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Movement as delayed evaluation: WH-fronting and reconstruction

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Synopsis: the simplest possible analysis of fronted wh phrases, motivated independently of reconstruction facts, automatically explains a systematic class of apparent counterexamples to the linear constrain on quantificational binding.

Simple relative clauses: gaps

(1)
a. the woman who [left]
b. the woman who [__ left]
c. the woman who [John likes __]

(2)

$$\frac{\mathsf{DP}\backslash\mathsf{S} \mid \mathsf{DP}\backslash\mathsf{S}}{\begin{array}{c}\mathsf{DP}\\ \text{John}\\ [\,]\\ \hline \mathbf{j}\end{array}} \left(\frac{\mathsf{DP}\backslash\mathsf{S} \mid \mathsf{DP}\backslash\mathsf{S}}{\begin{array}{c}(\mathsf{DP}\backslash\mathsf{S})/\mathsf{DP}\\ \text{likes}\\ [\,]\\ \hline \mathbf{likes}\end{array}} \quad \frac{\mathsf{DP}\backslash\mathsf{S} \mid \mathsf{S}}{\begin{array}{c}\mathsf{DP}\\ \text{\_\_}\\ \lambda y.[\,]\\ \hline y\end{array}} \right) = \frac{\mathsf{DP}\backslash\mathsf{S} \mid \mathsf{S}}{\begin{array}{c}\mathsf{S}\\ \text{John likes \_\_}\\ \lambda y.[\,]\\ \hline \mathbf{likes}\, y\, \mathbf{j}\end{array}}$$

$$\text{LOWER} \quad \begin{array}{c}\mathsf{DP}\backslash\mathsf{S}\\ \text{John likes \_\_}\\ \lambda y.\mathbf{likes}\, y\, \mathbf{j}\end{array}$$
$$\Rightarrow$$

In-situ wh is a scope-taking expression

(3)

$$
\begin{array}{c}
\begin{array}{c|c} \text{DP}\,?\,\text{S} & \text{DP}\,?\,\text{S} \\ \hline \multicolumn{2}{c}{\text{DP}} \end{array} \\
\text{John} \\
\dfrac{[\;]}{\mathbf{j}}
\end{array}
\left(
\begin{array}{c}
\begin{array}{c|c} \text{DP}\,?\,\text{S} & \text{DP}\,?\,\text{S} \\ \hline \multicolumn{2}{c}{(\text{DP}\backslash\text{S})/\text{DP}} \end{array} \\
\text{likes} \\
\dfrac{[\;]}{\textbf{likes}}
\end{array}
\quad
\begin{array}{c}
\begin{array}{c|c} \text{DP}\,?\,\text{S} & \text{S} \\ \hline \multicolumn{2}{c}{\text{DP}} \end{array} \\
\text{who} \\
\dfrac{\textbf{who}(\lambda y.[\;])}{y}
\end{array}
\right)
$$

$$
\overset{\text{LOWER}}{\Rightarrow}
\quad
\begin{array}{c}
\text{DP}\,?\,\text{S} \\
\text{John likes who?} \\
\textbf{who}(\lambda y.\textbf{likes}\, y\, \mathbf{j})
\end{array}
$$

(4)

$$
\begin{array}{c}
(\text{DP}?\text{S})/(\text{DP}\backslash\!\!\backslash\text{S}) \\
\textit{who} \\
\lambda\kappa.\textbf{who}(\lambda x.\kappa x)
\end{array}
\quad
\begin{array}{c}
\text{DP}\backslash\!\!\backslash\text{S} \\
\textit{does John like \_\_} \\
\lambda x.\textbf{like}\, x\, \mathbf{j}
\end{array}
\quad = \quad
\begin{array}{c}
\text{DP}?\text{S} \\
\textit{Who does John like \_\_?} \\
\textbf{who}(\lambda x.\textbf{like}\, x\, \mathbf{j})
\end{array}
$$

(5)

$$
\boxed{\begin{array}{c} \text{FRONT} \\ A_F /\!\!/ B \quad \Rightarrow \quad A/B \end{array}}
$$

Relative clauses parallel wh-fronting

(6)
$$\frac{\dfrac{(\mathsf{N}\backslash\mathsf{N})_F \mid \mathsf{S}}{\mathsf{DP}}}{\dfrac{\textit{who}_{rel}\quad \lambda Qx.(Qx)\wedge[\,]}{x}} \quad \textsc{front} \Rightarrow \quad \begin{array}{c}(\mathsf{N}\backslash\mathsf{N})/(\mathsf{DP}\backslash\!\backslash\mathsf{S}) \\ \textit{who}_{rel} \\ \lambda\kappa Qx.(Qx)\wedge(\kappa x)\end{array}$$

(7)
$$\frac{\dfrac{(\mathsf{DP?S})_F \mid \mathsf{S}}{\mathsf{DP}}}{\dfrac{\textit{who}_{q}\quad \mathbf{who}(\lambda x.[\,])}{x}} \quad \textsc{front} \Rightarrow \quad \begin{array}{c}(\mathsf{DP?S})/(\mathsf{DP}\backslash\!\backslash\mathsf{S}) \\ \textit{who}_{q} \\ \lambda\kappa.\mathbf{who}(\lambda x.\kappa x)\end{array}$$

(8)
$$\begin{array}{ccccc}(\mathsf{N}\backslash\mathsf{N})/(\mathsf{DP}\backslash\!\backslash\mathsf{S}) & & \mathsf{DP}\backslash\!\backslash\mathsf{S} & & \mathsf{N}\backslash\mathsf{N} \\ \mathsf{who}_{rel} & & \mathsf{John\ likes\ \_\_} & = & \mathsf{who}_{rel}\ \mathsf{John\ likes\ \_\_} \\ \lambda\kappa Qx.(Qx)\wedge(\kappa x) & & \lambda y.\mathbf{likes}\,y\,\mathbf{j} & & \lambda Qx.(Qx)\wedge(\mathbf{likes}\,x\,\mathbf{j})\end{array}$$

(9)
$$\begin{array}{ccccc}(\mathsf{DP\,?\,S})/(\mathsf{DP}\backslash\!\backslash\mathsf{S}) & & \mathsf{DP}\backslash\!\backslash\mathsf{S} & & \mathsf{DP\,?\,S} \\ \mathsf{who}_{q} & & \mathsf{does\ John\ like\ \_\_} & = & \mathsf{who}_{q}\ \mathsf{does\ John\ like\ \_\_} \\ \mathbf{who} & & \lambda y.\mathbf{like}\,y\,\mathbf{j} & & \mathbf{who}(\lambda y.\mathbf{likes}\,y\,\mathbf{j})\end{array}$$

Pied Piping

$$
(10)\quad
\begin{array}{c}
(\mathsf{DP}?\mathsf{S})_F \;\big|\; (\mathsf{DP}?\mathsf{S})_F \\ \hline
\mathsf{PP}/\mathsf{DP} \\
\textit{to} \\
\begin{array}{c} [\;] \\ \hline \textbf{to} \end{array}
\end{array}
\quad
\begin{array}{c}
(\mathsf{DP}?\mathsf{S})_F \;\big|\; \mathsf{S} \\ \hline
\mathsf{DP} \\
\textit{whom} \\
\begin{array}{c} \textbf{who}(\lambda x[\;]) \\ \hline x \end{array}
\end{array}
\quad = \quad
\begin{array}{c}
(\mathsf{DP}?\mathsf{S})_F \;\big|\; \mathsf{S} \\ \hline
\mathsf{PP} \\
\textit{to whom} \\
\begin{array}{c} \textbf{who}(\lambda x[\;]) \\ \hline \textbf{to}(x) \end{array}
\end{array}
$$

$$
\overset{\text{FRONT}}{\Rightarrow}
\quad
\begin{array}{c}
(\mathsf{DP}?\mathsf{S})/(\mathsf{PP}\backslash\!\!\backslash\mathsf{S}) \\
\textit{to whom} \\
\lambda\kappa.\textbf{who}(\lambda x.\kappa(\textbf{to}(x)))
\end{array}
$$

(11)
$$\frac{\dfrac{((\mathrm{DP}/\mathrm{N})?\mathrm{S})_F \mid \mathrm{S}}{\mathrm{DP}/\mathrm{N}} \quad \dfrac{\mathrm{S} \mid \mathrm{S}}{\mathrm{N}}}{\dfrac{((\mathrm{DP}/\mathrm{N})?\mathrm{S})_F \mid \mathrm{S}}{\mathrm{DP}}}$$

	which	*man*	=	*which man*
	$\mathbf{which}(\lambda f.[\,])$	$[\,]$		$\mathbf{which}(\lambda f.[\,])$
	f	$\mathbf{man}$		$f(\mathbf{man})$

$$\overset{\text{FRONT}}{\Rightarrow} \quad \begin{array}{c}((\mathrm{DP}/\mathrm{N})?\mathrm{S})/(\mathrm{DP}\backslash\!\backslash\mathrm{S}) \\ \textit{which man} \\ \lambda\kappa.\mathbf{which}(\lambda f.\kappa(f(\mathbf{man})))\end{array}$$

(12) a. [Who] did John speak to? $\mathbf{who}(\lambda x.\mathbf{speak}\,(\mathbf{to}(x))\,\mathbf{j})$

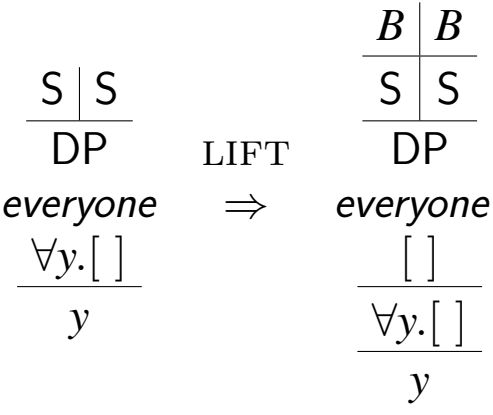
b. [To whom] did John speak? $\mathbf{who}(\lambda x.\mathbf{speak}\,(\mathbf{to}(x))\,\mathbf{j})$

(13) a. [Which man] did John speak to? $\mathbf{which}(\lambda f.\mathbf{speak}\,(\mathbf{to}(f(\mathbf{man}))$

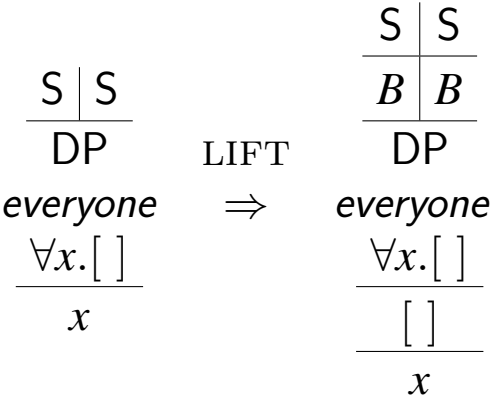
b. [To which man] did John speak? $\mathbf{which}(\lambda f.\mathbf{speak}\,(\mathbf{to}(f(\mathbf{man}))$

Before turning to superiority, inverse scope: multiple layers

(14)



(15)



(16)

$$\frac{\frac{S \mid S}{S \mid S}}{DP}\ \frac{\frac{[\,]}{\exists x.[\,]}}{x} \left(\frac{\frac{S \mid S}{S \mid S}}{(DP\backslash S)/DP}\ \frac{\frac{[\,]}{[\,]}}{\textbf{loves}} \quad \frac{\frac{S \mid S}{S \mid S}}{DP}\ \frac{\frac{\forall y.[\,]}{[\,]}}{y} \right) = \frac{\frac{S \mid S}{S \mid S}}{S}\ \frac{\frac{\forall y.[\,]}{\exists x.[\,]}}{\textbf{loves}\, y\, x}$$

Lower $\Rightarrow$ $\dfrac{\dfrac{S \mid S}{S}}{\dfrac{\forall y.[\,]}{\exists x.\,\textbf{loves}\, y\, x}}$ someone loves everyone

Lower $\Rightarrow$ $\dfrac{S}{\forall y.\,\exists x.\,\textbf{loves}\, y\, x}$ someone loves everyone

Also need to generalize COMBINE and LOWER in straightforward ways.

Superiority

(17) a. Who ate what?
b.*What did who eat __?

(18) a. Who$_i$ __$_i$ bought [pro_i what]?
b.*What$_i$ did [pro_i who] buy __$_i$?

(19)

$$
\begin{array}{c}
\mathsf{DP}\mathbin{\backslash\!\!\backslash}(\mathsf{DP}\,?\,\mathsf{S}) \;\big|\; \mathsf{DP}\,?\,\mathsf{S} \\ \hline
\mathsf{DP} \\
\_\_ \\
\lambda y.[\;] \\ \hline
y
\end{array}
\quad
\left(
\begin{array}{c}
\mathsf{DP}\,?\,\mathsf{S} \;\big|\; \mathsf{DP}\,?\,\mathsf{S} \\ \hline
(\mathsf{DP}\backslash\mathsf{S})/\mathsf{DP} \\
\mathsf{ate} \\
[\;] \\ \hline
\textbf{ate}
\end{array}
\quad
\begin{array}{c}
\mathsf{DP}\,?\,\mathsf{S} \;\big|\; \mathsf{S} \\ \hline
\mathsf{DP} \\
\mathsf{what} \\
\textbf{what}(\lambda x.[\;]) \\ \hline
x
\end{array}
\right)
$$

$$
=\quad
\begin{array}{c}
\mathsf{DP}\mathbin{\backslash\!\!\backslash}(\mathsf{DP}\,?\,\mathsf{S}) \;\big|\; \mathsf{S} \\ \hline
\mathsf{S} \\
\_\_\ \mathsf{ate\ what} \\
\lambda y.\textbf{what}(\lambda x.[\;]) \\ \hline
\textbf{ate}\,x\,y
\end{array}
\quad
\overset{\textsc{lower}}{\Rightarrow}
\quad
\begin{array}{c}
\mathsf{DP}\mathbin{\backslash\!\!\backslash}(\mathsf{DP}\,?\,\mathsf{S}) \\
\_\_\ \mathsf{ate\ what} \\
\lambda y.\textbf{what}(\lambda x.\textbf{ate}\,x\,y)
\end{array}
$$

"Who" generalized to handle multiple wh questions

(20)

$$\frac{(\mathsf{DP}\ ?A)_F \mid A}{\mathsf{DP}}$$

$$\mathit{who}_q$$

$$\frac{\mathbf{who}(\lambda x.[\ ])}{x}$$

(21)

$$\begin{array}{c}\begin{array}{c|c}\mathsf{DP}\backslash\!\!\backslash\mathsf{S} & \mathsf{DP}\backslash\!\!\backslash\mathsf{S}\\\hline \mathsf{DP}\,?\,\mathsf{S} & \mathsf{S}\\\hline \multicolumn{2}{c}{\mathsf{DP}}\end{array}\\ \textsf{who}\\ \dfrac{[\;]}{\dfrac{\textbf{who}(\lambda x.[\;])}{x}}\end{array}
\left(\begin{array}{c}\begin{array}{c|c}\mathsf{DP}\backslash\!\!\backslash\mathsf{S} & \mathsf{DP}\backslash\!\!\backslash\mathsf{S}\\\hline \mathsf{S} & \mathsf{S}\\\hline \multicolumn{2}{c}{(\mathsf{DP}\backslash\mathsf{S})/\mathsf{DP}}\end{array}\\ \textsf{ate}\\ \dfrac{[\;]}{\dfrac{[\;]}{\textbf{ate}}}\end{array}
\quad
\begin{array}{c}\begin{array}{c|c}\mathsf{DP}\backslash\!\!\backslash\mathsf{S} & \mathsf{S}\\\hline \mathsf{S} & \mathsf{S}\\\hline \multicolumn{2}{c}{\mathsf{DP}}\end{array}\\ __\\ \dfrac{\lambda y.[\;]}{\dfrac{[\;]}{y}}\end{array}\right)$$

$$= \begin{array}{c}\begin{array}{c|c}\mathsf{DP}\backslash\!\!\backslash\mathsf{S} & \mathsf{S}\\\hline \mathsf{DP}\,?\,\mathsf{S} & \mathsf{S}\\\hline \multicolumn{2}{c}{\mathsf{S}}\end{array}\\ \textsf{who ate }__\\ \dfrac{\lambda y.[\;]}{\dfrac{\textbf{who}(\lambda x.[\;])}{\textbf{ate}\,y\,x}}\end{array}
\overset{\textsc{lower}}{\Rightarrow}
\begin{array}{c}\begin{array}{c|c}\mathsf{DP}\backslash\!\!\backslash\mathsf{S} & \mathsf{S}\\\hline \multicolumn{2}{c}{\mathsf{DP}\,?\,\mathsf{S}}\end{array}\\ \textsf{who ate }__\\ \dfrac{\lambda y.[\;]}{\textbf{who}(\lambda x.\textbf{ate}\,y\,x)}\end{array}$$

Reconstruction effects

(22) a. Which of his$_i$ relatives does everyone$_i$ love __?
b. the relative of his$_i$ that everyone$_i$ loves __

(23) a. *Which of her$_i$ relatives __ loves everyone$_i$?
b. *the relative of hers$_i$ who __ loves everyone$_i$

(24) a. Which strings did John pull?
b. the strings that John pulled

(25) a. Which picture of herself does Mary like?
b. the picture of herself that Mary likes

(26) a. Which pictures of each other did they like?
b. the pictures of each other that they liked

Reconstructing quantificational binding in a question

(27) Which of his$_i$ relatives does everyone$_i$ love __?

(28)

$$\frac{\dfrac{\dfrac{((\mathsf{DP}/\mathsf{N})?\mathsf{S})_F \mid \mathsf{S}}{\mathsf{DP}\triangleright\mathsf{S} \mid \mathsf{DP}\triangleright\mathsf{S}}}{\begin{array}{c}\mathsf{DP}/\mathsf{N}\\ \textit{which}\\ \mathbf{which}(\lambda f.[\,])\end{array}}}{\dfrac{[\,]}{f}} \left(\frac{\dfrac{\dfrac{\mathsf{S} \mid \mathsf{S}}{\mathsf{DP}\triangleright\mathsf{S} \mid \mathsf{DP}\triangleright\mathsf{S}}}{\begin{array}{c}\mathsf{N}/\mathsf{DP}\\ \textit{relative-of}\end{array}}}{\dfrac{[\,]}{[\,]}}\ \mathbf{rel} \quad \frac{\dfrac{\dfrac{\mathsf{S} \mid \mathsf{S}}{\mathsf{DP}\triangleright\mathsf{S} \mid \mathsf{S}}}{\begin{array}{c}\mathsf{DP}\\ \textit{his}\end{array}}}{\dfrac{[\,]}{\lambda z.[\,]}}\ z \right) = \frac{\dfrac{\dfrac{((\mathsf{DP}/\mathsf{N})?\mathsf{S})_F \mid \mathsf{S}}{\mathsf{DP}\triangleright\mathsf{S} \mid \mathsf{S}}}{\begin{array}{c}\mathsf{DP}\\ \textit{which rel of his}\\ \mathbf{which}(\lambda f.[\,])\end{array}}}{\dfrac{\lambda z.[\,]}{f(\mathbf{rel}\, z)}}$$

$$\equiv \underset{\textit{which rel of his}}{((\mathsf{DP}/N)?\mathsf{S})_F /\!\!/ (\mathsf{pn}\backslash\!\!\backslash\mathsf{S})} \overset{\text{FRONT}}{\Rightarrow} \underset{\textit{which rel of his}}{((\mathsf{DP}/N)?\mathsf{S})/(\mathsf{pn}\backslash\!\!\backslash\mathsf{S})}$$

(29)

$$\frac{\dfrac{\mathsf{pn}\backslash\mathsf{S} \mid \mathsf{pn}\backslash\mathsf{S}}{\mathsf{S} \mid \mathsf{DP}\triangleright\mathsf{S}}}{\mathsf{DP}} \quad \textit{everyone} \quad \frac{[\,]}{\dfrac{\forall y.[\,]y}{y}} \qquad \left(\frac{\dfrac{\mathsf{pn}\backslash\mathsf{S} \mid \mathsf{pn}\backslash\mathsf{S}}{\mathsf{DP}\triangleright\mathsf{S} \mid \mathsf{DP}\triangleright\mathsf{S}}}{(\mathsf{DP}\backslash\mathsf{S})/\mathsf{DP}} \quad \textit{love} \quad \frac{[\,]}{\dfrac{[\,]}{\mathbf{love}}} \qquad \frac{\dfrac{\mathsf{pn}\backslash\mathsf{S} \mid \mathsf{S}}{\mathsf{DP}\triangleright\mathsf{S} \mid \mathsf{S}}}{\mathsf{DP}} \quad \underline{\quad} \quad \frac{\lambda\mathscr{P}.[\,]}{\dfrac{\mathscr{P}(\lambda w.[\,])}{w}} \right)$$

$$= \frac{\dfrac{\mathsf{pn}\backslash\mathsf{S} \mid \mathsf{S}}{\mathsf{S} \mid \mathsf{S}}}{\mathsf{S}} \quad \textit{(does) everyone love} \quad \underline{\quad} \quad \frac{\lambda\mathscr{P}.[\,]}{\dfrac{\forall y.(\mathscr{P}(\lambda w.[\,]))\,y}{\mathbf{love}\,w\,y}} \qquad \text{LOWER} \quad \Rightarrow \quad \frac{\mathsf{pn}\backslash\mathsf{S}}{\textit{(does) everyone love} \quad \underline{\quad} \quad \lambda\mathscr{P}.\forall y.(\mathscr{P}(\lambda w.\mathbf{love}\,w\,y))\,y}$$

(30)

((DP/N)?S)/(pn\S)	pn\S
which relative of his	*does everyone love __*
$\lambda\gamma.\mathbf{which}(\lambda f.\gamma(\lambda\kappa\lambda z.\kappa(f(\mathbf{rel}\,z))))$	$\lambda\mathscr{P}.\forall y.\mathscr{P}(\lambda w(\mathbf{love}\,w\,y))\,y$

(31)

$$(\lambda\gamma.\mathbf{which}(\lambda f.\gamma(\underline{\lambda\kappa\lambda z.\kappa(f(\mathbf{rel}\,z))})))(\lambda\mathscr{P}.\forall y.\mathscr{P}(\lambda w.\mathbf{love}\,w\,y)\,y)$$
$$\rightsquigarrow \mathbf{which}(\lambda f.(\lambda\mathscr{P}.\forall y.\mathscr{P}(\lambda w.\mathbf{love}\,w\,y)\,y)\underline{(\lambda\kappa\lambda z.\kappa(f(\mathbf{rel}\,z)))})$$
$$\rightsquigarrow \mathbf{which}(\lambda f.\forall y.\underline{(\lambda\kappa\lambda z.\kappa(f(\mathbf{rel}\,z)))}(\lambda w.\mathbf{love}\,w\,y)\,y)$$
$$\rightsquigarrow \mathbf{which}(\lambda f.\forall y.\mathbf{love}(f(\mathbf{rel}\,y))\,y)$$

Despite reconstruction, crossover effects remain in force

(32) a. Which relative of his does everyone __ love?
b. ?Which of his$_i$ relatives __ loves everyone?

Quantifier must linearly precede the *reconstructed* pronoun

Principle C effects are not expected

(33) *He$_i$ likes John$_i$'s friends.

(34) Which of John$_i$'s friends does he$_i$ like __?

(35) a. Which biography of Picasso$_i$ do you think he$_i$ wants to read?
b. Which witness's attack on Lee$_i$ did he$_i$ try to get expunged from the trial records?
c. Whose criticism of Lee$_i$ did he$_i$ choose to ignore?

Reconstruction into relative clauses

(36) a. [Which relative of his] does everyone love __?
b. [the relative of his] that everyone loves __

(37)

$\frac{((\mathsf{DP}/\mathsf{N})?\mathsf{S})_F \mid \mathsf{S}}{\mathsf{DP}/\mathsf{N}}$	$\frac{\mathsf{DP}_F \mid \mathsf{S}}{\mathsf{DP}/\mathsf{N}}$
which	*the*
$\mathbf{which}(\lambda f.[\,])$	$\mathbf{the}(\lambda f.[\,])$
f	f

(38) a. Which relative of his does everyone love __?
b. $\mathbf{which}(\lambda f.\forall y.\mathbf{love}(f(\mathbf{rel}\,y))\,y)$

(39) a. the relative of his that everyone loves __
b. $\mathbf{the}(\lambda f.\forall y.\mathbf{love}(f(\mathbf{rel}\,y))\,y)$

Relative pronouns with pied piping

(40) Relative pronouns: $\dfrac{\dfrac{(A \backslash\!\!\backslash S)_F \mid S}{A}}{\textit{who(se)/which}}$ $\dfrac{\lambda x.[\ ]}{x}$

(41) a. the man [who] John saw
b. the man [whose mother] John saw
c. the man [the mother of whom] John saw

(42) John is a man [[whose opinion of her$_i$] every woman$_i$ respects __]

(43) a theory [[every proponent$_i$ of which] {?he$_i$/?his$_i$ advisor} cites __]

Idiom chunks

(44) a. How much care did Mary say that John took of Bill?
b. the lip service that Mary said that John paid to civil liberties

(45)

$$\left(\begin{array}{cc} \dfrac{((\mathsf{DP}/\mathsf{N})?\mathsf{S})_F \mid \mathsf{S}}{\dfrac{\mathsf{DP}_\gamma/\mathsf{N}_\gamma}{\begin{array}{c}\textit{which}\\ \textbf{which}(\lambda f.[\,])\end{array}}\ f} & \dfrac{\mathsf{S} \mid \mathsf{S}}{\dfrac{\mathsf{N}_{str}}{\begin{array}{c}\textit{strings}\\ [\,]\end{array}}\ \textbf{connections}} \end{array}\right)$$

$$\left(\begin{array}{cc} \dfrac{\mathsf{DP}_{str}\backslash\mathsf{S} \mid \mathsf{DP}_{str}\backslash\mathsf{S}}{\dfrac{\mathsf{DP}}{\begin{array}{c}\textit{John}\\ [\,]\end{array}}\ \textbf{j}} & \left(\begin{array}{cc} \dfrac{\mathsf{DP}_{str}\backslash\mathsf{S} \mid \mathsf{DP}_{str}\backslash\mathsf{S}}{\dfrac{(\mathsf{DP}\backslash\mathsf{S})/\mathsf{DP}_{str}}{\begin{array}{c}\textit{pull}\\ [\,]\end{array}}\ \textbf{use}} & \dfrac{\mathsf{DP}_{str}\backslash\mathsf{S} \mid \mathsf{S}}{\dfrac{\mathsf{DP}_{str}}{\begin{array}{c}\_\_\\ \lambda x.[\,]\end{array}}\ x} \end{array}\right) \end{array}\right)$$

Reflexives and each other anaphors

(46) a. John liked a picture of himself.
b.*Mary liked a picture of himself.
c.*John claimed Mary liked a picture of himself.
d.*A picture of himself was liked by John.

(47) a. Which picture of himself does John like __?
b. the picture of herself that Mary likes __

(48)

$$\frac{\mathsf{DP\backslash S} \mid \mathsf{DP\backslash S}}{\mathsf{(DP\backslash S)/DP}} \quad \frac{\mathsf{DP\backslash S} \mid \mathsf{DP\backslash S}}{\mathsf{DP}} \quad \frac{\mathsf{DP\backslash S} \mid \mathsf{DP\backslash S}}{\mathsf{DP\backslash S}}$$

$$\textit{saw} \qquad \textit{himself} \qquad = \qquad \textit{saw himself}$$

$$\frac{[\ ]}{\mathbf{saw}} \quad \frac{\lambda x.[\ ]x}{x} \quad \frac{\lambda x.[\ ]x}{\mathbf{saw}\,x}$$

$$\overset{\text{LOWER}}{\Rightarrow} \quad \begin{array}{c} \mathsf{DP\backslash S} \\ \textit{saw himself} \\ \lambda x.\mathbf{saw}\,x\,x \end{array}$$

(49) Which picture of himself did John see?

(50)

$$\begin{array}{c} \begin{array}{c|c} ((\mathsf{DP/N})?\mathsf{S})_F & \mathsf{S} \\ \hline \mathsf{DP}\backslash\mathsf{S} & \mathsf{DP}\backslash\mathsf{S} \\ \hline \end{array} \\ \mathsf{DP/N} \\ \textit{which} \\ \dfrac{\mathbf{which}(\lambda f.[\ ])}{\dfrac{[\ ]}{f}} \end{array} \qquad \begin{array}{c} \begin{array}{c|c} \mathsf{S} & \mathsf{S} \\ \hline \mathsf{DP}\backslash\mathsf{S} & \mathsf{DP}\backslash\mathsf{S} \\ \hline \end{array} \\ \mathsf{N} \\ \textit{picture of himself} \\ \dfrac{[\ ]}{\dfrac{\lambda x.[\ ]x}{\mathbf{pic}\, x}} \end{array}$$

$$\overset{\text{FRONT}}{\Rightarrow} \quad \begin{array}{c} ((\mathsf{DP/N})?\mathsf{S})/(\dfrac{\mathsf{DP}\backslash\mathsf{S} \mid \mathsf{DP}\backslash\mathsf{S}}{\mathsf{DP}} \mathbin{\backslash\!\!\backslash} \mathsf{S}) \\ \textit{which picture of himself} \\ \lambda\gamma.\mathbf{which}(\lambda f.\gamma(\dfrac{\lambda x.[\ ]x}{f(\mathbf{pic}\, x)})) \end{array}$$

(51) a. Which picture of himself does John claim Mary liked __?
b. *John claimed Mary liked a picture of himself.

(52) a. Which of each other's papers did they read __?
b. the descriptions of each other that they offered __

Conclusions concerning reconstruction

(53)

$$\boxed{\begin{array}{c}\text{FRONT}\\ A_F /\!\!/ B \quad \Rightarrow \quad A/B\end{array}}$$