Do modals take propositions or questions? Evidence from Japanese
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**Introduction**: The standard view is that modal operators apply to propositions. Under this view, the interrogative-embedding use of responsive modal verbs like *know* is ‘reduced’ to their declarative-embedding use (e.g., Karttunen 1977, Spector & Egré 2015). For instance, *John knows who left* is analyzed as ‘For some proposition *p* that is an answer to the question expressed by the complement *who left*, John knows *p*’. Thus, whether *know* combines with a declarative or an interrogative complement, it is always taken to apply to a proposition.

Another, more recent view is that modals always take questions, modeled as sets of propositions, as their input (Uegaki, 2015; Ciardelli and Roelofsen, 2018). Under this view, both declarative and interrogative complements denote sets of propositions. In the case of a declarative complement this set only has one element (or only one maximal element in inquisitive semantics, where sentence denotations are downward closed). Thus, the interrogative-embedding use of a verb like *know* does not need to be reduced to its declarative-embedding use. Rather, the verb gets a single entry which applies uniformly to both types of complement.

Elliott et al. (2017) argue for the question-based view, observing that so-called verbs of relevance like *care* and *matter* cannot be given a reductive account. In particular, *John cares who left* cannot be analyzed as ‘For some answer *p* to *who left*, John cares that *p*’. On the other hand, George (2011) and Spector and Egré (2015) (S&E) raise a concern for the question-based view, which is that it does not predict any constraints on the range of possible responsive modal operator meanings. To illustrate this point, S&E consider the fictitious verb *shknow*, which is equivalent to *know* when taking a declarative complement and equivalent to *wonder* when taking an interrogative complement. Under the reductive treatment of responsive modal operators, such verbs are predicted not to exist in any language. On the non-reductive, question-based treatment of responsive modals, such constraints are not predicted.

We offer new evidence for the question-based view coming from the Japanese modal particle *darou*, which behaves roughly like S&E’s *shknow*. Below we present the core empirical observations (building on Hara and Davis, 2013; Hara, 2015) and an outline of our theoretical account, which is fully spelled out in the paper.

**Empirical observations**: With a declarative prejacent, as in (1a), *darou* translates as ‘I expect’. In contrast, in the presence of the question particle *ka*, it translates as ‘I wonder’, as in (1b)-(1c).

\[
\begin{align*}
(1) \quad &a. \text{Taro-wa utau-} \text{darou}. &b. \text{Taro-wa utau-} \text{darou-ka}. &c. \text{Dare-ga utau-} \text{darou-ka}. \\
&\text{Taro-top sing-DAROU} &\text{Taro-top sing-DAROU-Q} &\text{who-nom sing-DAROU-Q} \\
&'I expect Taro will sing.' &'I wonder if Taro will sing.' &'I wonder who will sing.'
\end{align*}
\]

Sentences like (1b)-(1c), do not behave like questions. For instance, one cannot respond to them with “Why are you asking me that question?”. Therefore, it is assumed that *ka* does not apply to the matrix clause in such constructions, but is part of the prejacent of *darou* (Hara and Davis 2013). This means that *darou* is a responsive modal particle that is compatible with both declarative and interrogative prejacents, just like verbal responsive modals like *know*. Importantly, however, the interrogative-embedding use of *darou* cannot be reduced to its declarative-embedding use: ‘I wonder *Q*’ does not mean that for some answer *p* to *Q*, ‘I expect *p*’.

What makes *darou* even more interesting is its interaction with intonation (Hara 2015). As seen in (2a), with final rising intonation, *darou* with a declarative prejacent expresses a biased question, similar to English tag-questions. On the other hand, rising intonation is incompatible with *darou-ka*, as in (2b)-(2c).
The semantic value of a sentence $\varphi$ in IEL, $[[\varphi]]$, is a downward-closed set of propositions, namely those propositions that support the information that $\varphi$ conveys (if any) and resolve the issue that $\varphi$ raises (if any). The truth-conditions of $\varphi$ are derivable from $[[\varphi]]$: $\varphi$ is true in $w$ iff $\{w\} \subseteq [[\varphi]]$. The informative content of $\varphi$, info($\varphi$), is the set of all worlds where $\varphi$ is true, $\bigcup[[\varphi]]$. The semantics of the relevant operators in IEL is given below: $E_o$ stands for ‘$a$ expects’, $W_o$ for ‘$a$ wonders’, $?$ is an operator that trivializes the informative content of $\varphi$, and $!$ one that trivializes the issue that $\varphi$ expresses, leaving its informative content intact.

Account: We treat $ka$ and the final rise as in (4) and $darou$ as in (5), where $[[\varphi]]$ is the at-issue content of $\varphi$, $[[\varphi]]^*$ its non-at-issue content, and $\odot$ the deictic center which for our purposes here is the speaker (the deictic center can shift in embedded contexts, Hara & Davis 2013). To paraphrase: $\varphi$ $darou$ has the informative content of $\varphi$ as its at-issue content, and contributes ‘I expect $\varphi$ but wonder whether indeed $\varphi$’ as non-at-issue content.

Predictions: The following semantic values are derived for the crucial examples (using the fact that for any atomic sentence $\psi$, $\psi$ = $\psi$, $\neg \psi$ = $\neg \psi$, and $E_o!\psi$ is tautologous.)

As seen in (6), the non-at-issue meaning of $\psi$ $darou$ conveys that the speaker expects $\psi$, and wonders whether $\psi$ is indeed the case. The first conjunct captures the most salient implication of (1a), described in its translation above. The second conjunct implies that the speaker does not know whether $\psi$ (by (3b), wondering implies lack of knowledge), which means that we correctly predict that in uttering (1a) the speaker does not commit to the at-issue informative content, info($\psi$). Turning now to (7), we predict that $\psi$ $darou$-ka has trivial at-issue content but carries a non-at-issue implication that the speaker is wondering whether $\psi$. This matches the intuitive translation of (1b) above. In (8), we see that the at-issue meaning of $\psi$-$darou$-ka$^*$ is.

(2) a. Taro-wa utau-$darou\uparrow$. b. *Taro-wa utau-$darou-ka\uparrow$. c. *Dare-ga utau-$darou$-ka$\uparrow$. ‘John will sing, won’t he?’

Theoretical background: Our account is formulated in inquisitive epistemic logic (IEL) (Cia-rdelli and Roelofsen, 2015). In this framework, every individual $a$ is associated, in every world $w$, with a doxastic state $dox_a^w$ and an inquisitive state $inq_a^w$. As usual, $dox_a^w$ is a set of possible worlds. On the other hand, $inq_a^w$ is a set of doxastic states, all extensions (i.e. subsets) of $dox_a^w$, in which the issues that $a$ entertains in $w$ are resolved. It is assumed that $dox_a^w = \bigcup inq_a^w$. Besides these basic IEL notions, we also associate every individual $a$ in every world $w$ with an ‘expectation state’ $exp_a^w$, consisting of all worlds compatible with what $a$ expects in $w$.
that of a polar question, whether $\psi$, while its non-at-issue meaning conveys a bias toward $\psi$, matching the translation in (2a). Finally, we predict the degradedness of $\psi$-darou-ka since, as seen in (9), both its at-issue and its non-at-issue content are necessarily non-inquisitive, even though the sentence is marked as a question by the final rise, and thus requires inquisitiveness.

References


Hara, Yurie. 2015. *Darou ka*: an interplay of bias, sentence types, and prosody. Ms., City University of Hong Kong, available online at http://semanticsarchive.net/Archive/TA0MmVkJ/


