The anti-rogativity of non-veridical preferential predicates

Anti-rogativity. The existence of ANTI-ROGATIVE PREDICATES, i.e., clause-embedding predicates that only select for declarative complements (e.g., *hope*, *think*), poses a problem for the semantics of clausal embedding. If embedded questions can be reduced to propositions under some predicates such as *know* (by e.g., the answerhood operator; Heim 1994, Dayal 1996), it is not clear why the same mechanism cannot apply to anti-rogative predicates. If a semantic type distinction is made between anti-rogative and question-embedding predicates, it remains unclear why the distinction correlates with certain lexical semantic properties, as discussed below.

Non-veridical preferential predicates. Roelofsen et al. (2017) propose an explanation for the selectional restriction of certain anti-rogative predicates, based on the generalization that neg-raising predicates are always anti-rogative (Zuber, 1982). According to them, the neg-raising property leads to systematic triviality when a neg-raising predicate takes an interrogative complement. This analysis, however, does not explain the selectional restriction of all anti-rogative predicates. In particular, it misses the cross-linguistically stable generalization that non-veridical preferential predicates, such as *hope* and *fear*, are anti-rogative. It is known that there is cross-linguistic variation in the neg-raising property of English *hope* and its Germanic cognates and Romance synonyms (e.g., Dutch *hopen*) (Horn, 1989), but regardless of this, they are anti-rogative in the Romance and Germanic languages.

The goal of this paper is to provide an independent semantic explanation for the anti-rogativity of non-veridical preferential predicates such as *hope* and *fear*. If on the right track, it will supplement Roelofsen et al.'s theory of anti-rogativity (We leave open the anti-rogativity of non-neg-raising non-preferential predicates such as *deny* and *say*.)

Semantic classification of attitude predicates. We employ two cross-cutting lexical semantic distinctions of attitude predicates: REPRESENTATIONAL VS. PREFERENTIAL distinction (Bolinger, 1968; Villalta, 2008; Anand and Hacquard, 2013) and VERIDICAL VS. NON-VERIDICAL distinction. Representational predicates (e.g., *believe*, *know*, *be certain*) express a relationship between the subject's attitude representation and the proposition denoted by the complement. On the other hand, the semantics of preferential predicates (e.g., *surprise*, *be glad*, *want*) refers to ordering of propositions in terms of preference, expectedness, etc. (Heim, 1992) (see references above for independent empirical motivations for the distinction). Using these distinctions, predicates can be classified as in (1). In light of this classification, the generalization that non-veridical preferential predicates are anti-rogative can be restated as in (2):

(1)

	Representational	**Preferential**
Veridical	*know*, *forget*, *remember*,	*be glad*, *surprise*, *annoy*
Non-veridical	*be certain*, *believe*	***hope***, ***wish***, ***fear***

(2) **Generalization:** Non-veridical preferential predicates are always anti-rogative.

Predicates in the other classes may also be anti-rogative (e.g., *believe*), and they may be explained by independent mechanisms (e.g., neg-raising; Roelofsen et al. 2017).

Analysis. We show that the generalization in (2) can be straightforwardly explained in a framework in which complements uniformly denote sets of propositions (Uegaki, 2015; Theiler et al., 2016), when coupled with independently motivated semantics of veridical and preferential predicates. In particular, we show that the ordering-based semantics for preferential predicates leads to systematic triviality when the whole set of propositions denoted by an interrogative complement enter into the ordering relation, and that this happens precisely when the predicate is *non-veridical* preferential, as in the case of *hope* and *fear*.

We assume that both declarative and interrogative complements denote *sets of propositions*. Specifically, an interrogative complement denotes a Hamblin set while a declarative complement denotes a singleton set of its standard propositional denotation. Examples denotations of declarative and interrogative complements are given below:

(3) $[\![\text{Max sings}]\!] = \{\lambda w.\textbf{sing}_w(\textbf{m})\}$ (4) $[\![\text{who sings}]\!] = \{p_{st} \mid \exists x[p = \lambda w.\textbf{sing}_w(x)]\}$

All clause-embedding predicates take a set of propositions as an argument (see Theiler et al. 2016; Elliot et al. 2017 for empirical support). Below, we first illustrate how veridicality is captured for representational predicates. The treatment is then extended to preferential predicates.

Following George (2011) and Spector and Egré (2015), we analyze responsive predicates as relating the subject's information state and *some* answer of the question. In this formulation, a predicate is veridical iff the answer to which the subject's information state is related is required to be true. The entry for *be certain* in (5) exemplifies the denotation of a non-veridical representational predicate while the entry for *know* in (6) exemplifies the denotation of a veridical representational predicate. (We ignore Gettier's problem for presentational purposes; the veridicality condition in (6) is $\boxed{\text{boxed}}$).

(5) $[\![\text{be certain}]\!]^w = \lambda Q_{\langle st,t\rangle}\lambda x.\ \exists p \in Q[\textbf{Dox}^w_x \subseteq p]$

(6) $[\![\text{know}]\!]^w = \lambda Q_{\langle st,t\rangle}\lambda x\colon w \in \bigcup Q.\ \exists p \in Q[\textbf{Dox}^w_x \subseteq p \wedge \boxed{p(w)}\ ]$

Combining these denotations with an interrogative complement, we derive a mention-some interpretation. Following George (2011) and Theiler et al. (2016), we assume that stronger interpretations, such as intermediate exhaustivity (IE) and strong exhaustivity (SE) can be derived by applying an additional operator to the question denotation.

Turning to preferential predicates, we incorporate Villalta's (2008) focus-sensitive ordering semantics to the current framework. In particular, we follow Romero (2015) in analyzing preferential predicates as gradable predicates. The semantics of non-veridical and veridical preferential predicates are exemplified by the denotations of *hope* and *be glad*, as follows:

(7) $[\![\text{hope}_C]\!]^w = \lambda Q_{\langle st,t\rangle}\lambda x.\ \exists p \in Q[☺_w(x,p) > \textbf{stnd}(\{☺_w(x,p') \mid p' \in C\})]$

- $☺_w(x,p)$:= the degree to which x is happy with p in w (cf. Kennedy, 2007)
- $\textbf{stnd}(\delta_{dt})$:= the standard of comparison given the set δ of degrees

(8) $[\![\text{be glad}_C]\!]^w = \lambda Q_{\langle st,t\rangle}\lambda x.\exists p \in Q[☺_w(x,p) > \textbf{stnd}(\{☺_w(x,p') \mid p' \in C\}) \wedge \boxed{p(w)}\ ]$

Again, veridicality is captured by the requirement that the existentially-quantified answer is true. In contrast, the non-veridical predicate *hope* does not have such a requirement.

Additionally, we assume that the function **stnd** has the presupposition in (9). The presence of this presupposition is empirically motivated by the oddness of examples like (10).

(9) $\textbf{stnd}(\delta)$ is defined only if there is significant variation among the degrees in δ.

(10) # No ribbonfish is long for a ribbonfish.

Without the presupposition in (9) associated with the gradable adjective *long*, (10) would express a non-trivial assertion that all ribbonfish have about the same length.

The denotations in (7,8) work as follows. First, (8) derives intuitive interpretations of both declarative and interrogative embedding under *be glad*, as exemplified below (we assume that $[\![\text{who sings}]\!]^w = [\![\text{who sings}]\!]^w_{focus} = \{\textbf{A},\textbf{B},\textbf{C}\}$; ~ is from Rooth 1992):

(11) $[\![\text{John is glad}_C \text{ that } [[\text{Ann}]_F \text{ sings}]{\sim}C]\!]^w$
$\Leftrightarrow \exists p \in \{\textbf{A}\}[☺_w(\textbf{j},p) > \textbf{stnd}(\{☺_w(\textbf{j},p') \mid p' \in \{\textbf{A},\textbf{B},\textbf{C}\}\}) \wedge p(w)]$ **(Non-trivial)**

(12) $[\![\text{John is glad}_C \text{ about [who sings]}{\sim}C]\!]^w$
$\Leftrightarrow \exists p \in \{\textbf{A},\textbf{B},\textbf{C}\}[☺_w(\textbf{j},p) > \textbf{stnd}(\{☺_w(\textbf{j},p') \mid p' \in \{\textbf{A},\textbf{B},\textbf{C}\}\}) \wedge p(w)]$ **(Non-trivial)**

The meaning in (11) states that the degree to which John is happy with **A** is greater than the standard given alternatives, i.e., {**A, B, C**}. (12) states that the degree to which John is happy with some *true* member of {**A, B, C**} is greater than the same standard.

Similarly, (7) leads to a non-trivial interpretation when it combines with a declarative complement, as in (13). Crucially, with an interrogative complement, (7) predicts a trivial interpretation: (14) is necessarily true as long as the presupposition in (9) is satisfied.

(13) $[\![\text{John hopes}_C \text{ that } [[\text{Ann}]_F \text{ sings}]{\sim}C]\!]^w$
$\Leftrightarrow \exists p \in \{\textbf{A}\}[☺_w(\textbf{j},p) > \textbf{stnd}(\{☺_w(\textbf{j},p') \mid p' \in \{\textbf{A},\textbf{B},\textbf{C}\}\})]$ **(Non-trivial)**

(14) $[\![\text{John hopes}_C \text{ (about) [who sings]}{\sim}C]\!]$
$\Leftrightarrow \exists p \in \{\textbf{A},\textbf{B},\textbf{C}\}[☺_w(\textbf{j},p) > \textbf{stnd}(\{☺_w(\textbf{j},p') \mid p' \in \{\textbf{A},\textbf{B},\textbf{C}\}\})]$ **(Trivial)**

Hence, assuming that systematic logical triviality leads to ungrammaticality (Gajewski, 2002), our account correctly captures the anti-rogativity of non-veridical preferential predicates.

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