Sluicing as anaphora to a scope remnant

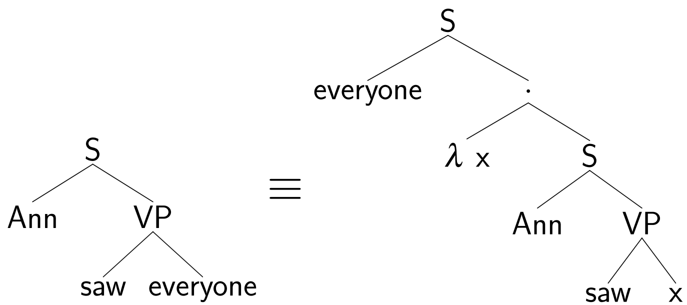
Chris Barker, *NYU*

Synopsis: I argue that sluicing is anaphora to a continuation, that is, to a constituent missing a piece. When a DP takes scope over a clause, it creates the right kind of antecedent. The prediction is that sluicing is sensitive to scope islands, but not to overt-movement islands.

Quantifier Raising: a logical inference?

- Montague 1973: Quantifying In: (2661 citations)
- May 1978,1985: Quantifier Raising (QR): (2866 citations)

$$\text{Montague}\downarrow \quad \frac{\text{everyone}(\lambda x.\text{Ann saw } x) \vdash S}{\text{Ann saw everyone} \vdash S} \quad \uparrow \text{May}$$



Richard Montague

Robert May

Today's question: *How to incorporate QR into a genuine logic?*

Lambek's substructural logic NL for natural language

Without Exchange, '$\rightarrow$' splits into '\' and '/'

- **Formulas:** $\mathscr{F} \;=\; \text{DP} \mid \text{S} \mid \mathscr{F}\backslash\mathscr{F} \mid \mathscr{F}/\mathscr{F}$
- **Structures:** $\mathscr{S} \;=\; \mathscr{F} \mid \mathscr{S}\cdot\mathscr{S}$
- **Sequents:** $\mathscr{S} \vdash \mathscr{F}$
- **Logical rules:**

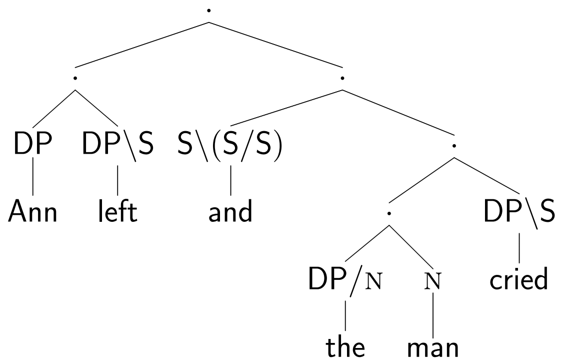
$$\frac{\Gamma\vdash A \quad \Sigma[B]\vdash C}{\Sigma[\Gamma\cdot A\backslash B]\vdash C}\backslash L \qquad \frac{A\cdot\Gamma\vdash B}{\Gamma\vdash A\backslash B}\backslash R$$

$$\frac{\Gamma\vdash A \quad \Sigma[B]\vdash C}{\Sigma[B/A\cdot\Gamma]\vdash C}/L \qquad \frac{\Gamma\cdot A\vdash B}{\Gamma\vdash B/A}/R$$

Structural rules: none! (Cut baked in)

How context notation works in inference rules

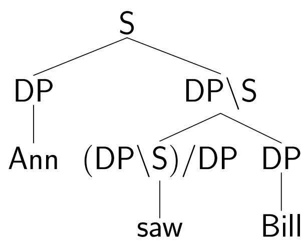
- Capital Greek letters (Δ, Γ, Σ) stand for complete structures
- '$\Sigma[\Delta]$' $\equiv$ Σ containing a distinguished instance of Δ
- '$\Sigma[\Gamma \cdot A\backslash B]$' matches the structure below in two ways:
  - [Ann · DP\S] · (and ((the · man) · cried))
  - (Ann · left) · (and · [(the · man) · DP\S])



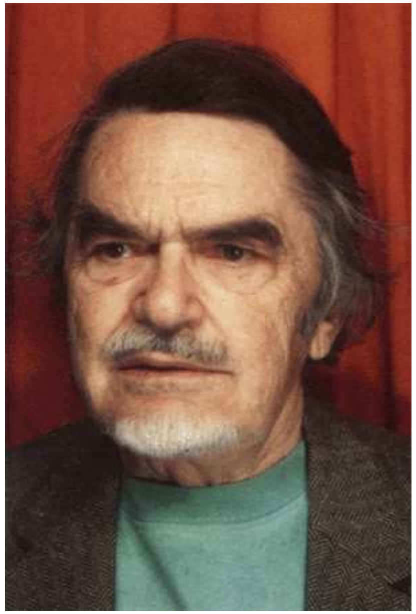
An example derivation of Ann saw Bill

(1)
$$\dfrac{\dfrac{\mathsf{DP} \vdash \mathsf{DP} \qquad \dfrac{\mathsf{DP} \vdash \mathsf{DP} \quad \mathsf{S} \vdash \mathsf{S}}{\mathsf{DP} \cdot \mathsf{DP}\backslash \mathsf{S} \vdash \mathsf{S}}\backslash L}{\mathsf{DP} \cdot ((\mathsf{DP}\backslash \mathsf{S})/\mathsf{DP} \cdot \mathsf{DP}) \vdash \mathsf{S}}/L}{\mathsf{Ann} \cdot (\mathsf{saw} \cdot \mathsf{Bill}) \vdash \mathsf{S}}\text{LEX}$$

(2)



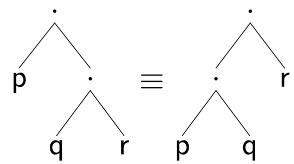
(3) a. Curry-Howard: L rules correspond to function application
b. **saw**(**bill**)(**ann**)



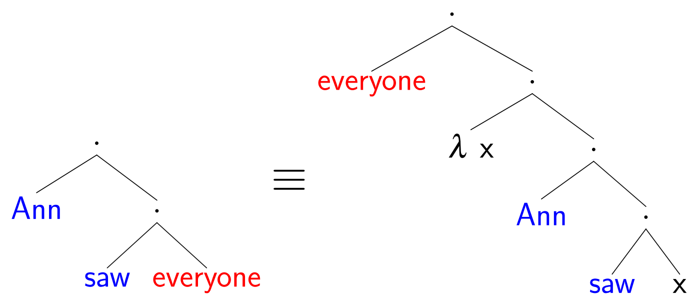
Joachim Lambek

Adding a structural rule for QR

Associativity: $p \cdot (q \cdot r) \equiv (p \cdot q) \cdot r$



Quantifier Raising: $\Sigma[\Delta] \equiv \Delta \cdot \lambda x \Sigma[x]$



$\mathbf{NL}_{QR}$: NL with Quantifier Raising

- **Variables:** $\mathscr{V} \;=\; x \mid y \mid z \mid \ldots$
- **Formulas:** $\mathscr{F} \;=\; \mathsf{DP} \mid \mathsf{S} \mid \mathscr{F}\backslash\mathscr{F} \mid \mathscr{F}/\mathscr{F}$
- **Structures:** $\mathscr{S} \;=\; \mathscr{F} \mid \mathscr{S}\cdot\mathscr{S} \mid \mathscr{V} \mid \lambda\mathscr{V}\mathscr{S}$
- **Sequents:** $\mathscr{S} \vdash \mathscr{F}$
- **Logical rules:**

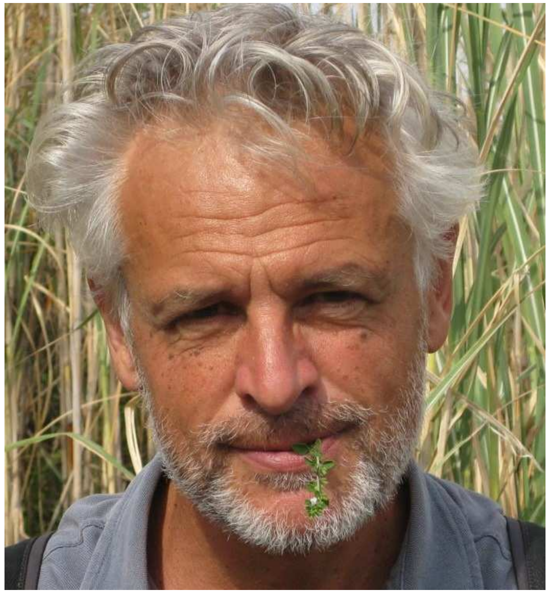
$$\dfrac{\Gamma\vdash A \quad \Sigma[B]\vdash C}{\Sigma[\Gamma\cdot A\backslash B]\vdash C}\,\backslash L \qquad\qquad \dfrac{A\cdot\Gamma\vdash B}{\Gamma\vdash A\backslash B}\,\backslash R$$

$$\dfrac{\Gamma\vdash A \quad \Sigma[B]\vdash C}{\Sigma[B/A\cdot\Gamma]\vdash C}\,/L \qquad\qquad \dfrac{\Gamma\cdot A\vdash B}{\Gamma\vdash B/A}\,/R$$

- **Structural rule:** $\Sigma[\Delta] \equiv_{QR} \Delta\cdot\lambda x\Sigma[x]$

Linear: !1 var per lambda; x chosen fresh

Scope-taking as a syntactic mode of combination



Michael Moortgat

Works great!

$$\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\vdots}{\mathsf{Ann}\cdot(\mathsf{saw}\cdot\mathsf{DP})\vdash\mathsf{S}}}{\mathsf{DP}\cdot\lambda x\,(\mathsf{Ann}\cdot(\mathsf{saw}\cdot x))\vdash\mathsf{S}}\,\mathrm{QR}}{\lambda x\,(\mathsf{Ann}\cdot(\mathsf{saw}\cdot x))\vdash\mathsf{DP}\backslash\mathsf{S}}\,\backslash R \quad \mathsf{S}\vdash\mathsf{S}}{\dfrac{\mathsf{S}/(\mathsf{DP}\backslash\mathsf{S})\cdot\lambda x\,(\mathsf{Ann}\cdot(\mathsf{saw}\cdot x))\vdash\mathsf{S}}{\dfrac{\mathsf{everyone}\cdot\lambda x\,(\mathsf{Ann}\cdot(\mathsf{saw}\cdot x))\vdash\mathsf{S}}{\mathsf{Ann}\cdot(\mathsf{saw}\cdot\mathsf{everyone})\vdash\mathsf{S}}\,\mathrm{QR}}\,\mathrm{LEX}}\,/L$$

...including the Curry-Howard labeling for the semantics:

$$\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\vdots}{\mathbf{ann}\cdot(\mathbf{saw}\cdot y)\vdash\mathbf{saw}\,y\,\mathbf{ann}}}{y\circ\lambda x(\mathbf{ann}\cdot(\mathbf{saw}\cdot x))\vdash\mathbf{saw}\,y\,\mathbf{ann}}\,\mathrm{QR}}{\lambda x(\mathbf{ann}\cdot(\mathbf{saw}\cdot x))\vdash\lambda y.\mathbf{saw}\,y\,\mathbf{ann}}\,\backslash R \quad p\vdash p}{\dfrac{Q\circ\lambda x(\mathbf{ann}\cdot(\mathbf{saw}\cdot x))\vdash Q(\lambda y.\mathbf{saw}\,y\,\mathbf{ann})}{\dfrac{\mathbf{everyone}\circ\lambda x(\mathbf{ann}\cdot(\mathbf{saw}\cdot x))\vdash\mathbf{everyone}(\lambda y.\mathbf{saw}\,y\,\mathbf{ann})}{\mathbf{ann}\cdot(\mathbf{saw}\cdot\mathbf{everyone})\vdash\mathbf{everyone}(\lambda y.\mathbf{saw}\,y\,\mathbf{ann})}\,\mathrm{QR}}\,\mathrm{LEX}}\,/L$$

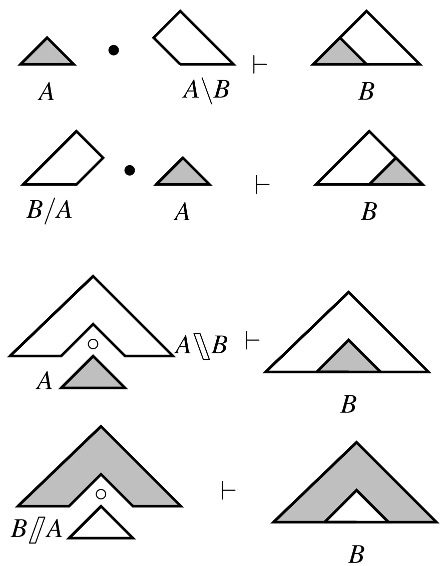
Two modes of syntactic combination

(4) $\rightarrow$

(5) $\leftarrow$

(6) $\uparrow$

(7) $\downarrow$



Compare with tangram diagrams in Moortgat 1996b

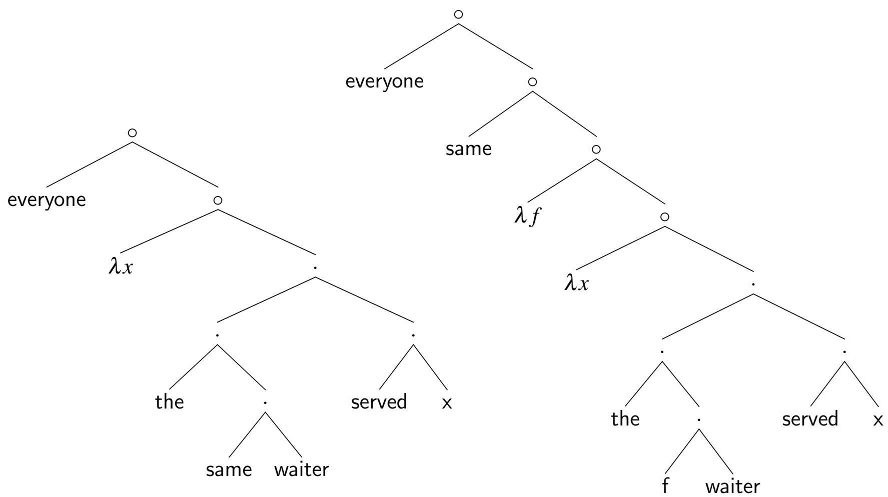
Parasitic scope: sentence-internal same

(8) a. The same waiter served everyone. [Stump, Heim]
b. There is a (unique) waiter x such that x served everyone.

$$\begin{array}{cl}
\vdots & \\
(\mathsf{the}\cdot(\mathrm{A}\cdot\mathsf{waiter}))\cdot(\mathsf{served}\cdot\mathsf{DP})\vdash\mathsf{S} & \\ \hline
\mathsf{DP}\circ\lambda x((\mathsf{the}\cdot(\mathrm{A}\cdot\mathsf{waiter}))\cdot(\mathsf{served}\cdot x))\vdash\mathsf{S} & \lambda \\ \hline
\lambda x((\mathsf{the}\cdot(\mathrm{A}\cdot\mathsf{waiter}))\cdot(\mathsf{served}\cdot x))\vdash\mathsf{DP}\backslash\!\!\backslash\mathsf{S} & \backslash\!\!\backslash R \\ \hline
\mathrm{A}\circ\lambda y\lambda x((\mathsf{the}\cdot(y\cdot\mathsf{waiter}))\cdot(\mathsf{served}\cdot x))\vdash\mathsf{DP}\backslash\!\!\backslash\mathsf{S} & \lambda \\ \hline
\lambda y\lambda x((\mathsf{the}\cdot(y\cdot\mathsf{waiter}))\cdot(\mathsf{served}\cdot x))\vdash\mathrm{A}\backslash\!\!\backslash(\mathsf{DP}\backslash\!\!\backslash\mathsf{S}) \quad \mathsf{DP}\backslash\!\!\backslash\mathsf{S}\vdash\mathsf{DP}\backslash\!\!\backslash\mathsf{S} & \backslash\!\!\backslash R \\ \hline
(\mathsf{DP}\backslash\!\!\backslash\mathsf{S})/\!\!/(\mathrm{A}\backslash\!\!\backslash(\mathsf{DP}\backslash\!\!\backslash\mathsf{S}))\circ\lambda y\lambda x((\mathsf{the}\cdot(y\cdot\mathsf{waiter}))\cdot(\mathsf{served}\cdot x))\vdash\mathsf{DP}\backslash\!\!\backslash\mathsf{S} & /\!\!/L \\ \hline
\mathsf{same}\circ\lambda y\lambda x((\mathsf{the}\cdot(y\cdot\mathsf{waiter}))\cdot(\mathsf{served}\cdot x))\vdash\mathsf{DP}\backslash\!\!\backslash\mathsf{S} \quad \mathsf{S}\vdash\mathsf{S} & \mathrm{LEX} \\ \hline
\mathsf{S}/\!\!/(\mathsf{DP}\backslash\!\!\backslash\mathsf{S})\circ(\mathsf{same}\circ\lambda y\lambda x((\mathsf{the}\cdot(y\cdot\mathsf{waiter}))\cdot(\mathsf{served}\cdot x))\vdash\mathsf{S} & /\!\!/L \\ \hline
\mathsf{everyone}\circ(\mathsf{same}\circ\lambda y\lambda x((\mathsf{the}\cdot(y\cdot\mathsf{waiter}))\cdot(\mathsf{served}\cdot x))\vdash\mathsf{S} & \mathrm{LEX} \\ \hline
\mathsf{everyone}\circ\lambda x((\mathsf{the}\cdot(\mathsf{same}\cdot\mathsf{waiter}))\cdot(\mathsf{served}\cdot x))\vdash\mathsf{S} & \lambda \\ \hline
(\mathsf{the}\cdot(\mathsf{same}\cdot\mathsf{waiter}))\cdot(\mathsf{served}\cdot\mathsf{everyone})\vdash\mathsf{S} & \lambda
\end{array}$$

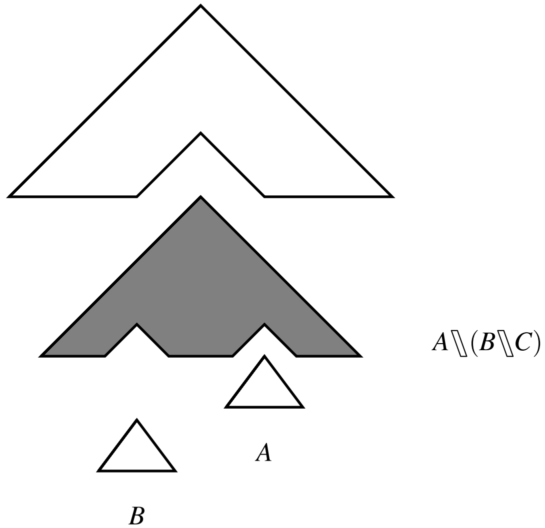
Details in Barker 2007; not derivable in MM96

Parasitic scope in tree format



Parasitic scope in schematic format

(9)



Grey constituent $\sim$ string with two points of discontinuity

Other phenomena with a parasitic scope analysis

(10) a. Anaphora: Morrill, Fadda & Valentín 2011
b. *he*: $(\mathsf{DP}\backslash\!\!\backslash\mathsf{S})/\!\!/(\mathsf{DP}\backslash\!\!\backslash(\mathsf{DPS}))$
c. Everyone thinks he is smart.
d. $\mathsf{everyone}\circ(\mathsf{he}\circ\lambda y\lambda x(x\cdot(\mathsf{thinks}\cdot(y\cdot(\mathsf{is}\cdot\mathsf{smart})))))\vdash\mathsf{S}$

(11) a. *Average*: Kennedy and Stanley 2009
b. The average American has 2.3 kids.
c. $\mathsf{2.3}\circ(\mathsf{avg}\circ\lambda f\lambda n((\mathsf{the}\cdot(f\cdot\mathsf{Am'n}))\cdot(\mathsf{has}\cdot(n\cdot\mathsf{kids}))))$

(12) a. Fancy coordination: Kubota & Levine (various papers)
b. I said the same thing to Terry on Mon and to Kim on Tue.
c. $\neq$ I said the same thing to Terry on Monday and ~~I said the same thing~~ to Kim on Tuesday.

(13) a. Remnant comparatives: Pollard and Smith 2013
b. Ann owes Bill more than Clara.

Kubota and Levine's workshop in week 2!

Recursive scope

(14) a. Solomon 2009
b. Ann and Bill know [some of the same people].
c. There is a set of people X such that Ann knows some of X and Bill knows some of X.
d. No guarantee that Ann and Bill know anyone in common!
e. Solomon: *same*:$((\mathrm{DP}\backslash\!\!\backslash \mathrm{S}) /\!\!/ (\mathrm{DP}\backslash\!\!\backslash(\mathrm{DP}\backslash\!\!\backslash \mathrm{S}))) /\!\!/ (\mathrm{A}\backslash\!\!\backslash \mathrm{DP})$

(15)
$$\dfrac{\dfrac{\dfrac{\text{they} \circ ((\text{same} \circ \lambda x(\text{some} \cdot (\text{of} \cdot (\text{the} \cdot (x \cdot \text{people}))))) \circ \lambda zy(y \cdot (\text{know} \cdot z))) \vdash \mathrm{S}}{\text{they} \circ \lambda y(y \cdot (\text{know} \cdot (\text{same} \circ \lambda x(\text{some} \cdot (\text{of} \cdot (\text{the} \cdot (x \cdot \text{people})))))))) \vdash \mathrm{S}}\lambda}{\text{they} \cdot (\text{know} \cdot (\text{same} \circ \lambda x(\text{some} \cdot (\text{of} \cdot (\text{the} \cdot (x \cdot \text{people})))))) \vdash \mathrm{S}}\lambda}{\text{they} \cdot (\text{know} \cdot (\text{some} \cdot (\text{of} \cdot (\text{the} \cdot (\text{same} \cdot \text{people}))))) \vdash \mathrm{S}}\lambda$$

lancet liver fluke (Dicrocoelium dendriticum)

Sluicing as anaphora to an anti-constituent

(1) Someone left, but I don't know [who __].

(2) [Someone$_{\text{INNER ANTECEDENT}}$ left]$_{\text{OUTER ANTECEDENT}}$,
but I don't know [who$_{\text{WH}}$ SLUICEGAP]$_{\text{SLUICE}}$.

$$\begin{aligned}\text{sluice} &= \text{wh-phrase} + (\text{antecedent-clause} - \text{inner-antecedent})\\ &= \text{who} + ([\text{someone left}] - \text{someone})\\ &= \text{who} + [\_\_ \text{ left}]\end{aligned}$$

- The outer antecedent with the inner antecedent removed
- The remnant of the outer antecedent after the inner antecedent has taken scope (i.e., a nuclear scope)
- The complement of the inner antecedent with respect to the outer antecedent, i.e., an anti-constituent
- The delimited continuation of the inner antecedent wrt to the outer antecedent

Three comparison analyses: structured silence?

Some analyses of sluicing assume that the sluice ellipsis site contains a silent object that has internal structure:

- **LF copying**: Chung, Ladusaw and McCloskey 1995
  - Re-use ("recycle") the Logical Form of the antecedent
  - Builds silent structure inside sluicegap
- **PF Deletion**: Merchant 2001
  - Build any IP you want to. Move the WH out; delete the remainder if there is a certain kind of semantic equivalence with the antecedent

Other analyses propose that sluicing is a kind of anaphora:

- **Anaphora**: Jäger 2005
  - Antecedent: clause containing an indefinite
  - No internal structure to silence

Three puzzles to use for comparing analyses

Case matching: the case of the WH element in the sluice must match the case of the inner antecedent.

(4) Er will jemandem schmeicheln, aber sie wissen nicht, {*wen / wem}.
he wants someone.DAT flatter but they know not {who.ACC / who.DAT}
'He wants to flatter someone, but they don't know who.'

(5) Er will jemanden loben, aber sie wissen nicht, {wen / *wem}.
he wants someone.ACC praise but they know not {who.ACC / who.DAT}
'He wants to praise someone, but they don't know who.'

Island insensitivity: the inner antecedent can be embedded within an island for WH-movement.

(6) He wants a detailed list, but I don't know how detailed
[~~he wants a __ list~~] (* if pronounced)

(7) Bo talked to the people who discovered something,
but we don't know what
[~~Bo talked to the people who discovered __~~].

Sprouting: sometimes there is no overt inner antecedent

(10) John left, but I don't know when.

Claims about silent structure: LF recycling

Chung, Ladusaw and McCloskey 1995:240–6:

> IP **recycling** can be thought of as copying the LF of some discourse-available IP into the empty IP position. ... In [some cases], the recycled IP does not come supplied with a syntactic position for the displaced [WH] constituent to bind. When such a position does not already exist, it must be created, by an additional part of the recycling process we call **sprouting**.

- Case matching: OK: The WH is base-generated, and must bind (be coindexed with) some DP inside the reconstructed sluice. This kind of binding must be sensitive to case.
- Island insensitivity: ☺ Being bound is not island-sensitive.
- Sprouting: Well... As long as the reconstructed LF obeys all of the selectional and other syntactic constraints of antecedent, sprouting is ok (see quotation above).

Claims about silent structure: PF Deletion

Merchant 2001 (PF Deletion): Sluicing involves movement of a wh-phrase out of a sentential [IP or FocP] constituent... followed by deletion of that node.

Mutual entailment restriction: clause can be deleted iff the antecedent and the deletion target mutually entail each other, modulo existential focus-closure.

- Case matching: ☺ Since the WH originated in-situ, then moved, it will show all of the case matching properties of ordinary wh-movement.
- Island insensitivity: Well... Must decide that remaining unpronounced rescues island violations
- Sprouting: ☺ There is no such thing as sprouting distinct from other types of sluicing. Generate any sluice you want; as long as it mutually entails the existential focus closure of the antecedent, no problem.

Voice alternations...

Jäger's 2001, 2005 anaphoric approach

$$\frac{X \Rightarrow M : A \qquad Y, x : A, Z, y : B, W \Rightarrow N : C}{Y, X, Z, w : B|A, W \Rightarrow N[M/x][wM/y] : C}\,[|L]$$

$$\frac{X, x : A, Y \Rightarrow M : B}{X, y : A|C, Y \Rightarrow \lambda z.M[yz/x] : B|C}\,[|R]$$

$$\frac{X, x : A, Y \Rightarrow M : B}{X, y : C \leadsto A, Y \Rightarrow \lambda z.M[yz/x] : C \leadsto B}\,[\leadsto]$$

a. A cup moved
b. a – $\lambda P x_{Px}.x : (np \leadsto np)/n$
c. $y : (np \leadsto np)/n, z : n, w : np\backslash s \Rightarrow \lambda u.w(yzu) : np \leadsto s$

a. which cup moved
b. which – $q/(s \uparrow np)/n$

which – $q|(np \leadsto s)/n : \lambda PQ?x.Px \wedge Q^{+}x$

Jäger's 2001, 2005 anaphoric approach, cont'd

- Indefinites contribute an unbound variable.
- Presence of unbound variables must be registered on category of containing clause (e.g., 'S^{DP}').
- WH words (e.g., *who*) ambiguous between normal version and a sluice version anaphoric to S^{DP}.

Status with respect to the three puzzles:

- Case matching: OK: Some anaphora must be sensitive to case ($S^{DP_{ACC}}$).
- Island insensitivity: ☺ unbound variables insensitive to islands.
- Sprouting: Oops! Analysis requires overt indefinite inner antecedent.

(8) Even overt inner antecedents need not be indefinite:
[John or Mary] left, but I don't know which one. (AnderBois)

Preview of the account here

- Inner antecedent must take scope over the antecedent clause.
- Sluicegap silent proform anaphoric to scope remnant

- Case matching: OK: Some anaphora must be sensitive to case.
- Island insensitivity: ☺ scopability independent of syntactic islands
- Sprouting: ☺ Reasonable assumptions explain sprouting

Summary of theoretical landscape:

	Case matching	Island insensitivity	Sprouting
LF Copying	OK	☺	Well ...
PF Deletion	☺	Well ...	☺
Indef. Anaphora	OK	☺	Oops!
Anaphora to continuation	OK	☺	☺

Quantificational binding as parasitic scope

An analysis inspired by a parallel proposal in Morrill, Fadda & Valentín 2007:52: *he* $= \lambda\kappa\lambda x.\kappa xx : (\text{DP}\backslash\!\!\backslash\text{S})/\!\!/(\text{DP}\backslash\!\!\backslash(\text{DP}\backslash\!\!\backslash\text{S}))$.

$$\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\text{DP}\cdot(\text{said}\cdot(\text{DP}\cdot\text{left}))\vdash\text{S}}{\text{DP}\circ\lambda x(x\cdot(\text{said}\cdot(\text{DP}\cdot\text{left})))\vdash\text{S}}\equiv}{\lambda x(x\cdot(\text{said}\cdot(\text{DP}\cdot\text{left})))\vdash\text{DP}\backslash\!\!\backslash\text{S}}\backslash\!\!\backslash R}{\text{DP}\circ\lambda y\lambda x(x\cdot(\text{said}\cdot(y\cdot\text{left})))\vdash\text{DP}\backslash\!\!\backslash\text{S}}\equiv}{\lambda y\lambda x(x\cdot(\text{said}\cdot(y\cdot\text{left})))\vdash\text{DP}\backslash\!\!\backslash(\text{DP}\backslash\!\!\backslash\text{S})}\backslash\!\!\backslash R\quad\dfrac{\dfrac{\text{DP}\backslash\!\!\backslash\text{S}\vdash\text{DP}\backslash\!\!\backslash\text{S}\qquad\text{S}\vdash\text{S}}{\text{S}/\!\!/(\text{DP}\backslash\!\!\backslash\text{S})\circ(\text{DP}\backslash\!\!\backslash\text{S})\vdash\text{S}}\backslash\!\!\backslash L}{\text{everyone}\circ(\text{DP}\backslash\!\!\backslash\text{S})\vdash\text{S}}\text{LEX}}{\text{everyone}\circ((\text{DP}\backslash\!\!\backslash\text{S})/\!\!/(\text{DP}\backslash\!\!\backslash(\text{DP}\backslash\!\!\backslash\text{S})))\circ\lambda y\lambda x(x\cdot(\text{said}\cdot(y\cdot\text{left})))\vdash\text{S}}\backslash\!\!\backslash L}{\text{everyone}\circ(\text{he}\circ\lambda y\lambda x(x\cdot(\text{said}\cdot(y\cdot\text{left}))))\vdash\text{S}}\text{LEX}}{\text{everyone}\circ\lambda x(x\cdot(\text{said}\cdot(\text{he}\cdot\text{left})))\vdash\text{S}}\text{LEX}}{\text{everyone}\cdot(\text{said}\cdot(\text{he}\cdot\text{left}))\vdash\text{S}}\equiv$$

$$\begin{aligned}&\textbf{everyone}((\lambda\kappa\lambda x.\kappa xx)(\lambda y\lambda x.\textbf{said}(\textbf{left}\,x)\,y))\\=\ &\textbf{everyone}(\lambda z.\textbf{said}(\textbf{left}\,z)\,z)=(\lambda P\forall x.Px)(\lambda z.\textbf{said}(\textbf{left}\,z)\,z)\\&=\forall x.\textbf{said}(\textbf{left}\,x)\,x\end{aligned}$$

Verb phrase ellipsis (VPE) as parasitic scope

DP*he*: $\lambda\kappa\lambda x.\kappa xx : (\text{DP}\backslash\!\!\backslash\text{S})/\!\!/(\text{DP}\backslash\!\!\backslash(\text{DP}\backslash\!\!\backslash\text{S}))$

VPE: $\lambda\kappa\lambda x.\kappa xx : ((\text{DP}\backslash\text{S})\backslash\!\!\backslash\text{S})/\!\!/((\text{DP}\backslash\text{S})\backslash\!\!\backslash((\text{DP}\backslash\text{S})\backslash\!\!\backslash\text{S}))$

(13) a. John left or Bill did. **Basic VPE**

b. $$\dfrac{\dfrac{\text{left}\circ(\text{VPE}\circ\lambda y\lambda x((\text{John}\cdot x)\cdot(\text{or}\cdot(\text{Bill}\cdot y))))\vdash\text{S}}{\text{left}\circ\lambda x((\text{John}\cdot x)\cdot(\text{or}\cdot(\text{Bill}\cdot\text{VPE})))\vdash\text{S}}\equiv}{(\text{John}\cdot\text{left})\cdot(\text{or}\cdot(\text{Bill}\cdot\text{VPE}))\vdash\text{S}}\equiv$$

(14) a. John said he left or Bill did. **Sloppy coreference**

b. $$\dfrac{\dfrac{\dfrac{\text{DP}\circ(he\circ\lambda y\lambda x(x\cdot(\text{said}\cdot(y\cdot\text{left}))))\vdash\text{S}}{\text{DP}\circ\lambda x(x\cdot(\text{said}\cdot(\text{he}\cdot\text{left})))\vdash\text{S}}\equiv}{\text{DP}\cdot(\text{said}\cdot(\text{he}\cdot\text{left}))\vdash\text{S}}\equiv}{\text{said}\cdot(\text{he}\cdot\text{left})\vdash\text{DP}\backslash\text{S}}\backslash R$$

c. Use this VP in place of *left* in (13); semantic value $\lambda x.\textbf{said}(\textbf{left}\,x)\,x$

(15) a. John said he left or Bill did. **Strict coreference**

b. $$\dfrac{\dfrac{\text{John}\circ(\text{he}\lambda y\lambda x((x\cdot(\text{said}\cdot(y\cdot\text{left})))(\text{or}\cdot(\text{Bill}\cdot\text{VPE}))))\vdash\text{S}}{\text{John}\circ\lambda x((x\cdot(\text{said}\cdot(\text{he}\cdot\text{left})))(\text{or}\cdot(\text{Bill}\cdot\text{VPE})))\vdash\text{S}}\equiv}{(\text{John}\cdot(\text{said}\cdot(\text{he}\cdot\text{left})))(\text{or}\cdot(\text{Bill}\cdot\text{VPE}))\vdash\text{S}}\equiv$$

c. Continue the proof by using the VP*said y left* to bind VPE.

Basic sluicing

SLUICEGAP: $\lambda k\lambda P.kPP : ((\text{DP}\backslash\!\!\backslash\text{S})\backslash\!\!\backslash\text{S})/\!\!/((\text{DP}\backslash\!\!\backslash\text{S})\backslash\!\!\backslash((\text{DP}\backslash\!\!\backslash\text{S})\backslash\!\!\backslash\text{S}))$

(16) Someone left, but I don't know who SLUICEGAP.

The continuation of *someone* relative to the clause *someone left* (i.e., $\lambda x(x\cdot\text{left})$) provides the semantic value for the sluice gap:

$$\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{(\text{someone}\circ\text{DP}\backslash\!\!\backslash\text{S})\cdot(\text{bidk}\cdot(\text{who}\cdot\text{DP}\backslash\!\!\backslash\text{S}))\vdash\text{S}}{\text{DP}\backslash\!\!\backslash\text{S}\circ\lambda y((\text{someone}\circ y)\cdot(\text{bidk}\cdot(\text{who}\cdot\text{DP}\backslash\!\!\backslash\text{S})))\vdash\text{S}}\equiv}{\lambda y((\text{someone}\circ y)\cdot(\text{bidk}\cdot(\text{who}\cdot\text{DP}\backslash\!\!\backslash\text{S})))\vdash(\text{DP}\backslash\!\!\backslash\text{S})\backslash\!\!\backslash\text{S}}\backslash\!\!\backslash R}{\text{DP}\backslash\!\!\backslash\text{S}\circ\lambda z\lambda y((\text{someone}\circ y)\cdot(\text{bidk}\cdot(\text{who}\cdot z)))\vdash(\text{DP}\backslash\!\!\backslash\text{S})\backslash\!\!\backslash\text{S}}\equiv}{\lambda z\lambda y((\text{someone}\circ y)\cdot(\text{bidk}\cdot(\text{who}\cdot z)))\vdash(\text{DP}\backslash\!\!\backslash\text{S})\backslash\!\!\backslash((\text{DP}\backslash\!\!\backslash\text{S})\backslash\!\!\backslash\text{S})}\backslash\!\!\backslash R\quad\dfrac{\dfrac{\dfrac{\dfrac{\text{DP}\cdot\text{DP}\backslash\text{S}\vdash\text{S}}{\text{DP}\circ\lambda x(x\cdot\text{left})\vdash\text{S}}\equiv}{\lambda x(x\cdot\text{left})\vdash\text{DP}\backslash\!\!\backslash\text{S}}\backslash\!\!\backslash R\qquad\text{S}\vdash\text{S}}{\lambda x(x\cdot\text{left})\circ(\text{DP}\backslash\!\!\backslash\text{S})\backslash\!\!\backslash\text{S}\vdash\text{S}}\backslash\!\!\backslash L}{\lambda x(x\cdot\text{left})\circ(((\text{DP}\backslash\!\!\backslash\text{S})\backslash\!\!\backslash\text{S})/\!\!/((\text{DP}\backslash\!\!\backslash\text{S})\backslash\!\!\backslash((\text{DP}\backslash\!\!\backslash\text{S})\backslash\!\!\backslash\text{S}))\circ\lambda z\lambda y((\text{someone}\circ y)\cdot(\text{bidk}\cdot(\text{who}\cdot z))))\vdash\text{S}}/\!\!/L}{\lambda x(x\cdot\text{left})\circ(\text{SLUICEGAP}\circ\lambda z\lambda y((\text{someone}\circ y)\cdot(\text{bidk}\cdot(\text{who}\cdot z))))\vdash\text{S}}\text{LEX}}{\lambda x(x\cdot\text{left})\circ\lambda y((\text{someone}\circ y)\cdot(\text{bidk}\cdot(\text{who}\cdot\text{SLUICEGAP})))\vdash\text{S}}\equiv}{(\text{someone}\circ\lambda x(x\cdot\text{left}))\cdot(\text{bidk}\cdot(\text{who}\cdot\text{SLUICEGAP}))\vdash\text{S}}\equiv}{(\text{someone}\cdot\text{left})\cdot(\text{bidk}\cdot(\text{who}\cdot\text{SLUICEGAP}))\vdash\text{S}}\equiv$$

bidk = but-I-don't-know

Good prediction: scope of inner antecedent

CLM p. 255 [my paraphrase]:
Inner antecedents must take scope over the rest of the antecedent.

(17) Each student wrote a paper on a Mayan language,
but I don't remember which one. [CLM]

(18) Someone saw everyone, but I don't know who.

(16) Ann photographed a woman and/*or a building yesterday, but I don't know who

(17) *No one spoke to a neighbor of his, but I don't know who.

(18) Every teacher called more than two students. [*more-than-two > every]

(19) Every teacher called more than two students, but I don't know who.

Good prediction: no syntactic island sensitivity

- The relationship between the inner antecedent and the antecedent clause is scopability, not wh-extractability.
- Indefinites in particular can scope out of syntactic islands.

Case matching

(19) who: $\mathsf{Q}/(\mathsf{DP}_{\textsc{acc}}\backslash\!\!\backslash \mathsf{S})$
$\mathsf{Q}/(\mathsf{DP}_{\textsc{dat}}\backslash\!\!\backslash \mathsf{S})$

(20) a. SLUICEGAP: $((\mathsf{DP}_{\textsc{acc}}\backslash\!\!\backslash \mathsf{S})\backslash\!\!\backslash \mathsf{S})/\!\!/((\mathsf{DP}_{\textsc{acc}}\backslash\!\!\backslash \mathsf{S})\backslash\!\!\backslash((\mathsf{DP}_{\textsc{acc}}\backslash\!\!\backslash \mathsf{S})\backslash\!\!\backslash \mathsf{S}))$
b. $((\mathsf{DP}_{\textsc{dat}}\backslash\!\!\backslash \mathsf{S})\backslash\!\!\backslash \mathsf{S})/\!\!/((\mathsf{DP}_{\textsc{dat}}\backslash\!\!\backslash \mathsf{S})\backslash\!\!\backslash((\mathsf{DP}_{\textsc{dat}}\backslash\!\!\backslash \mathsf{S})\backslash\!\!\backslash \mathsf{S}))$
c. pn: $(\mathsf{DP}_{\textsc{f}}\backslash\!\!\backslash \mathsf{S})/\!\!/(\mathsf{DP}_{\textsc{f}}\backslash\!\!\backslash(\mathsf{DP}_{\textsc{f}}\backslash\!\!\backslash \mathsf{S}))$
d. $(\mathsf{DP}_{\textsc{m}}\backslash\!\!\backslash \mathsf{S})/\!\!/(\mathsf{DP}_{\textsc{m}}\backslash\!\!\backslash(\mathsf{DP}_{\textsc{m}}\backslash\!\!\backslash \mathsf{S}))$

As in Jäger 2001, given an anaphoric type-logical treatment,

> "Sluicing is correctly predicted to be insensitive to syntactic islands, but sensitive to morphological features of the antecedent."

Full accounting principle of category formation: As in Jacobson (e.g., 1999), the category of a larger expression registers information about its missing pieces: there is no hiding of information in the derivational history.

Sprouting: a simple case

Suggested independently to me by Lucas Champollion and Dylan Bumford: If (some) WH phrases were S modifiers (rather than VP modifiers), the analysis would extend to sprouting immediately.

(21) a. I want to know why John left.
b. I want to know why Mary said John left. (unambiguous)
c. *why*: S/S; WHYSLUICEGAP: $(\mathsf{S}\backslash\!\!\backslash \mathsf{S})/\!\!/(\mathsf{S}\backslash\!\!\backslash(\mathsf{S}\backslash\!\!\backslash \mathsf{S}))$
d. Target: Mary said John left, but I don't know why.

$$\cfrac{(\text{John}\cdot\text{left})\circ(\textsc{whysluicegap}\circ\lambda y\lambda x((\text{Mary}\cdot(\text{said}\cdot x))\cdot(\text{bidk}\cdot(\text{why}\cdot y))))\vdash \mathsf{S}}{\cfrac{(\text{John}\cdot\text{left})\circ\lambda x((\text{Mary}\cdot(\text{said}\cdot x))\cdot(\text{bidk}\cdot(\text{why}\cdot\textsc{whysluicegap})))\vdash \mathsf{S}}{(\text{Mary}\cdot(\text{said}\cdot(\text{John}\cdot\text{left})))\cdot(\text{bidk}\cdot(\text{why}\cdot\textsc{whysluicegap}))\vdash \mathsf{S}}\equiv}\equiv$$

For the other reading, take *Mary said John left* as the antecedent.

Perfectly straightforward anaphora to a clause.

Sprouting: less simple

(22) a. I want to know when Mary said John left. (ambiguous!)

b. *when*: $\mathrm{S}/(\textsc{adv}\backslash\!\!\backslash\mathrm{S})$, where $\textsc{adv} = (\mathrm{DP}\backslash\mathrm{S})\backslash(\mathrm{DP}\backslash\mathrm{S})$

c. $\textsc{whenslgap}$: $((\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash\mathrm{S})/\!\!/((\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash((\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash\mathrm{S}))$

d. Target: Mary said John left, but I don't know when
[~~she said he (left _)~~].

e. Need to find an $\textsc{adv}$ position inside of *John left*.

- Strategy: allow empty antecedents
- Empty antecedents usually avoided in TLG (**very man*)
- Silent lexical entries avoided in general
- Strategies for eliminating silence, as in Jäger, could be tried;
- ...if so, however, unsure about interaction with swiping.
- In any case, already using silent lexical entry for $\textsc{sluicegap}$.

Independent motivation for empty antecedents: deriving gaps

- Assume the empty structure, '()', is an identity element for $\circ$
- So $\Gamma \circ () \equiv \Gamma \equiv () \circ \Gamma$

$$\dfrac{\dfrac{\mathrm{DP}\backslash\!\!\backslash\mathrm{S} \vdash \mathrm{DP}\backslash\!\!\backslash\mathrm{S}}{() \circ \mathrm{DP}\backslash\!\!\backslash\mathrm{S} \vdash \mathrm{DP}\backslash\!\!\backslash\mathrm{S}}\equiv}{() \vdash (\mathrm{DP}\backslash\!\!\backslash\mathrm{S})/\!\!/(\mathrm{DP}\backslash\!\!\backslash\mathrm{S})}/\!\!/R$$

who: $\textsc{q}/(\mathrm{DP}\backslash\!\!\backslash\mathrm{S})$: *who does John like*:

$$\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\mathrm{does}\cdot(\mathrm{John}\cdot(\mathrm{like}\cdot\mathrm{DP}))\vdash \mathrm{S}}{\mathrm{DP}\circ\lambda x(\mathrm{does}\cdot(\mathrm{John}\cdot(\mathrm{like}\cdot x)))\vdash \mathrm{S}}\equiv}{\lambda x(\mathrm{does}\cdot(\mathrm{John}\cdot(\mathrm{like}\cdot x)))\vdash \mathrm{DP}\backslash\!\!\backslash\mathrm{S}}\backslash\!\!\backslash R \quad \mathrm{DP}\backslash\!\!\backslash\mathrm{S}\vdash\mathrm{DP}\backslash\!\!\backslash\mathrm{S}}{(\mathrm{DP}\backslash\!\!\backslash\mathrm{S})/\!\!/(\mathrm{DP}\backslash\!\!\backslash\mathrm{S})\circ\lambda x(\mathrm{does}\cdot(\mathrm{John}\cdot(\mathrm{like}\cdot x)))\vdash \mathrm{DP}\backslash\!\!\backslash\mathrm{S}}\backslash\!\!\backslash L}{\textsc{gap}\circ\lambda x(\mathrm{does}\cdot(\mathrm{John}\cdot(\mathrm{like}\cdot x)))\vdash \mathrm{DP}\backslash\!\!\backslash\mathrm{S}}\textsc{lex}}{\mathrm{does}\cdot(\mathrm{John}\cdot(\mathrm{like}\cdot\textsc{gap}))\vdash \mathrm{DP}\backslash\!\!\backslash\mathrm{S}}\equiv$$

Likewise for $\cdot$ mode. Silent elements usually avoided in TLG, but standard in many logical settings.

Sprouting with silence

when : $\textsc{q}/(\textsc{adv}\backslash\!\!\backslash\mathrm{S})$, $\textsc{whenslgap} = ((\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash\mathrm{S})/\!\!/((\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash((\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash\mathrm{S}))$
$\textsc{adv} = (\mathrm{DP}\backslash\mathrm{S})\backslash(\mathrm{DP}\backslash\mathrm{S})$

$$\dfrac{\dfrac{\dfrac{(\mathrm{DP}\backslash\mathrm{S})\vdash\mathrm{DP}\backslash\mathrm{S}}{(\mathrm{DP}\backslash\mathrm{S})\cdot()\vdash\mathrm{DP}\backslash\mathrm{S}}\equiv}{()\vdash(\mathrm{DP}\backslash\mathrm{S})\backslash(\mathrm{DP}\backslash\mathrm{S})}\backslash R}{()\vdash\textsc{adv}}\textsc{def}$$

$$\dfrac{()\vdash\textsc{adv} \qquad \mathrm{S}\cdot(\mathrm{bidk}\cdot(\mathrm{when}\cdot\textsc{adv}\backslash\!\!\backslash\mathrm{S}))\vdash\mathrm{S}}{(()\circ\textsc{adv}\backslash\!\!\backslash\mathrm{S})(\mathrm{bidk}\cdot(\mathrm{when}\cdot\textsc{adv}\backslash\!\!\backslash\mathrm{S}))\vdash\mathrm{S}}\backslash\!\!\backslash L$$

$$\dfrac{(()\circ\textsc{adv}\backslash\!\!\backslash\mathrm{S})(\mathrm{bidk}\cdot(\mathrm{when}\cdot\textsc{adv}\backslash\!\!\backslash\mathrm{S}))\vdash\mathrm{S}}{\textsc{adv}\backslash\!\!\backslash\mathrm{S}\circ\lambda y((()\circ y)(\mathrm{bidk}\cdot(\mathrm{when}\cdot\textsc{adv}\backslash\!\!\backslash\mathrm{S})))\vdash\mathrm{S}}\equiv$$

$$\dfrac{\textsc{adv}\backslash\!\!\backslash\mathrm{S}\circ\lambda y((()\circ y)(\mathrm{bidk}\cdot(\mathrm{when}\cdot\textsc{adv}\backslash\!\!\backslash\mathrm{S})))\vdash\mathrm{S}}{\lambda y((()\circ y)(\mathrm{bidk}\cdot(\mathrm{when}\cdot\textsc{adv}\backslash\!\!\backslash\mathrm{S})))\vdash(\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash\mathrm{S}}\backslash\!\!\backslash L$$

$$\dfrac{\lambda y((()\circ y)(\mathrm{bidk}\cdot(\mathrm{when}\cdot\textsc{adv}\backslash\!\!\backslash\mathrm{S})))\vdash(\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash\mathrm{S}}{\textsc{adv}\backslash\!\!\backslash\mathrm{S}\circ\lambda z\lambda y((()\circ y)(\mathrm{bidk}\cdot(\mathrm{when}\cdot z)))\vdash(\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash\mathrm{S}}\equiv$$

$$\dfrac{\textsc{adv}\backslash\!\!\backslash\mathrm{S}\circ\lambda z\lambda y((()\circ y)(\mathrm{bidk}\cdot(\mathrm{when}\cdot z)))\vdash(\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash\mathrm{S}}{\lambda z\lambda y((()\circ y)(\mathrm{bidk}\cdot(\mathrm{when}\cdot z)))\vdash(\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash((\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash\mathrm{S})}\backslash\!\!\backslash R$$

$$\dfrac{\dfrac{\dfrac{\mathrm{John}\cdot(\mathrm{left}\cdot\textsc{adv})\vdash\mathrm{S}}{\textsc{adv}\circ\lambda x(\mathrm{John}\cdot(\mathrm{left}\cdot x))\vdash\mathrm{S}}\equiv}{\lambda x(\mathrm{John}\cdot(\mathrm{left}\cdot x))\vdash\textsc{adv}\backslash\!\!\backslash\mathrm{S}}\backslash\!\!\backslash R \qquad \mathrm{S}\vdash\mathrm{S}}{\lambda x(\mathrm{John}\cdot(\mathrm{left}\cdot x))\circ(\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash\mathrm{S}\vdash\mathrm{S}}\backslash\!\!\backslash L$$

$$\dfrac{\lambda z\lambda y((()\circ y)(\mathrm{bidk}\cdot(\mathrm{when}\cdot z)))\vdash(\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash((\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash\mathrm{S}) \qquad \lambda x(\mathrm{John}\cdot(\mathrm{left}\cdot x))\circ(\textsc{adv}\backslash\!\!\backslash\mathrm{S})\backslash\!\!\backslash\mathrm{S}\vdash\mathrm{S}}{\lambda x(\mathrm{John}\cdot(\mathrm{left}\cdot x))\circ(\textsc{whenslgap}\circ\lambda z\lambda y((()\circ y)(\mathrm{bidk}\cdot(\mathrm{when}\cdot z))))\vdash\mathrm{S}}/\!\!/L$$

$$\dfrac{\lambda x(\mathrm{John}\cdot(\mathrm{left}\cdot x))\circ(\textsc{whenslgap}\circ\lambda z\lambda y((()\circ y)(\mathrm{bidk}\cdot(\mathrm{when}\cdot z))))\vdash\mathrm{S}}{\lambda x(\mathrm{John}\cdot(\mathrm{left}\cdot x))\circ\lambda y((()\circ y)(\mathrm{bidk}\cdot(\mathrm{when}\cdot\textsc{whenslgap})))\vdash\mathrm{S}}\equiv$$

$$\dfrac{\lambda x(\mathrm{John}\cdot(\mathrm{left}\cdot x))\circ\lambda y((()\circ y)(\mathrm{bidk}\cdot(\mathrm{when}\cdot\textsc{whenslgap})))\vdash\mathrm{S}}{(()\circ\lambda x(\mathrm{John}\cdot(\mathrm{left}\cdot x)))\cdot(\mathrm{bidk}\cdot(\mathrm{when}\cdot\textsc{whenslgap}))\vdash\mathrm{S}}\equiv$$

$$\dfrac{(()\circ\lambda x(\mathrm{John}\cdot(\mathrm{left}\cdot x)))\cdot(\mathrm{bidk}\cdot(\mathrm{when}\cdot\textsc{whenslgap}))\vdash\mathrm{S}}{(\mathrm{John}\cdot(\mathrm{left}\cdot()))\cdot(\mathrm{bidk}\cdot(\mathrm{when}\cdot\textsc{whenslgap}))\vdash\mathrm{S}}\equiv$$

$$\dfrac{(\mathrm{John}\cdot(\mathrm{left}\cdot()))\cdot(\mathrm{bidk}\cdot(\mathrm{when}\cdot\textsc{whenslgap}))\vdash\mathrm{S}}{(\mathrm{John}\cdot\mathrm{left})\cdot(\mathrm{bidk}\cdot(\mathrm{when}\cdot\textsc{whenslgap}))\vdash\mathrm{S}}\equiv$$

Implicit arguments

(23) a. John ate, but I don't know what.

b. New category: given A, B formulas, $A\otimes B$

c. Residuation laws: $A\vdash C/B$ iff $A\otimes B\vdash C$ iff $B\vdash A\backslash C$

d. $\mathit{ate}_{\textsc{intr}}$: $\langle \mathbf{eat_{tr}}, \lambda P\exists x.Px\rangle$: $((\mathrm{DP}\backslash\mathrm{S})/\mathrm{DP})\otimes\mathrm{S}/\!\!/(\mathrm{DP}\backslash\!\!\backslash\mathrm{S})$

$$\dfrac{\Sigma[A\cdot B]\vdash C}{\Sigma[A\otimes B]\vdash C}\otimes L \qquad \dfrac{\Gamma\vdash A \qquad \Delta\vdash B}{\Gamma\cdot\Delta\vdash A\otimes B}\otimes R$$

$$\dfrac{\dfrac{(\mathrm{John}\cdot(((\mathrm{DP}\backslash\mathrm{S})/\mathrm{DP})\cdot\mathrm{S}/\!\!/(\mathrm{DP}\backslash\!\!\backslash\mathrm{S})))\cdot(\mathrm{bidk}\cdot(\mathrm{what}\cdot\textsc{sluicegap}))\vdash\mathrm{S}}{(\mathrm{John}\cdot((\mathrm{DP}\backslash\mathrm{S})/\mathrm{DP})\otimes\mathrm{S}/\!\!/(\mathrm{DP}\backslash\!\!\backslash\mathrm{S}))\cdot(\mathrm{bidk}\cdot(\mathrm{what}\cdot\textsc{sluicegap}))\vdash\mathrm{S}}\otimes L}{(\mathrm{John}\cdot\mathrm{ate}_{\textsc{intrans}})\cdot(\mathrm{bidk}\cdot(\mathrm{what}\cdot\textsc{sluicegap}))\vdash\mathrm{S}}\textsc{lex}$$

(24) a. Everyone ate, but I don't know what. $\forall > \exists$, ?*$\exists > \forall$

b. ?No one ate, but I don't know what.

Available to Jäger; how to guarantee narrowest scope of IA?

Problems for mutual entailment

Romero, Merchant: the focus closure of the antecedent clause and the sluice must entail each other.

Counterexamples:

(20) *Kelly was murdered, but we don't know who.

(21) *Someone paid Mary, but we don't know by whom.

(22) Some numbers between 2 and 20 are even or odd, but I'm not going to tell you which numbers ~~are prime or not prime~~.

The wh-correlate does NOT need to be indefinite

(23) I know that John left, but I don't know who else.

(24) Mary has dined at Masa, and I don't know where else.

(25) John liked the collards, but I don't know which other dishes.

(26) Mary tasted each hot dish, and I don't know what else.

The answer ban

- The antecendent clause must not resolve (or partly resolve) the issue raised by the sluiced interrogative.

(27) *John left, but I don't know who.

(28) John left, but I don't know who else.

(29) *John or Mary left, but I don't know who.

(30) John met a woman, but I don't know who.

(31) Mary knows that John left, but Bill doesn't know who.

Andrews Amalgams: ellipsis to a containing continuation

(33) Johnson 2013:
a. Sally will eat something today, but I don't know what __.
b. Sally will eat [I don't know what __] today.

$$\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\text{idk}\cdot(\text{what}\cdot\text{DP}\backslash\!\!\backslash\text{S})\vdash\text{S}}{\text{DP}\backslash\!\!\backslash\text{S}\circ\lambda x(\text{idk}\cdot(\text{what}\cdot x))\vdash\text{S}}\equiv}{\lambda x(\text{idk}\cdot(\text{what}\cdot x))\vdash(\text{DP}\backslash\!\!\backslash\text{S})\backslash\!\!\backslash\text{S}}\backslash\!\!\backslash R \qquad \textsc{g}\vdash\textsc{g}}{\textsc{g}/\!\!/((\text{DP}\backslash\!\!\backslash\text{S})\backslash\!\!\backslash\text{S})\circ\lambda x(\text{idk}\cdot(\text{what}\cdot x))\vdash\textsc{g}}/\!\!/L}{\textsc{amalgam}\circ\lambda x(\text{idk}\cdot(\text{what}\cdot x))\vdash\textsc{g}}\equiv}{\text{idk}\cdot(\text{what}\cdot\textsc{amalgam})\vdash\textsc{g}}\equiv$$

$$\dfrac{\dfrac{\dfrac{\lambda y(\text{idk}\cdot(\text{what}\cdot y))\vdash(\text{DP}\backslash\!\!\backslash\text{S})\backslash\!\!\backslash\text{S} \qquad \textsc{g}\circ\lambda x(\text{Sally}\cdot(\text{ate}\cdot x))\vdash\text{S}}{(\textsc{g}/\!\!/((\text{DP}\backslash\!\!\backslash\text{S})\backslash\!\!\backslash\text{S})\circ\lambda y(\text{idk}\cdot(\text{what}\cdot y)))\circ\lambda x(\text{Sally}\cdot(\text{ate}\cdot x))\vdash\text{S}}/\!\!/L}{(\text{idk}\cdot(\text{what}\cdot\textsc{amalgam}))\circ\lambda x(\text{Sally}\cdot(\text{ate}\cdot x))\vdash\text{S}}\equiv,\textsc{lex}}{\text{Sally}\cdot(\text{ate}\cdot(\text{idk}\cdot(\text{what}\cdot\textsc{amalgam})))\vdash\text{S}}\equiv$$

$\textsc{g}\equiv\text{S}/\!\!/(\text{DP}\backslash\!\!\backslash\text{S})$ (i.e., scope-taking DP, a generalized quantifier)

Mismatching examples

> Chung 2006: The syntactic objects which are copied or re-used will have to be abstract enough to permit certain 'mismatches' between the antecedent and the apparent requirements of the ellipsis-site.

(25) a. John remembers meeting someone,
but he doesn't remember who [~~he met~~].
b. $((\mathrm{DP}\mathbin{\backslash\!\!\backslash}\mathrm{S}_{\text{-ING}})\mathbin{\backslash\!\!\backslash}\mathrm{S})\mathbin{/\!\!/}((\mathrm{DP}\mathbin{\backslash\!\!\backslash}\mathrm{S})\mathbin{\backslash\!\!\backslash}((\mathrm{DP}\mathbin{\backslash\!\!\backslash}\mathrm{S}_{\text{-ING}})\mathbin{\backslash\!\!\backslash}\mathrm{S}))$

- Syntax is no problem.
- Semantically, no need to build a tensed clause: only necessary to turn an -ING clause meaning into a tensed clause meaning.
- In this case, we need a function from a "remembering" event type to an open proposition concerning a specific event within that event type

Claims

- The ellipsis site contains a silent proform, e.g., SLUICEGAP
- So silent elements are ok—but don't have internal structure
- The syntactic category of the inner antecedent is transparently available to the sluicegap, **case matching is easy**
- The inner antecedent must scope over the antecedent clause
- Because the only constraint on the relationship between the inner antecedent and the antecedent clause is scopability, sluicing is **insensitive to synctactic islands**.
- When implemented by a suitable type logical grammar that allows reasoning about scope, **sprouting follows** from independently motivated assumptions about empty antecedents

Sluicing is anaphora to an anti-constituent, that is, anaphora to a continuation.