

snippets

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Modal adverbs and constraints on type-flexibility

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A traditional view holds that *and* is ambiguous between the meanings in (1), among others: $\llbracket \text{and} \rrbracket$ composes with truth-values, and $\llbracket \text{and}_2 \rrbracket$ with quantifiers. The ambiguity is systematic (e.g. Keenan and Faltz 1978, 1985; Partee and Rooth 1983; Rooth 1985). In one conception, *and* is stored lexically as $\llbracket \text{and} \rrbracket$, while $\llbracket \text{and}_2 \rrbracket$ is derived through a type-shifting mechanism. Jacobson (1999, 2014) puts forward a general rule — the Geach Rule — which can in principle apply to any operator. This snippet shows that the rule over-generates an unattested reading with modal adverbs.

- (1) a. $\llbracket \text{and} \rrbracket = \lambda p_t. \lambda q_t. p \wedge q$
b. $\llbracket \text{and}_2 \rrbracket = \lambda Q_{et,t}. \lambda Q'_{et,t}. \lambda f_{et}. \llbracket \text{and} \rrbracket (Q(f))(Q'(f))$

Possibly precedes the *vP* in (2a), and a *DP* in (2b). Bogal-Allbritten (2013, 2014) observed that these are truth-conditionally distinct: unlike (2a), (2b) has an existential entailment that Mary climbed something. The contrast replicates in (3) with the *DP* being an existential quantifier.

- (2) a. Mary possibly climbed the tallest mountain in Ireland (TMI).
“It is possible Mary climbed the TMI.”
b. Mary climbed possibly the tallest mountain in Ireland.
“Mary climbed something, which possibly was the TMI.”
- (3) a. Mary possibly climbed something.
“It’s possible Mary climbed something.”
b. #Mary climbed possibly something.
“Mary climbed something, which possibly was something.”

Possibly denotes (4), and in (2a) adjoins to the *vP*, as in (5). Percus (2000) observed that verbal predicates are interpreted relative to the most local intensional operator. (5) therefore conveys that for some w' epistemically-accessible from w_0 , Mary climbed at w' the TMI at w' (if the *DP* is likewise interpreted relative to the modal). Rightly, no actual climbing is entailed.

- (4) $\llbracket \text{possibly} \rrbracket = \lambda p_{st}. \lambda w. \exists w' \in \text{EPI}(w) [p(w')]$ (type $\langle st, st \rangle$)

- (5) $[_{vP} \text{possibly } [_{vP} \text{Mary climbed the tallest mountain in Ireland}]]$

In (2b), Bogal-Allbritten proposes that *climb* is outside the scope of *possibly*, and thus interpreted by default relative to the actual world, yielding an existential entailment. One route involves hidden syntax: *possibly* takes low propositional scope in a covert relative clause:

- (6) $[_{vP} [_{DP} \exists [_{RC} \text{Op } \lambda 2 [\text{possibly } [t_2 \langle \text{was} \rangle \text{the TMI}]]]] \lambda 1 [_{vP} \text{Mary climbed } t_1]]$

Yet, with type-shifting, (2b) should allow another parse. The Geach Rule applied to an operator of type $\langle \alpha, \beta \rangle$ is (7). Through the Geach Rule, $\llbracket \text{possibly} \rrbracket$ may shift to $\llbracket \text{possibly}_2 \rrbracket$ in (8), which composes with a quantifier, analogously to $\llbracket \text{and}_2 \rrbracket$. To illustrate, I here assume an intensional semantics where every type t in an extensional system is replaced by $\langle s, t \rangle$ so quantifiers are type $\langle \text{est}, st \rangle$.

$$(7) \quad \mathbf{G}(\text{Op}_{\langle \alpha, \beta \rangle}) = \lambda F_{\langle \gamma, \alpha \rangle} . \lambda f_{\gamma} . \text{Op}(F(f))$$

$$(8) \quad \llbracket \text{possibly}_2 \rrbracket = \lambda Q_{\langle \text{est}, st \rangle} . \lambda f_{\text{est}} . \llbracket \text{possibly} \rrbracket(Q(f)) \quad (\text{type } \langle \langle \text{est}, st \rangle, \langle \text{est}, st \rangle \rangle)$$

Now, *possibly* composes directly with the DP, in this case itself lifted to quantifier type in (9) (Partee 1987). *Possibly DP* is a new quantifier, and scopes at the vP in (10). Per (11), *climb* is again in the semantic scope of *possibly*, and a meaning equivalent to (5) results. If this derivation were attested, (2b), like (2a), would have a parse with no existential entailment.

$$(9) \quad \llbracket \text{the TMI}^\uparrow \rrbracket = \lambda f_{\text{est}} . \lambda w . f(\iota x [x \text{ is the TMI in } w])(w)$$

$$(10) \quad [{}_{vP} [{}_{DP} \text{possibly}_2 \text{ the tallest mountain in Ireland}] \lambda 1 [{}_{vP} \text{Mary climbed } t_1]]$$

$$(11) \quad \begin{aligned} \text{a. } & \llbracket \text{possibly}_2 \rrbracket(\llbracket \text{the TMI}^\uparrow \rrbracket)(\lambda x . \lambda w . \text{Mary climbed } x \text{ in } w) \\ \text{b. } & = \llbracket \text{possibly} \rrbracket(\lambda w . \text{Mary climbed in } w \iota x [x \text{ is the TMI in } w]) \end{aligned}$$

Why is $\llbracket \text{possibly}_2 \rrbracket$ not freely available? If the Geach shift exists in grammar, further constraints are required. A flexible semantics may, for instance, be coupled with a syntactic constraint to block *possibly* from adjoining to a DP. On the other hand, the puzzle might suggest that type-flexibility is *not* available (as in e.g. Heim 2017, Sauerland 2018, Hirsch 2017, 2018; see also Schein 2017 on re-analysis of *and*). Heim and Sauerland formulate economy principles which effectively disallow Geach because it introduces λ -binders, but no new contentful predicate. Then, *possibly* is rigidly interpreted with its lexical meaning, $\llbracket \text{possibly} \rrbracket$, and the data follow from the semantics.

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