A compositional semantics for relative pronouns

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Background The semantics of interrogative pronouns (aka wh-words or indeterminate pronouns) has received significant attention ever since the advent of formal semantics (Hamblin 1973; Karttunen 1977; Groenendijk & Stokhof 1984; a.o.) and continues to be subject of intensive debate (Cable 2010; Uegaki 2015; Xiang 2016; Kotek 2019; a.o.). Compared to that, the semantics of relative pronouns, which are often morphologically related to interrogative pronouns, is understudied and relatively poorly understood (though see Caponigro 2003 for in-depth discussion of free relative pronouns). Moreover, commonly assumed denotations of interrogative pronouns/clauses do not readily extend to relative pronouns/clauses (cf. Chierchia & Caponigro 2013).

Basic idea Building on crosslinguistic generalizations from various domains of grammar, I suggest that relative pronouns (RPs) are morphosyntactically and semantically derived from the corresponding interrogative pronouns (IPs). This is made transparent in languages where RPs are derived by adding what I call relative morphemes (RMs) to IPs (e.g. Bulgarian *koj → kojto* 'which' or Hungarian *melyik → amelyik* 'which'). I assume that IPs only have focus semantics (Beck 2006) and that RMs indicate the presence of a subspecies of Rooth's (1992) squiggle-operator attached to the IP, call it $\sim^r$, as illustrated in (1). (I assume a head external analysis for the sake of brevity.) The role of this "relative squiggle" is (i) to relate the focus semantic value of its complement to the value of a variable (indicated by the index 1 on $\sim^r$) and (ii) to help identify this variable with the denotation of the relative NP head and thus establish an explicit anaphoric relation between the NP head and the RP. Property (i) follows from Rooth's (1992) classical proposal; property (ii) is my proposal.

(1) The LF of a relative pronoun
$[_{\text{RP}} \sim^r_1 [_{\text{IP}} \text{who}]]$

Technical implementation There are multiple ways of implementing the basic idea. What I present below just a simplified version which abstracts away from the relative clause-internal representation of the NP head. In this analysis, the RP presupposes that the value of the index on $\sim^r$ assigned by g is a subset of the focus semantic value of its complement and denotes a function characterizing the set $g(1)$, (3b). RP combines with TP by predicate modification, giving rise to (3c). The CP is then selected by an indexed Rel(ative) head, which relates the RP to the NP head by triggering lambda-abstraction over the index contributed by $\sim^r$. The resulting function, (3e), is then applied to the NP head, giving rise to (3f). The key element of the analysis is that the relative squiggle does not relate the focus semantic value to a discourse antecedent, but rather a local linguistic antecedent—the NP head.

(2)

(3)
a. $[\![[_{\text{IP}} \text{who}]\!]]^g_f = \{x \mid \text{HUMAN}(x)\}$
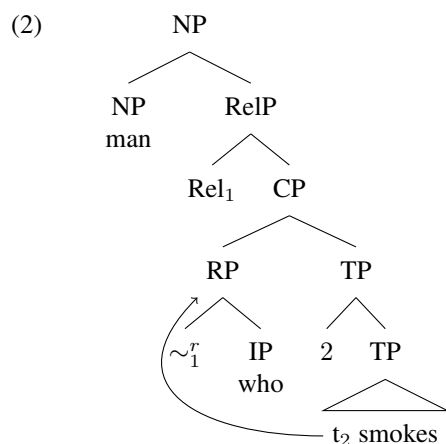
b. $[\![[_{\text{RP}} \sim^r_1 [_{\text{IP}} \text{who}]]\!]]^g_o$
   (i) defined if $g(1) \subseteq \{x \mid \text{HUMAN}(x)\}$
   (ii) if defined, then
   $[\![\text{RP}]\!]^g = \lambda x[x \in g(1)]$

c. $[\![\text{CP}]\!]^g = \lambda x[x \in g(1) \land \text{SMOKE}(x)]$

d. Rel$_1$ triggers lambda-abstraction

e. $[\![\text{RelP}]\!]^g = \lambda P \lambda x[x \in P \land \text{SMOKE}(x)]$

f. $[\![\text{NP}]\!]^g = \lambda x[x \in \text{MAN} \land \text{SMOKE}(x)]$

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Evidence Arguments from a variety of linguistic areas support the basic idea and partly also the particular technical implementation. **A1:** RPs are sometimes morphologically derived from IPs (B(ulgarian), G(reek), M(acedonian), H(ungarian), Sl(ovenian), Sp(anish) a.o.) but never conversely. **A2:** The set of wh-based RPs is always a subset of the set of IPs, never conversely (generalized Caponigro's generalization; Caponigro 2003; Šimík to appear). Using the logic of Chierchia & Caponigro (2013), one can make sense of this generalization if $\sim^r$ is, for whatever reason, a partial function (i.e. not all wh-words can be its input). **A3:** RMs are morphologically based on two kinds of expressions: (i) definite determiners, particularly (reduced forms of) definite articles or demonstratives (H *a-*, G *o-*, Sp *el/la/...*, possibly B *-to*) and (ii) (reduced forms of) complementizers (Sl *-r*, M *-što*, possibly B *-to;* Rudin 2014). My implementation introduces two expressions that are candidates for spelling out RMs: $\sim^r$ and the Rel head. The former is essentially an anaphoric expression, so it makes sense for it to be morphologically related to definite or demonstrative determiners, which can also be used anaphorically. The latter can be thought of as a relative complementizer and could therefore be syncretic with other complementizers. **A4:** German and to some extent other Germanic languages spell out RPs as demonstratives. The present analysis provides a rationale for why this happens: one of the canonical uses of demonstratives is the anaphoric use (e.g. Schwarz 2009); in my analysis the RP is an anaphoric element (note: anaphoric in a broad sense, including bound; and crucially not discourse-anaphoric), the only difference being that it is anaphoric to a property (the NP head) rather than an individual. Definite-like RMs and demonstrative RPs thus receive a conceptually unified treatment.

Broader implications The present analysis of RPs receives indirect support from a parallelism with set-based approaches to IPs. According to Cable (2010), for instance, IPs are interpreted using three main ingredients: (i) wh-words denoting alternatives (setting aside the technical issue of Hamblin vs. focus alternatives), (ii) the choice-functional Q-particle operating on the alternatives, and (iii) an interrogative complementizer binding the Q-particle and producing interrogative meaning. My analysis takes (i) as its starting point and introduces new conceptual parallels to (ii) and (iii): the relative squiggle corresponds to Cable's Q-particle in that it operates on alternative denotations ($\approx$ (ii)) and the relative complementizer binds (the index on) the squiggle in order to produce the final meaning of a relative clause ($\approx$ (iii)). Where the present and Cable's analyses diverge is the attachment site of the operator over alternatives. While Cable's Q-operator is always the sister of the pied-piped constituent, the relative squiggle must attach to the wh-word itself. Consider (4), which illustrates that despite the pied-piping of *whose mother,* the extension of MAN must correspond to a subset of $[\![who]\!]_f$ and not $[\![whose\ mother]\!]_f$. Pied-piping thus must be regulated independently (cf. Heck 2008) of $\sim^r$'s attachment.

(4)   the man [$_{\text{RelP}}$ Rel$_1$ [$_{\text{DP}}$ [$_{\text{RP}}$ $\sim_1^r$ [$_{\text{IP}}$ who]]se mother]$_2$ I saw t$_2$]

Outlook The present analysis is the first one to bring the semantics of RPs in line with common analyses of IPs (see also Kotek & Erlewine 2016 for a precedent on this part), while at the same time provide an answer to why RPs can be derived from IPs (never conversely) and why relative morphemes (or even the whole RPs) so often take a shape akin to definite determiners. Many issues remain open, including the precise morphosyntactic and semantic implementation, the issue of adapting this baseline analysis to other relative clause types (correlatives, free relatives) that also make use of RMs/RPs, or the question of what regulates pied-piping in relatives vs. interrogatives (cf. Horvath 2017).

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