

## Intensional-functional relative clauses with syntactic reconstruction

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**Overview:** We compare two theories of functional relative clauses, focusing on one type of relative clauses with embedded intensional quantifiers discussed in Grosu and Krifka (2007). The two theories agree on the overall meaning of the construction, but diverge on the compositional details. The first theory makes use of a semantic mechanism that type-shifts the relative head NP to a higher type (Grosu and Krifka, 2007; see also Jacobson 1994 et seq., Sharvit 1999). The second theory, developed here, adopts syntactic reconstruction of the relative head, following Heim’s (2012) analysis of functional readings in questions. The two theories make different predictions regarding the availability of functional readings with head-external relatives: type-shifting permits functional head-external relatives, but syntactic reconstruction without type-shifting does not. Using Hebrew resumptive pronouns, which disambiguate a relative clause in favor of the head-external structure, we show that the predictions of syntactic reconstruction are borne out: intensional-functional readings are blocked with resumed relatives but are incorrectly generated by type-shifting theories.

**Intensional-functional relative clauses:** Our focus is on two readings of sentences like (1) discussed in Grosu and Krifka (2007). *De re* reading: you claim to be a certain gifted mathematician, say Erdős, and he should be able to solve this problem. *De dicto* reading: if what is claimed about your mathematical skills is true, then you should be able to solve this problem.

- (1) The gifted mathematician that you claim to be should be able to solve this problem

Grosu and Krifka (2007) derive the *de dicto* reading by combining abstraction over functional variables of type  $\langle s, e \rangle$  with a semantic mechanism along the lines of Engdahl (1986) which type-shifts the relative head from a predicate of individuals to a predicate of individual concepts and binds variables embedded in the relative head, as in (2). Other compositional analyses of functional relative clauses that use type-shifting include Jacobson (1994) et seq. and Sharvit (1999).

$$(2) \quad \llbracket \text{TS}(\text{gifted mathematician}) \rrbracket^{\text{a}} = \lambda f_{\langle s, e \rangle}. \forall w \in \text{dom}(f) \left[ \text{gifted math}'_w (f(w)) \right]$$

**Syntactic-reconstruction theory:** Following Grosu and Krifka’s (2007) analysis of the *de dicto* reading of (1), we assume that the relative clause denotes a predicate of individual concepts (type  $\langle se, t \rangle$ ) achieved by a mechanism of abstraction over functional variables. Our own analysis is an adaptation to relative clauses of Heim’s (2012) theory of functional readings in questions: it replaces type-shifting and semantic binding with syntactic reconstruction of the relative head, but the resulting denotation is the same as Grosu and Krifka’s (2007). The LF of the subject, given in (3a), includes the key ingredients of Heim’s (2012) analysis. The higher syntactic copy is deleted and the lower copy (indicated by the outer square brackets) undergoes trace conversion (Fox, 2000); a functional variable  $f$  of type  $\langle s, e \rangle$  is saturated by a world pronoun available in the syntax; the functional variable is bound by the relative lambda operator and the world pronoun is bound by the intensional operator; the relative head is not type-shifted and keeps its basic  $\langle s, et \rangle$ -type meaning. The denotation of the subject is given in (3b). A few steps in the computation are given in (4)-(6): the converted trace projects its presuppositions as in Heim (2012) and the highest definite article locally accommodates the presuppositions of the predicate abstract in (6). Otherwise, the composition proceeds as in Grosu and Krifka (2007).

- (3) a. LF: THE GM  $\lambda_{f_{\langle s,e \rangle}}$  you<sub>2</sub> claim<sub>@</sub>  $\lambda_w$  PRO<sub>2</sub> to be<sub>w</sub> [THE GM<sub>w</sub> IDENT [ $f_{\langle s,e \rangle}$   $w_s$ ]]  
 b. the minimal function  $f : \text{CLAIM}_{you,@} \rightarrow D_e$  such that  $\forall w \in \text{CLAIM}_{you,@}$ ,  
 you =<sub>w</sub>  $f(w) \wedge f(w)$  is a gifted mathematician in  $w$
- (4)  $\llbracket \text{THE GM}_w \text{ IDENT } [f_{\langle s,e \rangle} w_s] \rrbracket^g = g(f)(g(w))$   
 if  $g(w) \in \text{dom}(g(f))$  and gifted mathematician<sub>w</sub>( $g(f)(g(w))$ ), otherwise undefined
- (5)  $\llbracket \lambda_w \text{ PRO}_2 \text{ to be}_w [\text{THE GM}_w \text{ IDENT } f_{\langle s,e \rangle} w_s] \rrbracket^g =$   
 $\lambda w : w \in \text{dom}(g(f)) \wedge \text{gifted mathematician}_w(g(f)(w))$ .  $\llbracket \text{PRO}_2 \rrbracket^g =_w (g(f)(w))$
- (6)  $\llbracket \lambda_f \text{ you}_2 \text{ claim}_@ [\lambda_w \text{ PRO}_2 \text{ to be}_w [\text{THE GM}_w \text{ IDENT } f_{\langle s,e \rangle} w_s] \rrbracket^g =$   
 $\lambda f : \forall w \in \text{CLAIM}_{you,@} [w \in \text{dom}(f) \wedge \text{GM}_w(f(w))]$ .  $\forall w \in \text{CLAIM}_{you,@} [you =_w f(w)]$

**Hebrew resumptive pronouns (RPs) block the *de dicto* reading.** In the Hebrew sentences corresponding to (1), an RP in the gap position is optional. Crucially, the gapped relative is compatible with the *de dicto* reading (7a) but the resumed relative (7b) is not. The primary evidence that such RPs involve head-external relatives in Hebrew comes from insensitivity to islands and various interpretive effects (Sichel, 2014). Example (8), with an RP in an island context, is only compatible with a head-external structure and the *de dicto* reading is blocked.

- (7) Hebrew interpretive asymmetry
- a. ha-matematikai ha-mexunan<sub>i</sub> še-to'anim še-ata  $t_i$  amur lehacliax...  
 the-mathematician the-gifted<sub>i</sub> that-claim.3PL that-you  $t_i$  should be.able...  
 'The gifted mathematician that they claim you are should be able...' (*de re, de dicto*)
- b. ha-matematikai ha-mexunan<sub>i</sub> še-to'anim še-ata **hu**<sub>i</sub> amur lehacliax...  
 the-mathematician the-gifted<sub>i</sub> that-claim.3PL that-you **him**<sub>i</sub> should be.able...  
 'The gifted mathematician that they claim you are should be able...' (*de re, \*de dicto*)
- (8) ha-mat' ha-mexunan<sub>i</sub> še-heficu et ha-[<sub>NP</sub> šmu'a še-ata **hu**<sub>i</sub>/\* $t_i$ ] amur...  
 the-math' the-gifted<sub>i</sub> that-spread.3PL ACC the-[<sub>NP</sub> rumor that-you **him**<sub>i</sub>/\* $t_i$ ] should...  
 Intended *de dicto*: 'there's a rumor that your mathematical skills are very high' (*\*de dicto*)

**The proposed account does not generate the *de dicto* reading with RPs:** under the assumption that type-shifting of the relative head is unavailable, the unmoved relative head cannot be type-shifted to a predicate of individual concepts, leading to a type mismatch and an uninterpretable LF ( $\llbracket \text{The } [math'_{\langle e,t \rangle} [\lambda f_{\langle s,e \rangle} \dots] \rrbracket_{\langle se,t \rangle} \dots \rrbracket$ ). **Type-shifting theories overgenerate the *de dicto* reading:** Grosu and Krifka (2007) would have the same *de-dicto*-inducing denotation for the relative clause regardless of the presence of the RP, by combining the type-shifted head (2) with the predicate abstract in (9). **Conclusion:** the interpretive pattern follows from syntactic reconstruction but is surprising under type-shifting theories, which would at least require additional constraints to block the *de-dicto* reading in (8) and (7b).

- (9)  $\llbracket \lambda_{f_{\langle s,e \rangle}} \text{ they claim}_@ \lambda_w \text{ you are } f_{\langle s,e \rangle} \rrbracket^@ = \lambda f_{\langle s,e \rangle} \cdot \forall w \in \text{CLAIM}_{you,@} [you =_w (f(w))]$

**Selected references.** Grosu, Alexander, and Manfred Krifka. 2007. The gifted mathematician that you claim to be: Equational intensional reconstruction relatives. *Linguistics and Philosophy* 30:445–485. Heim, Irene. 2012. Functional readings without type-shifted noun phrases. Ms., MIT. Sichel, Ivy. 2014. Resumptive pronouns and competition. *Linguistic inquiry* 45:655–693.