1 Introduction

Epistemic modals have been argued to take obligatory wide scope over quantifiers in simple clauses (Leech 1971, Drubig 2001, Iatridou & von Fintel 2003). This behavior can be illustrated with a wide range of quantifiers and across a wide range of languages. In (1) we give English examples and in (2) corresponding Japanese examples for which the quantificational expression cannot take scope over the modal when the modal is interpreted epistemically.¹

(1) a. Every student may be Jones
   b. Most students may be Jones
   c. No student must be Jones
   d. Who may be Jones?

(2) a. Subete-no  gakusei-ga  Jones  de  aru  kamoshirenai
    Every-GEN  student-NOM  Jones  COP  may
    *Every student may be Jones
   b. Hotondo-no  gakusei-ga  Jones  de  aru  kamoshirenai
    Most-GEN  student-NOM  Jones  COP  may
    Most students may be Jones
   c. Gakusei-ga  hitori-mo  Jones  de  wa  nai  ni  chigainai
    Student-NOM  one-MO  Jones  COP-TOP  NEG  must
    *It must be that not even one student is Jones
   c'. *Gakusei-ga  hitori-mo  Jones  de  aru  ni  chigainaku-naï)
    Student-NOM  one-MO  Jones  COP  must-NEG
    Not even one student is such that he must be Jones
   d. Dare-ga  Jones  de  aru  kamoshirenai  no?
    Who-NOM  Jones  COP  may  Q
    *Who may be Jones?

To illustrate what the readings are that are unavailable, consider the situation of a teacher at the beginning of a new semester looking over a list of students enrolled in her class and matching up as many names as possible with faces. If the teacher sees the name Jones on the class list but has no idea who any of the students are in her class, then for all she knows any one of the students she sees might be Jones. In such a circumstance, if a wide scope interpretation for the quantifiers in the (a) sentences were possible it would be predicted that

¹ The modals in the Japanese examples in (2) are unambiguously epistemic, unlike their English counterparts in (1).
these sentences would be true in this situation. However, the sentences are not true. Indeed, the only epistemic interpretation available for them is the nonsensical one in which the teacher leaves open the possibility that all of her students are Jones. Similar situations can be constructed to show that the quantifiers in the (b) and (c) examples as well cannot take scope over the modal when interpreted epistemically.

Wh-questions are somewhat more complicated than simple quantified sentences, though with the (d) examples it is possible to show that a similar restriction obtains with questions as well. Consider again the situation of a teacher at the beginning of a new semester looking over the list of students enrolled in her class. This time, imagine that having taught many of the students before, she readily marks off roughly half of the names on the list. The teaching assistant is watching this and he sees that among others, she fails to mark off Jones from the list. The TA has an idea of which student is Jones but isn't quite sure, and hopes to find out without having to ask the student directly. Being ever indirect, he decides to ask the teacher which of the students might, for all she knows, be Jones, hoping to use this information to help narrow down the possibilities. In such a situation, the (d) examples above are decidedly unnatural. In particular, as a request for identifying multiple students and without making explicit the set of students among which the teacher is to choose, these questions are unacceptable in the context given.²

Iatridou and von Fintel (2003) account for facts like those in (1a-c) by stipulating a ban on quantification into epistemically modalized sentences, a ban they refer to as the Epistemic Containment Principle (ECP). However, consideration of a wider range of quantificational expressions shows that quantification into epistemically modalized propositions is not in fact universally banned. Indeed, the astute reader will have noticed that the sentences used to describe the interpretations that were impossible in (1) and (2) were in fact simple modal sentences with wide scope quantifiers. The quantifiers each and either, free choice any, and wh-expressions headed by which all allow for just such wide scope quantification, as do their Japanese counterparts. Thus, in contrast to the sentences in (1) and (2), those in (3) and (4) readily allow for the subject expressions to take wide scope over the epistemically interpreted modal.

(3) a. Each student may be Jones  
    b. Either student may be Jones  
    c. Any student may be Jones  
    d. Which students may be Jones?

² The example becomes even worse in this context if the wh-expression is aggressively non-D-linked (in the sense of Pesetsky 1987), for example by adding the hell to who in (1d). I have been unable to find an expression in Japanese that reliably correlates with non-D-linking. The candidate most commonly used in the literature, namely ittai (cf. Nishigauchii 1986, among others) appears to pattern more closely to English on Earth. Among other things, these expressions can co-occur with a which-phrase, which is a prototypical D-linked expression.
(4) a. Kaku gakusei-ga Jones de aru kamoshirenai
   Each-GEN student-NOM Jones COP may
   *Each student may be Jones*
a’. Gakusei-ga sorezore Jones de aru kamoshirenai
   Student-NOM each Jones COP may
   *The students each may be Jones*
b. Dochira-no gakusei-demo Jones de aru kamoshirenai
   Which (of 2)-GEN student-ever Jones COP may
   *Either student may be Jones*
c. Dono gakusei-demo Jones de aru kamoshirenai
   Which (of 3 or more) student-ever Jones COP may
   *Any student may be Jones*
d. Dono gakusei-ga Jones de aru kamoshirenai no?
   Which student-NOM Jones COP may Q
   *Which student may be Jones?*

The quantified expressions in these examples all intuitively share the property of being obligatorily D-linked, suggesting a connection between D-linking and potential to scope over an epistemic modal. To account for the distinction between (1) and (2) on the one hand and (3) and (4) on the other, I propose the following alternative generalization to the ECP:

**Quantification into Epistemics is D-linked (QED)**

Only D-linked quantificational expressions can quantify into an epistemically modalized proposition.

The notion of D-linking intended is that brought to the fore by Pesetsky (1987). In this paper I will go part of the way toward deriving the QED hypothesis by analyzing D-linked expressions as type-distinct from their non-D-linked counterparts. In particular I will argue that the D-linked quantified phrases in (3) and (4) take predicate extensions as arguments, while the non-D-linked quantified phrases in (1) and (2) take predicate intensions as arguments. I will leave for another occasion the more interesting question of why D-linking correlates with having an extensional nuclear scope.

2 **Background on Epistemic and Circumstantial modality**

As is often noted, the availability of a wide scope reading for a DP quantifier in English sentences like (1) depends on whether or not the modal is interpreted epistemically. As statements of permission or of restriction, for example, each of these sentences easily allows the wide scope interpretation for the QP lacking with the epistemic interpretation of the modal.\(^3\) Why this is problematic can be made clear by considering the semantics of modals

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\(^3\) The particular examples used are perhaps not the best for bringing this reading out, as they were chosen specifically to make the epistemic reading the most salient. However, if
proposed in Kratzer (1991). According to Kratzer's analysis, modalized sentences are interpreted with respect to a modal base and an ordering source. The epistemic / non-epistemic distinction derives from a difference in the modal base, epistemic vs. circumstantial. The former consists of those propositions that a speaker knows, the latter of those propositions that together constitute the complete evidence available. The modal expression itself is given a uniform interpretation. In the case of may, this would be simple possibility, defined as follows:

**Kratzer's Modal Semantics (excerpts)**

A proposition $p$ is a **possibility** in a world $w$ with respect to a modal base $f$ and an ordering source $g$ iff $\neg p$ is not a necessity in $w$ with respect to $f$ and $g$.  

A proposition $p$ is a **necessity** in a world $w$ with respect to a modal base $f$ and an ordering source $g$ iff the following condition is satisfied: 

For all $u \in \bigcap f(w)$ there is a $v \in \bigcap f(w)$ such that 

$v \leq_g w$ and for all $z \in \bigcap f(w)$: if $z \leq_g w$, then $z \in p$.

What is important for our purposes in these definitions is that a simple difference in the identity of a modal base and/or an ordering source cannot affect the possible scopal interactions between a modal expression and a quantifier. This is because epistemic and circumstantial modal bases are formally the same in kind, i.e. function from worlds to sets of propositions. They differ only with respect to the source of the propositions in the set which serves as the value of the function at a given world, and this difference has no scopal consequences within the theory. As we have seen already, however, the scopal possibilities observed in (1) depend on whether the modal is analyzed as an epistemic modal or not.

There are several conceivable approaches to accounting for the scope restrictions on non-D-linked quantified expressions vis-à-vis epistemic modals. One would be to propose a systematic ambiguity in the modal expressions themselves, giving distinct but related interpretations for epistemic and non-epistemic may, must, etc. While technically feasible, however, such an approach leave unexplained the observation that the quantification over worlds involved with any particular modal expression in English is invariant with respect to the epistemic / non-epistemic distinction. That is, it would leave it a mystery why may, for example, is always existential, must always universal, etc., for all English modal verbs. To go beyond such an analysis, I propose that the epistemic / non-epistemic nature of a modalized sentence is determined by an operator that takes scope over the modal, and I give this operator a direct semantic interpretation. This approach makes it possible to analyze

interpreted as a statement of permission made to actors wishing to play the part of Jones in a play that is being performed many times, the wide scope reading of the quantifier in (1a) becomes readily available. The narrow scope reading is also available, though pragmatically it will be dispreferred except in those rare circumstances in which multiple actors simultaneously all play (perhaps different aspects of) the same character in a single play. The Japanese modals in (12) lack a non-epistemic interpretation, and so the scope variation triggered by circumstantial interpretation does not arise in these examples.
modal verbs such as *may, must* etc. uniformly in all of their occurrences. The analysis of the scope facts derives the observed scope restrictions from the interaction between quantifiers and the proposed modal operator.

3 The Analysis of English Modals

I propose the following operators as minimal modifications to Kratzer's analysis of epistemic and circumstantial interpretation, putting aside the integration of ordering sources.

\[(5)\]

a. \(\text{[Op}_{\text{epis}}]\xrightarrow{c} \lambda \varphi . [\exists S: \exists Q \subseteq B_{\text{Agt}(c)}] S = \cap Q \} (\varphi (S)) \quad (\langle \langle \text{st}, t \rangle, \varphi \rangle)
\]

\(B_{\text{Agt}(c)}\) = the set of propositions believed by the Agent of the Context\)

b. \(\text{[Op}_{\text{circum}}]\xrightarrow{c} \lambda \varphi \lambda w . [\exists S: \exists Q \subseteq \text{EV}_w] S = \cap Q \} (\varphi (S)) \quad (\langle \langle \text{st}, t \rangle, \varphi \rangle)
\]

\(\text{EV}_w\) = the set of propositions constituting the complete evidence available, fixed with respect to \(w\) and \(c\)

In distinguishing between modalization relative to a set of beliefs and that relative to available evidence, these operators do the same work as Kratzer's modal bases. However, there is an important additional difference in the semantic types of the two operators which plays a crucial role in accounting for the different behaviors of epistemic and circumstantial modals vis-à-vis quantifiers. The output of the epistemic operator in \((5a)\) is a propositional extension, i.e. a truth value, while the output of the circumstantial operator in \((5b)\) is a propositional intension, i.e. a function from worlds to truth values. This type distinction is highlighted by bold-facing and underlining in \((5)\).

To see how this type difference can explain the scopal differences observed in \((1)\) through \((4)\), it is necessary to further specify the semantics of the modal verbs and of quantifiers in these examples. I give adequate interpretations for *may, every* and *each* below. As can be seen, the interpretation of *may* is invariant, taking two propositional intensions as arguments and denoting an existential quantification over worlds.\(^5\) The first of these arguments is provided by its sister at LF. The second will be supplied only in the semantic interpretation by the modal operator immediately above the modal verb at LF. The generalized quantifiers *each* and *every* differ in their semantic type in a manner that makes them sensitive to the type distinction proposed between the two types of modal operator. Both quantifiers combine with an intensional noun phrase interpretation of type \(<e,\text{st}>\) as

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\(^4\) Note that epistemic modal statements can be attributed to others, i.e. they are shiftable, unlike English first person pronouns. This implies that epistemic modals and first person pronouns cannot both be interpreted with respect to the same context parameter. This shortcoming can be overcome by extending to epistemic modals an analysis like that of Sharvit (2004) that interprets pronouns with respect to 2 context parameters, \(C\) and \(c\) not just a single context parameter as employed by Kaplan (1977). Since problems of embedding are not our main concern, I leave this extension as an exercise for the reader.

\(^5\) For ease of exposition, I combine function denotations and set denotations in the analysis of *may, p* denoting a function from worlds to truth values and \(S\) denoting a set of worlds.
their first argument. After that, however, each NP is extensional, of type \(<et,t>\) while every NP is intensional, of type \(<<e,st>,st>\).

\[(6) \quad [[\text{may}]] = \lambda p \lambda S. [\exists w \in S] (p(w)) \quad (<st, <st, t>>)\]

\[(7) \quad \text{a. } [[\text{each}]]^w = \lambda p \lambda Q. \{x: P(x)(w) \subseteq \{x: Q(x)\}\} \quad (<<e,st>, <et, t>>) \]
\[\text{b. } [[\text{every}]]^w = \lambda p \lambda Q \lambda w. \{x: P(x)(w) \subseteq \{x: Q(x)(w)\}\} \quad (<<e,st>, <<e,st>, st>>)\]

Since the epistemic and circumstantial operators in (5) manifest a type difference that parallels that of the quantifiers each and every, this simple type difference in the quantifiers affects their possible scope positions at the syntactic level of Logical Form. Schematically, an each-type quantifier can only occur in the (bold-faced) Q-position in (8a), while an every-type quantifier can occur in any of the (italic) Q-marked positions in (8).

\[(8) \quad \text{a. } [Q \text{ Op}_{\text{epist}} [\in \text{ modal } [Q \ldots]]] \]
\[\text{b. } [Q \text{ Op}_{\text{circum}} [\in \text{ modal } [Q \ldots]]]\]

As can be seen in (8), there is no possibility of an every-type quantifier taking scope over an epistemic modal verb. The only way such a scope reading could surface would be if every NP could occupy the position of Q in (8a). However, they type of every NP (<<e,st>, st>) is incompatible with that of the sister to Q (<e,t> after predicate abstraction). The absence of a wide scope every construal for (1a) thus follows. Note that the modal verb phrases marked [\in \ldots ] and headed by the modal verbs in (8) are not potential adjunction sites for either of the quantifiers, blocking an alternative derivation of scope inversion. These modal verb phrases are of type <st,t>, which would be converted to type <e,<st,t>> by predicate abstraction. However, this type is incompatible with both the <et,t> type of each NP and with the <<e,st>,st> type of every NP. Adjunction of either type of quantifier phrase to this modal verb phrase would thus lead to a type clash.

With the analysis given above, the only interpretable structures for (1a) and (3a) under an epistemic interpretation of the modal are those in (9a) and (10a) respectively. The interpretations generated for these structures are given in (9b) and (10b).\(^6\)

\[(9) \quad \text{a. } [\text{Op}_{\text{epist}} [\text{may} [\text{every student}, t; \text{be Jones}]]] \]
\[\text{b. } [[[\text{Op}_{\text{epist}} [\text{may} [\text{every student}, t; \text{be Jones}]]]]]^{\in^w} \]
\[= [[[\text{Op}_{\text{epist}}]]^{\in^w} ([[\text{may}]]^w ([[\text{every student}, t; \text{be Jones}]]^w)) \]
\[= [\lambda p \lambda S. [\exists Q \subseteq B_{\text{Aglo}}] S = \cap Q ] (p(S))] \quad (\lambda p \lambda S. [\exists w \in S] (p(w)))]
\[\quad (\lambda x \lambda w. \{x: P(x)(w) \subseteq \{x: Q(x)(w)\}\}) \quad (\lambda x \lambda w. \text{student} (x,w)) \]
\[\quad (\lambda x \lambda w. \text{Jones}(x,w)))\]
\[= 1 \iff [\exists S: [\exists Q \subseteq B_{\text{Aglo}}] S = \cap Q ] [\exists w : w \in S]\]

\(^6\) I suppress context parameters where they have no effect on the interpretation. I also treat name as predicates for ease of illustration.
\[
\{ x : \text{student}(x,w) \} \subseteq \{ x : \text{Jones}(x,w) \}
\]

(10)  

a. [each student; [Op\text{epist} [may t; be Jones]]]  
b. \[ [\text{each}]^w ([\text{student}]^w) ([\text{if} [\text{Op}\text{epist} [may t; be Jones]]]^w) \]  
\[ = [\lambda \text{P} \cdot \text{Q}. \{ x : \text{P}(x)(w) \} \subseteq \{ x : \text{Q}(x) \} ] (\lambda x \lambda w. \text{student}(x,w)) \]  
\[ (\lambda x. [\lambda \phi. [\exists \text{O} \subseteq B_{\text{Ag}(c)}] S = \cap Q ^w ] (\phi (S))) \]  
\[ ([\lambda \phi \lambda S. [\exists w: w \in S] (\text{P}(w))] (\lambda x \lambda w. \text{Jones}(x,w))) \]  
\[ = 1 \]  
iff  
\[ \{ x : [\exists \text{O} \subseteq B_{\text{Ag}(c)}] S = \cap Q ^w ] \} ([\exists w': w' \in S] (\text{Jones}(x,w')))] \]

For (1a) this is a welcome result, since as was already seen this example is unambiguous in its scope options under an epistemic interpretation, having only the nonsensical interpretation that it is possible according to the speaker that every student is Jones. For (3a), however, this result is not as welcome. (10) does successfully capture the wide scope each reading available for that example. However, it fails to capture the equally possible narrow scope each reading. Given the semantics as it was set up above, there is no way of generating this latter reading without changing the types of at least one of the expressions involved. This is so since all expressions within the scope of the epistemic operator are intensional, while each requires an extensional argument as its second argument. The easiest way to fix this problem is to allow each to type raise into a purely intensional quantifier, i.e. to give each an interpretation that is parallel to that of every. The unavailability of a wide scope reading for every indicates that a type-lowering operation going in the other direction must not be available. To accomplish the type raising, I assume the following lexical type shifting rule.

(11)  
\[ [\forall \phi \in D^{<<\text{st},<\text{st},<\text{st},\text{st}>>>}] [\exists \phi' \in D^{<<\text{st},<\text{st},<\text{st},\text{st}>>>}] \]  
\[ ([\phi']^w = \lambda \text{P} \cdot \text{Q} \cdot \lambda w'. [[\phi]]^w (\lambda x. \text{Q}(x)(w'))) \]

This will have the effect of allowing (12) in addition to (10a) as an interpretable structure for (3a), capturing the observed narrow scope each interpretation found for that example. The interpretation will exactly parallel that of (9a).

(12)  
\[ [\text{Op}\text{epist} [may [each student; t; be Jones]]] \]

We noted above that when the modal is given a circumstantial interpretation in the sentences in (1) through (4), both wide and narrow scope readings are available for both every-type quantifiers and each-type quantifiers. This result now follows directly from the analysis developed. As seen, modal verbs are of type \(<\text{st},<\text{st},<\text{st}>\>>\) and the circumstantial operator is of type \(<<<\text{st},<\text{st},<\text{st}>\>>\). This means that the argument of a modal verb is of the same semantic type as the output of successively applying the modal verb meaning and then the circumstantial operator meaning to this argument. Both are of type \(<\text{st}>\), and can therefore be converted to type \(<\text{e, st}>\) by predicate abstraction. Given an \(<<<\text{e, st}>,\text{st}>\)
interpretation for both *each NP* and *every NP*, then, it follows that these quantifiers can be interpreted either within the scope of the modal verb or as having scope over a circumstantial operator above the modal verb, giving narrow and wide scope interpretations respectively when the modal is interpreted non-epistemically.

Summarizing, the technical analysis presented has the following features:

(13) **Features of the analysis:**

(i) Modal verbs are given a uniform analysis, operating over an argument of type *st* to produce an expression of type *

(ii) The force of a modal verb (epistemic or circumstantial) is provided by an independent operator, either *Op_{epist}* or *Op_{circum}*

(iii) The semantic type of an expression headed by *Op_{epist}* is type *t*

(iv) The semantic type of an expression headed by *Op_{circum}* is type *st*

(v) There are two distinct types for quantified NPs:  

(vi) *Every* is ambiguous between the two types in (v), while *each* is unambiguously of type *

**Predictions of the Analysis:**

The analysis presented in the preceding section makes several clear predictions. Since all modal verbs select for a proposition, i.e. for an expression of type *st*, and since the circumstantial modal operator produces an expression of type *st*, it follows that circumstantial modals should be embeddable under other modals of any kind. As we can see in (14) below, this prediction is borne out.

(14) a. John has *to_{circum}* go to prison  

b. John may_{epist} have *to_{circum}* go to prison  

c. *(To build a safe society,)* criminals must_{circum} have *to_{circum}* go to prison  

In contrast, since the epistemic modal operator produces expressions of type *t* rather than of type *st*, it follows that expressions headed by an epistemic modal operator cannot be embedded under another modal: any such embedding will lead to a type clash. Once again, the prediction is borne out, as seen in (15).

(15) a. John has *to_{epist}* be the man you are looking for  

b. #John may_{epist} have *to_{epist}* be the man you are looking for  

c. #(To build a safe society,)* criminals must_{circum} have *to_{epist}* be the people the police are looking for  

While the sentences in (15b,c) are interpretable, it is not possible for the occurrences of *have* *to* contained therein to be given an epistemic interpretation.
4 Extending the Analysis to Japanese

The technical analysis developed in the main section of this paper was worked out for the case of English modal verbs, where a single modal verb form can be given either an epistemic or a non-epistemic interpretation. Indeed, this ambiguity was part of the motivation for separating a modal force operator off from the lexical modal verb. Modal predicates in Japanese, however, generally do not exhibit an epistemic / non-epistemic ambiguity. Thus kamoshirenai (may) and ni-chigainai (must) in the examples in (2) are unambiguously epistemic, while -te ii (may, for permission) and -beki da (should) lack an epistemic reading. While it is possible in principle to apply the English analysis to the Japanese modals as well, such an analysis would have to be supplemented with an explanation of why Japanese modal expressions do not exhibit the epistemic / non-epistemic contrast found in their English counterparts, and no obvious principled explanation suggests itself. A more plausible approach is to analyze Japanese modal expressions as corresponding roughly to operator-lexical modal verb combinations in English. This will leave all of the selectional properties of the modals intact, and will also maintain the type distinction between epistemic and non-epistemic modals. Under this approach, the semantics of Japanese epistemic modal predicates would be modeled after (16a), and that of non-epistemic modal predicates after (16b).

(16)a. \[[\text{kamoshirenai}]^c = \lambda p. \exists S : (\exists Q \subseteq B_{Ag(e)}) S = \cap \{ S : w \in S \} (p(w)) \] (st, t)

b. \[[\text{-te ii}]^c = \lambda p \lambda w. \exists S : (\exists Q \subseteq F_{W,e}) S = \cap \{ S : w \in S \} (p(w)) \] (st, st)

The definitions given above preserve the type contrast used to give an explanation of the restrictions on quantifier scope for non-D-linked quantifiers like every and D-linked quantifiers like each. Since the same contrast held for Japanese as well as for English, this is a desirable consequence of the interpretations given. This analysis further leads to the same prediction as the English analysis regarding embeddability: non-epistemics should embed under other modals, while epistemics should not. The reason is again the same: epistemic modals take an argument of type st and produce something of type t, while non-epistemic modals take an argument of type st and produce something of type st. That this prediction is upheld for Japanese as well can be seen in the Japanese counterparts to (14) and (15) given respectively in (17) and (18) below.

(17)a. John-wa keimusho-ni iku-beki-da
   John-TOP prison-DAT go-should-copula
   John should go to prison (non-epistemic)

b. John-wa keimusho-ni iku-beki-kamoshirenai
   John-TOP prison-DAT go-should-may
   John may have to go to prison (epistemic may, non-epistemic have to)

c. John-wa keimusho-ni iku-beki-dearu-beki-da
   John-TOP prison-DAT go-should-copula-should-copula
   John should have to go to prison (non-epistemic)
Indeed if anything, the Japanese examples in (18) are even clearer than their English counterparts in (15) since there is no interfering non-epistemic interpretation possible for *ni chigainai* in (18), unlike for *must* in (15), making the Japanese examples outright unacceptable.

5 Possible Extension to Performatives

The analysis presented in this paper suggests that ability to scope over an epistemic can be used as a diagnostic for scopal expressions that can take an extensional argument. It furthermore suggests that sensitivity of a particular construction to the distinction between *every* type quantifiers and *each* type quantifiers can be used as a diagnostic for the extensionality or intensionality of that construction. In the remainder of this paper I point out that similar distinctions are found with performatives, and give a preliminary sketch of how the analysis given might be extended to account for their behavior.

The analysis above posits a type distinction between different kinds of DP quantifiers. If modal sentences were the only place such a distinction showed up, then the motivation for positing such a distinction would be relatively weak. However, we can detect a similar scope distinction in performative speech acts as well.\(^7\) To see this, consider (19a,b), uttered by a space explorer entering a new solar system, or (19c,d) uttered by a teacher to his class.

(19) a. I (hereby) claim every planet.
   b. I (hereby) claim each planet.
   c. I promise everyone here a donut.
   d. I promise each person here a donut.

(19b) can be interpreted as a multiple claiming, equivalent to “For each planet, I (hereby) claim it”. (19a), in contrast, can only be interpreted as a single claiming. Parallel comments apply to (19c,d), with multiple promises possible with (19d) but not with (19c). Performatives are of course quite different from epistemic modals in many respects. However, they share with epistemic modals their restriction to being interpreted with respect to the actual world. While a deontic modal such as (20a) can be relativized to a non-actual

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\(^7\) The scope effects in (19) are noticeably more difficult to isolate than those in (1) and (2), for reasons that remain unclear.
world, neither epistemic modals as in (20b) nor performatives as in (20c,d) can be so relativized.

(20) a. If the law changes, then John must be punished.
   b. If the law changes, then John must be happy.
   c. If the law changes, then I (hereby) claim this planet.
   d. If the law changes, then I promise you a donut.

(20a) can readily assert that the necessity of John’s being punished obtains only in worlds in which the law changes, and not in the actual world. (20b) as an epistemic statement does not have a similar interpretation. Indeed, the only coherent epistemic interpretation that can be given to it is one where the if-clause is factive, i.e. where the sentence means roughly if it is true that the law (occasionally) changes (in the actual world), then (I judge w.r.t. my actual world beliefs that) John must be happy. (20c), in contrast to (20b), is interpretable with a non-factive if-clause. However, the claiming of the planet is a speech act that occurs at the time of utterance of (20c), and cannot be shifted to the time at which the law changes (if it does). Thus, (20c) means roughly I hereby claim that if the law changes then this planet is mine, where the speech act is made squarely within the actual world. Similarly, (20d) can only be a current promise that if the law changes I will give you a donut.

The distinction between (20a) and (20b) can be made to follow if if-clauses are analyzed as modifying not the set of worlds that modals quantify over (i.e. S in (5)) but rather individual worlds (i.e. w in (5)). This can be accomplished by assigning the following interpretation to if, where \( W \) denotes the actual world.

(21) \[ \text{[[if]]} = \lambda p \lambda q \lambda w. p(W) \rightarrow q(w) \]

Given the analysis in (5), an epistemically modalized clause such as the second clause of (20b) will be of type \( t \), and hence will not be suitable as the second argument of \( \text{if} \). A deontically modalized clause, in contrast, is of type \( <s,t> \), and thus is a suitable second argument for \( \text{if} \). Given an appropriate semantics for performatives, the distinction between (20c) and (20a) will follow as well, and for the same reason.

6. Conclusion

I have argued in this paper that the epistemic / non-epistemic contrast among modal verbs interacts strongly with the D-linked / non-D-linked contrast among quantified expressions. In particular, I have shown that D-linked quantified expressions, unlike their non-D-linked counterparts, can scope over epistemically interpreted modals, a hypothesis formulated as QED. QED is intended to replace Iatridou and von Fintel’s (2003) ECP, which was shown to be an incorrect generalization since it ignores the exceptional behavior of D-linked quantified expressions like each, either, any and which.

Given QED, I showed that the analysis of modals in Kratzer (1991) is not equipped to generate distinctions in scopal behavior based only on the epistemic / non-epistemic
contrast in the interpretation of modals. I then developed an analysis of this contrast based on two type-distinct operators, $O_{epst}$ and $O_{circu}$, and a corresponding analysis of the D-linked / non-D-linked contrast among quantified expressions that interacts with these operators. The analysis explained the contrasts found as following from the semantic types of the expressions involved.

Finally, I suggested that the analysis could be extended to account for phenomena observed with performatives that resembles that observed with modals.

If the analysis developed is on the right track, it opens up a new line of inquire for investigating epistemicity and D-linking. How fruitful such a line of inquiry might be only future research can tell.

References


