Explaining Constructional Diversity: English Filler-Gap Constructions

Ivan A. Sag

Stanford University

Chomsky on Constructions

[In a Principles-and-Parameters approach,] the notion of grammatical construction is eliminated, and with it, the construction-particular rules. Constructions such as verb phrase, relative clause, and passive remain only as taxonomic artifacts, collections of phenomena explained through the interaction of the principles of UG, with the values of the parameters fixed. [Chomsky 1993, p. 4]

McCawley (1988) on Chomsky (1986)

Nothing in Chomsky's "more explanatory" analysis accounted for crucial issues like:

- the relevant verb morphology,
- the choice of the preposition *by*, or
- the role of the verb *be*.

Chomsky's proposal was comparably stipulative to the alternative it sought to replace.

- Why be interested in a construction-based grammar?
- Constructional patterns come in families.
- Grammars need to characterize the family resemblance that various patterns of phrasal and lexical combination exhibit.
- These generalizations, as well as constructional idiosyncrasy, can be naturally expressed in construction-based terms.

- TG didn't find a way to express generalizations over classes of constructions,
- This stems from the "generative-enumerative" character of transformational theory (Computer Science of the 1950s)
- Generalizations over classes of constructs can be expressed within constraint-based, model-theoretic analysis (Modern "Object-Oriented" Computer Science)
- [Pullum and Scholz 2001 and related work]

Some Aux-Initial Constructs

[After Fillmore 1999 and Ginzburg/Sag 2000]

- May your teeth fall out on your wedding night!
- **Were they here now**, we wouldn't have this problem.
- **Should there be a need**, we can always call for help.
- Boy, **was I stupid**!
- So **can I**!
- We won't have to go, **will we**?

The Family Resemblance

- The head daughter is an initial, finite, auxiliary verb.
- The subject is realized in the position immediately following the auxiliary.
- The head daughter may not be an auxiliary like *better* (**Better I/we do that now?*).
- The head daughter may be an otherwise non-occurring finite auxiliary like first-person *aren't* (*Aren't I allowed to go?* vs. **I aren't allowed to go.*).

Filler-Gap Constructs are a Family, Too

- They have two daughters: the filler daughter and the head daughter.
- The head daughter must contain a 'gap' corresponding to the filler daughter.
- The filler must contain/not contain a distinguished element of the appropriate kind.
- The gap position is subject to 'island' effects.
- The FG-clause has a clausal semantics - it denotes a proposition, question, fact, or outcome [the 4 kinds of **message** in Ginzburg/Sag 2000].

Wh-**Interrogative Clause:**

[How foolish] [is he __]?

I wonder **[how foolish] [he is __]**.

Wh-**Exclamative Clause:**

[What a fool] [he is __]!

It's amazing **[how odd] [it is __]**.

Topicalized Clause:

[The bagels], [I like __].

Wh-**Relative Clause:**

I met the person **[who] [they chose ___]**.

I'm looking for a bank **[in which] [to place my trust ___]**

The-**Clause:**

The more people I met, **[the happier] [I became ___]**.

[The more people] [I met ___], the happier I became.

Parameters of Variation in FG Clauses:

- Is there a distinguished *wh* element in the filler daughter, and if so, what kind?
- What "pied-pipings" are possible?
- What are the possible syntactic categories of the filler daughter?
- What are the possible syntactic categories of the head daughter?

Parameters of Variation in FG Clauses (2):

- Can the head daughter be inverted/finite? Must it be?
- What semantics/synactic category is associated with the mother?
- What semantics/syntactic category is associated with the head daughter?
- Is the clause an island? Must it be an 'independent clause'?

WH-Word Diversity

wh-word	int	excl	rel	example
who (Noun)	+	−	+	*who*
whose(Det)	+	−	+	*whose book*
what(Noun)	+	−	%	*what*
what(Det$_{sing}$)	+	−	−	*what book*
what(Det$_{pl}$)	+	+	−	*what stories*
which(Noun)	−	−	+	*which*
which(Det)	+	−	+	*which book*
how(Adv$_{manner}$)	+	+	%	*how*
how(Adj)	+	−	−	*how*
how(Degree word)	+	+	−	*how tall*
when(Adv$_{time}$)	+	−	%	*when*
where(Adv$_{place}$)	+	−	+	*where*
why(Adv$_{reason}$)	+	−	+	*why*

WH-Word Mismatches

Who did they visit?

*Who they visited!

The person who they visited ...

Whose book did she read?

*Whose book she read!

The person whose book she read ...

WH-Word Mismatches (2)

What did she read?

*What she read!

%The only book what she read ...

What book did she read?

*What book she read!

*The only one what book she read ...

WH-Word Mismatches (3)

Which book did she read?

*Which book she read!

*The only one which book she read ...

How do they like it there?

How they like it there!

%The way how they liked it ...

WH-Word Mismatches (4)

How was it?

*How it was!

*The color how it was ...

How tall did they get?

How tall they've become!

*The extent how tall they got ...

WH-Word Mismatches (5)

When/Where did they do that?

*When/Where they did that!

The time when they did that ...

The place where they did that ...

Why did they do that?

*Why they did that!

The reason why they did that ...

Pied Piping Differences

Those dignitaries [[*pictures of whom*] the newspaper had already published] ... (*wh*-relative)

*I wonder [[*pictures of whom*] the newspaper had already published]. (*wh*-interrogative)

*[*pictures of what a liar*] the newspaper published! (*wh*-exclamative)

Syntactic Category of the Filler Daughter

Topicalization/*Wh*-interrogative:
NP, PP, AP, AdvP

Finite relative: NP, PP

Infinitival relative: PP

Wh-exclamative/*The*-clause: NP, AP, AdvP

Mismatched Filler Categories

*the person [[*happy with whom*] Kim is]...

*[**visit what a mansion**] they did!

*the people [[*who(m)*] to confer with]...

*[**the more write books**] she does (, the more people listen).

Syntactic Category of the Head Daughter:

Top/Int/Rel/Excl Clauses: *S*

*Bagels, [that I like]

*who [that we like]. (*wh*-interrogative, relative or exclamative)

The-**Clause:** *S* or *CP* (S[*that*])

The more [(that) you see](, the more (that) you like.)

Must/Can the H-DTR Be an Inverted Clause?

a. *Wh*-interrogative: *inverted only in independent clause*.

   How tall **is Kim**?/*I wonder how tall **is Kim**.

b. Topicalization, *Wh*-relative/*Wh*-exclamative: *never inverted*.

   *Bagels, **do they like** ___ ?/!

   *the one who **did he see**...

   *How tall **is Kim** ___ !/*What a nice person **is Kim talking to** ___ !

Must/Can the H-DTR Be an Inverted Clause?

c. Noninitial *The*-clause: *optional inversion*

The more my head has ached, the more **have I/I have indulged in humor**.

See Culicover and Jackendoff (Culicover/Jackendoff 99: 559).

Must/Can the H-DTR be Infinitival?

Top/*Wh*-Excl/*The*-Clause:
always finite; never infinitival.

*It's amazing [how many people (for us) to talk to].

*The harder (for them) to come, the harder (for them) to fall.

Must/Can the H-DTR be Infinitival?

Wh-**Int/Rel**: infinitival VP head daughter possible.

I know how much time (*for them) to take.

The time in which (*for them) to finish ...

Semantics of the Clause

- **Interrogative:** question (propositional function)
- **Relative:** proposition
- **Exclamative:** fact
- *The*-**Clause**: proposition
- **Topicalization**: austinean (proposition or outcome)

A descriptively adequate theory of grammar must accommodate:

- the general, express generalizations
- the idiosyncratic, and
- the huge area in between.
- family resemblance across constructions

Sign-Based Construction Grammar (SBCG)

- Synthesis of HPSG and Berkeley Construction Grammar
- Constraint-Based and Lexicalist
- Based on notion of **Sign** and licensing of signs
- Sag, Ivan A. 2007. Sign-Based Construction Grammar: An informal synopsis. Available at `http://lingo.stanford.edu/sag/publications.html`

SBCG:

- A signature defining the appropriate space of feature structures, including a type hiearchy, feature and value-type declarations.
- A set of constructions licensing certain linguistic objects and not others.

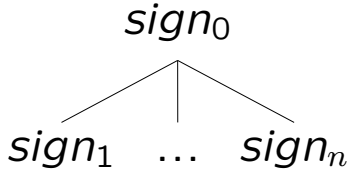
Signs and Constructs

Signs:

$$\begin{bmatrix} \text{PHON} & \textit{list}(\textit{phon}) \\ \text{FORM} & \textit{list}(\textit{form}) \\ \text{SYN} & \textit{syn-obj} \\ \text{SEM} & \textit{sem-obj} \\ \text{CNTXT} & \textit{context} \end{bmatrix}$$

Constructs:

$$\begin{bmatrix} \text{MOTHER} & \textit{sign} \\ \text{DTRS} & \textit{list}(\textit{sign}) \end{bmatrix}$$



Sign-Based Construction Grammar (SBCG)

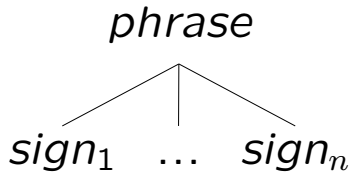
A lexicon (a set consisting of lexeme-descriptions and word descriptions)

Type constraints of the form: $L \Rightarrow \Delta$, where L is a subtype of *lexeme* or *word*, is called a **Lexical Class Construction**.

Type constraints of the form: $C \Rightarrow \Delta$, where C is a subtype of *construct* is called a **Combinatoric Construction**.

Phrasal Constructs

$$\begin{bmatrix} \text{MOTHER} & \begin{bmatrix} \textit{phrase} \\ \ldots \end{bmatrix} \\ \text{DTRS} & \langle\ \textit{sign}_1\ \ldots\ \textit{sign}_n\ \rangle \end{bmatrix}$$



Phrasal Constructs

$$\begin{bmatrix} \textit{subj-pred-cxt} \\ \text{MTR} \quad \begin{bmatrix} \textit{phrase} \\ \text{FORM} \quad \langle\ \text{Obama, actually, won}\ \rangle \\ \text{SYN} \quad \text{S} \ldots \end{bmatrix} \\ \text{DTRS} \quad \left\langle \begin{bmatrix} \text{FORM} \quad \langle\ \text{Obama}\ \rangle \\ \text{SYN} \quad \text{NP} \ldots \end{bmatrix}, \begin{bmatrix} \textit{phrase} \\ \text{FORM} \quad \langle\ \text{actually, won}\ \rangle \\ \text{SYN} \quad \text{VP} \ldots \end{bmatrix} \right\rangle \end{bmatrix}$$

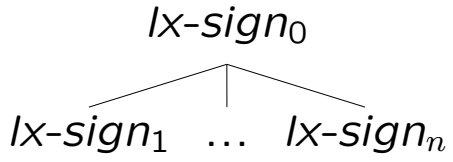
$$\begin{bmatrix} \textit{top-cxt} \\ \text{MTR} \quad \begin{bmatrix} \textit{phrase} \\ \text{FORM} \quad \langle\ \text{bagels, I, like}\ \rangle \\ \text{SYN} \quad \text{S}\Big[\text{GAP}\ \langle\ \rangle\Big] \ldots \end{bmatrix} \\ \text{DTRS} \quad \left\langle \begin{bmatrix} \text{FORM} \quad \langle\ \text{bagels}\ \rangle \\ \text{SYN} \quad \text{NP} \ldots \end{bmatrix}, \begin{bmatrix} \textit{phrase} \\ \text{FORM} \quad \langle\ \text{I, like}\ \rangle \\ \text{SYN} \quad \text{S}\Big[\text{GAP}\ \langle \text{NP} \rangle\Big] \ldots \end{bmatrix} \right\rangle \end{bmatrix}$$

Head Feature Principle:

$$\textit{hd-cxt} \Rightarrow \begin{bmatrix} \text{MTR} & \left[\text{SYN} \left[\text{CAT} \quad \text{X}\right]\right] \\ \text{H-DTR} & \left[\text{SYN} \left[\text{CAT} \quad \text{X}\right]\right] \end{bmatrix}$$

Lexical Constructs

$$\begin{bmatrix} \textit{lex-cxt} \\ \text{MOTHER} \quad \begin{bmatrix} \textit{lx-sign} \\ \dots \end{bmatrix} \\ \text{DTRS} \quad \left\langle \textit{lx-sign}_1 \ \dots \ \textit{lx-sign}_n \right\rangle \end{bmatrix}$$



Lexical Constructs

$$\begin{bmatrix} \textit{deriv-cxt} & \\ \text{MTR} & \begin{bmatrix} \textit{lexeme} \\ \text{FORM} \quad \langle\ \text{pumpkin}\ ,\ \text{bus}\ \rangle \\ \ldots \end{bmatrix} \\ \text{DTRS} & \left\langle \begin{bmatrix} \textit{lexeme} \\ \text{FORM} \quad \langle\ \text{pumpkin}\ \rangle \\ \ldots \end{bmatrix}, \begin{bmatrix} \textit{lexeme} \\ \text{FORM} \quad \langle\ \text{bus}\ \rangle \\ \ldots \end{bmatrix} \right\rangle \end{bmatrix}$$

$$\begin{bmatrix} \textit{infl-cxt} & \\ \text{MTR} & \begin{bmatrix} \textit{word} \\ \text{FORM} \quad \langle\ \text{see+s}\ \rangle\ \ldots \end{bmatrix} \\ \text{DTRS} & \left\langle \begin{bmatrix} \textit{lexeme} \\ \text{FORM} \quad \langle\ \text{see}\ \rangle\ \ldots \end{bmatrix} \right\rangle \end{bmatrix}$$

The Logical Structure of Linguistic Theory

Every sign must be lexically or constructionally licensed, where:

a sign is **lexically licensed** only if it satisfies some lexical entry, and

a sign is **constructionally licensed** only if it is the mother of some construct.

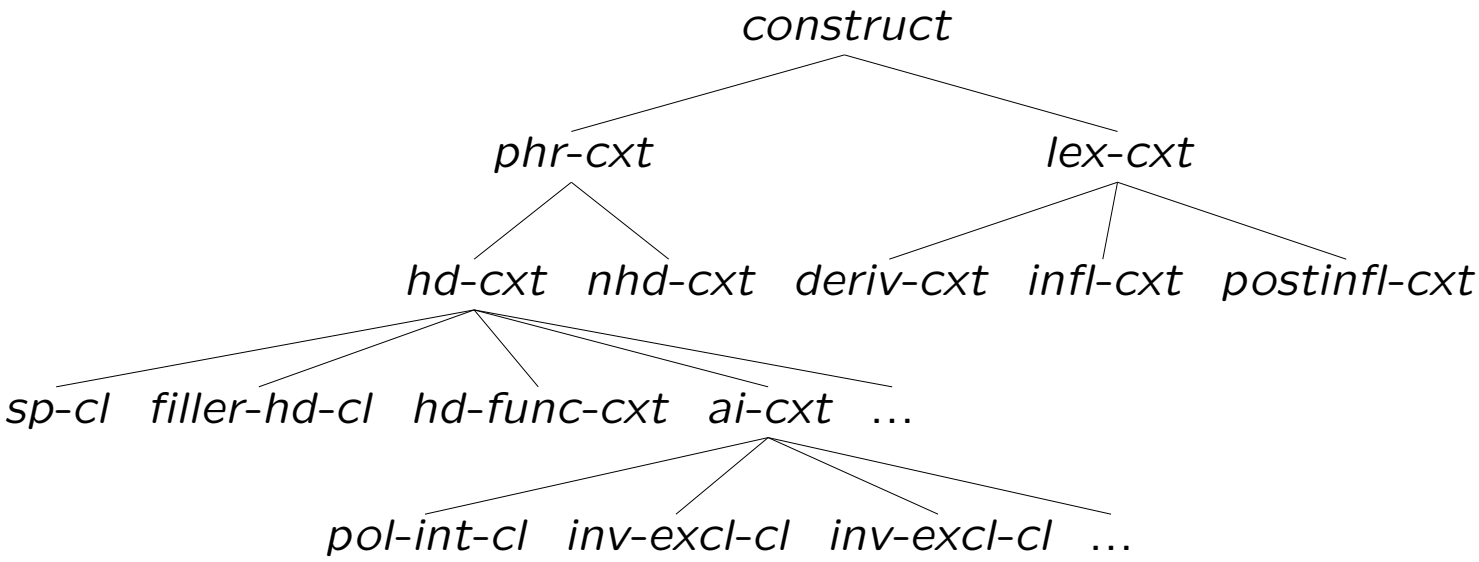
Properties of SBCG

A SBCG defines a sign recursion. (Syntactic trees are eliminated.)

Derivation (tree structure): just the record of how a sign is licensed, i.e. the steps one would go through to prove a sign is in the language.

The steps in these derivations are all local, i.e. constraints on constructs are constraints on mother-daughter relations.

Some Constructs of English: The Family Tree



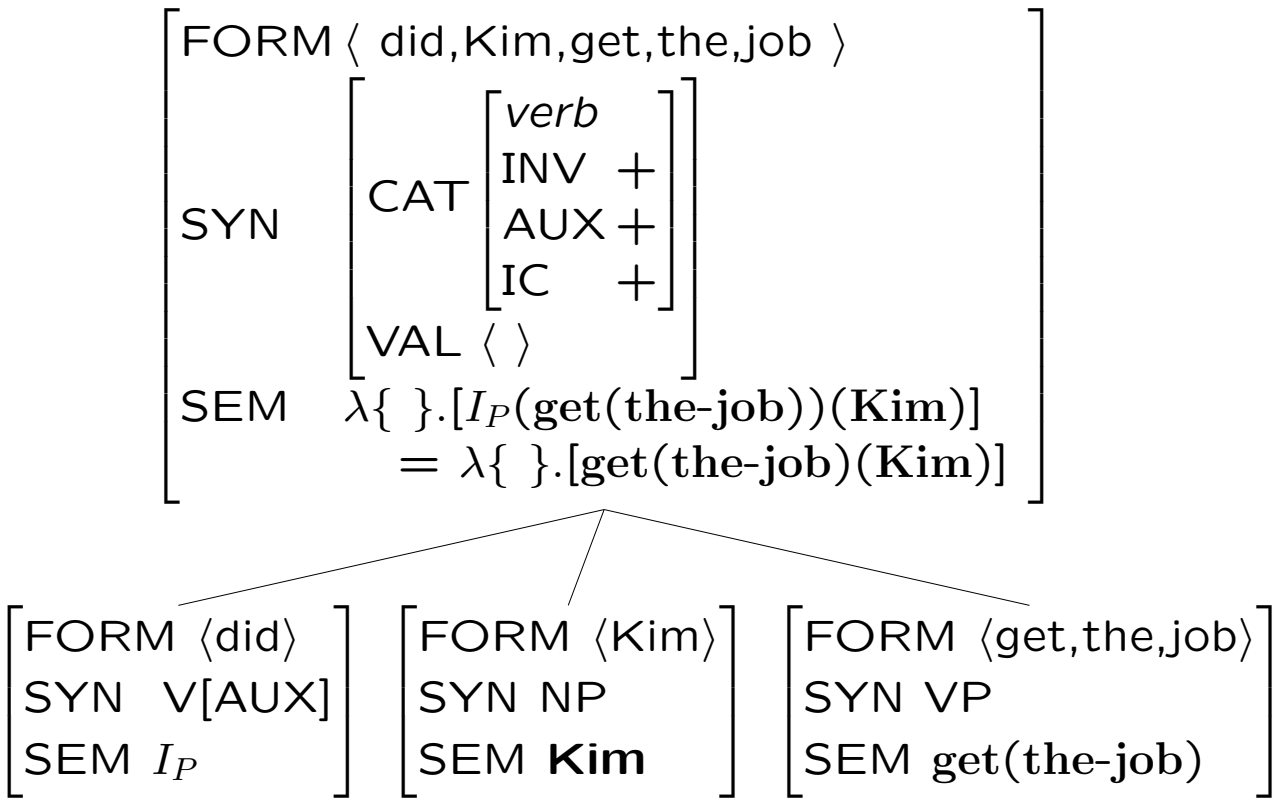
Auxiliary-Initial-Construct

$$\textit{ai-cxt} \Rightarrow \begin{bmatrix} \text{hd-cxt} & \\ \text{MTR} & \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{VAL} & \langle\ \rangle \end{bmatrix} \end{bmatrix} \\ \text{DTRS} & \langle\ \text{H},\ \text{X}_1,\ \ldots\ \text{X}_n\ \rangle \\ \text{H-DTR} & \text{H:} \begin{bmatrix} \textit{word} & \\ \text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{INV} & + \end{bmatrix} \\ \text{VAL} & \langle\ \text{X}_1,\ldots,\text{X}_n\ \rangle \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

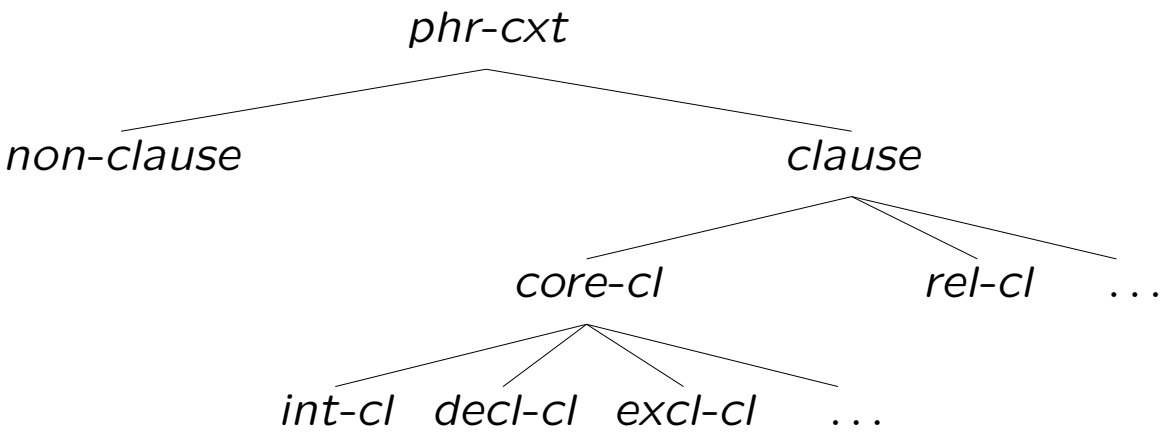
Polar Interrogative Clause:

$$\textit{pol-int-cl} \Rightarrow \begin{bmatrix} \textit{ai-cxt \& int-cl} \\ \text{MTR} \begin{bmatrix} \text{SYN} & \left[\text{CAT} \quad \left[\text{IC} \quad +\right]\right] \\ \text{SEM} & \lambda\{\ \}[\mathbf{FR}_p(X_1, \ldots, X_n)] \end{bmatrix} \\ \text{DTRS} \left\langle \left[\text{SEM } X_1\right], \ldots, \left[\text{SEM } X_n\right] \right\rangle \end{bmatrix}$$

$$\left[\begin{array}{ll}
\textit{pol-int-cl} & \\
\text{MTR} & \left[\begin{array}{ll}
\text{FORM} & \langle\ \text{did,Kim,get,the,job}\ \rangle \\
\text{SYN} & \left[\begin{array}{ll}
\text{CAT} & \left[\begin{array}{ll}
\textit{verb} & \\
\text{INV} & + \\
\text{AUX} & + \\
\text{IC} & +
\end{array}\right] \\
\text{VAL} & \langle\ \rangle
\end{array}\right] \\
\text{SEM} & \lambda\{\ \}.[I_P(\mathbf{get(the\text{-}job)})(\mathbf{Kim})] \\
 & \quad = \lambda\{\ \}.[\mathbf{get(the\text{-}job)(Kim)}]
\end{array}\right] \\
\text{DTRS} & \left\langle \left[\begin{array}{l}
\text{FORM}\ \langle\text{did}\rangle \\
\text{SYN}\ \ \text{V[AUX]} \\
\text{SEM}\ \ I_P
\end{array}\right], \left[\begin{array}{l}
\text{FORM}\ \langle\text{Kim}\rangle \\
\text{SYN NP} \\
\text{SEM}\ \mathbf{Kim}
\end{array}\right], \left[\begin{array}{l}
\text{FORM}\ \langle\text{get,the,job}\rangle \\
\text{SYN VP} \\
\text{SEM}\ \mathbf{get(the\text{-}job)}
\end{array}\right] \right\rangle
\end{array}\right]$$


FORM ⟨ did,Kim,get,the,job ⟩
SYN
CAT
verb
INV +
AUX +
IC +
VAL ⟨ ⟩
SEM λ{ }.[I_P(get(the-job))(Kim)]
= λ{ }.[get(the-job)(Kim)]
FORM ⟨did⟩
SYN V[AUX]
SEM I_P
FORM ⟨Kim⟩
SYN NP
SEM Kim
FORM ⟨get,the,job⟩
SYN VP
SEM get(the-job)

Clausal Types



Subject-Predicate Construction: (SPC)

$$\textit{subj-pred-cl} \Rightarrow \begin{bmatrix} \textit{subj-hd-cxt \& decl-cl} & \\ \text{MTR} & \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{VFORM} & \textit{fin} \\ \text{INV} & - \end{bmatrix} \end{bmatrix} \\ \text{SEM} & \mathbf{FR}_{\alpha}(\sigma_1, \sigma_2) \end{bmatrix} \\ \text{DTRS} & \langle\ [\text{SEM } \sigma_1\ ]\ ,\ [\text{SEM } \sigma_2\ ]\ \rangle \end{bmatrix}$$

Subject-Head Construction:

$$\textit{subj-hd-cxt} \Rightarrow \begin{bmatrix} \textit{hd-cxt} & & & \\ \text{MTR} & [\text{SYN} & [\text{VAL} & \langle\ \rangle\ ]] \\ \text{DTRS} & \langle\ X & ,\ H\text{: } [\text{VAL} & \langle X \rangle] \ \rangle \\ \text{HD-DTR} & H & & \end{bmatrix}$$

Declarative Clause Construction:

$$\textit{decl-cl} \Rightarrow \begin{bmatrix} \textit{core-cl} & \\ \text{MTR} & [\text{SEM} \quad \textit{austinean}] \\ \text{DTRS} & \textit{list}\left(\begin{bmatrix} \text{WH} & \{\ \} \\ \text{REL} & \{\ \} \end{bmatrix}\right) \end{bmatrix}$$

Core Clause Construction:

core-cl $\Rightarrow$

$$\begin{bmatrix} \textit{clause} & \\ \text{MTR} & \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \textit{verbal} & \\ \text{SEL} & \textit{none} \\ \text{VFORM} & \textit{fin-or-inf} \end{bmatrix} \end{bmatrix} \\ \text{SEM} & \textit{message} \end{bmatrix} \end{bmatrix}$$

Some Subject-Predicate Clauses

Sandy reads Proust.

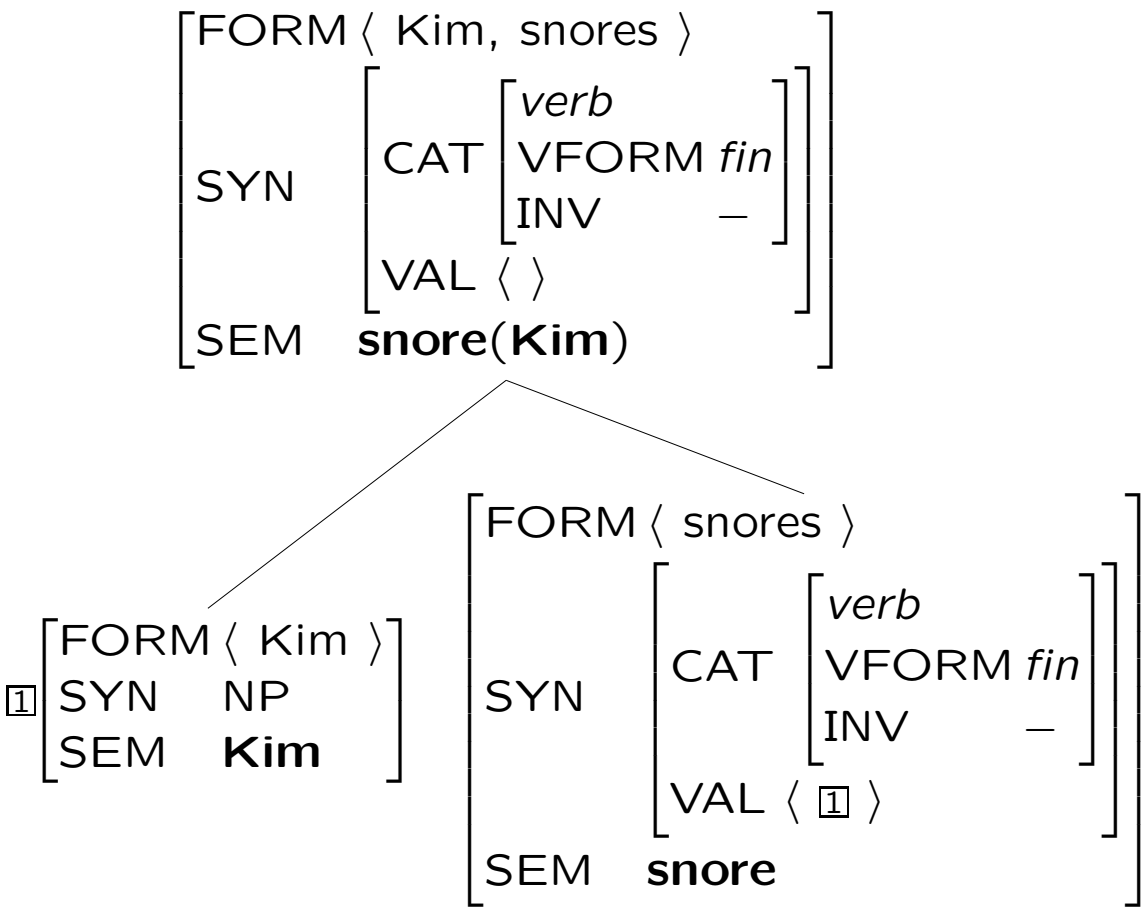
(I insist that) **Sandy read Proust**.

You/Everyone read Proust!

*Kim to go home.

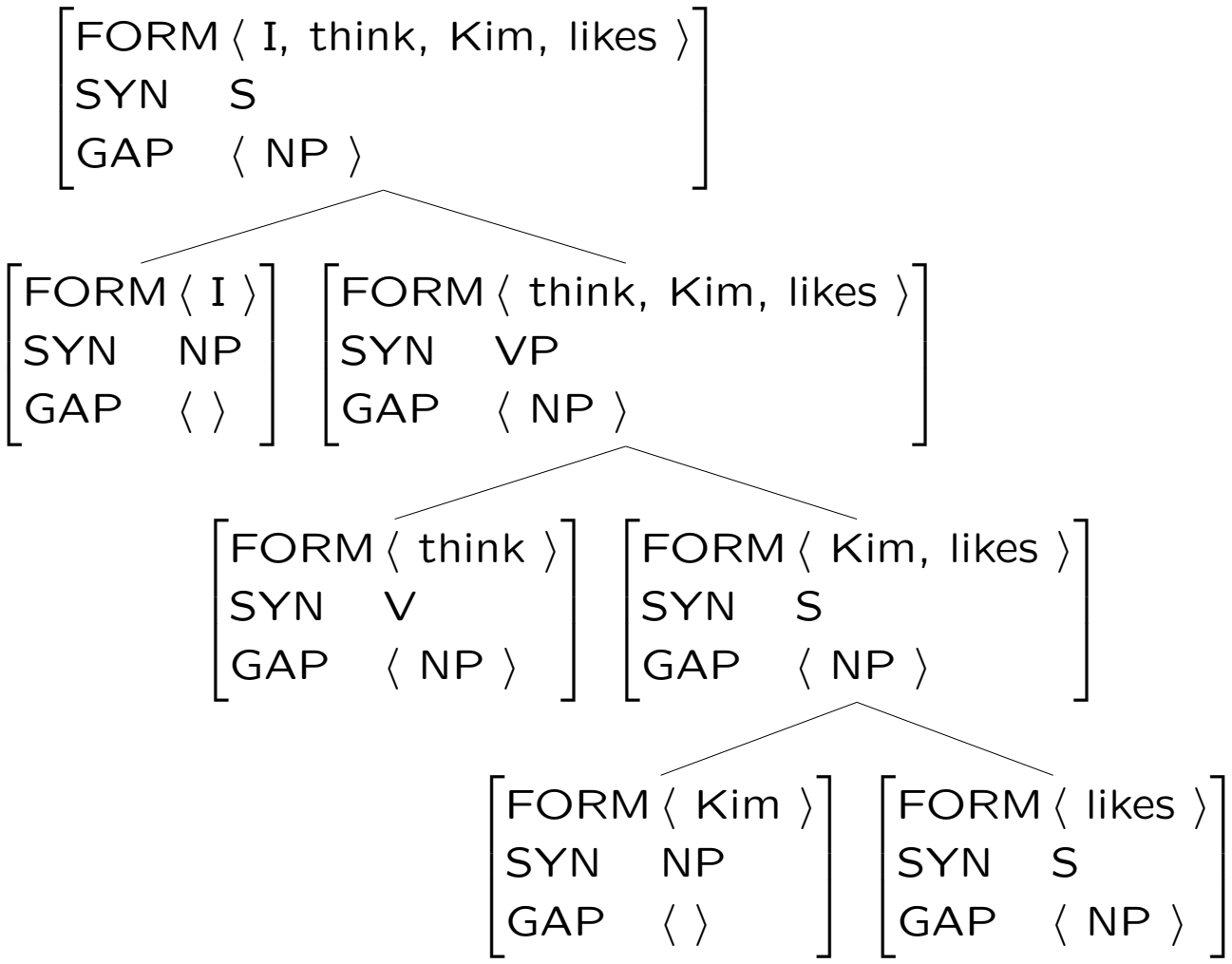
*Pat standing on my foot.

*I aren't coming to the party

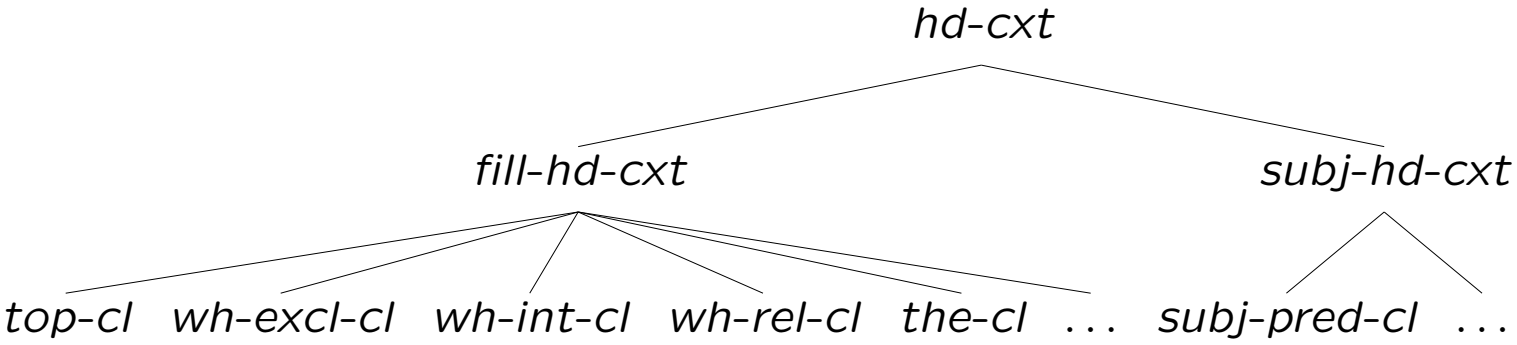

FORM ⟨ Kim, snores ⟩
SYN
CAT
verb
VFORM fin
INV −
VAL ⟨ ⟩
SEM snore(Kim)
1
FORM ⟨ Kim ⟩
SYN NP
SEM Kim
FORM ⟨ snores ⟩
SYN
CAT
verb
VFORM fin
INV −
VAL ⟨ 1 ⟩
SEM snore

Filler-Head Construct

$$\textit{fill-hd-cxt} \Rightarrow \begin{bmatrix} \textit{hd-cxt} & \\ \text{MTR} & \begin{bmatrix} \text{SYN} & [\text{VAL} \;\; L_1\,] \\ \text{GAP} & L_2 \end{bmatrix} \\ \text{DTRS} & \left\langle \begin{bmatrix} \text{SYN} & X \\ \text{STORE} & \Sigma \end{bmatrix}, \; H \right\rangle \\ \text{HD-DTR} \;\; H: & \begin{bmatrix} \textit{phrase} & \\ \text{SYN} & \begin{bmatrix} \text{CAT} & \textit{verbal} \\ \text{VAL} & L_1 \end{bmatrix} \\ \text{GAP} & \left\langle \begin{bmatrix} \text{SYN} & X \\ \text{STORE} & \Sigma \end{bmatrix} \right\rangle \oplus L_2 \end{bmatrix} \end{bmatrix}$$


FORM ⟨ I, think, Kim, likes ⟩
SYN S
GAP ⟨ NP ⟩
FORM ⟨ I ⟩
SYN NP
GAP ⟨ ⟩
FORM ⟨ think, Kim, likes ⟩
SYN VP
GAP ⟨ NP ⟩
FORM ⟨ think ⟩
SYN V
GAP ⟨ NP ⟩
FORM ⟨ Kim, likes ⟩
SYN S
GAP ⟨ NP ⟩
FORM ⟨ Kim ⟩
SYN NP
GAP ⟨ ⟩
FORM ⟨ likes ⟩
SYN S
GAP ⟨ NP ⟩

Filler-Head Constructs



Topicalization Construction:

$$
\textit{top-cl} \Rightarrow \left[\begin{array}{ll}
\textit{fill-hd-cxt \& decl-cl} & \\
\text{MTR} & \left[\begin{array}{ll} \text{SYN} & [\text{CAT} \quad [\text{IC} \quad +]] \\ \text{SEM} & \lambda\mathbf{X}\mathbf{[Y]}(\boldsymbol{Z}) \\ \text{GAP} & \langle\ \rangle \end{array}\right] \\
\text{DTRS} & \langle\ [\text{SEM} \quad \boldsymbol{Z}] \quad ,\ H\ \rangle \\
\text{HD-DTR} \quad H: & \left[\begin{array}{ll} \text{SYN} & \left[\begin{array}{ll} \text{CAT} & \left[\begin{array}{ll} \text{INV} & - \\ \text{VFORM} & \textit{fin} \end{array}\right] \\ \text{VAL} & \langle\ \rangle \end{array}\right] \\ \text{SEM} & \mathbf{Y} \\ \text{GAP} & \langle\ [\text{SEM} \quad \mathbf{X}\ ]\ \rangle \end{array}\right]
\end{array}\right]
$$

Some Independent Clauses are Embedded

They seemed convinced that [[*problems of this sort*], we would never be able to solve __].

Nothing made things clearer than the fact that [[*the people from her district*], no one had issued an invitation to __].

$$\begin{bmatrix}
\text{FORM} & \langle\ \text{bagels, I, think, she, likes}\ \rangle \\
\text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \textit{verb} \\ \text{VFORM} & \textit{fin} \\ \text{IC} & + \\ \text{INV} & - \end{bmatrix} \\ \text{VAL} & \langle\ \rangle \end{bmatrix} \\
\text{SEM} & [\lambda X.\mathbf{think}(\mathbf{like}(X)(\mathbf{she}))(\mathbf{I})](\mathbf{bagels}) \\
 & \quad = \mathbf{think}(\mathbf{like}(\mathbf{bagels})(\mathbf{she}))(\mathbf{I}) \\
\text{GAP} & \langle\ \rangle
\end{bmatrix}$$

$$\begin{bmatrix}
\text{FORM} & \langle\ \text{bagels}\ \rangle \\
\text{SYN} & \text{NP} \\
\text{SEM} & \mathbf{bagels} \\
\text{WH} & \{\ \} \\
\text{REL} & \{\ \}
\end{bmatrix}$$

$$\begin{bmatrix}
\text{FORM} & \langle\ \text{I, think, she, likes}\ \rangle \\
\text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \textit{verb} \\ \text{VFORM} & \textit{fin} \\ \text{IC} & + \\ \text{INV} & - \end{bmatrix} \\ \text{VAL} & \langle\ \rangle \end{bmatrix} \\
\text{SEM} & \mathbf{think}(\mathbf{like}(\ X\ )(\mathbf{she}))(\mathbf{I}) \\
\text{GAP} & \left\langle \begin{bmatrix} \text{SYN} & \text{NP} \\ \text{SEM} & X \end{bmatrix} \right\rangle
\end{bmatrix}$$

XP Fillers in Topicalized Clauses

Bagels, I like __ . (NP)

Onto the table,
they managed to throw seven books __ . (PP)

Happy, I'm not __ . (AP)

Carefully, she rotated the timing device __ . (AdvP)

Go to the store, he wouldn't __ . (VP)

- **Subjunctive Topicalizations (Core Clause Cxt):**

  We suggest that [[proposals of this kind], *she be kept informed of* ___ .]

  [Proposals of this kind], *nobody be taken in by* ___ !

- **No Spurious Ambiguity (Top-Cl Cxt):**

  [Proposals of this kind] bother me.

Wh-Exclamative Clause:

wh-excl-cl $\Rightarrow$

$$\left[\begin{array}{l}\textit{fill-hd-cxt \& excl-cl} \\ \text{MTR} \quad \left[\text{SEM} \quad \mathit{fact}(\mathbf{Q}_v(\lambda\mathbf{X}[\mathbf{Y}](\mathbf{Z})))\right] \\ \\ \text{DTRS} \quad \left\langle \left[\begin{array}{ll}\text{CAT} & \textit{nonvrbl} \\ \text{SEM} & \mathbf{Z} \\ \text{WH} & \mathbf{Q}_v \end{array}\right], \left[\begin{array}{ll}\text{SYN} & \left[\begin{array}{ll}\text{CAT} & \left[\begin{array}{ll}\text{INV} & - \\ \text{VFORM} & \textit{fin}\end{array}\right] \\ \text{VAL} & \langle\ \rangle\end{array}\right] \\ \text{SEM} & \mathbf{Y} \\ \text{GAP} & \langle\ [\text{SEM}\ \mathbf{X}]\ \rangle\end{array}\right]\right\rangle \end{array}\right]$$

$$\begin{bmatrix}
\text{FORM} & \langle\ \text{what, a, play, I, saw}\ \rangle \\
\text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \textit{verb} & \\ \text{VFORM} & \textit{fin} \\ \text{IC} & + \\ \text{INV} & - \end{bmatrix} \\ \text{VAL} & \langle\ \rangle \end{bmatrix} \\
\text{SEM} & \textit{fact}(\textbf{what!}_x\textbf{(play)}(\lambda\wp[\mathbf{see}(\wp)(\mathbf{I})](x^*))) \\
 & = \textit{fact}(\textbf{what!}_x\textbf{(play)}(\mathbf{see}(x^*)(\mathbf{I}))) \\
\text{GAP} & \langle\ \rangle
\end{bmatrix}$$

$$\begin{bmatrix}
\text{FORM} & \langle\ \text{what, a, play}\ \rangle \\
\text{SYN} & \text{NP} \\
\text{SEM} & x^* \\
\text{WH} & \{\ \textbf{what!}_x\textbf{(play)}\ \} \\
\text{REL} & \{\ \}
\end{bmatrix}$$

$$\begin{bmatrix}
\text{FORM} & \langle\ \text{I, saw}\ \rangle \\
\text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \textit{verb} & \\ \text{VFORM} & \textit{fin} \\ \text{IC} & + \\ \text{INV} & - \end{bmatrix} \\ \text{VAL} & \langle\ \rangle \end{bmatrix} \\
\text{SEM} & \mathbf{see}(\wp)(\mathbf{I}) \\
\text{GAP} & \left\langle \begin{bmatrix} \text{SYN} & \text{NP} \\ \text{SEM} & \wp \end{bmatrix} \right\rangle
\end{bmatrix}$$

Wh-Exclamatives are Uninverted and Finite

(It's amazing) what a nice person Sandy is __ .

*(It's amazing) what a nice person is Sandy __ .

*It's amazing [what a nice guy (for) Sandy to be __].

*What a nice guy (for) Sandy to be __ !

- ***Wh*-Exclamative Fillers Aren't Highest Subjects**

*It's amazing [what a nice person just walked in].

*What a nice person would get the job!

What a nice person they assured us would get the job!

- ***Wh*-Exclamatives Disallow Non-Prop Hd-Daughters**

*What a nice person [be sure to visit __]!

*It's amazing what a nice guy [they be considering __].

*What a nice person [who visited __]!/?

Nonverbal Fillers in WH-Exclamative Clauses

What a gem Kim wrote about __ ! (NP)

How happy Kim is __ ! (AP)

How quickly they forget __ ! (AdvP)

How under the weather she appears to be __ !

*Go to what a fine store he would __ ! (*VP)

Wh-Interrogative Clauses

What fell?

I wonder [what fell].

$\lambda\{x\}[\textbf{fall}(x)]$

Wh-Interrogative Nouns

$$\begin{bmatrix} \text{FORM} & \langle\ \text{who}\ \rangle \\ \text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \textit{noun} \\ \text{SEL} & \textit{none} \end{bmatrix} \end{bmatrix} \\ \text{SEM} & x^* \\ \text{WH} & \{(\ [x,\ \textbf{person}(x)]\ )\} \\ \text{REL} & \{\ \} \end{bmatrix}$$

Wh-**Interrogative Clause Construction:**

wh-int-cl $\Rightarrow$

$$\begin{bmatrix} \textit{int-cl \& fill-hd-cxt} \\ \text{MTR} \quad \left[\text{SEM} \quad \lambda\{\pi,\ldots\}[\lambda\mathbf{X}[\mathbf{Y}](\mathbf{Z})]\right] \\ \text{DTRS} \quad \left\langle \begin{bmatrix} \text{SYN} & [\text{CAT } \textit{nonvrbl}] \\ \text{SEM} & \mathbf{Z} \\ \text{WH} & \pi \end{bmatrix}, \begin{bmatrix} \text{SEM} & \mathbf{Y} \\ \text{GAP} & \langle[\text{SEM } \mathbf{X}]\rangle \end{bmatrix} \right\rangle \end{bmatrix}$$

Nonsubject *Wh*-**Interrogative Clause Construction:**

ns-wh-int-cl $\Rightarrow$

$$\begin{bmatrix} \textit{wh-int-cl} \\ \text{MTR} \quad [\text{VAL} \ \langle\ \rangle] \\ \text{DTRS} \quad \left\langle \text{X} \ , \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{INV} & W \\ \text{IC} & W \end{bmatrix} \\ \text{VAL} & \langle\ \rangle \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix}$$

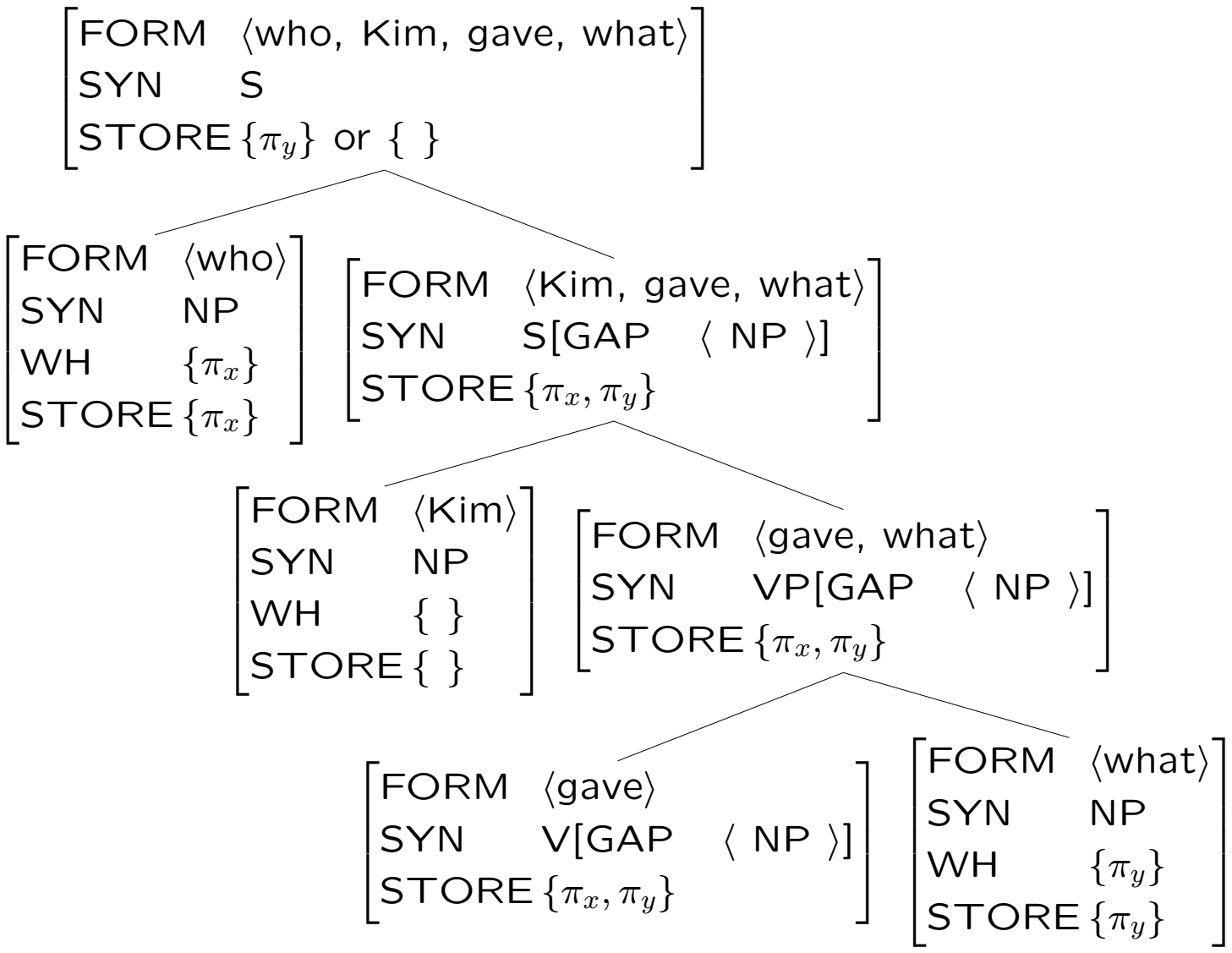
$$\begin{bmatrix}
\text{FORM} & \langle\ \text{who, do, you, like}\ \rangle \\
\text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \textit{verb} & \\ \text{VFORM} & \textit{fin} \\ \text{IC} & + \\ \text{INV} & - \end{bmatrix} \\ \text{VAL} & \langle\ \rangle \end{bmatrix} \\
\text{SEM} & \lambda\{[x, \mathbf{person}]\}[\lambda\wp[\mathbf{like}(\wp)(\mathbf{you})](x^*)] \\
 & = \lambda\{[x, \mathbf{person}]\}[\mathbf{like}(x^*)(\mathbf{you})] \\
\text{GAP} & \langle\ \rangle
\end{bmatrix}$$

$$\begin{bmatrix}
\text{FORM} & \langle\ \text{who}\ \rangle \\
\text{SYN} & \text{NP} \\
\text{SEM} & x^* \\
\text{WH} & \{[x, \mathbf{person}]\} \\
\text{REL} & \{\ \}
\end{bmatrix}$$

$$\begin{bmatrix}
\text{FORM} & \langle\ \text{do, you, like}\ \rangle \\
\text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \textit{verb} & \\ \text{VFORM} & \textit{fin} \\ \text{IC} & + \\ \text{INV} & + \end{bmatrix} \\ \text{VAL} & \langle\ \rangle \end{bmatrix} \\
\text{SEM} & \mathbf{like}(\wp)(\mathbf{you}) \\
\text{GAP} & \left\langle \begin{bmatrix} \text{SYN} & \text{NP} \\ \text{SEM} & \wp \end{bmatrix} \right\rangle
\end{bmatrix}$$

Interrogative Clause Construction:

$$\textit{int-cl} \Rightarrow \begin{bmatrix} \text{MTR} & \begin{bmatrix} \text{SEM} & \lambda\Sigma_1[\textit{proposition}] \\ \text{STORE} & \Sigma_2 \doteq \Sigma_1 \end{bmatrix} \\ \text{DTRS} & \textit{list}([\text{REL} \ \{\ \}]) \\ \text{HD-DTR} & [\text{STORE} \ \Sigma_2\ ] \end{bmatrix}$$


FORM ⟨who, Kim, gave, what⟩
SYN S
STORE {π_y} or { }
FORM ⟨who⟩
SYN NP
WH {π_x}
STORE {π_x}
FORM ⟨Kim, gave, what⟩
SYN S[GAP ⟨ NP ⟩]
STORE {π_x, π_y}
FORM ⟨Kim⟩
SYN NP
WH { }
STORE { }
FORM ⟨gave, what⟩
SYN VP[GAP ⟨ NP ⟩]
STORE {π_x, π_y}
FORM ⟨gave⟩
SYN V[GAP ⟨ NP ⟩]
STORE {π_x, π_y}
FORM ⟨what⟩
SYN NP
WH {π_y}
STORE {π_y}

Predicted Ambiguities:

Who remembers where we bought what?

- Who remembers the answer to the question 'Where did we buy what?'
  $\lambda\{\pi_z\}[z\ \mathbf{remembers}\ \lambda\{\pi_x, \pi_y\}[\mathbf{we\ bought}\ x\ \mathbf{at}\ y]]$

- For which pairs z, x, does z remember where we bought x?
  $\lambda\{\pi_z, \pi_x\}[z\ \mathbf{remembers}\ \lambda\{\pi_y\}[\mathbf{we\ bought}\ x\ \mathbf{at}\ y]]$

Semantic Conflicts:

*Who [(everybody/you) visit __]!/?

*I wonder who [what a nice book you gave __ to __].

*I wonder when [what to read __ __]?

*I wonder [what you be upset about __].

- **Inversion is Feature Harmony:**

  Who will you visit __ ?

  *Who you will visit __ ?

  They don't know who you will visit __ .

  *They don't know who will you visit __ .

- **Infinitival Instantiations Permitted (Core Cl. Cxt)**

  I wonder [who to visit __].

Nonverbal Fillers in Wh-Interrogatives:

Who did you see __ ?

To whom did you send the letter __ ?

How happy are they __ ?

How quickly do you think you can do that __ ?

*__Go to the store how often__ does he __ ?

Relative Clauses: WH-Rel Words

$$\begin{bmatrix} \text{FORM} & \langle\ \text{who}\ \rangle \\ \text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \textit{noun} \\ \text{SEL} \quad \textit{none} \end{bmatrix} \end{bmatrix} \\ \text{SEM} & x^* \\ \text{WH} & \{\ \} \\ \text{REL} & \{\ \textbf{[}x\textbf{, person(}x\textbf{)]}\ \} \end{bmatrix}$$

Wh-**Relative Clause Construction:**

$$\textit{wh-rel-cl} \Rightarrow \begin{bmatrix} \textit{fill-hd-cxt} \ \& \ \textit{rel-cl} \\ \text{MTR} \quad \left[\text{SEM} \quad \lambda P \lambda x[\lambda \wp[\mathbf{X}](\mathbf{Y}) \wedge \mathbf{R}(x) \ \wedge \ P(x)] \right] \\ \text{DTRS} \quad \left\langle \begin{bmatrix} \text{SYN} & [\text{VAL} \ \langle\ \rangle] \\ \text{SEM} & \mathbf{Y} \\ \text{REL} & [x, \mathbf{R}] \end{bmatrix}, \begin{bmatrix} \text{SEM} & \mathbf{X} \\ \text{GAP} & \langle\ [\text{SEM} \ \wp\ ]\ \rangle \end{bmatrix} \right\rangle \end{bmatrix}$$

Relative Clause Construction:

$$\textit{rel-cl} \Rightarrow \begin{bmatrix} \textit{clause} \\ \text{MTR} \quad \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{INV} & - \\ \text{IC} & - \\ \text{SEL} & \text{CNP} \end{bmatrix} \end{bmatrix} \end{bmatrix} \\ \text{DTRS} \quad \textit{list}([\text{WH} \ \{\ \}]) \end{bmatrix}$$

Finite *Wh*-Relative Clause Construction:

$$\textit{fin-wh-rel-cl} \Rightarrow \begin{bmatrix} \textit{wh-rel-cl} \\ \text{MTR} \quad [\text{SYN} \quad [\text{CAT} \quad [\text{VFORM} \quad \textit{fin}]]] \\ \text{DTRS} \quad \left\langle \begin{bmatrix} \text{SYN} \begin{bmatrix} \text{CAT} \ \textit{nom} \\ \text{VAL} \ \langle\ \rangle \end{bmatrix} \end{bmatrix}, \text{X} \right\rangle \end{bmatrix}$$

Semantic Conflicts:

*[the people] [who **am I sick of** ___]...
(*exclamative/fact)

*[the people] [who **did they visit** ___]...
(*interrogative/question)

*the books [which **he have read** ___ **by tomorrow**]...
(*subjunctive/outcome)

Nominal Fillers in Finite Wh-Relatives:

the person [[**(to) whom**] Kim ...]... (PP/NP)

the time [[**when**] they did it]... (PP?)

the reason [[**why**] Kim did it]... (PP?)

*the person [[**happy with whom**] Kim is]...

*the person [[**going out with whom**] Kim is]...

Subject Relatives Included

the woman [[whose friend] *likes Kim*]]...

[$_S$ NP VP_{fin}]

$$\begin{bmatrix}
\text{FORM} & \langle \text{ whose, friend, Kim, likes} \rangle \\
\text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \textit{verb} & \\ \text{VFORM} & \textit{fin} \\ \text{INV} & - \\ \text{SEL} & \text{CNP} \end{bmatrix} \\ \text{VAL} & \langle\ \rangle \end{bmatrix} \\
\text{SEM} & \lambda P \lambda x[\lambda \wp[\mathbf{like}(\wp)(\mathbf{Kim})](x\textbf{'s-friend}) \wedge \mathbf{person}(x) \wedge P(x)] \\
 & = \lambda P \lambda x[\mathbf{like}(x\textbf{'s-friend})(\mathbf{Kim}) \wedge \mathbf{person}(x) \wedge P(x)]
\end{bmatrix}$$

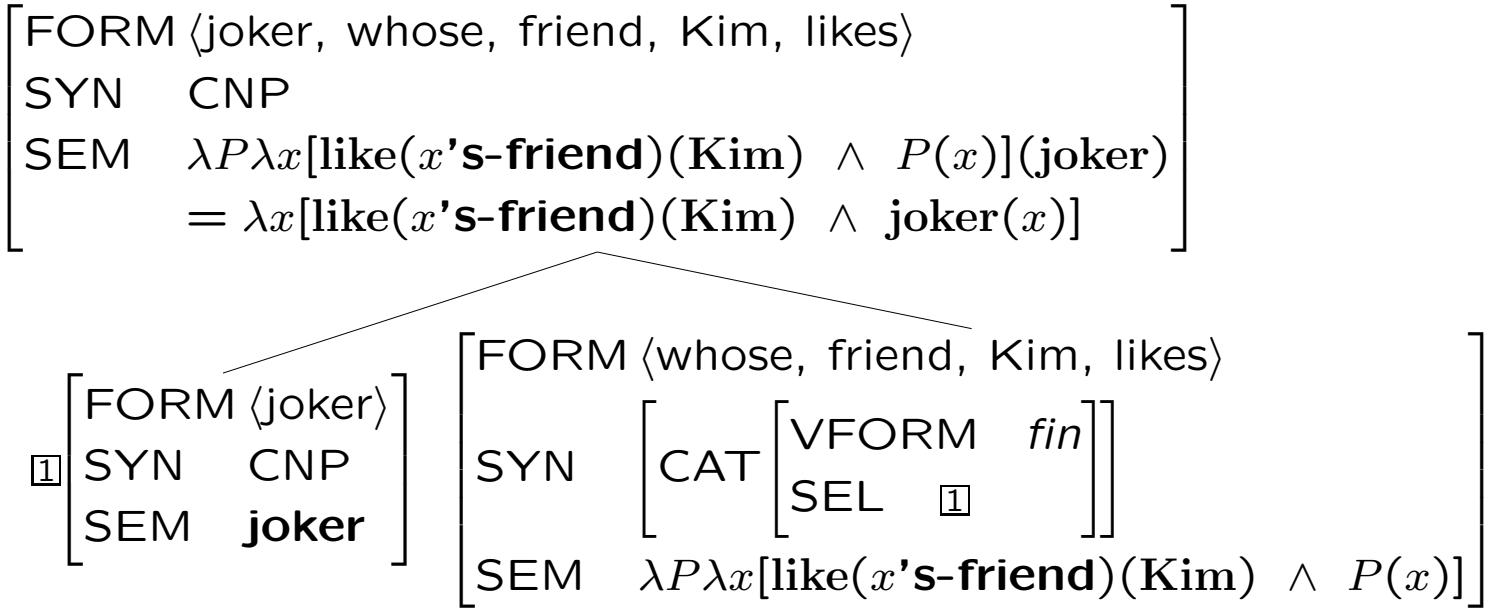
$$\begin{bmatrix}
\text{FORM} & \langle \text{whose, friend} \rangle \\
\text{SYN} & \text{NP} \\
\text{SEM} & x\textbf{'s-friend} \\
\text{WH} & \{\ \} \\
\text{REL} & [x, \mathbf{person}(x)]
\end{bmatrix}$$

$$\begin{bmatrix}
\text{FORM} & \langle \text{Kim, likes} \rangle \\
\text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \textit{verb} & \\ \text{VFORM} & \textit{fin} \\ \text{INV} & - \\ \text{SEL} & \text{CNP} \end{bmatrix} \\ \text{VAL} & \langle\ \rangle \end{bmatrix} \\
\text{SEM} & \mathbf{like}(\wp)(\mathbf{Kim}) \\
\text{GAP} & \langle\ [\text{SEM } \wp]\ \rangle
\end{bmatrix}$$

Stacking is Allowed

My [[uncle who lives in Oregon] whose friend Kim likes] ....

Any [[person whose friends Kim likes] that you failed to invite to the party] ....


FORM ⟨joker, whose, friend, Kim, likes⟩
SYN CNP
SEM λPλx[like(x's-friend)(Kim) ∧ P(x)](joker)
= λx[like(x's-friend)(Kim) ∧ joker(x)]
1
FORM ⟨joker⟩
SYN CNP
SEM joker
FORM ⟨whose, friend, Kim, likes⟩
SYN CAT VFORM fin
SEL 1
SEM λPλx[like(x's-friend)(Kim) ∧ P(x)]

Fillers in Infinitival Wh-Relative Clause

people [**with whom** [to confer __]]... (PP)

*people [**who(m)** [to confer with __]]... (NP)

*the degree [**how happy** [to remain __]]... (AP)

*the degree [**how happily** [to agree __]]... (AdvP)

*the people [**talk to whom** [to dare to __]]... (VP)

Infinitival *Wh*-Relative Clause Construction:

inf-wh-rel-cl $\Rightarrow$

$$\begin{bmatrix} \textit{wh-rel-cl} \\ \text{MTR} \quad [\text{SYN} \quad [\text{CAT} \quad [\text{VFORM} \quad \textit{inf}]]] \\ \text{DTRS} \quad \langle\ [\text{SYN} \quad [\text{CAT} \quad \textit{prep}]]\ ,\ [\text{SYN}\ [\text{VAL}\ \langle\ \textit{fni}\ \rangle]]\ \rangle \end{bmatrix}$$

For-Phrases not Allowed

The person [[in whom] to place your trust] is our president.

*The person [[in whom] for you to place your trust] is our president.

Comparative Correlatives
(Adapting Borsley 2004; Abeillé and Borsley 2006)

The more you read, the more you understand.

If you read, (then) you'll understand.

As you read, (so) you'll understand.

Comparative Correlative Clause Construction:

comp-corr-cl $\Rightarrow$

$$\begin{bmatrix} \text{MTR} & \begin{bmatrix} \text{SYN} & [\text{CREL} \quad \textit{none}] \\ \text{SEM} & \ldots \end{bmatrix} \\ \text{DTRS} & \left\langle \begin{bmatrix} \text{SYN} & [\text{CREL} \quad \textit{the}] \\ \text{SEM} & \phi \end{bmatrix}, \text{H:} \begin{bmatrix} \text{SYN} & [\text{CREL} \quad \textit{the}] \\ \text{SEM} & \psi \end{bmatrix} \right\rangle \\ \text{HD-DTR} & H \end{bmatrix}$$

Comparative Correlative Semantics (adapting Brasoveanu 2007,2008)

- The more books you read, the smarter you get.
- As the number of books you read increases, your degree of smartness increases, i.e. there's a systematic (monotonic) relation (**R**) between two differences:

  the difference between the number of books you've read on a given occasion and the number you read on a previous occasion, and

  the difference between your degree of smartness on the later occasion time and your degree of smartness at the earlier one.

The-Phrases

the more, **the taller**, **the taller a man**, **the more customers**, **the more customers' accounts**,....

Phrases like these will all be specified as:

$$\begin{bmatrix} \text{REL } \{[x, deg]\} \\ \text{STORE } \{[x, deg]\} \end{bmatrix}$$

The-**Clause:**

the-cl $\Rightarrow$

$$\begin{bmatrix} \textit{fill-hd-cxt \& decl-cl} \\ \text{MTR} \quad \begin{bmatrix} \text{SYN} & [\text{CREL} \quad \textit{the}\ ] \\ \text{SEM} & \lambda\mathbf{V}[\mathbf{X}](\mathbf{Y}) \end{bmatrix} \\ \text{DTRS} \quad \left\langle \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{CAT} & \textit{nonvrbl} \\ \text{VAL} & \langle\ \rangle \end{bmatrix} \\ \text{SEM} & \mathbf{Y} \\ \text{REL} & \{[x, \textit{degree}]\} \end{bmatrix}, \begin{bmatrix} \text{SEM} & \mathbf{X} \\ \text{GAP} & \langle\ [\text{SEM}\ \mathbf{V}\ ]\ \rangle \end{bmatrix} \right\rangle \end{bmatrix}$$

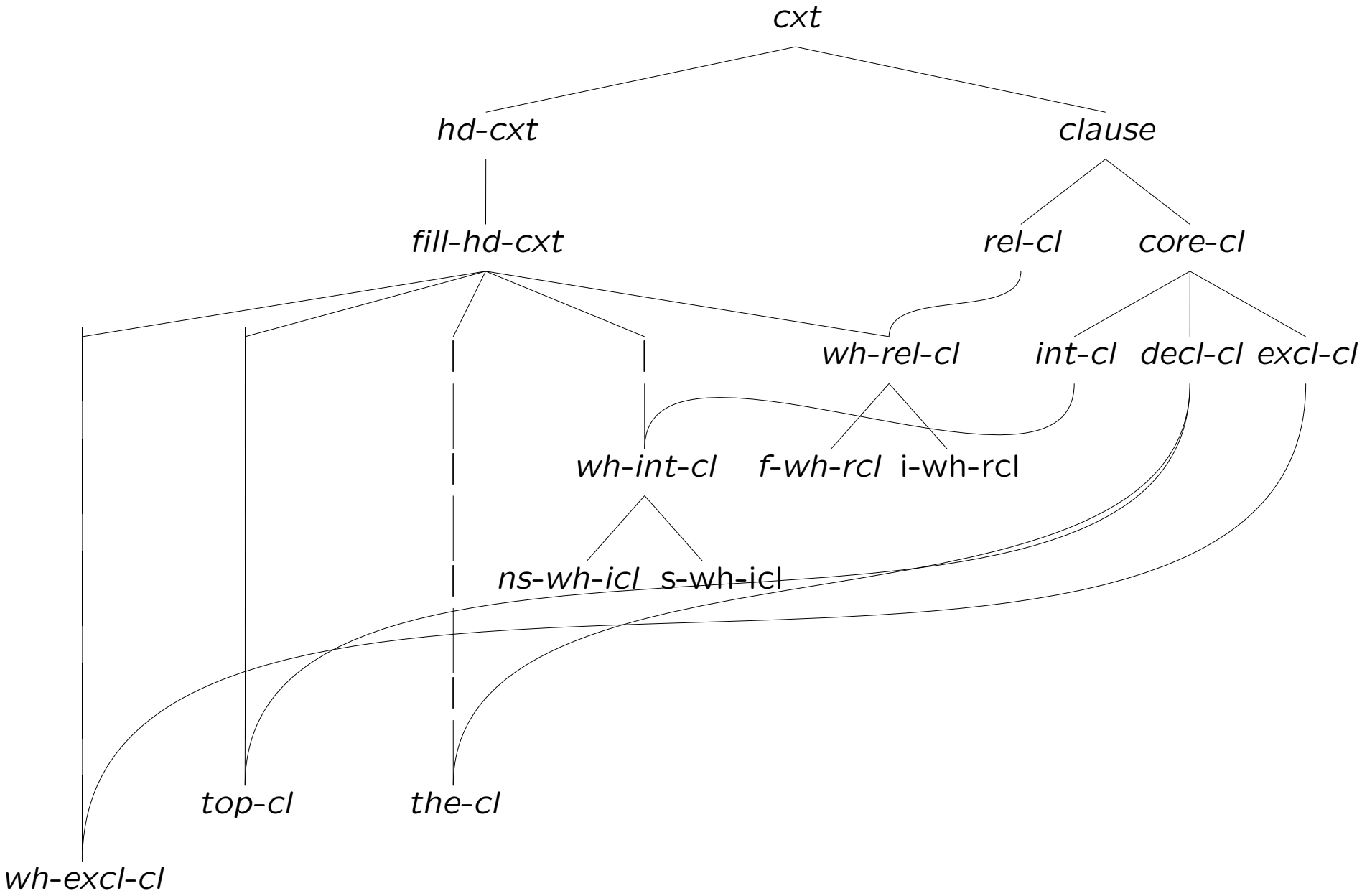
$$\begin{bmatrix}
\text{FORM} & \langle \text{the, more, books, you, read} \rangle \\
\text{SYN} & \begin{bmatrix}
\text{CAT} & \begin{bmatrix} \textit{verb} \\ \text{VFORM } \textit{fin} \\ \text{INV} \quad - \end{bmatrix} \\
\text{VAL} & \langle\ \rangle \\
\text{CREL} & \textit{the}
\end{bmatrix} \\
\text{SEM} & \lambda\wp[\mathbf{read}(\wp)(\mathbf{you})](\mathbf{d\text{-}many\text{-}books}) \\
 & = \mathbf{read}(\mathbf{d\text{-}many\ books})(\mathbf{you}) \\
\text{GAP} & \langle\ \rangle \\
\text{STORE} & \{[\mathbf{d}, \textit{degree}]\}
\end{bmatrix}$$

$$\begin{bmatrix}
\text{FORM} & \langle \text{the, more, books} \rangle \\
\text{SYN} & [\text{CAT} \quad \text{NP}] \\
\text{WH} & \{\ \} \\
\text{REL} & [\mathbf{d}, \textit{degree}] \\
\text{STORE} & \{[\mathbf{d}, \textit{degree}]\}
\end{bmatrix}$$

$$\begin{bmatrix}
\text{FORM} & \langle \text{you, read} \rangle \\
\text{SYN} & \begin{bmatrix}
\text{CAT} & \begin{bmatrix} \textit{verb} \\ \text{VFORM } \textit{fin} \\ \text{INV} \quad - \end{bmatrix} \\
\text{VAL} & \langle\ \rangle \\
\text{CREL} & \textit{none}
\end{bmatrix} \\
\text{SEM} & \mathbf{read}(\wp)(\mathbf{you}) \\
\text{GAP} & \left\langle \begin{bmatrix} \text{SEM } \wp \\ \text{STORE } \{[\mathbf{d}, \textit{degree}]\} \end{bmatrix} \right\rangle \\
\text{STORE} & \{[\mathbf{d}, \textit{degree}]\}
\end{bmatrix}$$

$$\begin{bmatrix}
\text{FORM} & \langle\ \text{the, more, books, you, read, the, more, you, know}\ \rangle \\
\text{SYN} & \begin{bmatrix}
\text{CAT} & \begin{bmatrix} \textit{verb} \\ \text{VFORM} \quad \textit{fin} \\ \text{INV} \quad - \end{bmatrix} \\
\text{VAL} & \langle\ \rangle \\
\text{CORREL} & \textit{none}
\end{bmatrix} \\
\text{SEM} & \forall t_1 \forall t_2, t_1 < t_2 \forall \Delta\ [[\Delta \geq 0\ \& \\
& \Delta = (\text{MAX}\ \{\text{d: [at } t_2]\textbf{read}(\textbf{d-many books})(\textbf{you})\} - \\
& \text{MAX}\ \{\text{d: [at } t_1]\textbf{read}(\textbf{d-many books})(\textbf{you})\})] \Rightarrow\ \exists \Delta'[\Delta' \geq 0 \\
& \&\ \Delta' = (\text{MAX}\ \{\text{d': [at } t_2]\textbf{know}(\textbf{d'-much})(\textbf{you})\} - \\
& \text{MAX}\ \{\text{d': [at } t_1]\textbf{know}(\textbf{d'-much})(\textbf{you})\})\ \&\ \mathbf{R}(\Delta, \Delta')\ ]] \\
\text{STORE} & \{\ \}
\end{bmatrix}$$

$$\begin{bmatrix}
\text{FORM} & \langle\text{the, more, books, you, read}\rangle \\
\text{SYN} & \begin{bmatrix}
\text{CAT} & \begin{bmatrix} \textit{verb} \\ \text{VFORM} \quad \textit{fin} \\ \text{INV} \quad - \end{bmatrix} \\
\text{VAL} & \langle\ \rangle \\
\text{CORREL} & \textit{the}
\end{bmatrix} \\
\text{SEM} & \textbf{read}(\textbf{d-many books})(\textbf{you}) \\
\text{STORE} & \{[\textbf{d}, \textit{degree}]\}
\end{bmatrix}
\qquad
\begin{bmatrix}
\text{FORM} & \langle\text{the, more, you, know}\rangle \\
\text{SYN} & \begin{bmatrix}
\text{CAT} & \begin{bmatrix} \textit{verb} \\ \text{VFORM} \quad \textit{fin} \\ \text{INV} \quad - \end{bmatrix} \\
\text{VAL} & \langle\ \rangle \\
\text{CORREL} & \textit{the}
\end{bmatrix} \\
\text{SEM} & \textbf{know}(\textbf{d'-much})(\textbf{you}) \\
\text{STORE} & [\textbf{d'}, \textit{degree}]
\end{bmatrix}$$


cxt
hd-cxt
clause
fill-hd-cxt
rel-cl
core-cl
wh-rel-cl
int-cl
decl-cl
excl-cl
wh-int-cl
f-wh-rcl
i-wh-rcl
ns-wh-icl
s-wh-icl
top-cl
the-cl
wh-excl-cl

Conclusions:

Parameters of Variation in Filler-Gap Clauses

- whether the head daughter can or must be inverted,
- what constraints are imposed on the grammatical category of the filler daughter,
- the presence of a particular kind of *wh*-word (interrogative, exclamative, or relative) within the filler vs. the absence of any *wh*-word,
- which "pied pipings" are possible,
- whether the head daughter can be subjectless or not,
- whether the clause can or must be be a main (independent) clause,
- whether the head daughter must be finite, must be infinitival, or may be either, and
- the semantics of the clause in relation to its components.

Conclusions:

- Formally precise construction theory is possible.
- Not just about exotica - will scale up.
- Allows generalizations to be expressed that have so far escaped other approaches.
- Psycholinguistically plausible.
- Computationally tractible.
- Needs to look at more langages.