Lecture 9.1

On Giving Compositional Semantics

wylie.b@new.ox.ac.uk

1. **English**
   - It is a *natural* language.
   - It has sentences that are lexically and structurally ambiguous:
     'I saw a man with binoculars'
     'I went to the bank'
     'I will go to the beach with John or Mary and Sue'
   - Its syntax is unclear. What is the syntactic structure of the following sentence?
     'Patch looks red'
     'John looks to be tired'
   - Whether or not it is compositional is a matter of debate.
   - If it is, its semantics is far from clear. How are the meanings of the previous sentences determined compositionally?

2. **Propositional Calculus**.
   - It is a *formal* language.
   - None of its sentences (formulae) are lexically or structurally ambiguous:
     '$[P \vee Q \wedge R]$'
     '$[P \wedge Q \rightarrow R]$'
   - It has a well-understood syntax.
   - It is compositional.
   - It has a well-understood semantics:
     '$[[P \wedge Q] \rightarrow R]$' is true iff either '$[P \wedge Q]$' is false or '$R$' is true; '$[P \wedge Q]$' is true iff '$P$' is true and '$Q$' is true.

3. **Predicate calculus**.
   - It too is a formal language, has no lexically or structurally ambiguous formulae, has a well-understood syntax, is compositional, and has a well-understood semantics.
   - Its syntax and semantics is more complex:
     '$\forall x[Px \vee Qx]$' is true iff it is satisfied by every sequence; '$\forall x[Px \vee Qx]$' is satisfied by the sequence (a, …) iff '$[Px \vee Qx]$' is satisfied by every sequence which differs from (a, …) in at most the first component; '$[Px \vee Qx]$' is satisfied by (b, …) iff 'Px' is satisfied by (b, …) or 'Qx' is satisfied by (b, …); 'Px' is satisfied by (b, …) iff b is in the set denoted by 'P'; 'Qx' is satisfied by (b, …) iff b is in the set denoted by 'Q'.

4. English language sentences are sometimes claimed to have certain 'logical forms':

   'All dogs have hair'
   '$\forall x[Dx \rightarrow Hx]$'
   'Some dogs have hair'
   $\rightarrow$
   'The dog has hair'
   $\rightarrow$

   Note:
   - We do not speak Predicate Calculus. The claim must be that the formulae are adequate translations of the sentence.
   - Are they translations that preserve meaning? Problem: they do not preserve syntactic structure. They are better translations of:
     'Everything if a dog has hair'

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- Are they translations that preserve truth conditions? Maybe.
- To give these translations is not to give a compositional semantics - it does not show the constituent structure of the sentence, nor the denotations of those constituents.
- They might be a step towards doing so.
- But not every quantified sentence in English is truth-conditionally equivalent to a formula of Predicate Calculus: ‘Most dogs have hair’.

5. **An example** of a compositional semantics for a fragment of English - the fragment that consists of all sentences of the form ‘*X Y*’, where ‘*X*’ is replaced by a singular definite NP, and ‘*Y*’ is replaced by a VP (such as ‘runs’). The theory is this:

- The denotation of each NP is an object. In particular, the denotation of ‘John’ is John, the denotation of ‘that man’ is that man, etc.
- The denotation of each VP is a set of objects. In particular, the denotation of ‘runs’ is the set of objects that run.
- If S is a sentence of the form ‘*X Y*’ then S is true iff the denotation of the NP that replaces ‘*X*’ is a member of the denotation of the VP that replaces ‘*Y*’.

According to this theory, ‘John runs’ is true iff the denotation of ‘John’ is a member of the denotation of ‘runs’; that is, iff John is a member of the set of objects that run; that is, iff John runs. So, according to this theory, ‘John runs’ is true iff John runs.

6. **Note**: the aim of a compositional semantics for a class of sentences is not to give the truth conditions of those sentences (we know what they are), but to show how their truth conditions are derived compositionally. The value of the first theory above, for example, is not that it tells us that ‘John runs’ is true iff John runs; it is that it derives these truth conditions from the constituent structure of ‘John runs’ and the denotation of those constituents.