Reflexives in the Correspondence Architecture

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Introduction

- The standard LFG theory of the syntax of anaphora (Dalrymple 1993) is rather unique:
    - Highly lexicalized: binding behaviour driven by reflexives, etc.
    - The superiority condition on binding (f-command) does not need to be separately stated: consequence of ‘inside-out’ formalization
    - No separate binding principles per se: a set of general (universal) constraints and parameters

Introduction

- Parameters (lexicalized):
  - Positive vs. negative binding equation
  - Domain: coargument (PRED), minimal complete nucleus (SUBJ), minimal finite domain (TENSE), root S
  - Antecedent: SUBJ vs. non-SUBJ
- Universal constraints:
  - Locality Condition on constraints (uninterrupted binding domains)
  - Noncontainment Condition on antecedents (not equiv. to i-within-i)
  - Primacy of positive constraints
  - Thematic hierarchy

Goals

1. Review Dalrymple's theory
2. Update the theory in light of some subsequent developments; in particular, variable-free binding in a resource-sensitive compositional semantics (Glue Semantics)
3. Augment the theory to formally capture interactions with logophoricity

Throughout:

1. Integration with LFG's 'Correspondence Architecture'
2. Reference to Icelandic data (from Þráinsson, Maling, Strahan)

Touchstone Quote 1

This indicates, I believe, that there is a close relationship between BT and lexical content of NPs but BT is nevertheless autonomous in the sense that not all binding properties of NPs follow from their lexical content. If they did, it would be difficult to imagine how non-overt NPs could have different binding properties.

(Þráinsson 1991: 70)

Touchstone Quote 2

But it is important to note that the semantic conditions for these syntactically unbound cases of long-distance reflexives in Icelandic (and Faroese) seem to be the same as those for the ones where a reflexive inside a finite (subordinate) clause is syntactically bound by the subject of a higher clause in the same sentence. This is shown in some detail in Sigurðsson (1986) and it indicates that we do not want a special account of the syntactically unbound long-distance reflexives in these languages. What we need is rather an account that takes care of both the more familiar instances of reflexives inside finite (subjunctive) clauses bound by (subject) antecedents in a higher clause and the intersentential, unbound reflexives just observed. That seems to make any attempt to extend the syntactic binding domain beyond finite-clause boundaries in languages like Icelandic and Faroese, for instance, a dubious enterprise.

(Þráinsson 1991: 59)

Overview

- Icelandic data
- Background on LFG and Glue Semantics
  - Correspondence Architecture
- Anaphora in LFG-Glue
  - Binding constraints
  - Variable-free binding
- Anaphoric Structure
- Logophoricity

Mig langar að fara till Islands... ✈

Icelandic

Icelandic *sig*

- Binding out of infinitive
  (1) Pétur$_i$ bað Jens$_j$ um [PRO$_j$ að raka sig$_{i/j}$]
- Subject orientation
  (2) * Eg$_i$ lofaði Önnu$_j$ [PRO$_i$ að kyssa sig$_j$]
- Binding and the subjunctive
  (3) Jón$_i$ sagði [að ég hefði svikið sig$_i$]
  (4) Jón$_i$ segir [að María telji [að Haraldur vilji [að Billi heimsæki sig$_i$]]]
  (5) * Jón$_i$ lýkur þessu ekki [nema þú hjálpir sér$_i$]
  (6) Jón$_i$ segir [að hann ljúki þessu ekki [nema þú hjálpir sér$_i$]
  (7) Hún$_i$ sagði [að sig$_i$ vantaði peninga]
  (8) Jón$_i$ upplýsti hver hefði/*hafði barið sig$_i$

LFG

Lexical-Functional Grammar

- Lexical-Functional Grammar (Kaplan and Bresnan 1982, Bresnan 1982, Dalrymple et al. 1995, Bresnan 2001, Dalrymple 2001) is a constraint-based, model-theoretic theory of grammar.
- Structural descriptions are constraints — statements that can be evaluated for truth (true or false) — that must be satisfied by structures (models).
- LFG postulates multiple structures, each having properties relevant to the linguistic aspect it models.

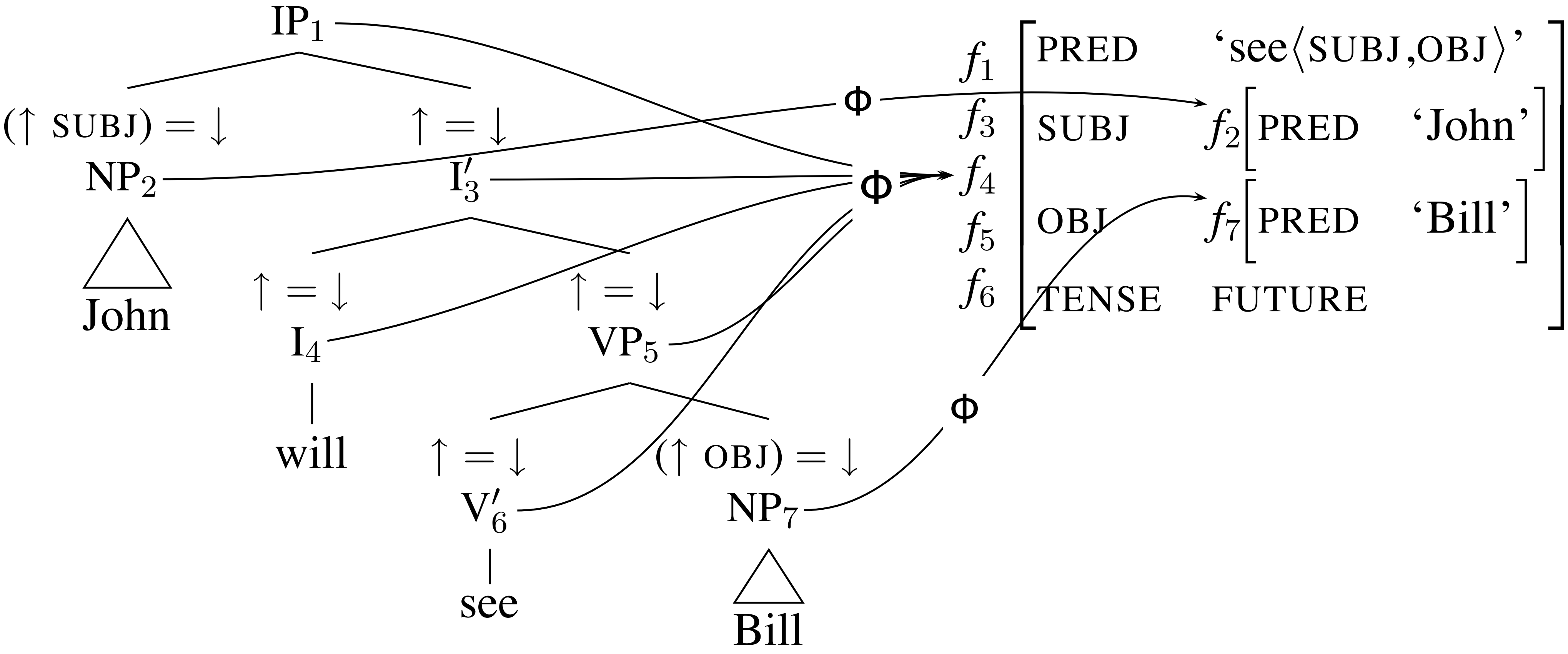
Lexical-Functional Grammar

- For example, constituency, dominance, and word order are described by phrase structure rules that define tree structures. This level of structure is called ‘constituent structure’ or ‘c-structure’ for short.
- Other, more abstract aspects of syntax — such as grammatical functions, predication, agreement, unbounded dependencies, local dependencies, case, binding, etc. — are described by quantifier-free equality statements and define attribute value matrices, a.k.a. feature structures. This level of structure is called ‘functional structure’ or ‘f-structure’ for short.

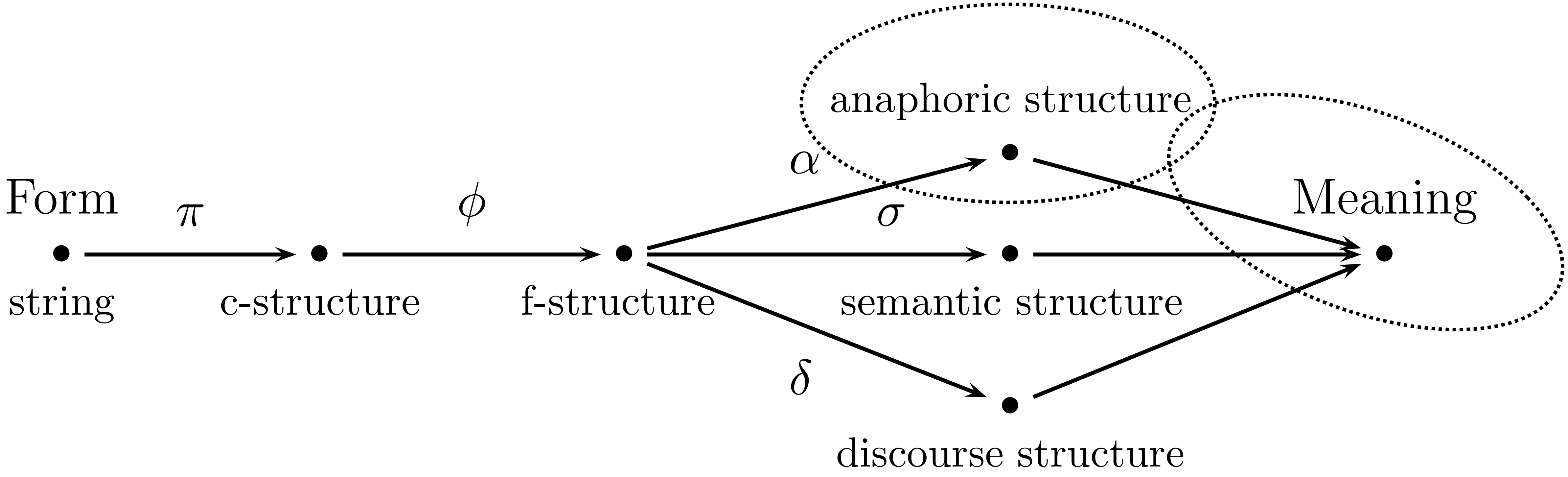
Lexical-Functional Grammar

- Structures are presented in parallel and elements of one structure ‘are projected to’ or ‘correspond to’ elements of other structures according to ‘projection functions’, which are also called ‘correspondence functions’. For example, the function relating c-structure to f-structure is the ϕ function.
- This was subsequently generalized to a ‘Correspondence Architecture’ (Kaplan 1987, 1989, Halvorsen & Kaplan 1988, Asudeh 2006, Asudeh & Toivonen 2009).
- Another term used in the literature is ‘Parallel Projection Architecture’, but this is perhaps best avoided to prevent confusion with Jackendoff’s recent proposals (e.g., Jackendoff 1997, 2002, 2007).

LFG: A Simple Example

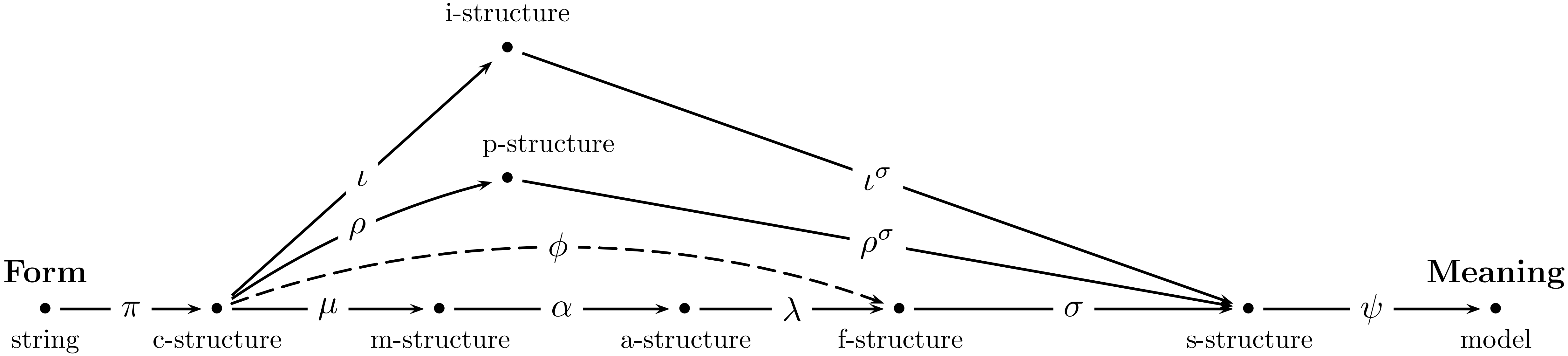


Correspondence Architecture: Programmatic



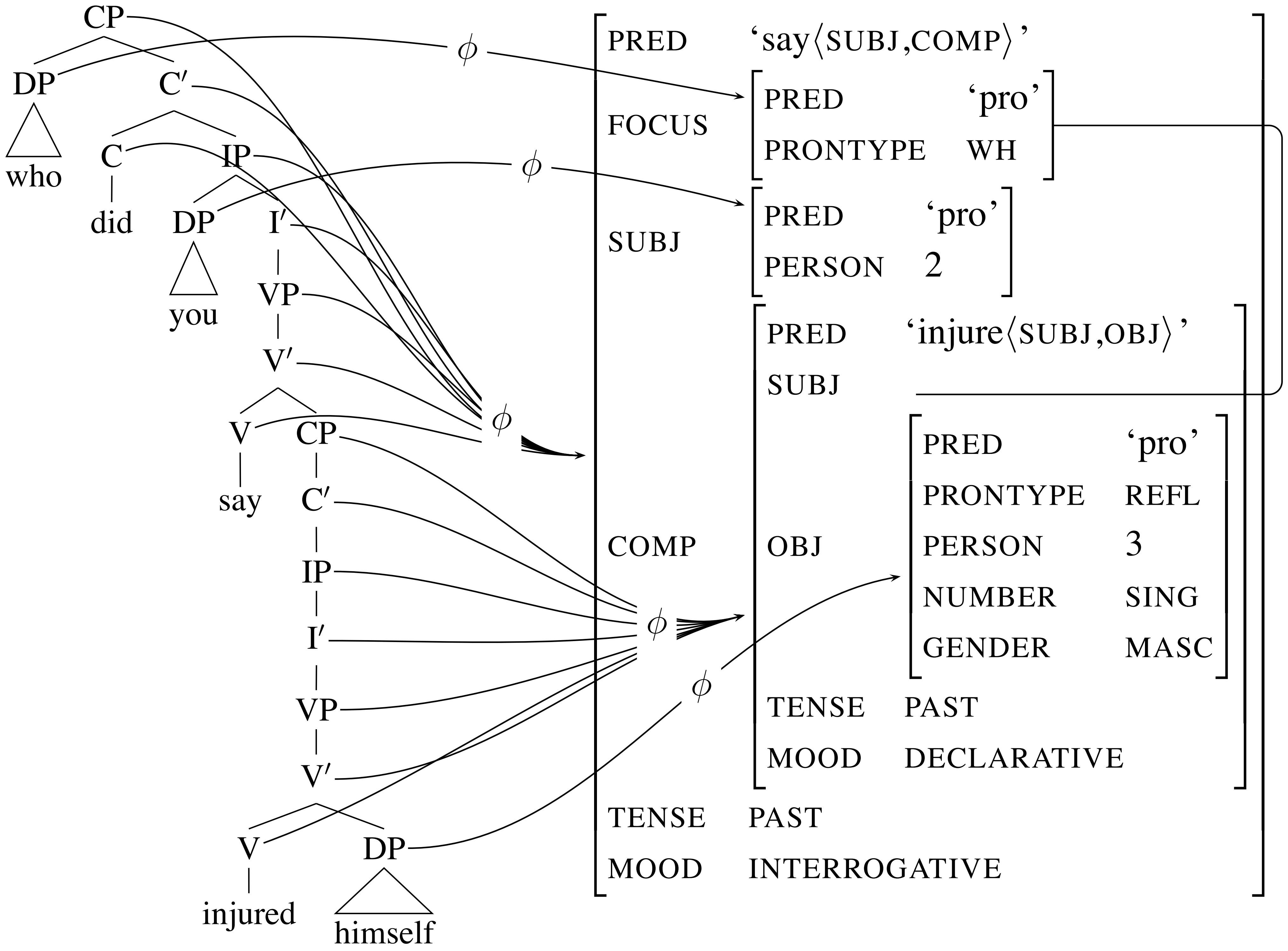
(Kaplan 1987, 1989)

Correspondence Architecture: A Recent Synthesis



(Asudeh 2006, Asudeh & Toivonen 2009)

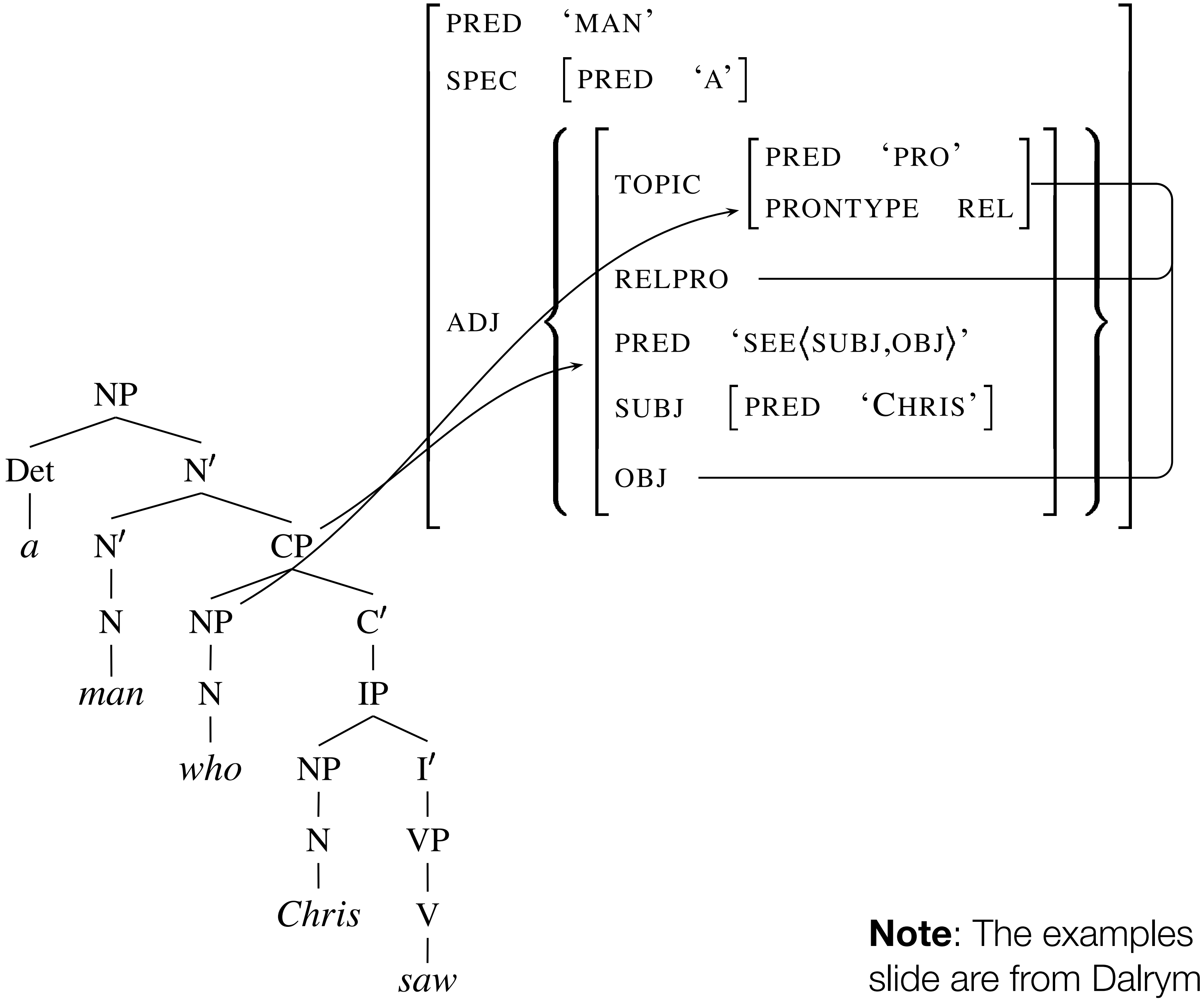
Unbounded Dependencies: Example



$$\begin{bmatrix} \text{PRED} & \text{‘say}\langle\text{SUBJ,COMP}\rangle\text{’} \\ \text{FOCUS} & \begin{bmatrix} \text{PRED} & \text{‘pro’} \\ \text{PRONTYPE} & \text{WH} \end{bmatrix} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{‘pro’} \\ \text{PERSON} & 2 \end{bmatrix} \\ \text{COMP} & \begin{bmatrix} \text{PRED} & \text{‘injure}\langle\text{SUBJ,OBJ}\rangle\text{’} \\ \text{SUBJ} & \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{‘pro’} \\ \text{PRONTYPE} & \text{REFL} \\ \text{PERSON} & 3 \\ \text{NUMBER} & \text{SING} \\ \text{GENDER} & \text{MASC} \end{bmatrix} \\ \text{TENSE} & \text{PAST} \\ \text{MOOD} & \text{DECLARATIVE} \end{bmatrix} \\ \text{TENSE} & \text{PAST} \\ \text{MOOD} & \text{INTERROGATIVE} \end{bmatrix}$$

Relative Clauses: Example

a man who Chris saw

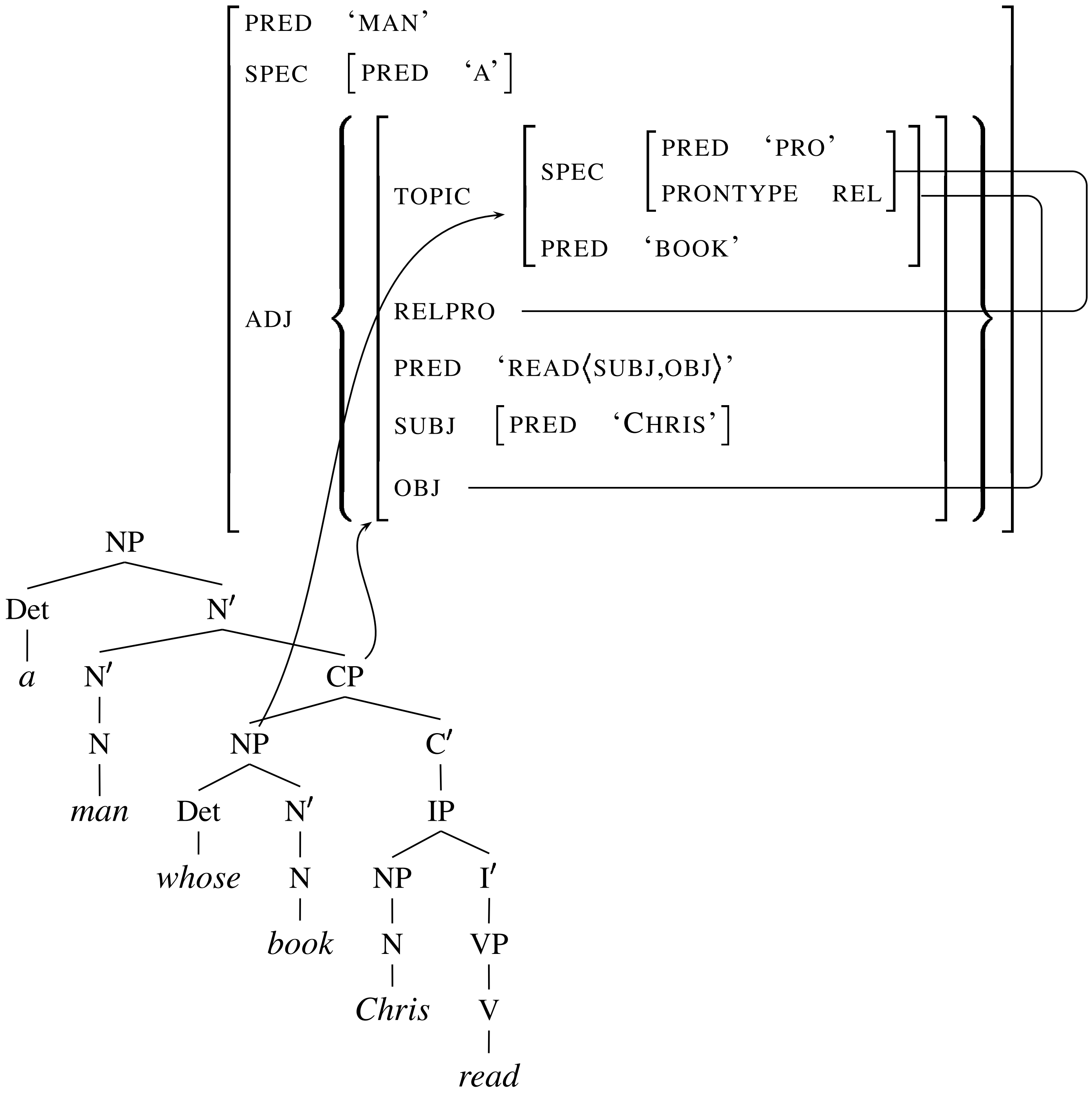


$$\begin{bmatrix} \text{PRED} & \text{‘MAN’} \\ \text{SPEC} & \begin{bmatrix}\text{PRED} & \text{‘A’}\end{bmatrix} \\ \text{ADJ} & \left\{ \begin{bmatrix} \text{TOPIC} & \begin{bmatrix}\text{PRED} & \text{‘PRO’}\\ \text{PRONTYPE} & \text{REL}\end{bmatrix} \\ \text{RELPRO} & \\ \text{PRED} & \text{‘SEE}\langle\text{SUBJ,OBJ}\rangle\text{’} \\ \text{SUBJ} & \begin{bmatrix}\text{PRED} & \text{‘CHRIS’}\end{bmatrix} \\ \text{OBJ} & \end{bmatrix} \right\} \end{bmatrix}$$

Note: The examples on this and the next slide are from Dalrymple (2001: ch. 14).

Relative Clauses: Pied Piping Example

a man whose book Chris read



Outside-In and Inside-Out equations

- Outside-in equations with respect to an f-structure *f* make specifications about paths leading **in from** *f*:

$$(\uparrow \text{COMP TENSE}) = \text{PRESENT}$$

- Inside-out equations with respect to an f-structure *f* make specifications about paths leading **out from** *f*:

$$(\text{COMP} \uparrow)$$

- The two kinds of equation can be combined:

$$((\text{COMP} \uparrow) \text{ TENSE}) = \text{PRESENT}$$

Outside-In and Inside-Out equations

- Outside-in equations with respect to an f-structure *f* make specifications about paths leading **in from** *f*:

$$(f\ \textsc{comp tense}) = \textsc{present}$$

- Inside-out equations with respect to an f-structure *f* make specifications about paths leading **out from** *f*:

$$(\textsc{comp}\ f)$$

- The two kinds of equation can be combined:

$$((\textsc{comp}\ f)\ \textsc{tense}) = \textsc{present}$$

Functional Uncertainty

- Simple or limited functional uncertainty can be expressed by defining abbreviatory symbols disjunctively:

$$\mathrm{GF} = \left\{\ \mathrm{SUBJ} \mid \mathrm{OBJ} \mid \mathrm{OBJ}_{\theta} \mid \mathrm{OBL} \mid \mathrm{COMP} \mid \mathrm{XCOMP} \mid \mathrm{ADJ} \mid \mathrm{XADJ}\ \right\}$$

- Unlimited functional uncertainty can be expressed with Kleene star (*) or Kleene plus ($^+$), where X* means ‘0 or more X’ and X$^+$ means ‘1 or more X’:

$$(\uparrow \mathrm{FOCUS}) = (\uparrow \{\mathrm{XCOMP} \mid \mathrm{COMP}\}^{*}\ \mathrm{GF})$$

$$(\uparrow \mathrm{INDEX}) = ((\mathrm{GF}^{+} \uparrow)\ \mathrm{SUBJ}\ \mathrm{INDEX})$$

- Note that f-descriptions are therefore written in a regular language, as is also the case for the right-hand side of c-structure rules.

Lexical Generalizations in LFG

yawns	V	$(\uparrow\ \text{PRED})=\text{‘yawn}\langle\text{SUBJ}\rangle\text{’}$ $(\uparrow\ \text{VFORM})=\text{FINITE}$ $(\uparrow\ \text{TENSE})=\text{PRES}$ $(\uparrow\ \text{SUBJ PERS})=3$ $(\uparrow\ \text{SUBJ NUM})=\text{SG}$

A lot of this information is shared by other verbs.

LFG Templates: Relations between Descriptions

yawns (↑ PRED)='yawn⟨SUBJ⟩'
(↑ VFORM)=FINITE
(↑ TENSE)=PRES
(↑ SUBJ PERS)=3
(↑ SUBJ NUM)=SG

PRESENT = (↑ VFORM)=FINITE
(↑ TENSE)=PRES

3SG = (↑ SUBJ PERS)=3
(↑ SUBJ NUM)=SG

⇩

yawns (↑ PRED)='yawn⟨SUBJ⟩'
@PRESENT
@3SG

Dalrymple, Kaplan & King (2004)
Asudeh, Dalrymple & Toivonen (2008)

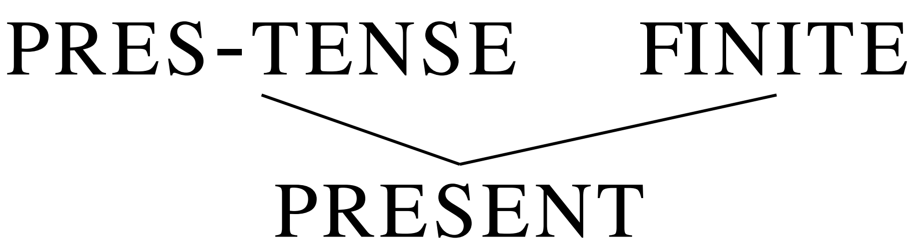
Templates: Factorization and Hierarchies

FINITE = (↑ VFORM)=FINITE

PRES-TENSE = (↑ TENSE)=PRES

PRESENT = @FINITE
@PRES-TENSE

⇩



PRES-TENSE FINITE

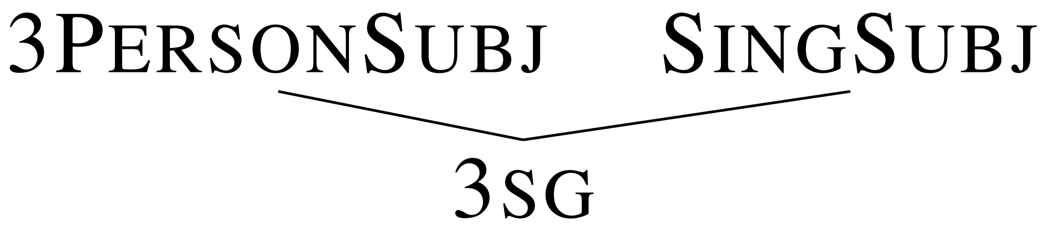
PRESENT

3PersonSubj = (↑ SUBJ PERS)=3

SingSubj = (↑ SUBJ NUM)=SG

3Sg = @3PersonSubj
@SingSubj

⇩



3PersonSubj SingSubj

3sg

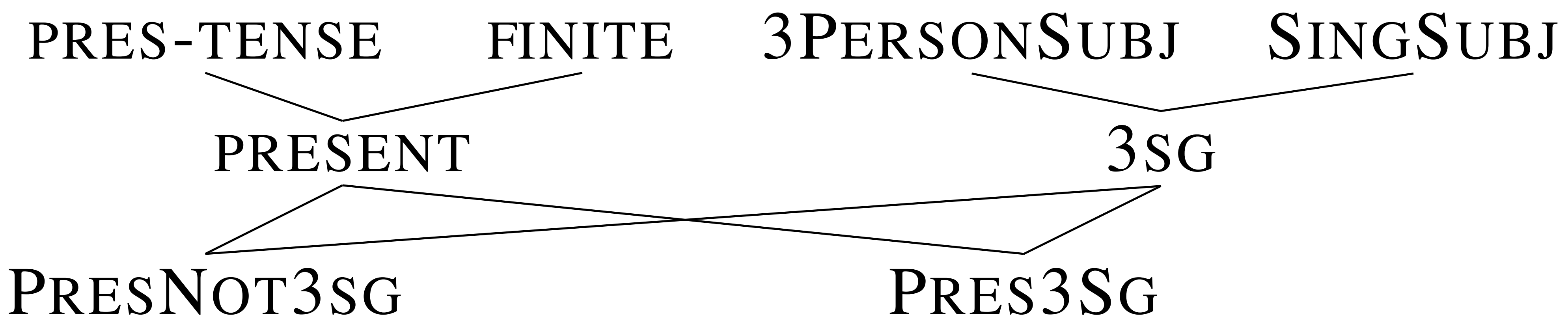
Templates: Boolean Operators

PRESNOT3SG = @PRESENT
¬@3SG

Negation

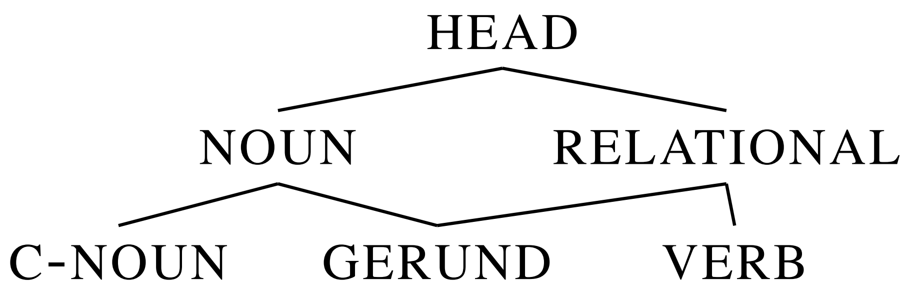
⇨

(↑ VFORM)=FINITE
(↑ TENSE)=PRES
¬{(↑ SUBJ PERS)=3
(↑ SUBJ NUM)=SG}



Hierarchies: Templates vs. Types

- Type hierarchies are *and/or* lattices:
  - Motherhood: ***or***
  - Multiple Dominance: ***and***



- Type hierarchies encode inclusion/inheritance and place constraints on how the inheritance is interpreted.
- LFG template hierarchies encode only inclusion: multiple dominance not interpreted as conjunction, no real status for motherhood.
- LFG hierarchies relate descriptions only: mode of combination (logical operators) is determined contextually at invocation or is built into the template.
- HPSG hierarchies relate first-class ontological objects of the theory.
- LFG hierarchies are abbreviatory only and have no real ontological status.

Parametrized Templates

yawns (↑ PRED)='yawn⟨SUBJ⟩'
@PRES3SG

INTRANSITIVE(P) = (↑ PRED)='P⟨SUBJ⟩'

⇩

yawns @INTRANSITIVE(yawn)
@PRES3SG

Defaults in LFG

$(\uparrow \text{CASE}) \vee (\uparrow \text{CASE}) = \text{NOM}$

The f-structure must have case and if nothing else provides its case, then its case is nominative.

$\text{DEFAULT}(\text{D V}) \quad = \quad \text{D} \vee \text{D} = \text{V}$

Parametrized template for defaults.

Also illustrates that parameterized templates can have multiple arguments

$\Downarrow$

$@\text{DEFAULT}((\uparrow \text{CASE})\ \text{NOM})$

Glue Semantics

Glue Semantics

- Glue Semantics is a type-logical semantics that can be tied to any syntactic formalism that supports a notion of headedness.
- Glue Semantics can be thought of as *categorial semantics without categorial syntax.*
- The independent syntax assumed in Glue Semantics means that the logic of composition is *commutative*, unlike in Categorial Grammar.
- Selected works:
  Dalrymple (1999, 2001), Crouch & van Genabith (2000),
  Asudeh (2004, 2005a,b, 2006, in prep.), Lev (2007), Kokkonidis (2008)

Glue Semantics

- Lexically-contributed *meaning constructors* :=

Meaning language term $\mathcal{M} : G$ Composition language term

- Meaning language := some lambda calculus
  - Model-theoretic
- Composition language := linear logic
  - Proof-theoretic
- Curry Howard Isomorphism between formulas (meanings) and types (proof terms)
- Successful Glue Semantics proof:

$$\Gamma \vdash \mathcal{M} : G_t$$

Key Glue Proof Rules with Curry-Howard Terms

Application : Implication Elimination

$$\dfrac{\begin{array}{c}\vdots\\ a : A\end{array} \qquad\qquad \begin{array}{c}\vdots\\ f : A \multimap B\end{array}}{f(a) : B}\multimap_{\mathcal{E}}$$

Abstraction : Implication Introduction

$$\dfrac{\begin{array}{c}[x : A]^1\\ \vdots\\ f : B\end{array}}{\lambda x.f : A \multimap B}\multimap_{\mathcal{I},1}$$

Pairwise Substitution : Conjunction Elimination

$$\dfrac{\begin{array}{c}\vdots\\ a : A \otimes B\end{array} \qquad\qquad \begin{array}{c}[x : A]^1 \quad [y : B]^2\\ \vdots\\ f : C\end{array}}{\mathsf{let}\ a\ \mathsf{be}\ x \times y\ \mathsf{in}\ f : C}\otimes_{\mathcal{E},1,2}$$

Beta reduction for let:

$$\mathsf{let}\ a \times b\ \mathsf{be}\ x \times y\ \mathsf{in}\ f \quad \Rightarrow_{\beta} \quad f[a/x, b/y]$$

Example: *Mary laughed*

1. $mary : \uparrow_{\sigma_e}$
2. $laugh : (\uparrow \textsc{subj})_{\sigma_e} \multimap \uparrow_{\sigma_t}$

$$f\begin{bmatrix} \text{PRED} & \text{‘laugh}\langle\text{SUBJ}\rangle\text{’} \\ \text{SUBJ} & g\begin{bmatrix}\text{PRED} & \text{‘Mary’}\end{bmatrix}\end{bmatrix}$$

$1'.\ mary : g_{\sigma_e}$

$2'.\ laugh : g_{\sigma_e} \multimap f_{\sigma_t}$

$1''.\ mary : m$

$2''.\ laugh : m \multimap l$

Proof

1.	$mary : m$	Lex. **Mary**
2.	$laugh : m \multimap l$	Lex. **laughed**
3.	$laugh(mary) : l$	E $\multimap$, 1, 2

≡

Proof

$$\boxed{\dfrac{mary : m \qquad laugh : m \multimap l}{laugh(mary) : l}\multimap_{\mathcal{E}}}$$

Example: *Most presidents speak*

1. $\lambda R \lambda S.most(R, S) : (v \multimap r) \multimap \forall X.[(p \multimap X) \multimap X]$ Lex. **most**
2. $president^* : v \multimap r$ Lex. **presidents**
3. $speak : p \multimap s$ Lex. **speak**

$$\dfrac{\dfrac{\begin{array}{l}\lambda R \lambda S.most(R, S) :\\ (v \multimap r) \multimap \forall X.[(p \multimap X) \multimap X]\end{array} \qquad \begin{array}{l}president^* :\\ v \multimap r\end{array}}{\begin{array}{l}\lambda S.most(president^*, S) :\\ \forall X.[(p \multimap X) \multimap X]\end{array}} \qquad \begin{array}{l}speak :\\ p \multimap s\end{array}}{most(president^*, speak) : s} \multimap_{\mathcal{E}}, [s/X]$$

Example:
Most presidents speak at least one language

$$\begin{bmatrix} \text{PRED} & \text{‘speak}\langle\text{SUBJ, OBJ}\rangle\text{’} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{‘president’} \\ \text{SPEC} & \begin{bmatrix} \text{PRED} & \text{‘most’} \end{bmatrix} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{‘language’} \\ \text{SPEC} & \begin{bmatrix} \text{PRED} & \text{‘at-least-one’} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Single parse

➡

Multiple scope possibilities (Underspecification through quantification)

1. $\lambda R \lambda S.most(R, S) :$ $(v1 \multimap r1) \multimap \forall X.[(p \multimap X) \multimap X]$ Lex. **most**
2. $president^* : v1 \multimap r1$ Lex. **presidents**
3. $speak : p \multimap l \multimap s$ Lex. **speak**
4. $\lambda P \lambda Q.at\text{-}least\text{-}one(P, Q) :$ $(v2 \multimap r2) \multimap \forall Y.[(l \multimap Y) \multimap Y]$ Lex. **at least one**
5. $language : v2 \multimap r2$ Lex. **language**

Most presidents speak at least one language
Subject wide scope

$$\dfrac{\dfrac{\begin{array}{l}\lambda R\lambda S.\mathit{most}(R,S) :\\ (\mathit{v1} \multimap \mathit{r1}) \multimap \forall X.[(p \multimap X) \multimap X]\end{array} \quad \begin{array}{l}\mathit{president}^* :\\ \mathit{v1} \multimap \mathit{r1}\end{array}}{\begin{array}{l}\lambda S.\mathit{most}(\mathit{president}^*, S) :\\ \forall X.[(p \multimap X) \multimap X]\end{array}} \quad \dfrac{\dfrac{\dfrac{\begin{array}{l}\lambda P\lambda Q.\mathit{a\text{-}l\text{-}o}(P,Q) :\\ (\mathit{v2}\multimap \mathit{r2}) \multimap \forall Y.[(l\multimap Y)\multimap Y]\end{array} \quad \begin{array}{l}\mathit{lang} :\\ \mathit{v2}\multimap\mathit{r2}\end{array}}{\begin{array}{l}\lambda Q.\mathit{a\text{-}l\text{-}o}(\mathit{lang},Q) :\\ \forall Y.[(l\multimap Y)\multimap Y]\end{array}} \quad \dfrac{\begin{array}{l}\lambda x\lambda y.\mathit{speak}(x,y) :\\ p\multimap l\multimap s\end{array} \quad [z : p]^1}{\begin{array}{l}\lambda y.\mathit{speak}(z,y) :\\ l\multimap s\end{array}}}{\mathit{a\text{-}l\text{-}o}(\mathit{lang},\lambda y.\mathit{speak}(z,y)) : s}\,[s/Y]}{\lambda z.\mathit{a\text{-}l\text{-}o}(\mathit{lang},\lambda y.\mathit{speak}(z,y)) : p\multimap s}\,\multimap_{\mathcal{I},1}}{\mathit{most}(\mathit{president}^*,\lambda z.\mathit{a\text{-}l\text{-}o}(\mathit{lang},\lambda y.\mathit{speak}(z,y))) : s}\,[s/X]$$

Most presidents speak at least one language
Object wide scope

$$
\dfrac{
\dfrac{\begin{array}{c}\lambda P\lambda Q.\mathit{a\text{-}l\text{-}o}(P,Q):\\ (v2\multimap r2)\multimap\forall Y.[(l\multimap Y)\multimap Y]\end{array}\qquad\begin{array}{c}\mathit{lang}:\\ v2\multimap r2\end{array}}{\begin{array}{c}\lambda Q.\mathit{a\text{-}l\text{-}o}(\mathit{lang},Q):\\ \forall Y.[(l\multimap Y)\multimap Y]\end{array}}
\qquad
\dfrac{\dfrac{
\dfrac{\begin{array}{c}\lambda R\lambda S.\mathit{most}(R,S):\\ (v1\multimap r1)\multimap\forall X.[(p\multimap X)\multimap X]\end{array}\qquad\begin{array}{c}\mathit{president}^{*}:\\ v1\multimap r1\end{array}}{\begin{array}{c}\lambda S.\mathit{most}(\mathit{president}^{*},S):\\ \forall X.[(p\multimap X)\multimap X]\end{array}}
\qquad
\dfrac{\begin{array}{c}\lambda y\lambda x.\mathit{speak}(x,y):\\ l\multimap p\multimap s\end{array}\qquad [z:l]^{1}}{\begin{array}{c}\lambda x.\mathit{speak}(x,z):\\ p\multimap s\end{array}}
}{\mathit{most}(\mathit{president}^{*},\lambda x.\mathit{speak}(x,z)):s}\,[s/X]}{\lambda z.\mathit{most}(\mathit{president}^{*},\lambda x.\mathit{speak}(x,z)):l\multimap s}\multimap_{\mathcal{I},1}
}{\mathit{a\text{-}l\text{-}o}(\mathit{lang},\lambda z.\mathit{most}(\mathit{president}^{*},\lambda x.\mathit{speak}(x,z))):s}\,[s/Y]
$$

Further Points of Interest

- Glue Semantics can be understood as a *representationalist* semantic theory (cf. Kamp & Reyle 1993, Cann et al. 2005)
    - Proofs can be reasoned about as representations (Asudeh & Crouch 2002a,b).
    - Proofs have strong identity criteria: normalization, comparison
- Glue Semantics allows recovery of a non-representationalist notion of *direct compositionality* (Asudeh 2005, 2006).

  ➡ Flexible framework with lots of scope for exploration of questions of compositionality and semantic representation

Anaphoric Binding in the Correspondence Architecture

Binding Constraints ca. Dalrymple (1993)

Positive binding constraint (schema):

$$((\underset{\neg(\rightarrow \text{X})}{\text{DomainPath}} \quad \textsc{gf}\uparrow)\ \text{AntecedentPath})_\sigma = \uparrow_\sigma$$

Negative binding constraint (schema):

$$((\underset{\neg(\rightarrow \text{X})}{\text{DomainPath}} \quad \textsc{gf}\uparrow)\ \text{AntecedentPath})_\sigma \neq \uparrow_\sigma$$

Example:

herself $((\underset{\neg(\rightarrow \textsc{subj})}{\textsc{gf}^*} \quad \textsc{gf}\uparrow)\ \textsc{gf})_\sigma = \uparrow_\sigma$

$$\vdots$$

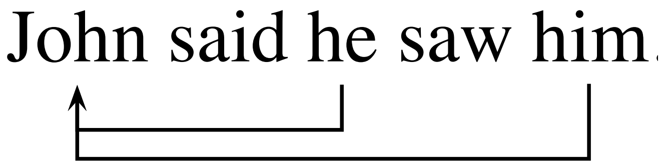
Example:

sig $((\underset{\neg(\rightarrow \textsc{tense})}{\textsc{gf}^*} \quad \textsc{gf}\uparrow)\ \textsc{subj})_\sigma = \uparrow_\sigma$

$$\vdots$$

Equality in LFG is Token Identity: A Nice Consequence

- Notice that there are no indices in this theory: the antecedent and the anaphor are *equated* in semantic structure.
    - This formally represents the fact that the two things denote the same entity in the semantics.
- Like coindexation, equality as token identity is transitive: If A = B and B = C then A = C, just as if A is coindexed with B and B is coindexed with C, the A is coindexed with C.
- This avoids the problem for asymmetric linking/dependency accounts (Higginbotham 1993, Safir 2004) with circumvention of illicit binding configurations (requires stipulation re. obviation):



(1) John said he saw him.

Binding Constraints ca. Dalrymple (2001), Asudeh (2004)

$$((\text{DomainPath} \quad \text{GF}\uparrow)\ \text{AntecedentPath})_\sigma = (\uparrow_\sigma\ \text{ANTECEDENT})$$
$$\neg\,(\rightarrow \text{X})$$

- Problem: Now the relation is asymmetric; same problem as for linking/ dependency accounts arises
- Why the change?
  - Glue Semantics: resource-sensitive semantic composition
    - Formally models without extra stipulations that the pronoun and its antecedent are satisfying separate compositional requirements (Asudeh 2004).
    - If the anaphor and its antecedent were token identical, there would be a resource deficit.
    - Benefit: Account of non-resumptive behaviour of relational nouns (Asudeh 2005)

Anaphora in Glue Semantics

- Variable-free: pronouns are functions on their antecedents (Jacobson 1999, among others)
- Commutative logic of composition allows pronouns to compose **directly** with their antecedents.
  - No need for otherwise unmotivated additional type shifting (e.g. Jacobson's *z*-shift)

Anaphora in Glue Semantics

(1) Joe said he bowls.

- Pronominal meaning constructor:

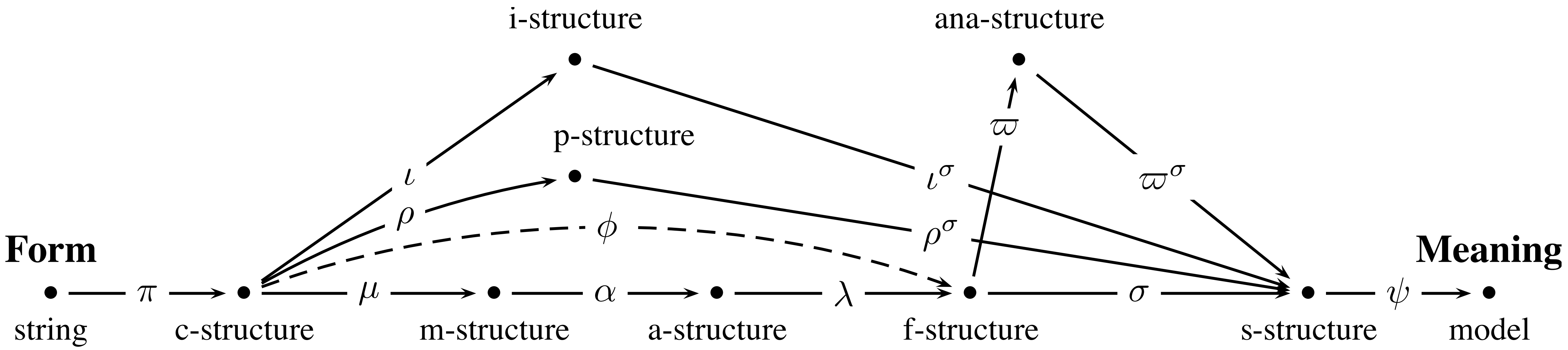
$$\lambda z.z \times z : A \multimap (A \otimes P)$$

$$\dfrac{\dfrac{\dfrac{\begin{array}{l} joe : \\ j \end{array} \qquad \begin{array}{l} \lambda z.z \times z : \\ j \multimap (j \otimes p) \end{array}}{joe \times joe : j \otimes p} \qquad \dfrac{\dfrac{[x : j]^1 \qquad \begin{array}{l} \lambda u \lambda q.say(u, q) : \\ j \multimap b \multimap s \end{array}}{\begin{array}{l} \lambda q.say(x, q) : \\ b \multimap s \end{array}} \qquad \dfrac{[y : p]^2 \qquad \begin{array}{l} \lambda v.bowl(v) : \\ p \multimap b \end{array}}{\begin{array}{l} bowl(y) : \\ b \end{array}}}{say(x,\ bowl(y)) : s}}{\text{let } joe \times joe \text{ be } x \times y \text{ in } say(x, bowl(y)) : s}\,\otimes_{\mathcal{E},1,2}}{say(joe, bowl(joe)) : s}\,\Rightarrow_\beta$$

A Solution

- The essential problem of the new system is that we would like the feature ANTECEDENT to play contrary roles: we want the pronoun and its antecedent to be equated for computation of binding constraints, but we want the antecedent and the anaphor to be distinguished for computation of Glue semantic proofs.
- Solution: Resuscitate *anaphoric structure*, an original component of Kaplan's programmatic Correspondence Architecture.
  - However, this is only a good solution if the move solves some other problems, too.
  - It does: logophoricity of Icelandic/Faroese long-distance reflexive

Adding Anaphoric Structure to the Architecture



herself $((\underset{\neg\,(\rightarrow\ \mathrm{SUBJ})}{\mathrm{GF}^*}\quad \mathrm{GF}\uparrow)\ \ \mathrm{GF})_{\varpi} = \uparrow_{\varpi}$

$$\lambda z.z \times z : (\uparrow_{\varpi})_{\varpi^\sigma} \multimap ((\uparrow_{\varpi})_{\varpi^\sigma} \otimes \uparrow_{\sigma})$$

$$\vdots$$

María $(\uparrow_{\varpi}\ \mathrm{ID}) = \mathrm{maria}$

$maria : \uparrow_{\sigma}$

Strahan's Observation

- In work in progress, Strahan (2009) observes that the logophoricity of Icelandic/Faroese *sig*/*seg* raises a problem for LFG's inside-out theory of anaphoric constraints.
- She contrasts the following examples:

(1) * Hann$_i$ kemur ekki nema þú bjóðir sér$_i$

(2) Jón$_i$ segir að hann komi ekki nema þú bjóðir sér$_i$

- The problem is: If logophoricity is a property of the long-distance reflexive, what allows it to acquire the feature in (2) but not in (1)?
- She proposes instead that the *logocentre* introduced by *segir* (i.e. *Jón*) should instead issue a downward (outside-in) search for something to bind.

Logophoricity

- We now have a symmetric relation between the anaphor and its antecedent at anaphoric structure and an asymmetric relation between the anaphor and its antecedent in the semantics (because the anaphor is a function that takes its antecedent as an argument).
- What remains is to capture the logophoricity of *sig* using our theoretical innovation.
- Intuitions (Þráinsson, Maling, Strahan, others):

1. Logophoricity is a property introduced by certain lexical items.
2. The property can ‘drip’ down (Þráinsson via Maling).
3. The long-distance reflexive is conditioned by this property, not by mood.
4. The LDR must bind to the logocentre (Strahan).

Introduction of Logophoricity and Making it Drip

segir, etc.

$$
\begin{array}{l}
(\uparrow \text{PRED}) = \text{`say}\langle\text{SUBJ}, \text{COMP}\rangle\text{'} \\
\lambda p \lambda x. say(x, p) : (\uparrow \text{COMP})_{\sigma} \multimap (\uparrow \text{SUBJ})_{\sigma} \multimap \uparrow_{\sigma} \\
\left(
\begin{array}{l}
((\uparrow \text{SUBJ})_{\varpi} \ \text{LOGOCENTRE}) = + \\
(\uparrow \text{LOGOPHORIC}) = + \\
\left(\uparrow \ \underset{\begin{array}{c}(\to \text{MOOD}) =_c \text{SUBJUNCTIVE} \\ (\uparrow \text{LOGOPHORIC}) = (\to \text{LOGOPHORIC})\end{array}}{\text{GF}^{+}} \right) \\
\lambda P \lambda x. perspective\text{-}of(x, P(x)) : [(\uparrow \text{SUBJ})_{\sigma} \multimap \uparrow_{\sigma}] \multimap [(\uparrow \text{SUBJ})_{\sigma} \multimap \uparrow_{\sigma}]
\end{array}
\right) \\
\vdots
\end{array}
$$

Introduction

Drip

sig

$$
\left\{
\begin{array}{c}
((\underset{(\to \text{LOGOPHORIC})}{\text{GF}^{*}} \ \text{GF} \uparrow) \ \underset{(\to_{\varpi} \text{LOGOCENTRE}) =_c +}{\text{SUBJ}})_{\varpi} = \uparrow_{\varpi} \\
\vee \\
\begin{array}{l}
((\underset{\neg (\to \text{TENSE})}{\text{GF}^{*}} \ \text{GF} \uparrow) \ \text{SUBJ})_{\varpi} = \uparrow_{\varpi} \\
((\underset{\neg (\to \text{PRED})}{\text{GF}^{*}} \ \text{GF} \uparrow) \ \text{SUBJ})_{\varpi} \neq \uparrow_{\varpi}
\end{array}
\end{array}
\right\}
$$

Somewhat over-simplistic
(should use templates!)

$$
\lambda z. z \times z : (\uparrow_{\varpi})_{\varpi^{\sigma}} \multimap ((\uparrow_{\varpi})_{\varpi^{\sigma}} \otimes \uparrow_{\sigma})
$$

$$\vdots$$

Back to the Icelandic Data

- Binding out of infinitive

(1) Pétur$_i$ bað Jens$_j$ um [PRO$_j$ að raka sig$_{i/j}$]

- Subject orientation

(2) * Eg$_i$ lofaði Önnu$_j$ [PRO$_i$ að kyssa sig$_j$]

- Binding and the subjunctive

(3) Jón$_i$ sagði [að ég hefði svikið sig$_i$]

(4) Jón$_i$ segir [að María telji [að Haraldur vilji [að Billi heimsæki sig$_i$]]]

(5) * Jón$_i$ lýkur þessu ekki [nema þú hjálpir sér$_i$]

(6) Jón$_i$ segir [að hann ljúki þessu ekki [nema þú hjálpir sér$_i$]

(7) Hún$_i$ sagði [að sig$_i$ vantaði peninga]

(8) Jón$_i$ upplýsti hver hefði/*hafði barið sig$_i$

Prospects for Intrasentential Logophors?

- Maling (1984), Sigurðsson (1986), Þráinsson (1991) have observed that *sig* can be bound from outside the clause, though it must have an antecedent in discourse (Þráinsson 1991: 62).

(1) María var alltaf svo andstyggileg. Þegar Ólafur$_j$ kæmi segði hún sér$_{i/*j}$ áreiðanlega að fara …

- We now have the structure we need to deal with logocentres that are introduced by discourse, but the discourse rules that govern this process need further investigation.

Another Apparent Puzzle Solved?

- Maling (1984: 235) struggles with the following relative clause data:

(1) Jón segir að Ólafur$_i$ hafi ekki enn fundið vinnu, sem sér$_i$ líki.

- Initially this seems problematic, because it would seem to complicate our generalizations about logophoric *sig*, because it is embedded in an object and it is not referring to the logocentre.
- However, *Ólafur* is the first subject outside of the coargument domain of the reflexive.
    - This case is in fact covered by the non-logophoric generalization about *sig*; i.e. it seems to be a case of narrow syntactic binding.
- A potentially troubling fact remains: the subjunctive marking on the relative clause.

Conclusion

- In light of recent developments in LFG, particularly the addition of Glue Semantics to the Correspondence Architecture, we had to reconsider classical LFG binding constraints (Dalrymple 1993).
- We revived the notion of anaphoric structure (Kaplan 1987, 1989) and put it to good use.
  - Not only do we recapture what was lost, we have made progress in tying the notion of logophoricity to the notion of syntactic binding explicitly, rather than treating logophoricity as an unanalyzed concept or a concept analyzable only purely orthogonally to non-logophoric uses (Sells 1987).
- There are some stipulations that remain and that can hopefully be eliminated.

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