Relative clause pied-piping

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February 29, 2020

We can assume that the relative operator is just an identity function:

(1) $Op_{Rel} \coloneqq \lambda x \,.\, x$ $\qquad$ $\mathtt{r} \to \mathtt{r}$

We can shift a relative operator into a scope taker via a shifter we can call Q_{Rel}.

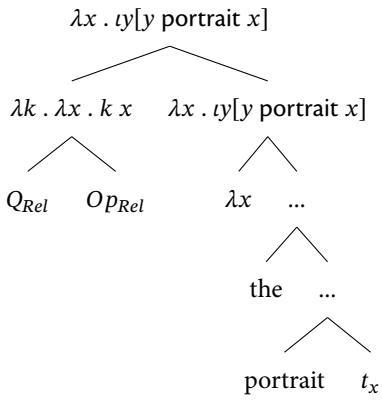
(2) $Q_{Rel}\ m \coloneqq \lambda k \,.\, \lambda x \,.\, k\ (m\ x)$ $\qquad$ $(\mathtt{r} \to \mathtt{a}) \to (\mathtt{a} \to \mathtt{b}) \to \mathtt{r} \to \mathtt{b}$

Now we have everything we need to get simple pied-piping:

(3) Mary met the man [[the portrait of whom] John bought].

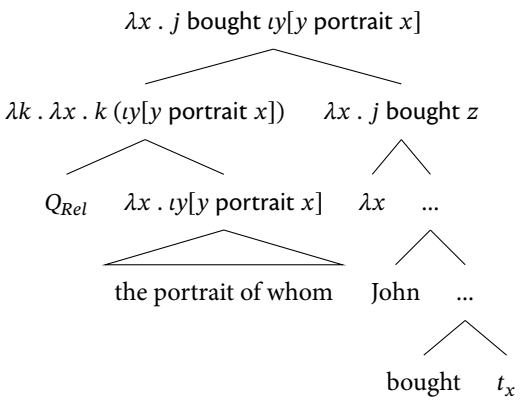
Let's start with the composition of the pied-piped DP – we shift the relative operator to a scope-taker via Q_{Rel}, and scope it to the edge:

(4)



Now we shift the result into a scope-taker via Q_{Rel}, and scope it to the edge of the relative clause, returning a derived predicate:

(5)


λx . j bought ιy[y portrait x]
λk . λx . k (ιy[y portrait x])
λx . j bought z
Q_Rel
λx . ιy[y portrait x]
λx
...
the portrait of whom
John
...
bought
t_x