Mind, Matter and Language

Philosophy of Language

Reference, Truth Conditions, and Propositions

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Outline

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Questions about Language

1. What are the constitutive elements of a language? (words? sentences? sounds?)
2. What is (linguistic) *meaning* and what kinds of things *have* (linguistic) meaning?
3. What is the difference between *literal meaning* and *implied meaning*?
4. In virtue of what does a thing have the linguistic meaning that it has?
5. Can context influence meaning? And, if so, in what ways?
6. What explains our capacity to communicate using language?
7. What kinds of actions can language be used to perform?
8. In what way does language inform and influence our choices and decisions?

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Preliminary Distinctions

- A semantic theory addresses the following question:
  - What *are* the literal meanings of simple (atomic) and complex (non-atomic) expressions of a given language, e.g. English, and what explains our capacity to this kind of meaning. You can think of simple expressions as words and morphemes, and complex expressions as expressions built from simple expressions, e.g. whole sentences.
- A metasemantic or foundational theory addresses the question:
  - *In virtue of what* do expressions of a given language have the meaning that they have? For example, why does the word 'giraffe' refer to the specific kind of animal that it does?
- A pragmatic theory addresses the question:
  - What is non-literal meaning and what are the general principles that enable understanding of non-literal meaning?

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A Simple Referential Theory

- Let's begin with the (simple) referential theory of meaning. According to this theory, the meaning of an expression (simple or complex) is simply its reference.
- Let '$[\![\cdot]\!]$' be a function mapping expressions to their reference. The meaning of simple (atomic) expressions can then be stated as follows:
  - $[\![\text{Fido}]\!] = \text{Fido}$ — i.e. the reference of the expression 'Fido' is just Fido
  - $[\![\text{Snowy}]\!] = \text{Snowy}$
  - $[\![\text{barks}]\!] = \{x \mid x \text{ barks}\}$ — i.e. the set of x's such that x barks
  - $[\![\text{dog}]\!] = \{x \mid x \text{ is a dog}\}$
  - $[\![\text{love}]\!] = \{\langle x, y\rangle \mid x \text{ loves } y\}$ — i.e. the ordered set of x and y's such that x loves y
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Compositionality

- Natural language is compositional. As Frege observed,

> *It is astonishing what language accomplishes. With a few syllables it expresses a countless number of thoughts, and even for a thought to be grasped for the first time by a human it provides a clothing in which it can be recognized by another to whom it is entirely new. This would not be possible if we could not distinguish parts in the thought that correspond to parts of the sentence, so that the construction of the sentence can be taken to mirror the construction of the thought [...]*

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Compositionality (cont.)

> *[...] if we thus view thoughts as composed of simple sentence-parts, we can understand how a few sentence-parts can go to make up a great multitude of thoughts. The question now arises how the construction of the thought proceeds, and by what means the parts are put together so that the whole is something more than the isolated parts. (Frege, 1923, p.36)*

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Compositionality (cont.)

- In other words, natural languages adhere to the Principle of Compositionality (also referred to as Frege's Conjecture):

> The meaning of a complex expression, e.g. a sentence, is a function of the meaning of the expressions' constituents and the order in which these are combined.

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Compositionality (cont.)

- For example, the meaning of (1) is intuitively a function of its two constituents, namely the proper name 'Fido' and the verbal predicate 'bark'.

  (1) Fido barks.

- However, meaning is not determined solely by the meaning of the constituents. The order of combination of the constituents (technically, the *syntactic structure*) also matters. Witness, for example, the difference in meaning between (2) and (3).

  (2) Fido loves Snowy.
  (3) Snowy loves Fido.

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Compositionality (cont.)

- The principle of compositionality is not only intuitively plausible, it is likely required to explain Frege's observation that competent speakers of a language are capable of understanding a potential infinity of sentences while having only a finite vocabulary.
- For example, you have probably never heard or seen the sentence in (4), yet understanding the meaning of the words and the structure of the sentence suffices for you to understand its meaning.

(4) *While bipartisan victories tend to be those most celebrated outside of Washington, success by the president is now often measured more by the scope of the policy achieved than by any claim of sweeping consensus.* (NYTimes, Sept, 11, 2015)

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Recursion

- How can a *finite* set of words be used to produce a *potentially infinite* number of sentences? The answer is that natural language is recursive.
- Recursion is a special kind of repeatable process that occurs when something is defined in terms of itself or its own type.
- To illustrate, suppose a speaker *a* is familiar with the meaning of only the following expressions: 'Fido', 'Snowy', 'barks', and 'believes'. Using just these expressions, *a* could produce any of the following sentences.
    - Snowy believes (that) Fido barks.
    - Fido believes (that) Snowy believes (that) Fido barks.
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Recursion (cont.)

- Other examples of recursion include so-called *center embeddings*:
  - Sue kissed Jack who kissed Mary.
  - Sue kissed Jack who kissed Mary who kissed Frank.
  - Sue kissed Jack who kissed Mary who kissed Frank who kissed Lisa.

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- And *possessive definite descriptions*:
  - The father of Frank laughed.
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- And *possessive definite descriptions*:
  - The father of Frank laughed.
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A Simple Referential Theory

- So, according to the referential theory of meaning, the meaning of an expression (simple or complex) is simply its reference.
- But what would be the reference of a complete sentence?

Frege's answer: The reference of a sentence is a *truth value*.

- For example, as Frege would say, the reference of (5) is *the true* whereas the reference of (6) is *the false*.

(5) Fido is a dog.
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  - If two expressions co-refer, then according to the referential theory of meaning these expressions contribute the same thing to the reference of a complex expression, e.g. a sentence.
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— Now consider the sentences in (7) and (8) below.

(7) Jay-Z was born in Brooklyn.
(8) Shawn Carter was born in Brooklyn.

— Since 'Jay-Z' and 'Shawn Carter' name the same individual, the reference of (7) and (8) should remain unchanged. So, if the reference of a sentence is its truth value, substitution of co-referring terms should not change the truth value.

— But (7) is intuitively true only if (8) is true (and vice versa), so this seems to support Frege's suggestion.

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The Meaning of Sentences (cont.)

— Similarly,

(9) Vixens are omnivores.
(10) Female foxes are omnivores.

— Again, since 'vixen' and 'female fox' refer to the same group of animals, substituting one for the other should not change the reference, viz. the truth value. And, intuitively, it does not.

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- A couple of concerns:
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Truth Values vs. Truth Conditions (cont.)

- Given that the reference of a sentence *S* is a truth value, the following general principle holds:

  For any sentence *S*: $[\![S]\!] \in \{\text{true, false}\}$

- So, maybe what we should say is that to *understand* the meaning of a sentence, one only needs to understand under what conditions the sentence refers to *the true* or *the false*. That is, one only needs to understand the truth conditions of the sentence—*not* the truth value.

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- For example, to understand the meaning of (5) is to understand that it is true if and only if (iff) Fido is a dog.
- That is, to understand the meaning of (5) is to understand that the following biconditional holds:

  'Fido is a dog' is true iff Fido is a member of the set of dogs.

- In semi-formal notation:

  'Fido is a dog' is true iff $[\![\text{Fido}]\!] \in \{x \mid x \text{ is a dog}\}$

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- Similarly, while (5) and (12) have the same reference (viz. true), their truth conditions are different.

(5) Fido is a dog.
TRUTH CONDITION: 'Fido is a dog' is true iff $[\![\text{Fido}]\!] \in \{x \mid x \text{ is a dog}\}$.

(12) Garfield is a cat.
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Meaning as Truth Conditions

- In conclusion:

  The meaning of a sentence S is determined by the truth conditions of S.

- Notice that truth conditions here are *compositionally* determined.

  TRUTH CONDITION: 'Fido is a dog' is true iff $[\![\text{Fido}]\!] \in \{x \mid x \text{ is a dog}\}$.

- These truth conditions depend only on the reference (meaning) of 'Fido' and the reference (meaning) of the predicate 'is a dog'.

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Truth Conditions and Compositionality

- To simplify things, let's introduce a bit of formal notation.
- Instead of representing 'dog' as just the set of all dogs, let's treat it instead as a function that takes individuals as inputs and truth values as outputs. (NB! these two ways of thinking about the reference of 'dog' are equivalent.)
- We use the λ-notation below to indicate that an expression denotes a function.
  - $[\![\text{Fido}]\!]$ = Fido
  - $[\![\text{dog}]\!] = [\lambda x \,.\, x \text{ is a dog}]$ i.e. a function from individuals x to true iff x is a dog
- By applying the function to 'Fido', we get the following result:
  - $[\lambda x.\ x \text{ is a dog}](\text{Fido}) = 1$ iff Fido is a dog.

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Summing Up

- In short, the referential theory of meaning provides a simple analysis of meaning in terms of reference.
- While the reference of a sentence is its truth value, to understand the meaning of the sentence one must merely understand its truth conditions.
- Finally the referential theory of meaning delivers a way of computing the meaning (the truth conditions) of complete sentences from the meanings of its constituents (where these meanings are assumed to be exhausted by the reference). That is, it is compositional.

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Outline

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Sentence Meaning

- According to the referential theory of meaning, sentences are the fundamental bearers of linguistic meaning. However, there are reasons to think that sentences cannot fulfill all the relevant roles needed from a theory of linguistic meaning.
- We will now consider a range of arguments showing that we need more sophisticated objects than sentences to properly account for linguistic meaning.

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Different Sentences, Same Meaning

- Suppose that speakers *a*, *b*, and *c* are each entertaining a thought which in their native language is expressed by (13), (14), and (15) respectively.

(13) The grass is green.
(14) Græsset er grønt.
(15) Das grass is grün.

- Intuitively it seems clear that *a*, *b*, and *c* are entertaining the same thought.
- But if sentences are the objects of thought, then since these sentences are different, how do we explain that *a*, *b*, and *c* are thinking the same thing?
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Same Sentence, Different Meaning

- Suppose that *a* and *b* both utter the sentence in (16).

(16) I'm tired.

- Clearly *a* and *b* have said different things. In particular, *a* has said that *a* is tired, and *b* has said that *b* is tired.
- But if sentences are the fundamental bearers of meaning, then *a* and *b* should have said the same thing—and clearly they have not.
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Different Sentences, Same Truth Conditions

- Another problem. Consider the sentences below:

(17) Every renate is a product of evolution.
(18) Every cordate is a product of evolution.

- The predicates 'renate' (creature with a kidney) and 'cordate' (creature with a heart) are co-referential (also called co-extensional). That is:

$$\{x \mid x \text{ is a renate}\} = \{x \mid x \text{ is a cordate}\}$$

- Given this, if the meaning of the sentence is simply its truth conditions, (17) and (18) are predicted to have the same meaning. But this seems incorrect.

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Belief Reports

- This problem becomes even clearer if we consider belief reports, i.e. sentences that report beliefs.

(19) Bertrand believes that every renate is a product of evolution.
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- It seems obvious that (19) could be true while (20) is false. After all, Bertrand might not even know what a heart is.

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Something Other Than Sentences

- To solve these problems, we need something that can fulfill the following roles:
  - It is the fundamental bearer of truth values.
  - It is the object of mental states such as belief.
  - (and potentially various other roles...)
- Since sentences are incapable of this, the standard solution is to assume that the meaning of a sentence (also called its *content*) is an abstract object called a proposition.
- But this, of course, raises the question: What is a proposition?

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Outline

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Meaning Relativized to Possible Worlds

- In possible worlds semantics, it is assumed that the conception of meaning as mere reference (or mere extension) is too impoverished.
- So, instead of thinking of meaning as simply *actual* reference, meaning is explicated in terms of *potential* reference. Specifically, meaning is relativized to possible worlds, i.e. possible state of affairs.

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Extensions vs. Intensions

- For example, instead of treating a predicate such as 'is a dog' as simply the set of actual dogs, viz. the extension of the predicate, we instead analyze 'is a dog' as a function from a possible world w to the set of dogs in w—also called the intension of the predicate.

EXTENSION of 'dog': $[\![\text{dog}]\!]_{ext} = \{x \mid x \text{ is a dog}\}$

INTENSION of 'dog': $[\![\text{dog}]\!]_{int} = \lambda w\,.\,\{x \mid x \text{ is a dog in } w\}$

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Extensions vs. Intensions

- The general thought here is that while a certain set of individuals comprises the set of dogs at the actual world, things could have been otherwise. There *could* have been more or less dogs. So, there are *possible* worlds where the predicate 'is a dog' would apply to more or less individuals than at the actual world.
- This notion of an intension is richer than the notion of an extension, because even if two expressions are *co-extensional*, this does not entail that they are *co-intensional*, cf. the difference between 'renate' and 'cordate' below.

$$\{x \mid x \text{ is a renate}\} = \{x \mid x \text{ is a cordate}\}$$

- However, we can easily imagine a (counterfactual) possible world where some animal is a renate but not a cordate. Hence,

$$[\lambda w.\ \{x \mid x \text{ is a renate in } w\}] \neq [\lambda w.\ \{x \mid x \text{ is a cordate in } w\}]$$

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The Intensions of Sentences

- Analogously, in possible world semantics, sentences are also assumed to have both extensions and intensions.
- While the extension of a sentence is a truth value, the intension is a function from possible worlds to truth values.
- For example, the intension of (5) is the following:

$$\textsc{intension of } (5)\text{: } [\![\text{Fido is a dog}]\!]_{int} = [\lambda w.\ \text{Fido is a dog in } w]$$

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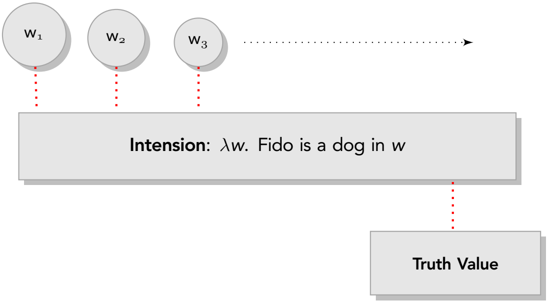
The Intensions of Sentences (diagram)

- In diagrammatic form, the derivation of a truth value from the intension of (5) looks as follows:



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Propositions and Possible Worlds

- A conceptually different (but formally equivalent) way of thinking of propositions is as *sets of possible worlds*.
- To illustrate, let's suppose logical space is exhausted by just three propositions (F), (S), and (G), viz.

  (F) Fido is a dog.
  (S) Snowy is a dog.
  (G) Garfield is a cat.

- We can now represent the space of all possibilities in the following way:

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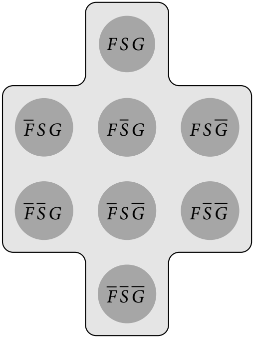

The space of all possible worlds

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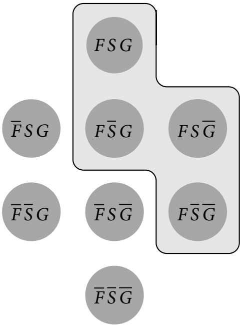
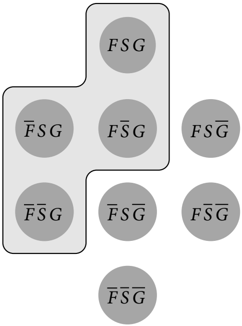
Propositions and Possible Worlds (cont.)



The set *F*-worlds



The set of *G*-worlds

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Propositions and Possible Worlds (cont.)

- One elegant feature of the sets of possible worlds view is that it illustrates nicely the relations between the meaning of the logical connectives (e.g. 'and' and 'not') and their set theoretic counterparts.
- For example,
  - Conjunction, viz. '$P \wedge Q$', is equivalent to the set theoretic operation of intersection (the set of elements that are in both P and Q).
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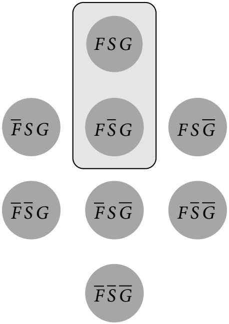
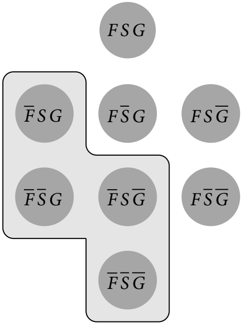


The set of $(F \wedge G)$-worlds



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Propositions and Possible Worlds (cont.)

- Another advantage of possible worlds semantics is that it provides an elegant way to model a number of complex things, for example common knowledge and belief change. Here is a toy example of how to model belief change.

    1. Suppose agent *a* has only one belief, namely that the proposition F is true.
    2. If so, *a*'s belief state can be modelled simply as the set of F-worlds (the set of worlds where F is true).
    3. Now, suppose *a* comes to believe that G is true.
    4. We can model this change to (or *update* of) *a*'s belief state as intersection, i.e. the operation of taking the set of worlds representing *a*'s belief worlds (the F-worlds) and intersecting this set with the set of G-worlds.

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Logical Omniscience

- There is one major drawback to explicating meaning in terms of possible worlds. This is referred to as the problem of logical omniscience.
- Consider the sentences in (21) and (22).

(21) Every bachelor is unmarried.
(22) Every vixen is a fox.

- The sentences in (21) and (22) are necessary truths. Some might even say that these are analytic—true simply in virtue of their meaning. In other words, it is not possible for (21) and (22) to be false.
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(23) Bertrand believes that every bachelor is unmarried.
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Clearly, it is possible for (23) to be true while (24) is false. But according to possible world semantics, (23) and (24) are intensionally equivalent and hence have the same meaning.

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Logical Omniscience (cont.)

- Ironically, possible worlds semantics is motivated by the observation that the referential theory of meaning (or the extensional theory) is insufficiently fine-grained. Specifically, according to the referential theory the sentences in (17) and (18) have the same meaning.

(17) Every renate is a product of evolution.
(18) Every cordate is a product of evolution.

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- The examples above seem to suggest that we need a notion of meaning that is even more fine-grained than possible worlds.
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Structured Propositions (cont.)

- According to this view, a proposition is a structured complex consisting of objects, functions, and relations.
- For example:

(25) a. Fido is a dog.
b. $\langle\langle o\rangle, D\rangle$

(26) a. Fido loves Snowy.
b. $\langle\langle o, o'\rangle, L\rangle$

- Here *o* is the actual object that 'Fido' refers to and *D* is the property of being a dog. Similarly,

(27) a. Fido is not a dog.
b. $\langle \textsc{neg}\langle\langle o\rangle, D\rangle\rangle$

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Structured Propositions (cont.)

- This view of propositions gets complicated quickly (especially when considering more complex sentences). But the primary take away message here is that if one adopts the view that propositions are structured entities, the problem of logical omniscience disappears. Consider again (21) and (22).

(21) Every bachelor is unmarried.
(22) Every vixen is a fox.

- These sentences are not predicted to mean the same thing since their propositional representations will be very different:
  - (21) is a structured complex that contains (among other things) the property of being unmarried
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Problems for the Structured View of Propositions

- The structured propositions view does, however, have its own set of problems. Consider the structures in (26a) and (26b).

(26) Fido is a dog.
a. $\langle\langle o\rangle, D\rangle$
b. $\langle\langle D\rangle, o\rangle$

- These structures are different, but both seem equally well-suited to represent (26). So, why think one better represents the proposition expressed by (26)?

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Problems for the Structured View of Propositions (cont.)

- Relatedly, being told that e.g. (26a) is the proposition expressed by (26) is not obviously explanatory. It seems a further question now needs to be addressed, namely what does (26a) mean? I.e. under what conditions is the thing in (26a) true?

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- A semantic theory is supposed to (compositionally) determine the meaning, i.e. the truth conditions. The truth conditions are assumed to represent the thing that we are "conceptualizing" which in turn explains our *understanding* of the sentence. But structured propositions do not seem to deliver this.

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Outline

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Context Sensitivity

- Consider the following sentences.

(27) a. *She* is *here now*. (indexicals)
b. Mary is *tall*. (gradable adjectives)
c. *Every bottle* is in the fridge. (quantifier phrases)

- The expressions in italics above are all context sensitive.
- What this means is that the *propositions expressed* by each of these sentences (and hence their truth conditions) depend crucially on the context in which the sentences are used and the intentions of the speaker.

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Ambiguity

- Consider the following sentences.

Lexical Ambiguity

(28) a. I saw a *bat*.
b. He is looking for a *match*.

Structural/Syntactic Ambiguity

(29) a. Visiting relatives can be boring.
b. The girl saw the boy with the binoculars.
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Ambiguity (cont.)

- Note that ambiguity is not the same as context-sensitivity. For example, in English there is, intuitively, just one word 'she'. It just so happens that this word can be used to refer to different individuals on different occasions of use.
- In contrast, it is not the case that there is just one word 'bat' and that this word can be used to refer to either certain flying animals or baseball bats. Rather, there are *two* words in English. These words just happen to be homonyms.

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Vagueness

- Consider the following sentences.

(30) a. Frank is *bald*
b. Usain Bolt is *fast*.

- Predicates such as 'bald' and 'fast' are vague A predicate is vague when the cutoff for inclusion in the predicate set is intuitively indeterminate.
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Vagueness

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Vagueness (cont.)

- It seems very reasonable to assume that if a person is bald, adding a single hair to their head is not going to make them not-bald.
- But once this is assumed, an absurd conclusion seems to follow. Consider the following argument:

(P1) Frank is bald (e.g. suppose Frank has only one hair on his head).
(P2) For any number n of hair, if x is bald and x has n hairs, then if x has n+1 hairs, x remains bald. (the reasonable principle stated above)

- From these assumptions, we can (through repeated applications of the premises) derive the following conclusion:

∴ Frank has 1.000.000 hairs and Frank is bald.

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Implicated Meanings and Presuppositions

- There are numerous other issues that an adequate theory of meaning would need to address.
- For example, it seems that competent speakers can use a sentence with one literal meaning to communicate something very different. For example, an utterance of (31) is not normally intended merely as a question about the addressee's physical capabilities.

(31) Can you pass the salt?

- Relatedly, some sentences seem to trigger so-called presuppositions. For example, a speaker who utters (32) must be interpreted as *presupposing* that Sue *used* to smoke.

(32) Sue stopped smoking.

- If Sue never smoked, it would be linguistically inappropriate to assert (32).

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to be continued...

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