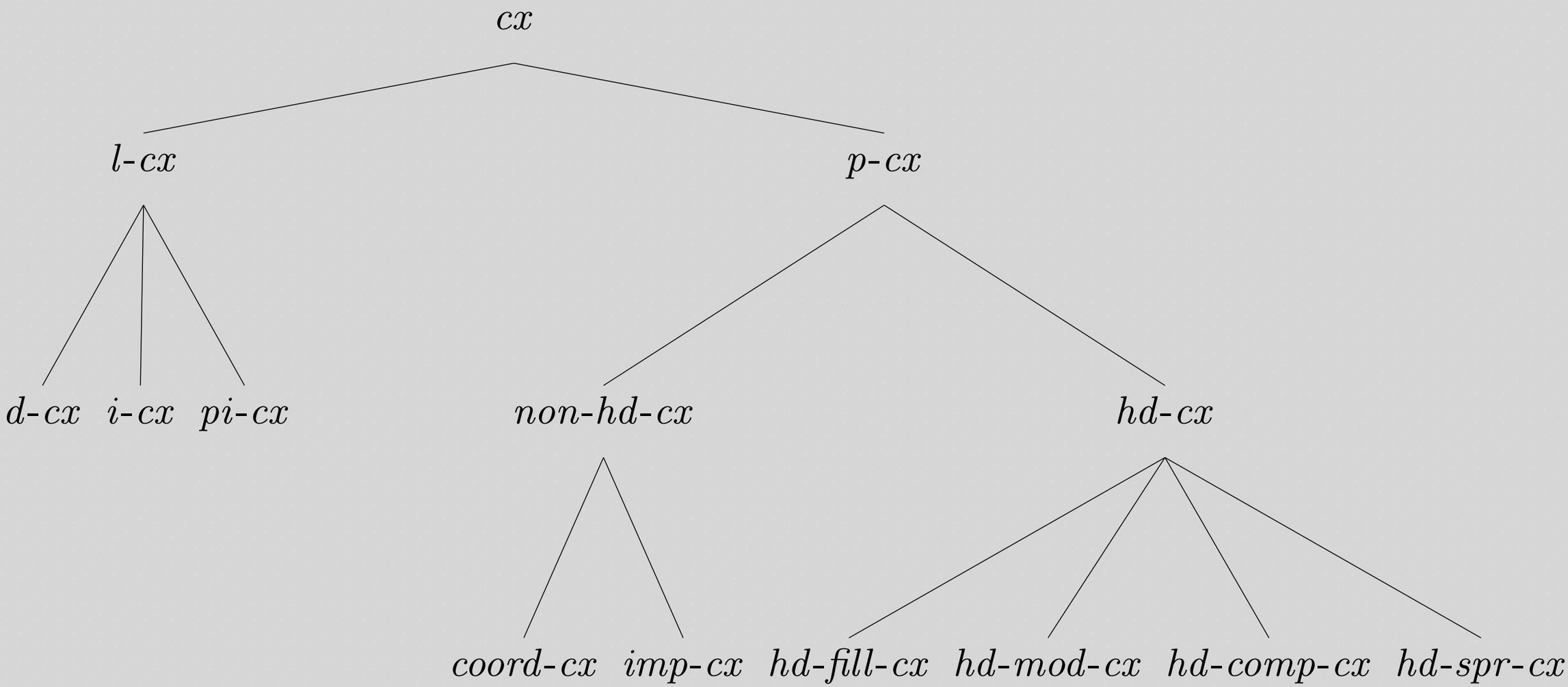
Types and Constraints

TYPE	FEATURES/VALUE TYPES	IST
sign	$\begin{bmatrix}\text{PHON} & \textit{list}(\textit{form}) \\ \text{SYN} & \textit{syn-cat} \\ \text{SEM} & \textit{sem-cat}\end{bmatrix}$	*feat-struc*
expression		*sign*
lex-sign	$[\text{ARG-ST} \quad \textit{list}(\textit{expression})]$	*sign*
phrase		*expression*
word		*expression* & *lex-sign*
lexeme		*lex-sign*

Constructions: Some Abbreviations

cx	*construction*
l-cx	*lexical-construction*
d-cx	*derivational-construction*
i-cx	*inflectional-construction*
pi-cx	*postinflectional-construction*
p-cx	*phrasal-construction*
non-hd-cx	*non-headed-construction*
hd-cx	*headed-construction*
coord-cx	*coordinate-construction*
imp-cx	*imperative-construction*
hd-fill-cx	*head-filler-construction*
hd-comp-cx	*head-complement-construction*
hd-spr-cx	*head-specifier-construction*
hd-mod-cx	*head-modifier-construction*

The World of Constructions



Properties of Constructions

TYPE	FEATURES/VALUE TYPES	IST
cx	$\begin{bmatrix} \text{MOTHER} & \textit{sign} \\ \text{DTRS} & \textit{list}(\textit{sign}) \end{bmatrix}$	*feat-struc*
l-cx	$\begin{bmatrix} \text{MOTHER} & \textit{lex-sign} \\ \text{DTRS} & \langle\ \textit{lex-sign}\ \rangle \end{bmatrix}$	*cx*
p-cx	$\begin{bmatrix} \text{MOTHER} & \textit{phrase} \\ \text{DTRS} & \textit{list}(\textit{expression}) \end{bmatrix}$	*cx*

Well-Formed Tree Structure

Φ is a Well-Formed Structure according to a grammar G if and only if

1. there is some construction C in G, such that
2. there is a feature structure I that is an instantiation of C, such that Φ is the value of the MOTHER feature of I.

A Well-Formed Feature Structure

The grammar licenses a feature structure of type *phrase* whose PHON value is < *ate* , *a* , *pizza* > because there is a feature structure instantiating the head-complement construction that has that feature structure as its MOTHER value. This phrasal construct satisfies the following description:

$$\begin{bmatrix} \textit{phrase} \\ \text{PHON} \quad \langle\, \text{ate} \,,\, \text{a} \,,\, \text{pizza} \,\rangle \\ \text{SYN} \quad \begin{bmatrix} \text{HEAD} \quad \begin{bmatrix} \textit{verb} \\ \text{FORM} \quad \text{fin} \end{bmatrix} \\ \text{VAL} \quad \begin{bmatrix} \text{SPR} \quad \langle\, \text{NP} \,\rangle \\ \text{COMPS} \quad \langle\,\rangle \\ \text{MOD} \quad \langle\,\rangle \end{bmatrix} \\ \text{GAP} \quad \langle\,\rangle \end{bmatrix} \\ \text{SEM} \quad \begin{bmatrix} \text{MODE} \quad \text{prop} \\ \text{INDEX} \quad s \\ \text{RESTR} \quad \left\langle \begin{bmatrix} \text{RELN} \quad \mathbf{eat} \\ \text{SIT} \quad s \\ \text{EATER} \quad i \\ \text{EATEN} \quad j \end{bmatrix}, \begin{bmatrix} \text{RELN} \quad \mathbf{a} \\ \text{BV} \quad j \end{bmatrix}, \begin{bmatrix} \text{RELN} \quad \mathbf{pizza} \\ \text{INST} \quad j \end{bmatrix}, \right\rangle \end{bmatrix} \end{bmatrix}$$

Another Well-Formed Feature Structure

$$\begin{bmatrix} \textit{lexeme} & & \\ \text{PHON} & \langle\ \text{driver}\ \rangle & \\ \text{SYN} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{noun} & \\ \text{AGR} & [\text{PER} \quad \text{3rd}] \end{bmatrix} \\ \text{VAL} & \begin{bmatrix} \text{SPR} & \langle\ \text{DP}\ \rangle \\ \text{COMPS} & \langle\ \rangle \\ \text{MOD} & \langle\ \rangle \end{bmatrix} \\ \text{GAP} & \langle\ \rangle \end{bmatrix} \\ \text{SEM} & \begin{bmatrix} \text{MODE} & \text{ref} \\ \text{INDEX} & i \\ \text{RESTR} & \left\langle \begin{bmatrix} \text{RELN} & \textbf{drive} \\ \text{SIT} & s \\ \text{DRIVER} & i \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

Two Constraints

Root Constraint:

$$\begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{verb} \\ \text{FORM} \quad \text{fin} \end{bmatrix} \\ \text{VAL} & \begin{bmatrix} \text{COMPS} & \langle\ \rangle \\ \text{SPR} & \langle\ \rangle \end{bmatrix} \\ \text{GAP} & \langle\ \rangle \end{bmatrix} \end{bmatrix}$$

Principle of Order:

$$cx: \begin{bmatrix} \text{MOTHER} & [\text{PHON} \quad \boxed{\text{A1}} \oplus \ldots \oplus \boxed{\text{An}}\ ] \\ \text{DTRS} & \langle\ [\text{PHON}\ \boxed{\text{A1}}]\ ,\ \ldots\ ,\ [\text{PHON}\ \boxed{\text{An}}]\ \rangle \end{bmatrix}$$

Semantic Compositionality Principle

$$cx: \begin{bmatrix} \text{MOTHER} & [\text{SEM } [\text{RESTR } \boxed{\text{A1}} \oplus \ldots \oplus \boxed{\text{An}} \,]] \\ \text{DTRS} & \langle\, [\text{SEM } [\text{RESTR } \boxed{\text{A1}}]] \;,\; \ldots \;,\; [\text{SEM } [\text{RESTR } \boxed{\text{An}}]] \,\rangle \end{bmatrix}$$

Alternative Version:

$$cx: \begin{bmatrix} \text{MOTHER} & [\text{SEM } [\text{RESTR } \boxed{\text{A0}} \oplus \boxed{\text{A1}} \oplus \ldots \oplus \boxed{\text{An}} \,]] \\ \text{DTRS} & \langle\, [\text{SEM } [\text{RESTR } \boxed{\text{A1}}]] \;,\; \ldots \;,\; [\text{SEM } [\text{RESTR } \boxed{\text{An}}]] \,\rangle \\ \text{CX-SEM} & \boxed{\text{A0}} \end{bmatrix}$$

Headed Constructions

TYPE	FEATURES/VALUE TYPES	IST
hd-cx	[HD-DTR *sign*]	*cx*

Head Feature Principle:

$$hd\text{-}cx : \begin{bmatrix} \text{MOTHER} & [\text{SYN} & [\text{HEAD} & \boxed{1}]] \\ \text{HD-DTR} & [\text{SYN} & [\text{HEAD} & \boxed{1}]] \end{bmatrix}$$

Two More Principles

Semantic Inheritance Principle:

$$hd\text{-}cx : \begin{bmatrix} \text{MOTHER} & \begin{bmatrix} \text{SEM} & \begin{bmatrix} \text{MODE} & \boxed{1} \\ \text{INDEX} & \boxed{2} \end{bmatrix} \end{bmatrix} \\ \text{HD-DTR} & \begin{bmatrix} \text{SEM} & \begin{bmatrix} \text{MODE} & \boxed{1} \\ \text{INDEX} & \boxed{2} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Valence Principle:

$$hd\text{-}cx : \begin{bmatrix} \text{MOTHER} & [\text{SYN} & [\text{VAL} & / \boxed{1}]] \\ \text{HD-DTR} & [\text{SYN} & [\text{VAL} & / \boxed{1}]] \end{bmatrix}$$

The GAP Principle

hd-cx:

$$\left[\begin{array}{lll} \text{MOTHER} & [\text{SYN}\ [\text{GAP}\ \ (\ \boxed{\text{A1}} \oplus \ldots \oplus \boxed{\text{An}}\ )\ \ \ominus\ \ \boxed{\text{A0}}\ ]\ ] \\ \text{HD-DTR} & [\text{SYN}\ [\text{STOP-GAP}\ \ \boxed{\text{A0}}\ ]] \\ \text{DTRS} & \langle\ [\text{SYN}\ [\text{GAP}\ \boxed{\text{A1}}\ ]]\ ,\ \ \ldots\ \ ,\ [\text{SYN}\ [\text{GAP}\ \boxed{\text{An}}\ ]]\ \rangle \end{array}\right]$$

The Head-Complement Construction

$$hd\text{-}comp\text{-}cx : \begin{bmatrix} \text{MOTHER} & [\text{SYN} \; [\text{VAL} \; [\text{COMPS} \; \langle \; \rangle \;]\,]] \\ \text{HD-DTR} & \boxed{0}\begin{bmatrix} word & \\ \text{SYN} & [\text{VAL} \; [\text{COMPS} \; \boxed{\text{A}} \;]] \end{bmatrix} \\ \text{DTRS} & \langle \; \boxed{0} \; \rangle \; \oplus \; \boxed{\text{A}}nelist \end{bmatrix}$$

And with inherited constraints....

$$\left[\begin{array}{ll}
\text{MOTHER} & \left[\begin{array}{ll}
\text{PHON} & \boxed{\text{A1}} \oplus \ldots \oplus \boxed{\text{An}} \\
\text{SYN} & \left[\begin{array}{ll}
\text{HEAD} & \boxed{1} \\
\text{VAL} & \left[\begin{array}{ll}
\text{COMPS} & \langle\ \rangle \\
\text{SPR} & \boxed{\text{D}} \\
\text{MOD} & \boxed{\text{E}}
\end{array}\right]
\end{array}\right] \\
\text{SEM} & \left[\begin{array}{ll}
\text{MODE} & \boxed{2} \\
\text{INDEX} & \boxed{3} \\
\text{RESTR} & \boxed{\text{C1}} \oplus \ldots \oplus \boxed{\text{Cn}}
\end{array}\right]
\end{array}\right] \\
\text{HD-DTR} & \boxed{4}\left[\begin{array}{ll}
\textit{word} & \\
\text{SYN} & \left[\begin{array}{ll}
\text{HEAD} & \boxed{1} \\
\text{VAL} & \left[\begin{array}{ll}
\text{COMPS} & \langle\ \boxed{5}\ ,\ \ldots\ ,\ \boxed{\text{m}}\ \rangle \\
\text{SPR} & \boxed{\text{D}} \\
\text{MOD} & \boxed{\text{E}}
\end{array}\right]
\end{array}\right] \\
\text{SEM} & \left[\begin{array}{ll}
\text{MODE} & \boxed{2} \\
\text{INDEX} & \boxed{3}
\end{array}\right]
\end{array}\right] \\
\text{DTRS} & \left\langle \boxed{4}\left[\begin{array}{ll}\text{PHON} & \boxed{\text{A1}} \\ \text{RESTR} & \boxed{\text{C1}}\end{array}\right], \boxed{5}\left[\begin{array}{ll}\text{PHON} & \boxed{\text{A2}} \\ \text{RESTR} & \boxed{\text{C2}}\end{array}\right], \ldots, \boxed{\text{m}}\left[\begin{array}{ll}\text{PHON} & \boxed{\text{An}} \\ \text{RESTR} & \boxed{\text{Cn}}\end{array}\right] \right\rangle
\end{array}\right]$$

An Instance of the HCC

$$\left[\begin{array}{l}
\textit{hd-comp-cx} \\
\text{MOTHER} \left[\begin{array}{l}
\textit{phrase} \\
\text{PHON} \langle \text{ talked , to , Kim } \rangle \\
\text{SYN} \left[\begin{array}{ll} \text{HEAD} & \textit{verb} \\ \text{VAL} & \left[\begin{array}{l} \text{SPR} \quad \boxed{\text{A}} \langle \text{ NP } \rangle \\ \text{COMPS} \quad \langle \, \rangle \end{array}\right] \end{array}\right] \\
\text{SEM} \left[\text{ ... } \right]
\end{array}\right] \\
\text{HD-DTR} \quad \boxed{0} \\
\text{DTRS} \left\langle \boxed{0} \left[\begin{array}{l}
\textit{word} \\
\text{PHON} \quad \langle \text{ talked } \rangle \\
\text{SYN} \left[\begin{array}{ll} \text{HEAD} & \textit{verb} \\ \text{VAL} & \left[\begin{array}{l} \text{SPR} \quad \boxed{\text{A}} \\ \text{COMPS} \langle \boxed{1} \rangle \end{array}\right] \end{array}\right] \\
\text{SEM} \left[\text{ ... } \right]
\end{array}\right], \boxed{1} \left[\begin{array}{l}
\textit{phrase} \\
\text{PHON} \quad \langle \text{ to , Kim } \rangle \\
\text{SYN} \left[\begin{array}{ll} \text{HEAD} & \textit{prep} \\ \text{VAL} & \left[\begin{array}{l} \text{SPR} \langle \, \rangle \\ \text{COMPS} \langle \, \rangle \end{array}\right] \end{array}\right] \\
\text{SEM} \left[\text{ ... } \right]
\end{array}\right] \right\rangle
\end{array}\right]$$

$$\left[\begin{array}{l}
\textit{hd-comp-cx} \\
\text{MOTHER} \left[\begin{array}{l}
\textit{phrase} \\
\text{PHON} \quad \langle\ \text{in}\ ,\ \text{Seattle}\ \rangle \\
\text{SYN} \left[\begin{array}{l}
\text{HEAD} \quad \textit{prep} \\
\text{VAL} \left[\begin{array}{ll}
\text{SPR} & \boxed{\text{A}} \\
\text{COMPS} & \langle\ \rangle \\
\text{MOD} & \boxed{\text{B}}
\end{array}\right]
\end{array}\right] \\
\text{SEM}\ [\ \ldots\ ]
\end{array}\right] \\
\text{HD-DTR}\ \ \boxed{0} \\
\text{DTRS} \left\langle \boxed{0} \left[\begin{array}{l}
\textit{word} \\
\text{PHON}\ \langle\ \text{in}\ \rangle \\
\text{SYN} \left[\begin{array}{l}
\text{HEAD}\ \textit{prep} \\
\text{VAL} \left[\begin{array}{l}
\text{SPR}\ \boxed{\text{A}} \\
\text{COMPS}\ \langle\ \boxed{1}\ \rangle \\
\text{MOD}\ \boxed{\text{B}}
\end{array}\right]
\end{array}\right] \\
\text{SEM}\ [\ \ldots\ ]
\end{array}\right] , \boxed{1} \left[\begin{array}{l}
\textit{word} \\
\text{PHON}\ \langle\ \text{Seattle}\ \rangle \\
\text{SYN} \left[\begin{array}{l}
\text{HEAD}\ \textit{noun} \\
\text{VAL} \left[\begin{array}{l}
\text{SPR}\ \langle\ \rangle \\
\text{COMPS}\ \langle\ \rangle
\end{array}\right]
\end{array}\right] \\
\text{SEM}\ [\ \ldots\ ]
\end{array}\right] \right\rangle
\end{array}\right]$$

Two More Constructions

hd-spr-cx :

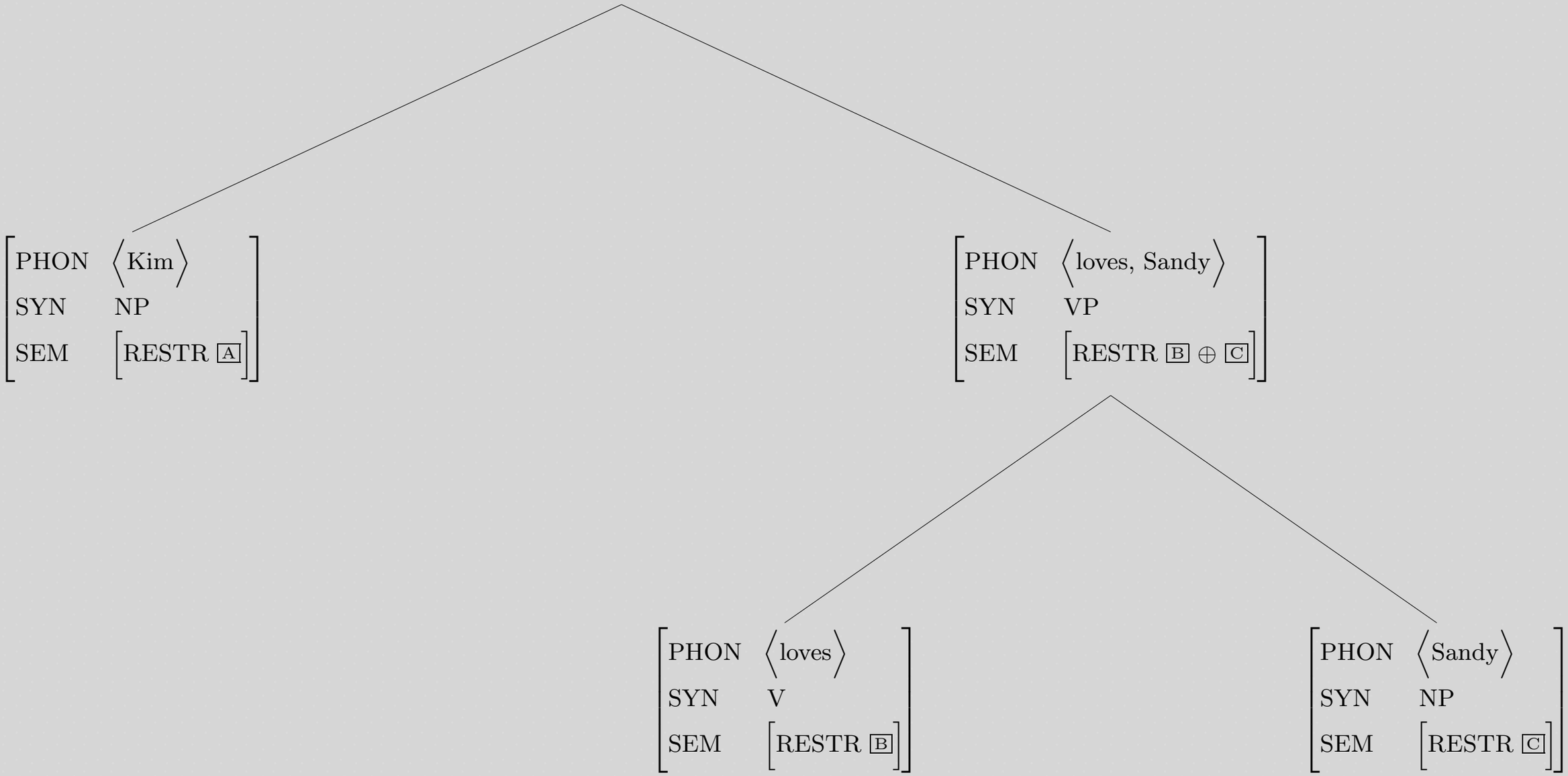
$$\begin{bmatrix} \text{MOTHER} & \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{SPR} & \langle\,\rangle \end{bmatrix} \end{bmatrix} \\ \text{HD-DTR} & \boxed{0}\begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{SPR} & \langle\,\boxed{1}\,\rangle \\ \text{COMPS} & \langle\,\rangle \\ \text{STOP-GAP} & \langle\,\rangle \end{bmatrix} \end{bmatrix} \\ \text{DTRS} & \langle\,\boxed{1}\,,\,\boxed{0}\,\rangle \end{bmatrix}$$

hd-mod-cx :

$$\begin{bmatrix} \text{HD-DTR} & \boxed{1}\begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{VAL} & \begin{bmatrix} \text{COMPS} & \langle\,\rangle \end{bmatrix} \\ \text{STOP-GAP} & \langle\,\rangle \end{bmatrix} \end{bmatrix} \\ \text{DTRS} & \left\langle \boxed{1}\,,\begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{VAL} & \begin{bmatrix} \text{COMPS} & \langle\,\rangle \\ \text{MOD} & \langle\,\boxed{1}\,\rangle \end{bmatrix} \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix}$$

A Tree

$$\begin{bmatrix} \text{PHON} & \langle \text{Kim, loves, Sandy} \rangle \\ \text{SYN} & \text{S} \\ \text{SEM} & \left[\text{RESTR } \boxed{\text{A}} \oplus \boxed{\text{B}} \oplus \boxed{\text{C}} \right] \end{bmatrix}$$



The Head-Filler Construction

$$
\textit{hd-fill-cx}: \left[\begin{array}{ll}
\text{HD-DTR} & \boxed{0} \left[\begin{array}{ll}
\text{SYN} & \left[\begin{array}{ll}
\text{HEAD} & \left[\begin{array}{ll} \textit{verb} & \\ \text{FORM} & \text{fin} \end{array}\right] \\
\text{VAL} & \left[\begin{array}{ll} \text{SPR} & \langle\ \rangle \\ \text{COMPS} & \langle\ \rangle \end{array}\right] \\
\text{GAP} & \langle\ \boxed{1}\ \rangle \\
\text{STOP-GAP} & \langle\ \boxed{1}\ \rangle
\end{array}\right]
\end{array}\right] \\
\text{DTRS} & \langle\ \boxed{1}[\text{GAP}\ \langle\ \rangle]\ ,\ \boxed{0}\ \rangle
\end{array}\right]
$$

$$\left[\begin{array}{l} \textit{hd-fill-cx} \\ \text{MOTHER} \left[\begin{array}{ll} \text{PHON} & \langle\ \text{Bagels , I , think , she , likes}\ \rangle \\ \text{SYN} & \left[\begin{array}{ll} \text{HEAD} & \boxed{2}\left[\begin{array}{ll} \textit{verb} & \\ \text{FORM} & \text{fin} \end{array}\right] \\ \text{VAL} & \left[\begin{array}{ll} \text{SPR} & \langle\ \rangle \\ \text{COMPS} & \langle\ \rangle \end{array}\right] \\ \text{GAP} & \langle\ \rangle \end{array}\right] \\ \text{SEM} & [\ \ldots\ ] \end{array}\right] \\ \text{HD-DTR}\ \boxed{0} \\ \text{DTRS}\ \left\langle \boxed{1}\left[\begin{array}{ll} \text{PHON} & \langle\ \text{Bagels}\ \rangle \\ \text{SYN} & \left[\begin{array}{ll} \text{HEAD} & \textit{noun} \\ \text{VAL} & \left[\begin{array}{ll} \text{SPR} & \langle\ \rangle \\ \text{COMPS} & \langle\ \rangle \end{array}\right] \end{array}\right] \\ \text{SEM} & [\ \ldots\ ] \end{array}\right] , \boxed{0}\left[\begin{array}{ll} \text{PHON} & \langle\ \text{I, think, she, likes}\rangle \\ \text{SYN} & \left[\begin{array}{ll} \text{HEAD} & \boxed{2} \\ \text{VAL} & \left[\begin{array}{ll} \text{SPR} & \langle\ \rangle \\ \text{COMPS} & \langle\ \rangle \end{array}\right] \\ \text{GAP} & \langle\ \boxed{1}\ \rangle \\ \text{STOP-GAP} & \langle\ \boxed{1}\ \rangle \end{array}\right] \\ \text{SEM} & [\ \ldots\ ] \end{array}\right] \right\rangle \end{array}\right]$$

The Imperative Construction

$$\left[\begin{array}{ll}\text{MOTHER} & \left[\begin{array}{ll}\text{SYN} & \left[\begin{array}{ll}\text{HEAD} & \textit{verb}\\ \text{VAL} & \left[\text{SPR} \quad \langle\ \rangle\right]\\ \text{GAP} & \boxed{\text{A}}\end{array}\right]\\ \text{SEM} & \left[\begin{array}{ll}\text{MODE} & \text{dir}\\ \text{INDEX} & s\end{array}\right]\end{array}\right]\end{array}\right]$$

imp-cx :

$$\left[\begin{array}{ll}\text{DTRS} & \left\langle\left[\begin{array}{ll}\text{SYN} & \left[\begin{array}{ll}\text{HEAD} & \left[\begin{array}{ll}\textit{verb}\\ \text{INF} & -\\ \text{FORM} & \text{base}\end{array}\right]\\ \text{VAL} & \left[\begin{array}{ll}\text{SPR} & \langle\ \text{NP[PER 2nd]}\ \rangle\\ \text{COMPS} & \langle\ \rangle\end{array}\right]\\ \text{GAP} & \boxed{\text{A}}\end{array}\right]\\ \text{SEM} & [\text{INDEX} \quad s\ ]\end{array}\right]\right\rangle\end{array}\right]$$

Coordination Construction

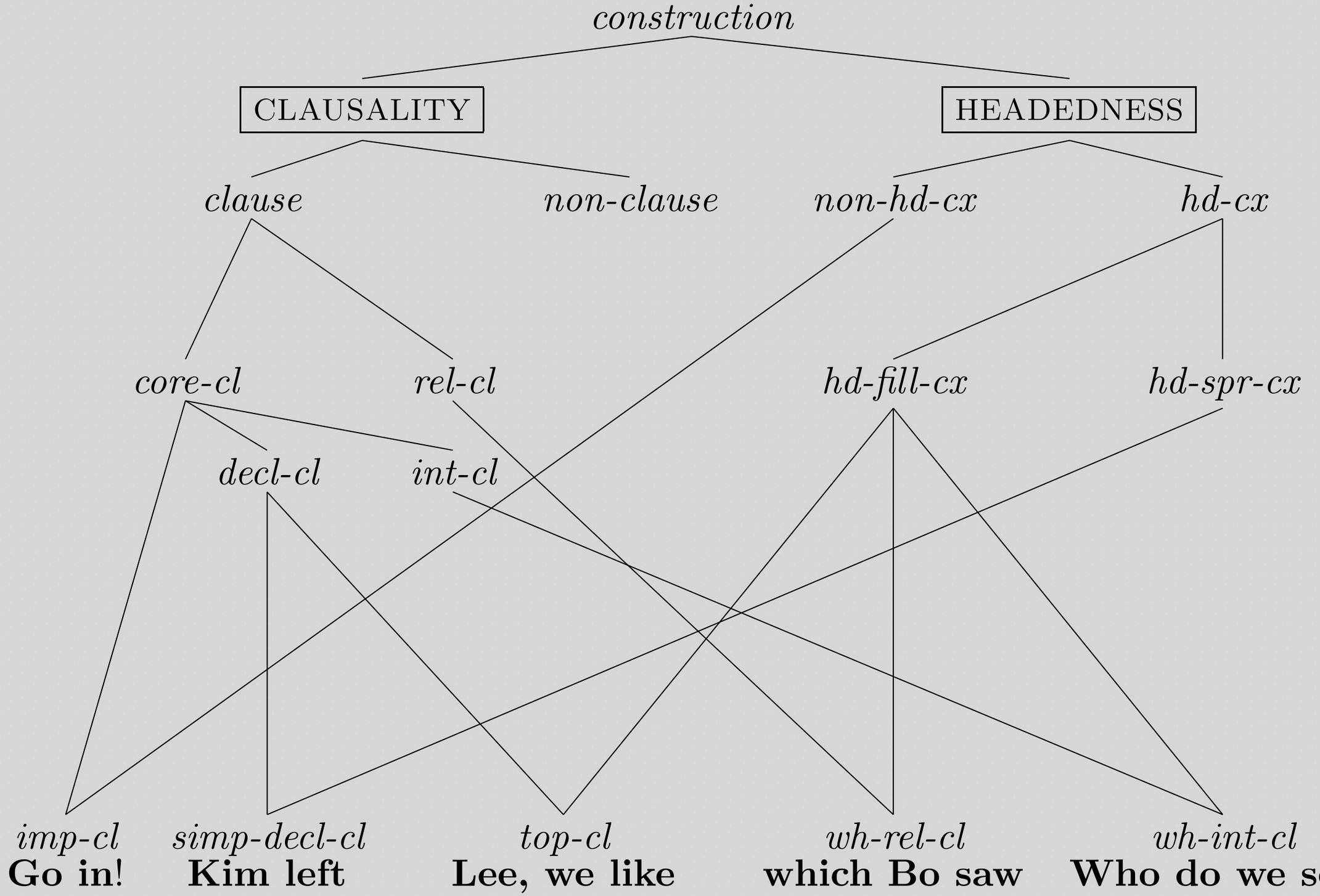
$$\left[\begin{array}{l}
\text{MOTHER} \left[\begin{array}{ll} \text{SYN} & \left[\begin{array}{ll} \text{HEAD} & [\text{FORM } \boxed{1}] \\ \text{VAL} & \boxed{2} \\ \text{GAP} & \boxed{A} \end{array}\right] \\ \text{SEM} & [\text{IND} \quad s_0] \end{array}\right] \\
\text{DTRS} \left\langle \left[\begin{array}{ll} \text{SYN} & \left[\begin{array}{ll} \text{HEAD} & [\text{FORM } \boxed{1}] \\ \text{VAL} & \boxed{2} \\ \text{GAP} & \boxed{A} \end{array}\right] \\ \text{SEM} & [\text{IND} \quad s_1] \end{array}\right], \ldots, \left[\begin{array}{ll} \text{SYN} & \left[\begin{array}{ll} \text{HEAD} & [\text{FORM } \boxed{1}] \\ \text{VAL} & \boxed{2} \\ \text{GAP} & \boxed{A} \end{array}\right] \\ \text{SEM} & [\text{IND} \quad s_{n-1}] \end{array}\right], \right. \\
\left. \left[\begin{array}{l} \text{HEAD } \textit{conj} \\ \text{IND} \quad s_0 \\ \text{RESTR} \left\langle [\text{ARGS } \langle s_1 \ldots s_n \rangle] \right\rangle \end{array}\right], \left[\begin{array}{ll} \text{SYN} & \left[\begin{array}{ll} \text{HEAD} & [\text{FORM } \boxed{1}] \\ \text{VAL} & \boxed{2} \\ \text{GAP} & \boxed{A} \end{array}\right] \\ \text{SEM} & [\text{IND} \quad s_n] \end{array}\right] \right\rangle
\end{array}\right]$$

$$\left[\begin{array}{l}
\text{MOTHER}\left[\begin{array}{ll}
\text{PHON} & \langle\ \text{Kim , sleeps , and , Pat , works}\ \rangle \\
\text{SYN} & \left[\begin{array}{ll}
\text{HEAD} & \textit{verb} \\
\text{VAL} & \left[\begin{array}{ll}
\text{SPR} & \langle\ \rangle \\
\text{COMPS} & \langle\ \rangle
\end{array}\right]
\end{array}\right] \\
\text{SEM} & [\ \ldots\ ]
\end{array}\right] \\
\text{DTRS}\ \langle\ \left[\begin{array}{ll}
\text{PHON} & \langle\ \text{Kim , sleeps}\ \rangle \\
\text{SYN} & \left[\begin{array}{ll}
\text{HEAD} & \textit{verb} \\
\text{VAL} & \left[\begin{array}{ll}
\text{SPR} & \langle\ \rangle \\
\text{COMPS} & \langle\ \rangle
\end{array}\right]
\end{array}\right] \\
\text{SEM} & [\ \ldots\ ]
\end{array}\right],\ \left[\begin{array}{ll}
\text{PHON} & \langle\ \text{and}\ \rangle \\
\text{SYN} & \left[\text{HEAD}\ \textit{conj}\right] \\
\text{SEM} & [\ \ldots\ ]
\end{array}\right],\ \left[\begin{array}{ll}
\text{PHON} & \langle\ \text{Pat , works}\ \rangle \\
\text{SYN} & \left[\begin{array}{ll}
\text{HEAD} & \textit{verb} \\
\text{VAL} & \left[\begin{array}{ll}
\text{SPR} & \langle\ \rangle \\
\text{COMPS} & \langle\ \rangle
\end{array}\right]
\end{array}\right] \\
\text{SEM} & [\ \ldots\ ]
\end{array}\right]\ \rangle
\end{array}\right]$$

Some More Abbreviations

imp-cl	*imperative-clause*
decl-cl	*declarative-clause*
simp-decl-cl	*simple-declarative-clause*
top-cl	*topicalized-clause*
wh-rel-cl	*wh-relative-clause*
wh-int-cl	*wh-interrogative-clause*
core-cl	*core-clause*

A Construction Hierarchy



Locality

- Like CFG rules, constructions involve only mothers and daughters.
- A lexical head can place constraints on its sisters or on an appropriate maternal dependent.
- Unbounded dependencies are localized.

  Sandy is hard ((for us) to continue) to please___

  Getting it done is hard for us to imagine them considering___
- Our principles provide a theory of what information (reflected in terms of HEAD,VAL, GAP, etc.) is passed up within the domain projected by a lexical head (including subjects and modifiers) and hence a theory of what information is locally accessible at any given point in a tree.

Overview

- Chapter 16 framework (same analyses, different underlying system)
- Reading questions
- Final preview
- Untangle this
- General wrap up

Reading Questions

- What are some examples of constructionally-introduced semantics?
- Can HPSG handle discourse-level structure?
- How is it stipulated which daughter (first or last) is the head of a phrase?

Two More Constructions

hd-spr-cx :

$$\begin{bmatrix} \text{MOTHER} & \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{SPR} & \langle\,\rangle \end{bmatrix} \end{bmatrix} \\ \text{HD-DTR} & \boxed{0}\begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{SPR} & \langle\,\boxed{1}\,\rangle \\ \text{COMPS} & \langle\,\rangle \\ \text{STOP-GAP} & \langle\,\rangle \end{bmatrix} \end{bmatrix} \\ \text{DTRS} & \langle\,\boxed{1}\,,\,\boxed{0}\,\rangle \end{bmatrix}$$

hd-mod-cx :

$$\begin{bmatrix} \text{HD-DTR} & \boxed{1}\begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{VAL} & \begin{bmatrix} \text{COMPS} & \langle\,\rangle \end{bmatrix} \\ \text{STOP-GAP} & \langle\,\rangle \end{bmatrix} \end{bmatrix} \\ \text{DTRS} & \left\langle\,\boxed{1}\,,\begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{VAL} & \begin{bmatrix} \text{COMPS} & \langle\,\rangle \\ \text{MOD} & \langle\,\boxed{1}\,\rangle \end{bmatrix} \end{bmatrix} \end{bmatrix}\right\rangle \end{bmatrix}$$

Reading Questions

- I remember discussing in class how defeasible constraints doesn't play well with multiple inheritance, but in this chapter we introduce multiple inheritance and still have defeasible constraints. What's up with that? For really practical sign-based construction grammar would we eventually have to drop defeasible constraints, or would we want to keep it indefinitely?

- In the example given for Head-Specifier rule pg. 476, would it mean that mother's and head daughter's SPR values would be defeasible whereas COMPS and MOD values wouldn't be?

Reading Questions

- In a multiple inheritance hierarchy, should siblings always be mutually exclusive? (E.g., a leaf could have both *adj-lxm* and *si-lxm* as parents, but would never have both *verb-lxm* and *adj-lxm* as parents since these children of POS are mutually exclusive.)

- Do we use multiple inheritance in implemented HPSG grammar? I recall an argument made against using multiple inheritance, but I don't remember exactly what the reasons were.

Reading Questions

- How do you show constituent information for a whole sentence with constructions? Don't we lose the visual order independence that trees conveyed? Are there any conventions for starting at a leaf node or the start symbol?

- We will still have trees when we analyze sentences right? Because there is phonological form in the feature structure, leaf node will be just of type *word*?

- Does not having tree structures make it more difficult to represent more than one parse for an ambiguous sentence, or is this taken care of by grouping the PHON list of the phrases differently (and therefore having different semantics)?

Reading Questions

- If there is a change in tree-drawing, what would the new trees look like? I'm having trouble visualizing the changes described here.
- Do instantiated forms of the rules like on pages 484 and 485 ever appear anywhere when analyzing or generating sentences? If so, where?
- On page 475, the feature structure for Kim walks does't appear to differentiate between the NP and the VP that constitute the phrase. Would we still need a tree for that?

Reading Questions

- Why is the "mother" considered the output and the "daughter" the input? In previous lexical rules with input/output, usually the more generalized case was the input and the addition of certain constraints created the output, such that the output was further down the tree.

Reading Questions

- In practice, when we use HPSG to analyze texts, do we still use trees or just the new formalism?
- Is the ERG a Sign-Based Construction Grammar?

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Untangle This

- What phenomena are illustrated by this sentence?
- What rules or interesting lexical types are involved in our analysis of it?
- What tree structure does our grammar assign?

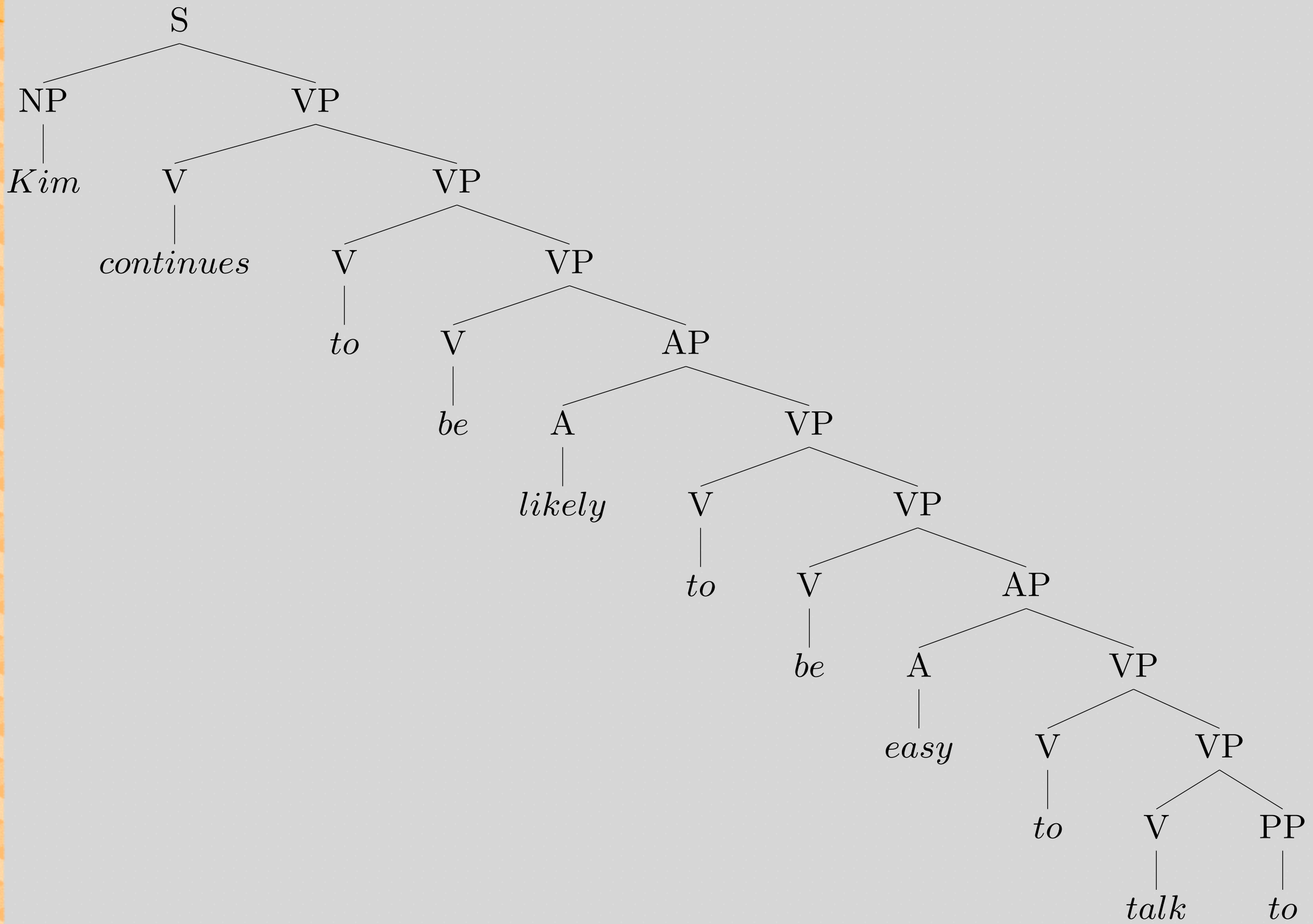
Complicated example #6

Kim continues to be likely to be easy to talk to.

**Kim continue to be likely to be easy to talk to.*

**Kim continues to be likely to is easy to talk to.*

**Kim continues to Kim be likely to be easy to talk to.*



Complicated example #7

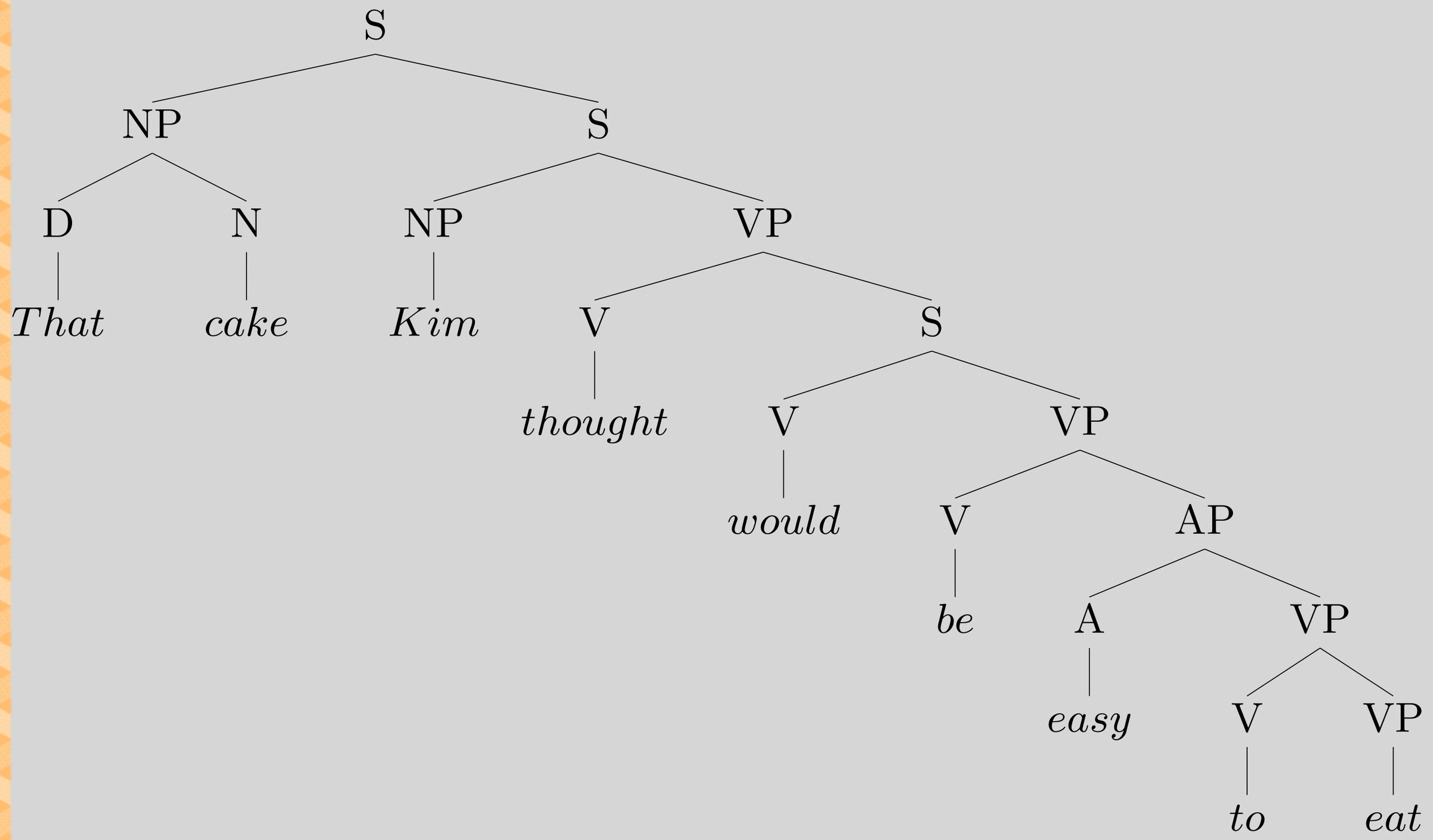
That cake, Kim thought would be easy to eat.

**That cake, Kim thought would be easy to eat pie.*

**That cake, Kim thought would be easy to eaten.*

**Cupcake, Kim thought would be easy to eat.*

**That cake, Kim thought that would be easy to eat.*



Course overview

- Survey of some phenomena central to syntactic theory
- Introduction to the HPSG framework
- Process over product: How to build a grammar fragment
- Value of precise formulation (and of getting a computer to do the tedious part for you!)

Reflection

- What was the most surprising thing in this class?
- What do you think is most likely wrong?
- What do you think is the coolest result?
- What do you think you're most likely to remember?
- How do you think this course will influence your work as a computational

Overview

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