- **Word and sentence meaning**
- **Intension and extension**
- **Truth conditions**

Background reading:

- *CL* Ch 6, §1
    - → focus on §1.2, "Extension and intension" in §1.3

0. Course information

- We are moving into the third part of the course

  - First vs. second language acquisition

  - Language use in context

    - Meaning: semantics and pragmatics

    - Language, society, identity: sociolinguistics

  - Historical language change

- Recurring theme: How does understanding phonetics, phonology, morphology, syntax help us understand these additional aspects of language?

1. What is semantics?

- **Semantics**: The study of **meaning** in human language

- Semantics has a long history, and a deep connection to areas such as

    - philosophy
    - logic
    - mathematics

1. What is semantics?

- Today, we will look at **core ideas in semantics** and how they relate to morphology and syntax

    - What is the meaning of a **morpheme**/**word**?

    - What is the meaning of a **sentence**? How are meanings of sentences **related** to each other?

- Next time, we will build on these ideas to consider **principles of conversation**, **indirect communication**, and **misleading language**

    - How do people **use language in context** to communicate extra dimensions of meaning?

2. Word/morpheme/phrase meaning

- Some things we have already proposed about how to **model** the meaning of morphemes and words
  - **Morpheme** meaning

  - **Complex word** meaning

2. Word/morpheme/phrase meaning

- Some things we have already proposed about how to **model** the meaning of morphemes and words

  - **Morpheme** meaning — stored in the **lexical entry** of the morpheme (in the mental lexicon)
  - **Complex word** meaning — **built** from the meanings of the component morphemes
    - *Exception:* complex words with **unpredictable** meanings also **store** meanings in lexical entries

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- We can extend this approach to **phrases**
    - Phrase meaning

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2. Word/morpheme/phrase meaning

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  - **Complex word** meaning — **built** from the meanings of the component morphemes
  - **Phrase** meaning — **built** from the meanings of the component words

- But what do the meanings of morphemes, words, and phrases **consist** of?

2. Word/morpheme/phrase meaning

Does word/morpheme/phrase meaning consist of...

- A mental picture?

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Does word/morpheme/phrase meaning consist of...

- A mental picture?

    - Can this be made to work for all cases? What about *obligation* or *promise*? (Or *dog* or *bird*?)

- The set (collection) of all the things in the world that the expression **denotes** (**refers** to)?

2. Word/morpheme/phrase meaning

Does word/morpheme/phrase meaning consist of...

- A mental picture?
    - Can this be made to work for all cases? What about *obligation* or *promise*? (Or *dog* or *bird*?)

- The set (collection) of all the things in the world that the expression **denotes** (**refers** to)?
    - This is known as the **extension** of an expression
    - This is part of meaning, but not all...
        - Something like *unicorn* or *perpetual motion* has no extension, but still has meaning

2. Word/morpheme/phrase meaning

- The **meaning** of word/morpheme/phrase X is:
  the **set of qualities or properties** that something
  would have to have in order <u>to qualify as</u> X

  - This is known as the **intension** of X

- Be careful thinking about this…

  - The intension of some expression is not just any
    roundabout way of describing the referent of
    that expression! (See examples below)

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- The **extension** of a word/morpheme/ phrase X is then the set of all **entities or states or actions** in the real world (in the relevant situation) that the **intension** picks out

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2. Word/morpheme/phrase meaning

- Try it: What are the **intension** and the **extension**?
  - *cat*

  - *sing*

2. Word/morpheme/phrase meaning

- Try it: What are the **intension** and the **extension**?
  - *cat*
    - **intension**: properties needed to qualify as a cat — mammal, pointy ears, whiskers, purrs, eats mice…
    - **extension**: all the cats in the relevant situation

  - *sing*
    - **intension**: properties needed to qualify as doing an act of singing — vocalizing on particular pitches…
    - **extension**: all the situations of singing in the relevant situation

2. Word/morpheme/phrase meaning

- Try it: What are the **intension** and the **extension**?

  - *the UNC men's basketball coach*

2. Word/morpheme/phrase meaning

- Try it: What are the **intension** and the **extension**?
    - *the UNC men's basketball coach*
        - **intension**: the person coaching the men's basketball team
        - **extension**: Hubert Davis

2. Word/morpheme/phrase meaning

- For the expression *the capital of France*:

  - What is the **extension**?
  - What is the **intension**?

2. Word/morpheme/phrase meaning

- For the expression *the capital of France*:

  - What is the **extension**? | Paris
  - For the **intension**, should this be 'the city where the Eiffel Tower is'?
    - Why or why not?

2. Word/morpheme/phrase meaning

- For the expression *the capital of France*:
  - What is the **extension**? | Paris
  - For the **intension**, should this be 'the city where the Eiffel Tower is'? | No!
    - Why or why not?
    - It is true that Paris *happens to be* the city where the Eiffel Tower is — BUT —
    - Having the Eiffel Tower is not part of what *makes* Paris be the capital of France

2. Word/morpheme/phrase meaning

- For the expression *the capital of France*:

  - What is the **extension**? | Paris

  - For the **intension**, should this be 'the city where the Eiffel Tower is'? | No!

    - A better proposal for the intension here would be something like: 'the city where the government of France is located'

2. Word/morpheme/phrase meaning

- Of course, we also need to develop a theory of the building blocks of meaning

  - What do the memorized meanings of morphemes, stored in the mental lexicon, actually consist of?

  - What are the principles for building up the meanings of complex words, and phrases, from the meanings of their parts?

- These are interesting questions for more advanced work in semantics (see LING 537, usually offered in fall)

3. Sentence meaning

- How can we think about the **meaning** of a **sentence**?

  (1)   The door is open.

- How can we relate this to the way we think about the meaning of a morpheme like *door*?

3. Sentence meaning

- When we know the **meaning** of a morpheme or word or phrase, we know its **intension** — the properties needed for something to qualify as an example

- When we know the **meaning** of a (declarative) sentence...

3. Sentence meaning

- When we know the **meaning** of a morpheme or word or phrase, we know its **intension** — the properties needed for something to qualify as an example

- When we know the **meaning** of a (declarative) sentence, we know the **circumstances** under which the sentence would be **true** or **false** — known as the **truth conditions** of the sentence

    - **Intension** of a sentence = its **truth conditions**

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- The **extension** of a morpheme or word or phrase is the set of **entities or states or actions** picked out by the intension when applied to a relevant context

  - What about the **extension** of a sentence?

3. Sentence meaning

- When we know the **meaning** (**intension**) of a (declarative) sentence, we know the **circumstances** under which the sentence would be **true** or **false** — known as the **truth conditions** of the sentence

  - **Intension** of a sentence = its **truth conditions**

- The **extension** of a morpheme or word or phrase is the set of **entities or states or actions** picked out by the intension when applied to a relevant context

  - **Extension** of a sentence in a given situation = its **truth value** (*true* or *false*) in that situation

3. Sentence meaning

- Are truth conditions the <u>only</u> relevant thing about sentence meaning?

  (2)   *Lucy told Linus a story.*

  (3)   *Linus was told a story by Lucy.*

3. Sentence meaning

- Are truth conditions the <u>only</u> relevant thing about sentence meaning?

  (2)   Lucy told Linus a story.

  (3)   Linus was told a story by Lucy.

- No — two sentences can have the same truth conditions but <u>emphasize</u> different pieces of information differently

  - Still, we can understand a lot about sentence meaning by exploring truth conditions

4. Composing sentence meanings

- The mental grammar must contain **rules** for **composing** (putting together) sentence meanings
  - Why?

4. Composing sentence meanings

- The mental grammar must contain **rules** for **composing** (putting together) sentence meanings

    - Possible sentences are infinite in number

    - Their meanings cannot be memorized

- When the meaning of a larger constituent is determined by the meaning of its parts, we say that the meaning is **compositional**

- We will now look at just one compositional rule for sentence semantics; going further would require background in math, philosophy

4. Composing sentence meanings

Here are some ideas we can put together:

- The **intension of a** (declarative) **sentence** consists of its **truth conditions**

- A sentence has a **subject** and a **predicate**, and the predicate "says something about" the subject

- Can we conclude anything general about how the **extension of the subject** and the **extension of the predicate** are related when a sentence is **true**?

4. Composing sentence meanings

- Composing the **intension of a declarative sentence** (intension of sentence = its truth conditions)

  A declarative sentence is true in a given situation if and only if:

  - the ***extension of the subject*** in that situation is a ***subset*** of
  - the ***extension of the predicate*** in that situation

- The intensions of phrases like NP and VP are likewise built from those of the words/morphemes they contain, but we won't pursue this point further

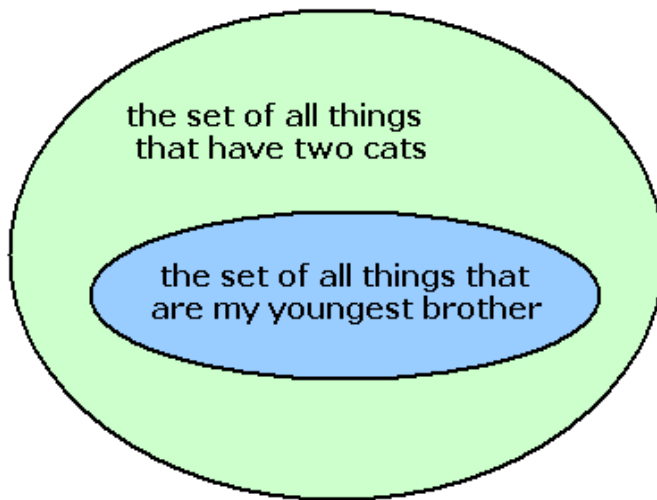# 4. Composing sentence meanings

- How do we compute the circumstances under which sentence (1) is true?

  (1)   *My youngest brother has two cats.*

  - What is the **syntactic structure** of this sentence?
  - What is the **extension** of the **subject NP**?
  - What is the **extension** of the **predicate VP**?

- For the world we actually live in (where my youngest brother does indeed have two cats), this sentence can be represented in terms of a **Venn diagram**:

- Can you draw the Venn diagram (for the world we actually live in) of a <u>false</u> sentence such as *Cats are reptiles*?

5. Meaning relations among sentences

- Once we have a way to think about sentence meaning, we can examine ways in which the meaning of one sentence **relates** to that of another
  - **entailment**
  - **paraphrase**
  - **contradiction**

- We'll introduce these concepts now, and we will work with them again on Wednesday

5. Meaning relations among sentences

Entailment

- From *CL*, p 222: "When the truth of one sentence guarantees the truth of another sentence, we say that there is a relation of **entailment**."

- What does "guarantees the truth" mean here?
    → Consider: We are talking about **truth conditions**

- What kind of <u>explicit procedure</u> could we follow in order to determine whether sentence A entails sentence B?

Entailment

- A more explicit definition of **entailment**:
  Sentence A entails sentence B if <u>in all situations</u> where sentence A is true, sentence B is also true

  - What kind of evidence can we provide to show that entailment does *not* hold in some case?

Entailment

- A more explicit definition of **entailment**:
  Sentence A entails sentence B if <u>in all situations</u> where sentence A is true, sentence B is also true

  - What kind of evidence can we provide to show that entailment does *not* hold in some case?

  → Describe a situation where A is true but <u>B is not</u>

Entailment

- A more explicit definition of **entailment**:
  Sentence A entails sentence B if <u>in all situations</u>
  where sentence A is true, sentence B is also true

  - Can there be a situation where A is true but B is not?

- Does sentence (1) entail sentence (2)?
  Does sentence (2) entail sentence (1)?

  (1) Linus ate a sugar-covered doughnut.
  (2) Linus ate something sweet.

Entailment

- A more explicit definition of **entailment**:
  Sentence A entails sentence B if <u>in all situations</u>
  where sentence A is true, sentence B is also true

  - Can there be a situation where A is true but B is not?

- Does sentence (1) entail sentence (2)? | Yes
  Does sentence (2) entail sentence (1)? | No

  (1) Linus ate a sugar-covered doughnut.
  (2) Linus ate something sweet.

Paraphrase

- From *CL*, p 221: "Two sentences that have essentially the same meaning are said to be **paraphrases** of each other."

- Try this on your own — we will check in on Wed

    - Can we give a more explicit definition of **paraphrase**, by defining it in terms of <u>entailment</u>?

    - Based on this definition, what kind of evidence can we provide to show that two sentences **do** or **do not** paraphrase each other?

Contradiction

- From *CL*, pp 222–3: "Sometimes, it turns out that if one sentence is true, then another sentence must be false. […] When two sentences cannot both be true, we say that there is a **contradiction**."

- Try this on your own — we will check in on Wed

    - Can we give a more explicit definition for **contradiction**, inspired by <u>entailment</u>?

    - Based on this definition, what kind of evidence can we provide to show that two sentences **do** or **do not** contradict each other?

5. Meaning relations among sentences

- What is all this stuff good for? When might we care whether one sentence entails another, or one sentence contradicts another?

- How about legal situations, such as...

    - contracts

    - testimony in court

    - claims of false advertising

    - ...

→ **More about some of these topics on Wednesday!**