# Modality

**Readings:**　Portner, Ch. 8.3

## 1. What is modality?

- *Modality* has to do with sentences whose truth conditions depend on what happens in a world other than the world of evaluation. For example, (1a) is true if all pedestrians stop at a "Don't walk" signal in the world of evaluation, while (1b) is true if all pedestrians stop at a "Don't walk" signal in all the worlds that are in accordance with the law:

(1)　a.　At crosswalks all pedestrians obey the "Don't Walk" signals.
　　　b.　At crosswalks all pedestrians **must** obey the "Don't Walk" signals.

- Modality is not a syntactic notion, but a semantic one. There are many ways to express modality: modal verbs, nouns, adjectives, adverbs, attitude verbs, etc.:

(2)　a.　Daniel **might** be a secret agent.
　　　b.　There is a **possibility** that Daniel is a secret agent.
　　　c.　It is **possible** that Daniel is a secret agent.
　　　d.　**Maybe** Daniel is a secret agent.
　　　e.　Harry **thinks** that Daniel is a secret agent.

- In this lecture we will mostly focus on *modal verbs* such as *must* or *might*.

## 2. Types of modals

### 2.1. Modal flavor

- We can classify modal contexts based on what worlds their truth conditions depend on. I.e., modality comes in different *flavors*.
- The two main types of modality are *deontic* and *epistemic*.
- Deontic modality cares about worlds that are in accordance with laws, moral principles, obligations imposed by some authority, etc.:

(3)　a.　(According to Connecticut state law,) all pedestrians must obey "Don't Walk" signals.
　　　b.　(According to what is morally good,) Hannah should help Neil.
　　　c.　(According to what Richard's mom allowed,) Richard may go to a baseball game.

- Epistemic modality cares about worlds compatible with someone's knowledge or beliefs:

(4)　(Based on what I know,) Hannah might be in the library.

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**In-class Exercise 1**

- Some English modals, such as *must* and *may*, can have both deontic and epistemic uses. For both modals, come up with examples for both uses (so, four sentences in total). Try to make your sentences unambiguous.

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- Some other modal flavors include:

(5)   a.   Avocado trees can grow there. (The conditions are good for them.)      *circumstantial*
      b.   Hannah wants to travel to Greece.                                                *bouletic*

## 2.2. Modal strength

- Modal contexts differ not only in flavor but in *modal strength*:

(6)   *Modal necessity*
      a.   Richard has to do his homework.
      b.   (Based on my knowledge,) Hannah must be in the library.

(7)   *Modal possibility*
      a.   Richard may go to a baseball game.
      b.   Lisa might be in the school hall.

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**In-class Exercise 2**

- For each of the sentences in (8) identify (i) the modal flavor (deontic or epistemic), and (ii) the modal strength (possibility or necessity) of the bolded modal.

(8)   a.   Harry **needs** to return the book by noon.

      b.   The last of the sunlight faded to our left, so we **must** be facing north.

      c.   The prophecy **could** be true.

      d.   According to the teacher's decision, Mario **can**not go on the class trip.

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## 3. Modality in possible world semantics

- Modals denote quantifiers over worlds:
  - Necessity modals = universal quantifiers over worlds
  - Possibility modals = existential quantifiers over worlds.
- Which worlds do they quantify over? Those that are *accessible* according to the relevant *accessibility relation*. Which accessibility relation that is depends on the modal flavor:
  - Deontic modality: deontic accessibility relation, i.e., a relation that picks out "morally good", "law-abiding", etc. worlds.
  - Epistemic modality: epistemic accessibility relation, i.e., a relation that picks out those worlds that are compatible with one's knowledge or beliefs.
- For example, *must* requires that its argument is true in all deontically accessible worlds:

(9)     $[\![ \text{must} ]\!]^w(p) = 1$    iff    $\forall w' : [R_{deon}(w, w') \rightarrow p(w')]$

- Let's look at an example. Let $L$ stand for *All cars stop at a red light*, and $S$ for *Soccer is the most popular sport*. Now let's assume the model in (10) where $w_0$ is the world of evaluation and the arrows point to the worlds deontically accessible from $w_0$:

(10)     $w_0 : \neg L, S \longrightarrow w_1 : L, S$

$w_2 : L, \neg S \qquad w_3 : \neg L, \neg S$
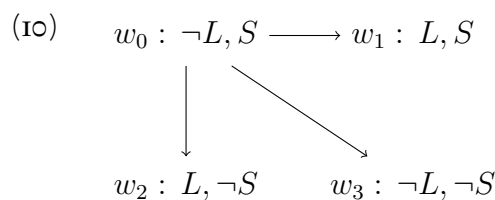
- The sentence *All cars must stop at a red light* is false in (10), because $L$ doesn't hold in all accessible worlds.
- The same sentence is true in (11), however. In both cases whether $S$ holds in any worlds is irrelevant.

(11)     $w_0 : \neg L, S \longrightarrow w_1 : L, S$

$w_2 : L, \neg S \qquad w_3 : \neg L, \neg S$

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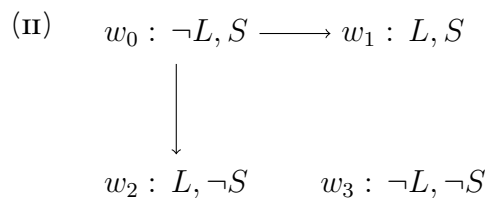
**In-class Exercise 3**

- Now take the arrows to be an epistemic accessibility relation. Are the sentences in (12) true in the model in (10)?

(12)     a.    Soccer may be the most popular sport.

b.    Soccer must be the most popular sport.

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## 4. Scope of modals

- Since modals quantify over possible worlds, they interact scopally with other scope-taking elements, such as negation and quantifiers over individuals.
- For example, the following sentence is ambiguous:

(13)    Bill must marry a Norwegian.
        $\exists > must$ : There is some specific Norwegian $x$ such that Bill must marry $x$.
        $must > \exists$ : Bill must marry some Norwegian. It doesn't matter who exactly, as long as it's a Norwegian.

- The first reading ($\exists >$ modal) is called the *de re reading*.
- The second reading (modal $> \exists$) is called the *de dicto reading*.
- Negation is also a scope-taking element: it can take scope above and below modals (and above and below quantifiers more generally).
- But in English, there are some restrictions on how negation can scope with respect to different modals. The below exercise explores these restrictions.

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**In-class Exercise 4**

- Let's examine the deontic necessity modal *must*: what does (14) mean?

    (14)    Logan must not do his homework.

- Which scope configuration does this meaning correspond to? Negation below the modal or above?

- Is the other scope configuration also available as a reading for (14)? If not, how would you express this other configuration in English?

- Now let's turn to deontic possibility modals, *can* and *may*. What do (15a-b) mean?

    (15)    a.    Logan can't go to the baseball game.
            b.    Logan may not go to the baseball game.

- Which scope configuration does this correspond to? Is the other one also available?

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## What you need to know

**Key notions:**  modality, modal verbs, modal flavor, deontic modality, epistemic modality, modal strength, modal necessity, modal possibility, accessibility relations, de re reading, de dicto reading

**Skills:**
- For any given modal expression in a given context, identify
  - its modal flavor (deontic or epistemic);
  - its modal strength
- Given a model and an accessibility relation, determine if a given sentence containing a modal is true or false.
- Provide paraphrases for different scope relationships between a modal and another scope-taking element in a given sentence.