

Relative pronoun pied-piping, the structure of which informs the analysis of relative clauses

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CLS 51

April 2015


English allows the construction of relative clauses (RC) which use *wh*-words as relative pronouns, fronted to the edge of the RC.

(1) **English relative pronoun RC:**

[_{DP} The person [_{RC} *who* John asked _____ for help]] thinks John is an idiot.  (McCawley, 1988, p. 417)

Today: We investigate the structure and interpretation of *relative pronoun pied-piping* (RPPP). (We do not discuss *that/∅* RC.)

(2) **The relative pronoun can pied-pipe material with it:**

[_{DP} The person [_{RC} [_{RPPP} *whose* parrot] John asked _____ for help]] thinks John is an idiot. 

- §1 Background
- §2 New evidence from intervention effects
- §3 Proposal
- §4 Conclusion and open questions

§1 Background

- the interpretation of relative clauses
- the problem of pied-piping and two approaches
- a note on the size of pied-piping

§2 New evidence from intervention effects

§3 Proposal

§4 Conclusion and open questions

Interpreting restrictive RCs

English RCs come in **restrictive and non-restrictive** (appositive, supplemental) varieties. Both can use relative pronouns with (some degree of) pied-piping.

Consider first a simple restrictive RC, as in (3).

- (3) Every phonologist [_{RC} who I met at CLS] gave a great presentation.

Following Quine (1960); Partee (1973), a.o., the restrictor of *every* is the set of individuals satisfying *phonologist* and “ $\lambda x . I \text{ met } x \text{ at CLS.}$ ”

Interpreting non-restrictive RCs

Non-restrictive (appositive, supplemental) RCs have a very different semantics, **traditionally compared to an independent (conjoined) clause**: (Quine, 1960; Taglicht, 1972; Thorne, 1972; Emonds, 1979; McCawley, 1981; de Vries, 2006)

- (4) Mary, who I met at CLS, gave a great presentation.
≈ Mary gave a great presentation. (*And*) *I met Mary at CLS.*

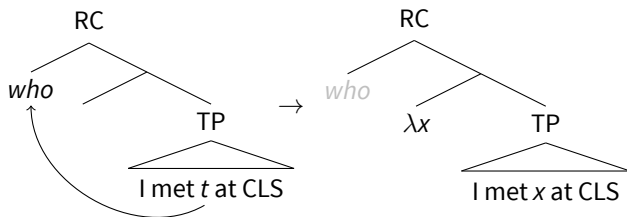
(Following Potts (2005) and citations there, this meaning introduced by)
(the non-restrictive RC is not part of the asserted content.)

- 👉 This meaning, “I met Mary at CLS,” is derived by combining the referent described, *Mary*, with the predicate “ $\lambda x . I \text{ met } x \text{ at CLS.}$ ”

The RC denotes a predicate

For both restrictive and non-restrictive RCs, then, we need the RC structure to yield the derived predicate “ λx . I met x at CLS.”

- ☞ This predicate “ λx . I met x at CLS” is formed through **movement of the relative pronoun**, interpreted as **λ -abstraction**.

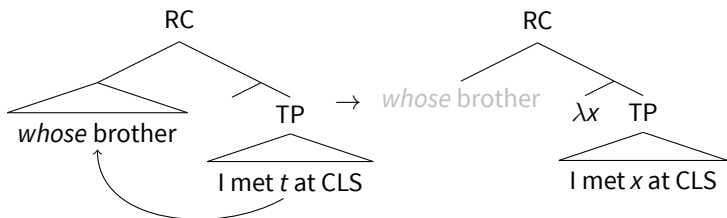


(Here, assume the relative pronoun is semantically vacuous, as in Heim)
(and Kratzer (1998, p. 186).)

The problem of pied-piping

This process is complicated with **relative pronoun pied-piping (RPPP)**:

- (5) The girl [_{RC} [_{RPPP} *whose* brother] I met at CLS]...



Again, movement and λ -abstraction gives us " λx . I met *x* at CLS."

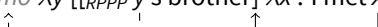
But this is not the predicate we want. For the correct interpretation, we need to somehow derive " λx . I met [*x*'s brother] at CLS."

The problem of pied-piping

Two ways to solve this problem of pied-piping:

- 1 Covert movement of the *wh*-pronoun out of the pied-piping

(6) $[_{RC} \textit{who} \lambda y [[_{RPPP} \textit{y's brother}] \lambda x . \textit{I met x...}]]$



(Or similarly: movement of the head of the RC from the relative pronoun itself (Kayne, 1994))

- 2 Interpret the pied-piping as is, with the relative pronoun *in-situ*

Today: An argument for the second approach for non-restrictive RCs.

A note on the size of pied-piping

Why do we claim this just for non-restrictive RCs? For methodological reasons, we need to look at **larger pied-piping**.

👉 **Non-restrictive RCs allows for larger pied-piping than restrictives**
(Emonds, 1976, 1979; Jackendoff, 1977; Nanni and Stillings, 1978, a.o.).

- (7) **Larger pied-piping in non-restrictive relatives:** (exx Cable, 2010)
- a. This book, [_{RC} [_{RPPP} the reviews of *which*] were awful], is really quite nice.
 - b. * No book [_{RC} [_{RPPP} the reviews of *which*] are awful] is really quite nice.

§1 Background

§2 **New evidence from intervention effects**

- Intervention in *wh*-question pied-piping
- Intervention in relative clause pied-piping


§3 Proposal

§4 Conclusion and open questions

New evidence from intervention effects

Today we advocate for interpreting the *wh* relative pronoun *in-situ* inside the pied-piping, specifically using **Rooth-Hamblin alternative computation** (squiggly arrow) (Hamblin, 1973; Rooth, 1985, a.o.).



(8) $[_{RC} [_{RPPP} \textit{who's brother}] \lambda x . \textit{I met } x \dots]]$



Evidence for this approach comes from **intervention effects**...

Intervention effects affect regions of alternative computation, but not (overt or covert) movement (Beck, 2006; Beck and Kim, 2006; Kotek and Erlewine, to appear; Kotek, 2014, last week)

(9) **Intervention affects alternatives, not movement:**

- a. * [_{CP} C ... **intervener** ... *wh*]

- b. ✓ [_{CP} C ... *wh* **intervener** ... *t*]


Alternative computation and intervention effects

(10) Japanese: Intervention effects avoided through scrambling

- a. ✓ Hanako-ga nani-o yon-da-no?
Hanako-NOM what-ACC read-PAST-Q
'What did Hanako read?'
- b. ?* **Dare-mo** nani-o yom-ana-katta-no?
no.one what-ACC read-NEG-PAST-Q
- c. ✓ Nani-o **dare-mo** _____ yom-ana-katta-no?
what-ACC no.one read-NEG-PAST-Q
'What did no one read?'
-

Examples from Tomioka (2007).

We can also observe intervention effects in *wh*-question pied-piping.

- (11) Jim owns a picture of *which* president
- a. [*Which* president] does Jim own a picture of ____?
 - b. [Of *which* president] does Jim own a picture ____?
 - c. [A picture of *which* president] does Jim own ____?

Wh-pied-piping and intervention effects

Sauerland and Heck (2003); Cable (2007); Kotek and Erlewine (to appear) show that *intervention effects* occur inside pied-piped constituents:

- (12) **Intervention effect in English pied-piping:** (Cable, 2007, exx)
- a. [A picture of *which* president] does Jim own ____?
 - b. * [No pictures of *which* president] does Jim own ____?
 - c. * [Few pictures of *which* president] does Jim own ____?
 - d. * [Only PICTURES of *which* president] does Jim own ____?

If an *intervener* is placed between the *wh*-word and the edge of its pied-piping constituent, it results in ungrammaticality.

- (13) **The pied-piping intervention schema:**

*[*pied-piping* ... **intervener** ... *wh*]
←~~~~~

Predictions for RPPP

Recall: Two theories for the interpretation of RPPP

- 1 Covert movement of the *wh*-pronoun out of the pied-piping

$$(14) \quad \checkmark \quad [_{RC} \underset{\uparrow}{wh} \lambda y \quad [[_{RPPP} \dots \text{intervener} \dots y \dots] \lambda x . \dots x \dots]]$$

- 2 Interpret the pied-piping using focus-alternatives computation

$$(15) \quad * \quad [_{RC} \quad [[_{RPPP} \dots \text{intervener} \dots wh \dots] \lambda x . \dots x \dots]]$$

Prediction: expect intervention effects iff alternatives are used **2**!

👉 **Relative pronoun pied-piping (RPPP) is also sensitive to this form of intervention:**

- (16) a. ✓ This is the unfortunate recipe, [[an ingredient for *which*] I am missing].
- b. * This is the unfortunate recipe, [[no ingredients for *which*] I have at home].

This pattern is not limited to *no*. It occurs with other known pied-piping interveners (Kotek and Erlewine, to appear; Erlewine and Kotek, 2014).

- (17) a. ✓ This recipe, [[**three** ingredients for *which*] I have...],
b. ?? This recipe, [[**only** [one]_F ingredient for *which*] I have...],
c. ?? This recipe, [[**very few** ingredients for *which*] I have...],

Intervention in RPPP

It is also not the case that these are strange meanings in some way...

👉 No intervention if smaller pied-piping is chosen:

- (18) a. * [_{RC} [_{RPPP} **no** ingredients for *which*] I have ___...] (=16b)
b. ✓ [_{RC} [_{RPPP} for *which*] I have **no** ingredients ___ at home]
c. ✓ [_{RC} [_{RP} *which*] I have **no** ingredients for ___ at home]

NB: This contrast shows that the pied-piping constituent is not uniformly *reconstructed* into its base position. That would predict no contrast between these pied-piping options.

- (19) **Hypothetical LFs with reconstructed RPPP:**
[_{RC} I have **no** ingredients for *which* at home]

We observe intervention effects in RPPP whenever an intervener occurs **above the relative pronoun, inside its pied-piping.**

- ☞ This is explained if **RPPP is interpreted using Rooth-Hamblin alternative computation**, but not if RPPP is interpreted using (covert) movement of the relative pronoun.

Support from RPPP with islands

Further support against the movement approach comes from island diagnostics (Ross, 1967). (Covert) movement is island-sensitive.

☞ The relative pronoun can be inside a syntactic island, inside the RPPP.

- (20) a. This portrait, [[the background of *which*] is quite stunning],
b. ? This portrait, [[the background that was chosen for *which*] is quite stunning], is...

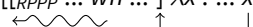
A note on restrictive RC

Recall that restrictive relatives do not allow larger RPPP, and therefore we cannot test this intervention effect:

- (21) a. * QR is one topic [[an/every/the/some article(s) about *which*]
the journal rejected].
- b. * QR is one topic [[only one/no/very few article(s) about
which] the journal rejected].

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We propose that RPPP in English non-restrictive RC are interpreted using **Rooth-Hamblin alternative computation**.

$$(22) \quad [_{RC} [[_{RPPP} \dots wh \dots] \lambda x . \dots x \dots]]$$


- Alternative computation is a method of semantic composition in another “dimension.”
- Alternative computation has been used for the interpretation of in-situ focus (Rooth, 1985, 1992), as well as for interrogative *wh*-words (Hamblin, 1973; Beck, 2006, a.o.).
- Sternefeld (2001); Sauerland and Heck (2003) discuss such an approach to RPPP.

Alternative computation

For example, for a *wh*-in-situ question, alternatives are computed between the in-situ *wh*-word and C (Hamblin, 1973; Beck, 2006, a.o.).

(23) [C [_{TP} Alex likes *who*]]


Ordinary semantic values are computed using $[[\cdot]]^o$ and the alternatives (focus semantic values) using $[[\cdot]]^f$ (Rooth, 1992, a.o.).

(24) **The denotation of a *wh*-word:** (Beck, 2006)

- a. $[[who]]^o$ undefined
- b. $[[who]]^f$ = the set of human individuals = {Bobby, Chris, Dana...}

Alternative computation

$\llbracket \cdot \rrbracket^f$ is computed recursively, like $\llbracket \cdot \rrbracket^o$, composing alternatives pointwise.

(25) a. $\llbracket \text{TP} \rrbracket^o$ undefined

$$\text{b. } \llbracket \text{TP} \rrbracket^f = \left\{ \begin{array}{l} \lambda w . \text{Alex likes Bobby in } w, \\ \lambda w . \text{Alex likes Chris in } w, \\ \lambda w . \text{Alex likes Dana in } w, \dots \end{array} \right\}$$

C takes the alternatives in its complement ($\llbracket \text{TP} \rrbracket^f$) to form the question denotation (Beck and Kim, 2006, a.o.). The alternatives in $\llbracket \text{TP} \rrbracket^f$ correspond to *possible answers* to the question.

Alternative computation

This works for the interpretation of *wh*-question pied-piping, too.

(26) [[_{PP} *whose brother*] [λx [you like x]]]


(27) $\llbracket \textit{whose brother} \rrbracket^f = \text{the set of brothers} =$
 $\left\{ \begin{array}{l} \text{John (= Bobby's brother),} \\ \text{Bill (= Chris's brother),} \\ \text{Fred (= Dana's brother)} \end{array} \right\}$

(28) $\llbracket (26) \rrbracket^f = \left\{ \begin{array}{l} \lambda w . \text{you like John (= Bobby's brother) in } w, \\ \lambda w . \text{you like Bill (= Chris's brother) in } w, \\ \lambda w . \text{you like Fred (= Dana's brother) in } w \end{array} \right\}$

This combines the pied-piping constituent with the rest of the question to derive the correct set of possible answers.

Alternative computation for RPPP

Now consider the RPPP. In order to construct the derived predicate “ $\lambda x . I$ met [x 's brother] at CLS,” we need the RPPP to provide **a function from individuals to their brothers.**

(29) Mary, [_{RC} [[_{RPPP} *whose* brother] $\lambda x . I$ met x at CLS]],


- 👉 However, a naive attempt to interpret RPPP using Rooth-Hamblin alternative computation runs into difficulties.

- (30) **The denotation of a *wh*-word:** (Beck, 2006)
- a. $\llbracket who \rrbracket^o$ undefined
 - b. $\llbracket who \rrbracket^f = \text{the set of humans} = \{\text{Bobby, Chris, Dana, ...}\}$
- (31)
- a. $\llbracket whose \text{ brother} \rrbracket^o$ undefined
 - b. $\llbracket whose \text{ brother} \rrbracket^f = \text{the set of brothers} = \{\text{John, Bill, Fred, ...}\}$

Problem: The resulting meaning is simply a set of individuals who are someone's brother. We can't use this to construct the function from individuals to their brothers (Rooth 1992 fn. 15, citing Ede Zimmermann (p.c.); Sternefeld 2001; Sauerland and Heck 2003).

Important: Non-restrictive RCs are only compatible with referring expressions (Thorne, 1972; Karttunen, 1976; McCawley, 1988; Potts, 2002, a.o.).

Following Potts (2005), we can dynamically refer to this e-type referent.

Proposal

Proposal: We contextually restrict the alternative denotation of the relative pronoun. For *Mary, whose brother I met at CLS*:

(32) a. $\llbracket who \rrbracket^o$ undefined

b. $\llbracket who \rrbracket^f = \{Mary\}$

(33) a. $\llbracket whose\ brother \rrbracket^o$ undefined

b. $\llbracket whose\ brother \rrbracket^f = \{Andrew (= Mary's\ brother)\}$

(34) a. $\llbracket RC \rrbracket^o$ undefined

b. $\llbracket RC \rrbracket^f = \{(\lambda x . I\ met\ x\ at\ CLS)(Mary)\}$
 $= \{I\ met\ Mary\ at\ CLS\}$

Proposal: an operator at the edge of the pied-piping introduces the projective meaning of the non-restrictive relative (Potts, 2005).

(35) [*Op* RC] : for $\phi \in \llbracket \text{RC} \rrbracket^f$, ϕ is true

(36) [*Op* [_{RC} *whose* brother I met at CLS] :

“I met Mary’s brother at CLS” is true

Comparison to binding

Note that because we contextually restrict $\llbracket wh \rrbracket^f$ to be a singleton set, this is in effect a lot like coindexation/binding.

(37) Mary_i, [[who_i's brother] I met at CLS],

- 👉 The crucial difference is that we are computing the RPPP using Rooth-Hamblin alternatives (albeit a singleton set), which makes it susceptible to intervention effects.

Non-singleton referents?

Q: Are there cases where the meaning of the non-restrictive RC ranges over a set of individuals?

A: Apparently no. Even if a plurality is described, it is described together as a single, plural individual.

- (38) a. Every mother whose son is in the army is concerned.
⇒ each (relevant) mother has their own son *restrictive*
- b. Mary and Sue, whose son is in the army, are concerned.
⇒ Mary and Sue have a son together. *non-restrictive*

👉 Non-restrictive RCs do not “distribute” over individuals; there is always a single referent (possibly a plurality) which is described.


(See also discussion of Weakest Crossover in Lasnik and Stowell (1991).)

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Conclusion

Today we investigated the structure and interpretation of **English non-restrictive relatives** with **relative pronoun pied-piping** (RPPP).


- 👉 We propose that the RPPP is interpreted via **Rooth-Hamblin alternative computation**, with the *wh* relative pronoun *in-situ*.

$$(39) \quad [_{RC} \left[[_{RPPP} \dots wh \dots] \lambda x . \dots x \dots \right]]$$


- **The relative pronoun projects a set of alternatives** but lacks an ordinary semantic value, like interrogative *wh*-words (Beck, 2006, a.o.).
- But unlike in interrogatives, this set is **contextually restricted to the single referent** described by the relative.

There is, however, more to this story. **The addition of a partitive layer allows us to get around intervention.** (Gary Thoms, p.c.)

- (40) **Avoiding intervention with a partitive (Gary Thoms, p.c.):**
- a. * This recipe, [[**no** ingredients for *which*] I have at home], is...
 - b. ✓ This recipe, [[**none** of the ingredients for *which*] I have at home], is...
 - c. ✓ This recipe, [[**only** some of the ingredients for *which*] I have at home], is...

 Perhaps the partitive structure allows for covert movement of a smaller *wh*-containing phrase, within the RPPP. Relative pronouns are susceptible to intervention only if they cannot be covertly moved to the edge.

In future work, we hope to investigate the interpretation of RPPP in **restrictive RCs**.

- Is alternative computation used?
- Is the use of alternative computation for non-restrictive RCs part of why non-restrictive RCs allow for larger pied-piping?

Thank you!

Thank you! Questions?

For comments and discussion we would like to thank Martin Hackl, Danny Fox, David Pesetsky, and Gary Thoms. The second author is supported by a Mellon fellowship at McGill University. Errors are each other's.

Slides at <http://mitcho.com> and <http://hkotek.com> soon.

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Non-singleton referents?

In fact, describing a plurality vs quantifying over individuals is a distinguishing characteristic between non-restrictive and restrictive RCs.

(41) Carlson (1977):

- a. The men, of whom all were astronauts, left.
- b. * The men of whom all were astronauts left.

(42) **Adding 'all' in the RC forces non-restrictive RC:**

- a. The linguists who chose not to go to CLS regretted their decision, because [the linguists(,) [_{RC} who went]](,) had fun.
 - i. ✓ restrictive: two sets of linguists
 - ii. # non-restrictive: infelicitous because of preceding context
- b. # The linguists who chose not to go to CLS regretted their decision, because the linguists(,) who **all** went(,) had fun.
 - i. * restrictive: two sets of linguists
 - ii. # non-restrictive: infelicitous because of preceding

Reconstruction of the RPPP

Safir (1999) argues that R-expressions which are pied-piped trigger condition C just like they do in *wh*-questions:

(43) Condition C in questions

- a. ?? *Which* picture of John_i does he_i like?
- b. ✓ I bought the picture of John_i that he_i liked

(44) Condition C in RPPP

- a. * I always respect a journalist [*whose* depiction of Jesse_i]_j he_i objects to t_j
- b. ?? Max, [*whose* depiction of Jesse_i]_j he_i objects to t_j...
- c. ✓ I always respect a journalist [*whose* depiction of Jesse_i]_j t_j offends him_i
- d. ✓ Max, [*whose* depiction of Jesse_i]_j t_j offends him_i ...

Lasnik and Stowell (1991) notes that WCO seems to affect restrictive RCs but not non-restrictive RCs: (Judgments differ from Chomsky (1982).)

(45) **Restrictive RCs:**

- a. * the man_{*i*} who_{*i*} [his_{*i*} mother] loves *t_i*
- b. * the book_{*i*} which_{*i*} [its_{*i*} author] read *t_i*

(46) **Non-restrictive RCs:**

- a. Gerald_{*i*}, who_{*i*} [his_{*i*} mother] loves *t_i*, is a nice guy.
- b. This book_{*i*}, which_{*i*} [its_{*i*} author] wrote *t_i* last week, is a hit.

See also ?Safir (1986).

Pied-piping in overt focus movement

Erlewine and Kotek (2014) show that intervention effects also affect overt focus movement.

The pivot in English *it*-clefts can be considered to be a form of pied-piping movement (Krifka, 2006):

(47) **Pied-piping in *it*-clefts:**

John read a book from THIS_F library.

- a. It's [THIS_F library] that John read a book from ____.
- b. It's [from THIS_F library] that John read a book ____.
- c. It's [a book from THIS_F library] that John read ____.

Pied-piping in overt focus movement

The *it*-cleft associates with focus inside the pivot (Jackendoff, 1972; Krifka, 2006). Therefore *it*-clefts are interpreted using both movement and alternative computation, much like *wh*-pied-piping:

- (48) It's [_{pied-piping} a book from THIS_F library] λx John read x .
Rooth-Hamblin alternatives movement

Intervention in overt focus movement

There is intervention in focus pied-piping

(49) **Intervention in *it*-cleft pivots:**

- a. * It's [**no** book from THIS_F library] that John read ____.
- b. It's [from THIS_F library] that John read **no** book ____.
- c. It's [THIS_F library] that John read **no** book from ____.

- (50)
- a. * It's [**few** books from THIS_F library] that John read ____.
 - b. * It's [**only**_i BOOKS_{F,i} from THIS_F library] that John read ____.