

Interpreting DP-modifying modal adverbs

Elizabeth Bogal-Allbritten (University of Massachusetts Amherst)

I. Introduction: I explore the semantics of DP-modifying epistemic modal adverbs (1), comparing them with sentences in which the modal adverb occurs along the clausal spine (2).

- (1) a. Mary is drinking [_{DP} *probably* / *perhaps* [_{DP} the American wine]].
 b. Mary hiked toward [_{DP} *possibly* / *maybe* [_{DP} the tallest mountain in Spain]].
- (2) a. *Probably* / *perhaps* [_{TP} Mary is drinking the American wine].
 b. *Possibly* / *maybe* [_{TP} Mary hiked toward the tallest mountain Spain].

I first present a semantic analysis of sentences like (1) which permits modal adverbs of familiar <st,st> type to modify DPs. Second, I compare the behavior of DP-modifying modals with the behavior of modals on the clausal spine, focusing on their interpretations in intensional contexts.

II. Composition of modal adverbs with DP: I argue that the DP-adjacent modal adverbs in (1) are interpreted where they appear in surface structure: they take semantic scope only over DP. They cannot be analyzed as parenthetically displaced adverbs for two reasons. First, they lack the comma intonation characteristic of parenthetical adverbs (Ernst 2002). Second, the linear position of the adverb affects the sentence's truth conditions. Sentences with DP-adjacent modals carry actuality entailments. Sentence (3a) is only true if Mary climbed some object; uncertainty introduced by *possibly* is restricted to the object climbed. (3b) is true if Mary climbed Spain's tallest mountain in at least one of the speaker's epistemic alternatives. By contrast, parenthetical displacement of adverbs has no truth conditional effect (4a,b).

- (3) Mary planned to climb Pico de Teide yesterday, which is Spain's tallest mountain. The weather was bad, however, so it's possible she didn't climb after all. You say,
 a. # Yesterday, Mary climbed possibly [_{DP} the tallest mountain in Spain].
 b. Yesterday, Mary possibly climbed the tallest mountain in Spain.
- (4) a. Happily, Mary missed my phone call. b. Mary missed, happily, my phone call.

Although non-parenthetical adverbs are generally prohibited in object position (**Mary missed happily my phone call*; Ernst 2002), epistemic modal adverbs can appear there. The ability of modal adverbs to be interpreted when they only scope over DP is initially surprising if we wish to retain familiar type <st,st> entries (5a). I propose that composition between type <st,st> modal adverbs and type <se> DP intensions (5c) is made possible by typeshifting the DP into a property with IDENTIFY, an intensional form of Partee's IDENT (5b). IDENTIFY is utilized in work on Concealed Questions (*Mary knows the tallest mountain in Spain*) which, like modal-modified DPs, involve composition of DPs with typically <st,st> expressions (*know*) (Frana 2006, Schwager 2008). The resulting property (5d) composes with the modal adverb via Function Composition (6).

- (5) a. $[[possibly]] = \lambda p_{st} \lambda s [\exists s'' \in \text{EPI-MB}(s)[p(s'')]]$ b. $[[IDENTIFY]] = \lambda \chi_{se} \lambda z_e \lambda s' [z = \chi(s')]$
 c. $[[the\ tallest\ mountain\ in\ Spain]] = \lambda s. \iota x [TMIS(x,s)]$ (TMIS=tallest mountain in Spain)
 d. $[[IDENTIFY\ TMIS]] = \lambda z_e \lambda s' [z = \iota x [TMIS(x,s')]]$
- (6) $[[possibly\ the\ tallest\ mountain\ in\ Spain]] = possibly \circ TMIS = \lambda y (possibly(TMIS(y)))$
 $= \lambda y \lambda s [\exists s'' \in \text{EPI-MB}(s)[y = \iota x [TMIS(x,s'')]]]$

The property denoted by the modal-modified DP composes with the subject and verb via Predicate Modification followed by Existential Closure (*viz.* RESTRICT, Chung & Ladusaw 2001). The actuality entailment attested for sentence (3a) follows from the truth conditions in (7b).

- (7) a. $[[possibly\ the\ tallest\ mountain\ in\ Spain] \lambda y \text{ Mary climbed } y]$ **PM**
 $= \lambda z \lambda s' [\text{Mary climbed } z \text{ in } s'] \ \& \ [\exists s'' \in \text{EPI-MB}(s') [z = \iota x [TMIS(x,s'')]]]$
- b. $\lambda s' \exists z [\text{Mary climbed } z \text{ in } s'] \ \& \ [\exists s'' \in \text{EPI-MB}(s') [z = \iota x [TMIS(x,s'')]]]$ **EC**
 $= \text{Situations } s' \text{ in which Mary climbed } z \text{ in } s' \ \& \ z \text{ is possibly Spain's tallest mountain in } s'$

With a proposal in place for the composition of modal adverbs and DPs, I now compare the behavior in intensional contexts of DP-modifying modals and modals along the clausal spine.

III. Transparent interpretations of DP-modifying modals: Modals and quantificational adverbs on the clausal spine necessarily receive opaque interpretations when embedded by an intensional operator (Percus 2000, Hacquard 2007). In (8) –adapt. Hacquard 2007– *possibly* must be evaluated relative to *thought* (s_I); it cannot be evaluated relative to the utterance situation (s_θ):

- (8) λs_θ Every contestant_{*i*} thought λs_I he_{*i*} was possibly _{s_I/s_θ} the winner.
 a. *Opaque*: Each contestant_{*i*} thinks that he_{*i*}'s in a world s_I in which it's possible he won.
 b. **Transparent*: Every contestant_{*i*} thinks that he_{*i*} is in a world s_I in which the speaker believes it to be possible (given **the speaker's** beliefs in s_θ) that he_{*i*} won.

Unlike clausal adverbs, DPs permit transparent and opaque interpretations, suggesting that DPs –unlike adverbs (cf. Percus 2000)– have syntactically-represented situation pronouns which permit them to have different indexings (Fodor 1970, Keshet 2008, Schwarz 2012):

- (9) λs_θ Mary wants λs_I her infant son to marry [the tallest woman in the state] _{s_I/s_θ} .

When a modal adverb modifies a DP (6), the resulting expression has a single situation argument. Example (10) shows that under doxastic attitudes (*thinks*), the situation argument of a modal-modified DP –and, thus, of the modal itself– permits the transparent indexing that is available to DPs (9) but which was unavailable to modals along the clausal spine (8):

- (10) λs_θ Mary thinks λs_I she ate [possibly the best pizza in New Haven] _{s_I/s_θ} .
 a. *Opaque*: Mary thinks she is in a world s_I in which what she ate is 'possibly the best pizza in NH' given **her** beliefs in s_I . The speaker might not share these beliefs.
 b. *Transparent*: Mary thinks she is in a world s_I in which what she ate is 'possibly the best pizza in NH' given **the speaker's** beliefs in s_θ . Mary might not share these beliefs.

IV. Missing opaque interpretations of DP-modifying modals: There are, however, still parallels in behavior between epistemic modals in both syntactic positions. I give two examples where missing opaque interpretations for epistemic modal-modified DPs follow from more general restrictions on the interpretation of epistemic modals along the clausal spine.

First, although non-modal-modified DPs can receive either opaque or transparent interpretations beneath *want* (9), the opaque reading disappears when the DP is modified by the epistemic adverb *possibly* (11). The same pattern can be observed for *look for*, *need*, and *wish*.

- (11) λs_θ Mary wants λs_I her infant son to marry [possibly the tallest woman in the state] _{s_I/s_θ} .
 a. **Opaque*: Mary believes that very tall women make good partners. She wants whoever her son ends up marrying to be **at that time** possibly the tallest woman in the state.
 b. *Transparent*: There is a woman (Sally) who the **speaker** (but maybe not Mary) thinks is **currently** possibly the tallest woman in the state. Mary wants her son to marry Sally.

Second, modal adverbs block the Concealed Question (CQ) reading of *know*. The CQ reading for *know* arises when the object DP is interpreted opaquely (i.e. when *know* binds the object DP's situation argument; Romero 2005, Frana 2006, Schwager 2008):

- (12) a. Jan knows possibly the tallest NBA player. \neq Jan knows who is possibly the tallest NBA player.
 b. Jan knows_{CQ} the tallest NBA player. = Jan knows who is the tallest NBA player.

I propose that the missing opaque readings are due to restrictions also relevant to epistemic modals along the clausal spine. Anand & Hacquard (2013) show that *have to* allows an epistemic interpretation beneath 'representational attitudes' (*think*; 13a) but not beneath desideratives (13b). They argue that only the former provide situations interpretable by epistemic modals. I likewise posit that (11) lacks an opaque reading because *want* cannot bind the modal-modified DP's situation.

- (13) a. John thinks that Paul has to be innocent. b. **John* wants Paul to have to be the murderer.

Anand & Hacquard treat both *know* and *think* as representational attitudes and thus don't predict the missing reading of (12a). I argue, however, that the missing reading is expected given subjective epistemic modals' inability to appear in the complements of factive attitude verbs (Papafragou 2006). A question under investigation is whether Anand & Hacquard's theory of attitude types can capture these finer differences between *think* and *know*.